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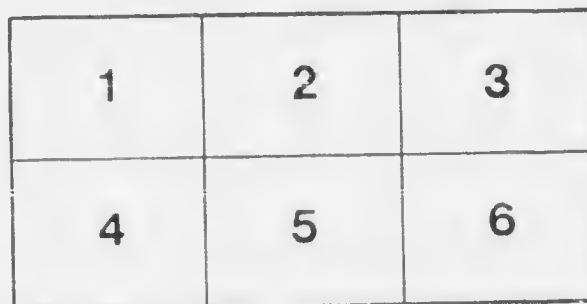
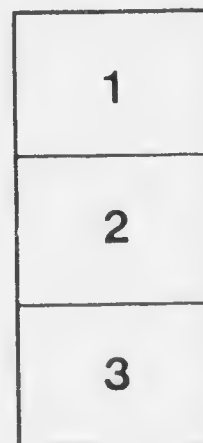
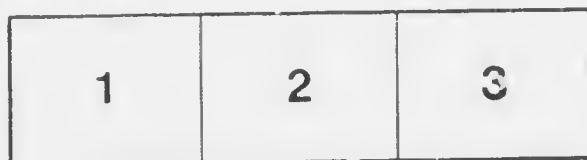
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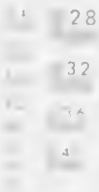
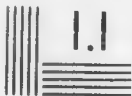
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AN INDEX OF PROGNOSIS  
AND  
END-RESULTS OF TREATMENT



AN  
INDEX OF PROGNOSIS  
AND END-RESULTS OF TREATMENT

BY  
VARIOUS WRITERS

Edited by

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SECOND EDITION, REVISED AND ENLARGED

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1918



## PREFACE TO SECOND EDITION

THE second edition has been extensively revised throughout, and contains a number of new articles. The account of *Tropical Disease* has been re-written by Sir Leonard Rogers. Other fresh material includes articles on *Tetanus*, *Gas Gangrene*, *Septic Peritonitis*, and *Gunsot Wounds*.

It is probable that a certain amount of recently published literature that might have been made use of for an even more thorough revision has not been included. For this and other shortcomings we must plead in extenuation that the editor and many of the contributors are serving overseas.

A. KENNETH SHOOK

W. B. E. Frawley





## PREFACE

This volume is issued as a companion to the *Index of Treatment* and *Index of Differential Diagnosis* brought out by the same publishers. Its principal aims are :

(1) To set forth the results, and particularly the end-results, of various methods of treatment, in such a form as will enable the practitioner to obtain a fair, unbiassed, reasoned opinion as to the prospects of securing for his patient permanent relief, and the risks of such treatment.

(2) To furnish data by means of which, apart from the question of treatment, one may seek to arrive at an accurate forecast of what will probably happen to the individual patient.

Although the art of prognosis is vitally important—and nearly every intelligent patient, or his friends, will ask for an opinion as to his prospects, and will judge of the capacity of the medical attendant by the accuracy of that opinion—it is extraordinary to find how little help is given by current text-books. Especially is it difficult to find reliable data as to the end-results of treatment, more particularly surgical treatment. Even large monographs on special diseases, though they usually advise certain measures, only express a pious opinion as to the probable results thereof, unsupported by any trustworthy figures.

The compilation of the present *Index* has, therefore, been extremely laborious, because a painstaking search through the wilderness of modern medical literature in several languages has often yielded very small results. The editor has found it necessary to supplement the published records by investigating the end-results of treatment at the Bristol Royal Infirmary—upwards of a thousand patients having been communicated with for this purpose; and other contributors have also taken great trouble to acquire, from their private or hospital practice, the necessary figures.

The only way to express end-results in such a manner as to give authoritative guidance is by quoting statistics. Thus alone can the practitioner, unless his personal experience is far wider than ordinary, verify or qualify the promises of an enthusiastic specialist.

Published end results have been calculated on various systems, and may be hopelessly unreliable. Sometimes, for instance, the cases are too few to warrant generalization. Very many figures are vitiated by too early reporting; patients with cancer, for example, having been followed up for a year or two only.

There are three principal classes of statistics: (1) Reports called from the literature; (2) The records of individual surgeons; and (3) Studies of hospital cases published by registrars or others. Pickings from the literature are often absolutely misleading, because successes and curiosities have been selected for publication, while failures are unmentioned. The records of individual surgeons are sometimes touched with *couleur de rose*. Hospital figures are the most reliable, but are usually less favourable than the results obtained in private practice, where patients are naturally better able to look after themselves.

Throughout this book, therefore, careful note is taken of the source of the information, and its relative value is taken into account in the summing up. We believe, moreover, it will be found that the figures are so presented that they do not unduly obtrude themselves, or confuse the plain and simple conclusions of the text which accompanies them.

Lastly, this volume is unique: nothing of similar character has appeared before or can compare with it. It therefore possesses a value entirely its own, and one which time will not diminish. Should it find sufficient favour with practitioners for further editions to be called for in the decades to come, the present compilation will yet maintain its position as a register of the progress of the healing art up to the time of its appearance—a date memorable in the world's history as that of the Great War.

It will be for the future to improve upon the end-results of treatment here recorded, which at the time of writing have attained "thus far, but no farther."

A. KENDLE SHORT,  
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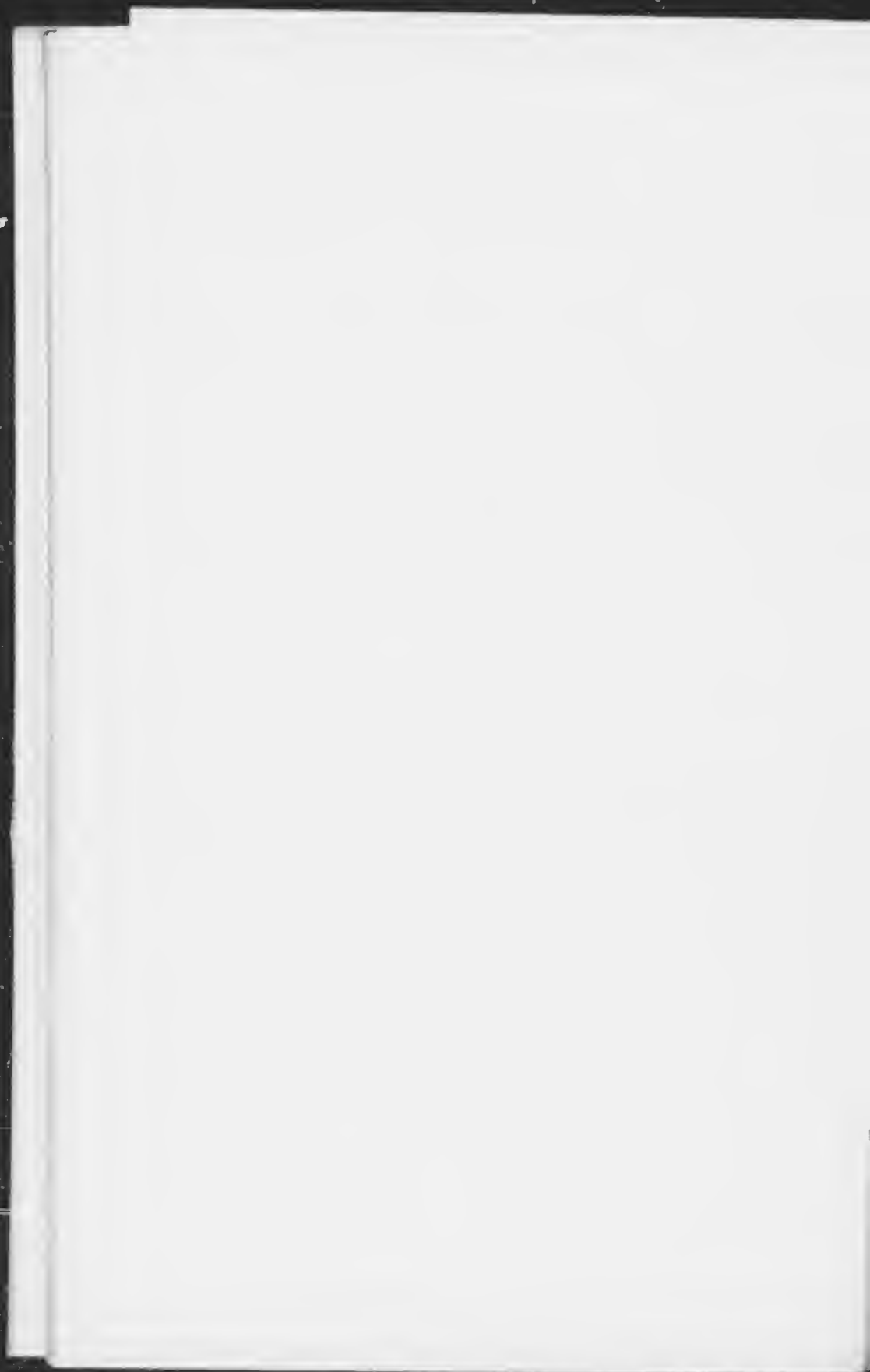
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# AN INDEX OF PROGNOSIS

## END-RESULTS OF TREATMENT.

### ABDOMEN, GUNSHOT WOUNDS OF.—(See GUNSHOT WOUNDS.)

**ABDOMINAL INJURIES.**—We have to consider the consequence of (1) Blows on the abdomen; (2) Punctured wounds. It will be necessary to set these forth according to the viscera which may be injured.

1. **Contusions.**—After a severe blow on the abdomen, the patient is usually seen within a few hours by a medical man, and the diagnosis and prognosis at first are often very difficult. Such injuries as a kick by a horse, buffer accidents, and cases where a vehicle has run over the abdomen, are always to be regarded as entailing very serious possibilities, because great force may have been localized upon a small area. It is extremely important to realize that the degree of shock when the patient is first seen is most misleading as a guide to diagnosis or prognosis. Thus, on the one hand, to take an extreme case, a powerful athlete may die outright as a result of a blow over the solar plexus, without any laceration of abdominal viscera whatever. An area the size of a half-crown is well known to pugilists as the 'mark,' where a hard punch will induce instantaneous shock. If the injured person does not die at once, however, he will almost certainly recover completely, provided that the contusion of the abdomen has not ruptured any important viscera or vessels.

On the other hand, the prevalent impression that after rupture of one of the important organs the patient's pulse will necessarily be quick and feeble, is misleading to the last degree, and many reputations have suffered because the doctor has seen a patient soon after the injury, and, trusting to the normal pulse and absence of shock, has sent him home with a good prognosis, whereas six hours later he was dying of internal hemorrhage. Most hospitals have tragic stories to tell of this calamity. Ruptured spleen is particularly apt to lie hidden in this way. In a series of 15 cases of rupture of various abdominal viscera studied by the writer, in only 4 was the pulse over 100 when first seen, and these four all died within twenty-four hours.

It ought to be well recognized that prognosis is absolutely impossible within a few hours of a severe injury of the abdomen, unless, of course, the patient is already obviously dying. Even if there are no symptoms whatever, he ought to be put to bed and carefully watched, the pulse



being counted every fifteen minutes for several hours. It is usually possible to recognize when he is warm in bed, and given hot applications for the abdomen, that the condition remains or becomes favourable if no viscera are torn. Morphia ought not to be given until the diagnosis is certain, as it masks symptoms.

On the other hand, if important organs are torn, the condition will get worse, or at any rate there will be no improvement. The pulse-rate often rises and its volume diminishes, the face becomes anxious, the patient, as we say, 'looks bad' and there is often rigidity of the abdominal wall. The temperature may be subnormal. Vomiting is fairly common, but not necessarily important; even slight hæmatemesis may be of no serious import. In a case under the writer's care, although twice vomiting blood, a boy recovered without further trouble. Evidence of free fluid in the abdomen, or the pallor and air-hunger of great hæmorrhage, are, of course, very grave signs. In ruptured spleen there may be fixed dullness in the left flank and shifting dullness in the right. Loss of liver dullness is of no importance.

Such signs as the above are usually to be detected after watching the patient for four or five hours, and may, of course, be evident much sooner. They urgently demand laparotomy. In our experience at the Bristol Royal Infirmary, mistakes in diagnosis in cases thus watched are very uncommon, though it is often impossible to tell what organ is damaged.

One possible result of a blow on the abdomen well deserves notice. The writer has seen two cases illustrating it. After a contusion of the right iliac fossa, acute appendicitis may come on rapidly. In the first case, following a blow by a football, there was pain, tenderness, and rigidity, but the patient looked well, the pulse was normal, and he walked up to the hospital. The local signs were attributed to the blow the day before, and the lad was told to rest at home. Two days later he was admitted with appendicitis and general peritonitis, and died. In the second case, the condition when first seen was exactly similar, but the temperature was taken, and found to be raised. This boy was operated on, and recovered well. The temperature is the clue to these very deceiving cases.

*Ruptured Intestine.*—We are greatly indebted to the careful study of Berry and Giuseppe on 132 cases, being the total number treated in ten London hospitals from 1893 to 1907. The writer has been able to trace 6 more treated at the Bristol Royal Infirmary (1900-1912).

#### TRAUMATIC RUPTURE OF INTESTINES.

	WITHOUT OPERATION			WITH OPERATION		
	Cases	Died	Recovered	Cases	Died	Recovered
London Hospitals	48	41	4 = 8%	84	67	17 = 20%
Bristol Royal Infirmary	1	1	0	5	1	4

Many of the patients, of course, were admitted moribund, or had fractured pelvis or spine. Apart from operation, death usually ensued within twenty-four hours; one patient lived ten days.

The best results were obtained by early operation, which means within twelve hours. All the Bristol successes were treated from four to six hours after injury; of the London cases, 13 out of 33 operated on within twelve hours recovered, but only 1 after the lapse of twenty-four hours.

As regards site of the injury, duodenal tears were almost invariably fatal.

It will be observed that, even apart from operation, 4 cases recovered in which abscesses or obstruction, developing subsequently, showed that rupture had occurred. One patient got well without operation who was thought too ill to have anything done!

After successful suture, the great majority of the cases seem to remain quite well. Of the Bristol cases, 3 were examined long afterwards, and had no trouble except a slight incisional hernia in 1 case; 2 of these were seen by the writer six and eight years after the operation. A few of the London cases returned for obstruction or abscesses.

*Ruptured Liver.*—Recent data concerning this injury are not easy to obtain. The writer has abstracted the records of 10 cases treated at the Bristol Royal Infirmary, of whom 6 were operated on and 2 recovered. One of the latter had a small tear, and was not diagnosed for two days. The other recovery was operated on after five hours.

Adding together the statistics during ten years in the Bristol series, and five years at St. Thomas's and the Middlesex Hospitals, one obtains a record of 18 cases operated on, of which 12 died and 6 recovered.

Tilton reports the figures from ten New York hospitals during 1895 to 1905, whereof 7 out of 12 died and 5 recovered.

*Ruptured Spleen.*—This injury is less common than the above. The dangerous tendency to produce no alarming symptoms for several hours has already been mentioned.

Laspeyres has found in the literature 58 cases of splenectomy for rupture, of which 39, or 67.2 per cent, recovered; but such records are likely to be far too favourable, as deaths are less written up than successes.

Putting together the figures for the Bristol Royal Infirmary and St. Thomas's and the Middlesex hospitals, one finds 15 cases with 9 deaths and 6 recoveries.

*Ruptured Pancreas.*—This appears to be a rare injury: two large London hospitals had no case in five years. At the Bristol Royal Infirmary there have been 2 recent cases; 1 died, the other recovered, and was well four years later. The fatal case furnishes an instance of a common sequel, namely, severe self-digestion of the tissues leading to subphrenic abscess. Mikulicz in 1903 collected from the literature 24 cases, of which 13 died without operation, and of the 11 operated on 7 were cured.

Pancreatic cyst has followed injury of this gland.

*Rupture of Kidney.*—Beall has given to us several tables of statistics collected from the literature and from hospital reports jointly, and therefore probably rather too favourable. Probably the same cases are included in several of the lists. The most useful figures are those of Dell et al and Watson, which are as follows. It will be observed that of cases not operated on about two-thirds recover, of those submitted to nephrectomy about three-quarters, and all but about 5 per cent of those explored but found not to need removal of the kidney.

	DELL ET AL.			WATSON			MILLER TOMI		
	Cases	Survived	Died	Cases	Exp. Recovered	Exp. Died	Cases	Exp. Recovered	Exp. Died
Dell et al.	225	105	45	50	2	1	44	11	25
Watson	273	81	30	99	7	7	115	25	22

When the only evidence is a transient hæmaturia, the patients make a perfect and complete recovery.

When there is in addition a swelling in the loin, but no tear of the ureter and no early shock or hæmorrhage, the outlook is good. Three cases, seen by the writer many years afterwards, had continued quite well.

Marked signs of shock make a bad prognosis, whether the effusion of blood is into the loin or into the peritoneum. Two such cases at the Bristol Royal Infirmary treated by nephrectomy both died. Laceration of the renal pelvis or ureter leads to leakage of urine or hydro-nephrosis, which may suppurate, when the outlook becomes very grave. The outlook in children is serious; according to Maas, 85 per cent die.

*Rupture of Bladder.*—This is not very common. Two large London hospitals had no cases in five years. Of 6 cases at the Bristol Royal Infirmary, only 1 recovered, but usually the operation was undertaken too late to give the patient a chance. There can be no doubt that if there are not severe injuries besides, and no cystitis is present, early diagnosis would save a larger proportion. One man fell into a ditch whilst intoxicated, and ruptured his bladder into the peritoneum. He was treated by a doctor in the country for a week; sometimes he passed water himself, and sometimes a catheter was used. He was up and about most of the time. On admission, the abdomen was greatly distended; at the operation, 13 pints of urinous fluid were evacuated, and twelve sutures were necessary to sew up the rent in the bladder. He died, but could no doubt have been saved by earlier operation.

Collections of isolated cases from the literature, such as Quick's and Ashhurst's, are quite unreliable in estimating the true mortality, because fatal cases so often fail to get into print. The latter reports 22 cures out of 29 cases operated on by various writers since 1893.

**2. Perforating Wounds.**—It is not possible to say much about the

prognosis of stab wounds of abdominal viscera, because so much depends upon the circumstances and upon early operation. Given prompt diagnosis and treatment, the majority of the cases ought to recover, just as a perforated gastric ulcer usually does; but a few hours' delay, at any rate beyond twelve hours, will seriously jeopardize the patient's chances. When the signs of widespread peritonitis are present the outlook is very grave, but by no means hopeless.

Statistics are not easy to obtain. Tilton reports that of 43 cases of stab or shot wound of the liver from ten New York hospitals, 4 died and 9 recovered. The prognosis is, of course, much better than that of contusion.

REFERENCES.—Rendle Short, *Lancet*, 1911, ii, 818; Berry and Giuseppe, *Proc. Roy. Soc. Med. (Surg. Sect.)*, 1909, iii, 1; Tilton, "Ruptured Liver," *Ann. Surg.*, 1905, 20; Laspeyres, *Centr. Grenz.*, 1904, vii, 152; Quick, "Ruptured Bladder," *Ann. Surg.*, 1907, xlv, 94; Beall, *Med. Rec.*, 1913, lxxxiii, 64.

A. Rendle Short.

**ABCESS, SUBPHRENIC.**—(See SUBPHRENIC ABCESS.)

**ACCESSORY SINUSITIS OF THE NOSE.**—(See NASAL ACCESSORY SINUSITIS.)

**ACIDOSIS.**—The prognosis of acidosis depends more on its cause than on its intensity, though, *ceteris paribus*, the degree of the latter is a most important item. The most common conditions in which it occurs are diabetes mellitus, starvation, sudden withdrawal of carbohydrate food, after some anaesthetics, during febrile diseases, in the toxic vomiting of pregnancy, the cyclic vomiting of children, and in phosphorus poisoning. Although many factors, including the administration of mineral acids, may lead to diminished alkalinity of the juices of the body, and so produce a state of acidosis, here we are not referring to such conditions, but to an acid intoxication set up by the presence of  $\beta$ -oxybutyric acid, diacetic acid, and acetone. To this form of poisoning children are more susceptible than women, and the prognosis is worse in children than in women. Similarly the outlook is worse in women than in men. These substances not only exert a direct toxic effect on the tissues of the body, but also act detrimentally on account of their acid properties. In severe cases they are excreted in very large quantities, and this represents a large quantity of unused fuel, entailing a considerable loss of energy to the body. For purposes of prognosis it is necessary not only to determine the presence of acidosis, but also, so far as is possible, the degree of acid intoxication. By the usual tests the presence of these substances will be proved in the urine. Probably also the odour of acetone in the breath will be obvious.

T. Stuart Hart, in the *Quarterly Journal of Medicine*, has given the following method for estimating the acidosis index. The first demonstrates the presence of acetone by the usual test (Lange's). Secondly he employs the ferric chloride method (Gerhardt's test) to show the

presence of diacetic acid. He uses the following solutions for the determination of the acidosis index:—

*a.* The 'standard solution,' consisting of ethyl aceto-acetate 1 c.c., alcohol 25 c.c., and distilled water to 1000 c.c.

*b.* Ferric chloride solution, consisting of 100 grams of ferric chloride dissolved in 100 c.c. of distilled water.

An equal quantity (10 c.c.) of (*a*) and of the urine to be tested is put into two test-tubes separately. To each of these 1 c.c. of (*b*) is added. After waiting a few minutes, the intensity of the colour of the two is compared. If the solution in the (*a*) test-tube is lighter than the urinary solution, add known quantities of distilled water to the latter till the shade of the two is the same. From the figures so obtained the 'acidosis index per litre' is arrived at.

Thus:	Acidosis index per litre
Lange's test positive and Gerhard's test negative	0.5
Lange's test positive and Gerhard's test positive	
Volume of urine solution 10 c.c.	1
" " " 20 "	2
" " " 100 "	10
and so on in proportion.	

To obtain the 'acidosis index,' the 'acidosis index per litre' is multiplied by the amount of urine in litres passed in twenty-four hours.

This method gives an 'acidosis index' which can be translated in terms of 3-oxylbutyric acid. Thus an acidosis index of 10 is equivalent to the daily excretion of 10 gram. of 3-oxylbutyric acid.

Another helpful test is the reaction of the patient's urine to alkali given by the mouth. e.g., a patient who requires more than 1 oz. a day of sodium bicarbonate to make his urine alkaline is suffering from acidosis of very considerable severity. In a healthy individual 2 dr. of sodium bicarbonate will keep the urine alkaline for twenty-four hours. If, however, an excess of acid is being formed in the body, the *secla* will unite with the acid radicals, and be excreted in the form of neutral salts, and thus fail to make the urine alkaline. The amount of sodium bicarbonate required to be given to induce alkalinity helps materially therefore in forming a prognosis.

The reduction in the alkalinity of the blood will also give valuable indications, for if this is reduced, it is almost certain that the rest of the tissues have suffered to a greater degree. The method more frequently used at the bedside is the determination of the percentage of nitrogen excreted in the form of ammonia, and the comparison of this percentage with the percentage of nitrogen excreted in the form of urea. The ammonia nitrogen in health is at most about 5 per cent of the urinary nitrogen, but in conditions of acidosis it not infrequently rises to 18 to 20 per cent, and readings as high as 40, 50, or even 60 per cent have been recorded.

The nitrogen is apparently excreted in the form of ammonium

salts, instead of being built up in the body into urea, in order to neutralize the condition of acidosis in the tissues and to save the mineral bases of the body.

It must not, however, be assumed that acid intoxication exists because the percentage of ammonia nitrogen excreted in the urine is very greatly increased. For this proportion may be raised, not because there is any absolute increase in the amount of ammonia nitrogen, but because there is an absolute decrease in the amount of urea excreted. This not infrequently happens in conditions of protein or total starvation. It has been found that when the urea excretion falls below 7 to 8 gram. in the twenty-four hours, the relative percentage of ammonia nitrogen increases, and that this may occur apart from the presence of organic acids. An absolute as well as a relative increase in the output of ammonia nitrogen must be looked for, if this is to be used as a basis of prognosis. As much as 12 gram. of ammonia nitrogen have been observed to have been excreted in twenty-four hours, being 49 per cent. of the total nitrogen excreted.

The total quantity of ammonia excreted forms an indication of the degree of acid intoxication, but not necessarily of the amount of organic acid being simultaneously excreted. For the estimation of this, the test of Hart, mentioned above, forms a very useful guide.

It is of the greatest value to make constant observations on the percentage of the ammonia-nitrogen excretion in any given case, to ascertain the presence of increasing danger; but the figures so obtained are of little value in comparing one patient with another, for a man may be in fairly good health who is excreting a much greater amount of ammonia nitrogen than one who is in diabetic coma. There appears to be little doubt that acid intoxication is responsible for the coma and other toxic symptoms in diabetes, and kills the patient; but the excretion of acetone bodies may go on for many months without acid intoxication supervening.

In starvation, the condition is different. Because, in spite of the fact that the patient suffers from acidosis, he can still assimilate and use carbohydrates if he can get them, and as he still possesses the power of utilizing cleavage carbohydrate derived from his own tissues, he probably dies rather from actual deprivation of food than from acid intoxication, a point which makes the outlook, as far as treatment is concerned, much more hopeful than in the corresponding state of diabetes.

In post-anæsthetic poisoning, it must be remembered that the patients have generally been starved, and that in starvation the total excretion of ammonia is to be estimated, not merely the percentage of the ammonia nitrogen, as this may appear unduly high, owing to the small amount of urea excreted. The prognosis is much improved if treatment with sodium bicarbonate and glucose is used before the administration of the anæsthetic. Glucose seems to be more effective than the alkali in preventing post-anæsthetic vomiting.

When acids are present and diacetic acid excreted, it is said to be a favourable sign if the output of diacetic acid increases after the administration of sodium bicarbonate. This is explained on the assumption that the base unites with the acid and enables the acid to be excreted in larger amount.

*J. R. Charles.*

**ACROMEGALY.**—We now believe that this disease is caused by an excess of secretion of the anterior lobe of the pituitary gland, and in many cases it is found that the sella turcica shows enlargement in the sphenoid, and at the apex the gland is usually much increased in size. If the symptoms of hyperpituitarism come on before the epiphyses of the long bones have united, gigantism results. We have to consider first, the natural prognosis, and then the effect of operation. In the great majority of cases there is no immediate danger to life, and the patient may not even be reduced to invalidism. The profession is much indebted to Dr. Mark for the graphic description he has given us of his own case. The principal troubles are likely to be neuralgic pains, protrusion of the lower jaw interfering with eating, and limitation of the field of vision by pressure on the optic chiasma. In other cases, symptoms of hypopituitarism follow, possibly due to deficiency of the posterior lobe, leading to impotence in the male and amenorrhoea and sterility in the female. The subjects of gigantism are generally feeble, and seldom live to a great age.

There are cases, however, in which the outlook becomes unfavourable owing to further increase in the size of the gland leading to intracranial pressure. This is much commoner in the converse condition of hypopituitarism (Frohliel's type) characterized by adiposity and atrophy of the genitals: these patients are often suffering from a sarcomatous or cystic growth. When, therefore, in cases either of acromegaly, gigantism, or Frohliel's type, the patient complains of continuous severe headache, vomiting, and progressive blindness, which are found to be associated with slow pulse and optic neuritis or atrophy, it is probable that death is not far off. The cases of hypopituitarism are more numerous than those of acromegaly.

**Prognosis of Operation.** The operation mortality is not so high as one might suppose from the inaccessible situation of the gland. Von Eiselsberg reports 16 cases with 4 deaths (from acute meningitis). Cushing, avoids opening the nasal sinuses so as to reduce the risk of sepsis, and has only lost 10 per cent out of 61 operations: several of the patients were already desperately ill. The purpose of the operation was to relieve pressure by decompression, the base of the pituitary fossa being removed; in other cases, part of the gland was excised, or a cyst evacuated. If the signs of intracranial pressure are marked and generalized, a subtemporal decompression gives more relief.

With reference to the cycular results, von Eiselsberg claims that all his recovered cases were greatly relieved of their headache and morbidness: he followed some of them as long as four years afterwards.

Cushing records improvement in half of his cases. Both observers remark that the bony enlargements of acromegaly may show reduction.

Glandular feeding does no good in acromegaly and gigantism. In cases of the Frohlich type, feeding or injection is occasionally followed by remarkable benefit.

REFERENCES: Cushing, *Pituitary Body and its Disorders*; von Eiselsberg, *Arch. f. Klin. Chir.*, 1912, Dec. 8. A. Rendle Short.

**ACTINOMYCOSIS.**—It is probable that under this clinical term various forms of streptothricosis are also included, but it is not clear that there is any marked difference in behaviour.

The prognosis depends principally upon two factors: the location of the disease, and the degree of septic infection which has supervened. To some extent also the nature of the treatment controls the end-result.

**Actinomycosis of the Appendix and Cæcum.** This forms a fairly well-defined clinical group, of which the writer has seen 6 cases, and reported 2 more, in the wards of the Bristol Royal Infirmary. Up to 1907 there were about 150 cases in the literature, of which 27 were British, but it is certain that the real frequency is much greater. In about 60 per cent of cases of abdominal actinomycosis this region is affected. The outlook is very grave. Grill reported 77 cases, whereof 22 were said to be cured, 10 relieved, and 45 died; but it is probable that this estimate is too favourable, in that the cases were not followed long enough. Patients of Gangolphe, Waring, and Blaseko, and 2 seen by the writer, were apparently cured or relieved for months or years, but the disease returned, in one of the writer's cases after eight years, and death resulted. There are, however, a few authentic cures. The eight Bristol cases all died.

The course of the illness is miserably chronic in the majority of cases, though some have died in a few weeks or months. Beginning like an ordinary appendicitis, or occasionally with attacks of diarrhoea, a huge resistant mass gradually forms in the right iliac fossa, and abscesses open and burst through the skin. The pain is not great. By degrees the fungus spreads over the whole abdomen, metastases appear in or about the liver, and usually death from septic absorption follows in about nine to twelve months. By this time abscesses may have opened into the bowel, bladder, or other organs, producing fecal or urinary fistulae.

**Abdominal Actinomycosis in other Localities.**—Next to the right iliac fossa, the ray-fungus most commonly affects the liver, and may come through the chest wall, as in a case seen by the writer. Almost any other organ in the abdomen may be affected, but rather uncommonly.

The prognosis is unfavourable, but not hopeless. Jiron (quoted by Kohn) gives the death-rate in abdominal actinomycosis as 74 per cent, which is probably too flattering, as figures taken haphazard from the literature are apt to be.



**Actinomycosis of the Face, Jaw, and Tongue.** This is a common location, and a relatively favourable one if the diagnosis is made reasonably early. Huge swelling, with much induration but little pus, fixed to the jaw (usually the lower), but extending widely into the cheek or tongue, with a tendency to form sinuses, characterizes the disease. Given efficient treatment, however, it can usually be controlled, though it will be months before the patient is well again.

Jiron quotes the mortality in this situation as 11 per cent; here again the figure is probably too favourable.

**Pulmonary Actinomycosis.** The fungus may attack the lungs, or appear in the chest wall, forming a spongy abscess. In either case the outlook is very grave. Hodcupyl collected 34 cases, of which 32 died. The duration of life is about six to twelve months.

Jiron reports that cases from the literature show a mortality of 83 per cent in thoracic cases.

**Actinomycosis of the Brain.** This is rare, and appears to be rapidly fatal.

**Actinomycosis of the Skin.** This is a favourable location, and though it may be very chronic, the considerable majority of the cases, if treated, are eventually cured.

*The Effect of Treatment.*—The outlook is most favourable, of course, in situations where a radical removal can be undertaken, but actinomycosis of the appendix has several times recurred in the stump.

Potassium iodide in large doses (240 gr. a day for months at a time) probably exerts a real curative effect, and the United States Commission reported that it cured 63 per cent of cases in cattle. Copper salts, which are very poisonous to algae and moulds, are recommended both locally and by mouth, but statistics are not available. The best results are obtained by a combination of these methods with surgery.

REFERENCES. *Keen's Surgery*, vol. 1, article "Actinomycosis"; Jiron (reference not found; incorrectly given by Keen); A. Rendle Short, *Lancet*, 1907, ii, 760.

A. Rendle Short.

#### ACUTE YELLOW ATROPHY OF THE LIVER. (*See* LIVER.)

**ADDISON'S DISEASE.** In gauging the influence of treatment in Addison's disease, it must be borne in mind that periods of improvement occur spontaneously, and may be erroneously explained as due to therapeutic measures. In this connection the generally admitted difficulty in forecasting a successful response to treatment in a given case is significant. Further, as in other grave organic diseases, the mitigation of treatment is often followed by transient improvement, due more to auto-suggestion than to any specific action of the drug.

**General Treatment.** The avoidance of fatigue and worry is always essential, and in advanced stages absolute rest in bed is most important, to prevent sudden fatal syncope. A patient whom I saw with charac-

teristic symptoms survived for ten years, but was in bed for the last eight years. Although open-air treatment has done good, and is reasonable on the ground that most of the cases show tuberculosis of the adrenals, protection from cold and exposure must be insured. Healthy and cheerful surroundings, with sun and warmth, by improving the general health and resistance, have an obvious bearing on the prognosis. In a few instances, of which Gaucher and Gougerot<sup>1</sup> have collected six examples, syphilis appears to be the causal factor, and in these circumstances it is reasonable to hope that improvement will follow careful antisyphilitic medication, but these patients bear mercury badly, and the administration of salvarsan preparations would be an anxious proceeding.

**Organotherapy** in this disease is very disappointing as compared with the results in myxoedema. A small proportion of cases are permanently benefited or cured, marked improvement occurs in some instances, and that there is some relation between the two is borne out by the onset of relapses when the treatment is stopped, and by improvement when it is resumed; on the other hand, relapses and even death may occur during treatment. In nearly half the reported cases, treatment does not exert any influence, and in a few instances alarming symptoms appear to be due to the administration of suprarenal products. That arterial lesions comparable to those produced experimentally may be caused in Addison's disease by adrenal medication is unlikely, though Loeper and Crozon<sup>2</sup> report a case bearing this interpretation. Adams's<sup>3</sup> critical analysis of 112 collected cases of Addison's disease treated by suprarenal medication shows that in 6, or 5.35 per cent, permanent benefit or cure resulted; in 33, or 29.5 per cent, marked improvement followed; in 49, or 43.75 per cent, no effect was noted; and in 7, or 6.25 per cent, alarming symptoms were due to the treatment.

**Tuberculin Treatment.** Although cases thus treated may undoubtedly improve or appear to be almost cured, as in Munro's<sup>4</sup> patient whom I saw, it must be remembered that even small doses of tuberculin may cause alarming symptoms, and probably for this reason the number of reported cases is very small. The prognosis in cases thus treated is complicated by the difficulty of determining that a given case is due to adrenal tuberculosis. Cases of tuberculous disease of the adrenals may fail to show any improvement after tuberculin.

**Operative Treatment** would appear to be entirely contra-indicated by the high grade of asthenia characteristic of the fully-developed disease, and has only been attempted in isolated cases. A tuberculous adrenal which formed a palpable tumour was removed from a woman with the constitutional signs but without the pigmentation of the disease, and recovery followed (Oestreich).<sup>5</sup> Transplantation of an animal's adrenal into the testis of a patient with Addison's disease was carried out by Busch and Wright,<sup>6</sup> who reported some improvement, but death occurred two and a half weeks after the operation.

**Prognosis in Individual Cases.** Addison's disease, when so well established that it can be confidently diagnosed, appears to be almost always fatal sooner or later; but it is well known that very considerable lesions of the suprarenals may be entirely latent until, as the result of some acute infection or intoxication falling on the adrenals, acute inadequacy occurs and leads to a fatal termination. Sergent<sup>7</sup> insists with some reason that such cases should not be included in Addison's disease, but he entitled 'acute adrenal inadequacy.' Further, some degree of suprarenal inadequacy or 'Addisonism,' especially in chronic pulmonary tuberculosis, in which the symptoms suggest but fall short of those in Addison's disease, may be a temporary condition (Bourde). The diagnosis in the early stages is difficult, and the possibility of error must be frankly admitted, for cases diagnosed by thoroughly competent physicians may recover and remain perfectly well. Thus, I know a distinguished physician who was diagnosed as a case of Addison's disease by Greenhow, a well-known authority on the disease, more than thirty years ago, and who was a great athlete and is now a grandfather in perfect health. Out of 293 cases collected by Lewin<sup>8</sup> in 1892, cure was stated to have occurred in ten. It is therefore probable that arrest may occur after initial symptoms of slight intensity have been noticed.

The average duration of symptoms in Wilks's cases was eighteen months, but some of these cases ran a very acute course. On the other hand, survival for ten or even more years after the onset of symptoms has been recorded. The most acute cases are those in which the suprarenals are already damaged, usually by tuberculous infiltration, but in which symptoms are absent until, as the result of some acute infection or toxæmia, the available chromaffin substance is paralyzed, so that symptoms burst out in a fulminating manner, leading to death in a few days or weeks. As already pointed out, these cases are not, strictly speaking, examples of Addison's syndrome. Between the very chronic and the fulminating cases there are intermediate groups which contain most of the cases. Cases of simple atrophy of the adrenals appear to run a more rapid course than the more usual cases in which the glands are invaded by tuberculosis. Possibly this is because there is atrophy of the whole chromaffin system, which thus prevents any compensatory hypertrophy.

Pigmentation, which usually suggests the diagnosis, is much less important than asthma as a guide to the course of the disease; in fact, the most acute cases are commonly free from bronzing. In children, the disease is both rarer and runs a more rapid course than in adults; it is said that two-thirds of the cases in children last less than a year (Castaigne and Simon<sup>13</sup>). The outlook is obviously worse in cases which steadily progress downhill than in those which have periods of remission.

*Disseminating Signs.* Great asthenia and collapse, excessively subnormal temperature, yawning, low arterial blood-pressure (e.g., a systolic blood pressure of 65 mm. Hg), and disappearance of the radial pulse,

to imminent dissolution. I have twice found the radial pulse absent, and in both instances death followed within thirty-six hours. Severe vomiting and diarrhoea, and acute abdominal crises which may indicate appendicitis, are also grave signs. The onset of acute infections, such as influenza or pneumonia, makes the outlook almost hopeless. A high differential count of lymphocytes has been regarded as an unfavourable sign; this is probably because it points to the co-existence of the status lymphaticus which favours sudden syncope or death.

REFERENCES.—<sup>1</sup>Gancher et Gougerot, *Ann. des mal. ven.*, Paris, 1911, xvi, 121; <sup>2</sup>Leeper et Cronzon, *Bull. S. anat.*, Paris, 1903, s. 6, v, 918; <sup>3</sup>Adams, *Proc. Amer.*, 1903, lxxi, 472; <sup>4</sup>Muro, *Brit. Med. Jour.*, 1912, i, 665; <sup>5</sup>Oest, *Zeit. f. Klin. Med.*, Berlin, 1897, xxxi, 123; <sup>6</sup>Busch and Wright, *Arch. Int. Med.*, Chicago, 1910, v, 30; <sup>7</sup>Sergent, E., *Etudes cliniques sur l'Insuffisance Surrenale*, 1898, 14 Paris; <sup>8</sup>Boinet, *Rev. de med.*, Paris, 1897, xvii, 136; <sup>9</sup>Lewin, *Charit. Ann.*, Berlin, 1892, xvii, 336; <sup>10</sup>Wilks, S., *System of Medicine* (Weybalds), 1879, v, 359; <sup>11</sup>Castaigne et Simon, *La pratique des maladies des reins*, 1910, iii, 307.

H. D. Rolleston.

**ALBUMINURIA.** (*See also* NEPHRITIS). The question of prognosis when albuminuria is present must, in the first place, depend entirely on accurate diagnosis. Albuminuria may result from contamination of the urine by an albuminous liquid, such as blood, pus, or spermatic fluid. Such albuminuria is spoken of as spurious, false, or accidental albuminuria, and should be sharply differentiated from true albuminuria, where the albumin enters the urine from the glomeruli or numerous tubules. The differentiation between spurious and true albuminuria does not, as a rule, present any great difficulties, for a contaminating fluid usually contains a very large number of cell elements, which form a sediment on standing, leaving a clear supernatant fluid which contains but a small proportion of albumin. Again, microscopic examination of the sediment will aid differentiation; and tissue elements may be present which do not belong to the urine. The occurrence of true pus cells in large numbers points to an inflammatory affection of the urinary passages; for though polymorphonuclear leucocytes are found in the sediment of a nephritic urine, they are never present in large numbers. When a diffused nephritis occurs in combination with an inflammatory affection of the urinary passages, the supernatant urine will contain a large proportion of albumin. When false albuminuria is present in association with a chronic interstitial nephritis, the proportion of albumin in the supernatant fluid may be small, and diagnosis may present difficulties; consideration of the total quantity of urine, and the condition of the cardiovascular system, together with estimation of the blood-pressure, will always give valuable data for guidance in diagnosis.

**Physiological Albuminuria.**—There can be no doubt that, if the tests used be sufficiently sensitive and delicate, albumin can be demonstrated in a large number of normal urines; and it is now 'old

that, though albumin cannot be demonstrated in every healthy urine, yet, under physiological conditions—conditions quite within the limits of health—it may appear in such quantity as to be easily demonstrable by ordinary tests. This form of albuminuria occurs in healthy individuals before middle life, at intervals, and *only in response to some definite stimulus or strain*, such as a heavy meal, unusual exertion, cold bathing, mental excitement, etc. If the urine be examined with the centrifuge, a few hyaline casts and cylindroids will be found, but no epithelial or granular casts. The albuminuria in such cases has no definite pathological significance, and the prognosis is good. Take, for instance, the athlete at the commencement of training: exertion may produce albuminuria, but as training proceeds, similar exertion may no longer produce it.

**Cyclical Albuminuria** is distinguished from the physiological variety by the fact that no special exciting factor is required for its production, and the condition cannot truly be considered physiological. It occurs in young persons, who are frequently of poor nutrition and with a somewhat defective, atonic digestion. The urine shows a fairly high specific gravity, easily deposits urates, and contains albumin. The latter follows a recognized cycle: on rising, the urine is free from albumin; but it appears during the morning hours; it reaches a maximum in the early afternoon; and it diminishes in the evening. The centrifuged deposit may show a few hyaline, but never epithelial casts. Cardiovascular changes are entirely absent, and the blood pressure is not above the normal. In these cases the prognosis is favourable. The patients are somewhat weakly individuals, whose digestion requires care and attention, but they do not ultimately develop nephritis. Under care they may, and do, enjoy good health; though the albuminuria may persist for years, it ultimately disappears, and the expectation of life seems unaffected by the condition.

**Febrile Albuminuria.**—During an acute infectious disease, it is common to get a small quantity of albumin in a urine which, otherwise, does not give the characters of a nephritic urine. It is possible that, in such cases, circulatory disturbances may come into play; but the main causal factor is cloudy swelling resulting from infection and intoxication. Strictly speaking, such an albuminuria must be regarded as the first stage of an infectious nephritis, which may or may not develop into a definite nephritis. The presence of the albuminuria shows that the fever has had a marked effect on the organism. The general condition of the patient is often serious: the temperature is high, the pulse frequent, and dyspnoea and collapse may supervene. Most of these symptoms are, however, dependent upon the general disease, and not upon the renal disturbance. Prognosis will, therefore, be governed by the general condition. The albuminuria is merely an expression of the profound nature of the general disturbance, which has given rise to cloudy swelling of the tubular epithelium. In the large majority of cases, febrile albuminuria does not develop

into definite nephritis, but disappears with improvement in the general condition.

**Albuminuria of Non-febrile General Disease** is found, especially, in diseased conditions involving the blood, such as anemia, leukæmia, scorbutus, and jaundice. The albuminuria, in such conditions, is largely to be accounted for by the blood condition and the circulatory disturbances which so often accompany the primary disease. It is true that, in a certain number of cases, epithelial changes have been found in the kidneys; but these are by no means constant. As a rule, prognosis will be guided by the general condition of the patient. The albuminuria is an expression of profound disturbance, and will, therefore, be a factor to be taken into consideration in guiding prognosis.

Albuminuria occurring in the course of diabetes mellitus seems to stand in a different category. It has been ascribed to the excessive ingestion of eggs; but, in the majority of cases, it is the expression of an insidious nephritis of the interstitial variety, and the patients, for the most part past middle life, show cardiovascular changes. The question of prognosis is a mixed one; for when interstitial nephritis develops in the course of diabetes, amelioration may take place in the diabetic symptoms and glycosuria may disappear. The prognosis then becomes that of chronic interstitial nephritis complicated with hyperglycæmia; that is to say, it is always grave.

**Albuminuria due to Circulatory Disturbances** is common in cases of cardiac disease with loss of compensation and passive congestion of the kidneys. In these cases, imperfect circulation leads to deficient oxidation and secondary changes in the renal epithelium. An additional causal factor will be found in increased pressure in the renal veins. The quantity of albumin present is usually small, and examination of the centrifuged deposit will exclude nephritis. Prognosis will depend upon the influence of therapeutic measures in improving the circulatory condition; with improved general circulation, kidney function is re-established, and a diuresis follows, with disappearance of the albuminuria.

**Proteinuria.**—Bence-Jones's proteinuria, in the majority of cases, occurs in instances of multiple myelomata; though it has been found associated with other pathological conditions, such as leukæmia, chloroma, lymphosarcoma, myxœdema, and carcinomatous metastasis. The recognition of the protein depends upon its relatively easy precipitation below the boiling point, while, on boiling, the solution tends to clear. The prognosis depends, not on the proteinuria, but on the primary disease. As a rule, it is utterly bad; many sufferers only survive the recognition of their complaint a few months. Cases are on record of a much longer duration, however; one, indeed, where the condition persisted twelve years, and the patient appeared to enjoy fair health. Such cases are, however, exceptional; as a general rule, the recognition of proteinuria justifies a very grave prognosis.

*Francis D. Boyd*

**ALBUMINURIA OF PREGNANCY** (see also ECLAMPSIA). The frequency with which albuminuria occurs is variously given. The majority of reporters place the figure at 10 per cent of all pregnancies, but others find it present in 50 per cent of the women. This figure is certainly abnormally high, and the albumin is only to be detected by careful examination, and often only indicates a transient catarrh of the Uterus. Albuminuria with casts was present in 7.3 per cent of women in the Johns-Hopkins Hospital cases.

At the outset, one wants to know what proportion of the cases go on to eclampsia. There are, unfortunately, no recent figures obtainable, and the earlier observers gave 50 per cent as developing such symptoms. The general view held at the present day is best expressed in the remark of Turner, who said that he had never seen convulsions supervene in a case which had been on strict milk diet and rest for seven days. Unfortunately, the milk regime is not tolerated by the great women in some cases, and in others the patient cannot be induced to submit to it. Consequently it will be necessary to consider the prognosis from the point of view of (1) *The clinical features*; (2) *The examination of the urine*; and (3) *The duration of treatment*. The prognosis in respect of (4) *The fetus* must also be considered.

1. **The Clinical Features**, which should especially arouse anxiety are those commonly grouped under the heading of 'pre-eclamptic,' which include troubles of vision, amblyopia and transient blindness, severe persistent headache, hemorrhages such as epistaxis, and finally epigastric pain. In addition an oedema originally confined to the lower half of the body, but now extending to the upper limbs and to the face, is an indication of at any rate severe albuminuria. The development of such symptoms while under active treatment should call for more energetic measures. Bailey finds that the blood-pressure is raised in the more marked cases of albuminuria, and a pressure exceeding 150 mm. H<sub>2</sub> is to be taken as indicating an impending eclamptic seizure.

2. **The Urine**, beyond the daily reading of the quantity of albumin, will serve as a guide to the patient's condition by the total quantity of urine passed in the twenty-four hours, together with the amount of urea excreted. With a defective excretion of urea in a urine diminished in quantity, the question of terminating labour should be considered.

3. **The Treatment** may be complicated by the fact that some people cannot take milk. In these cases good results are reported as following the administration of a salt-free diet.

If with rest, purgation, and careful dieting the condition becomes aggravated, then it becomes necessary to adopt measures for interrupting the pregnancy. Many cases miscarry in spite of treatment.

4. **Prognosis as regards the Fetus**. It is to be remembered that the frequency of premature labour lowers the chance of survival, and further that the occurrence of placental hemorrhages, which are often seen in albuminuria of pregnancy, are said to endanger the life

of 1-4 tetras, so that in many instances the child is still-born and even macerated.

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**ALCOHOLISM.**—(See MENTAL DISEASES.)

**AMOEBIAC OR TROPICAL LIVER ABSCESS.** This is a serious, but now easily preventable, disease. It is always a complication of amoebic ulceration of the bowel, although that disease may be latent. In warm countries, where it is of common occurrence, the mortality in cases treated by the open operation is high, having been from 60 to 70 per cent in several hundred cases in Calcutta. In the climatic cases seen occasionally in patients invalided to Europe it is considerably less, but figures based on small numbers of such cases are very misleading. The mortality varies greatly in different classes of cases, as shown by the following Calcutta figures:—

Multiple small abscesses, usually found post mortem in cases of dysentery and hepatitis from the medical wards, are probably nearly always fatal, although it is conceivable that in a very early stage emetine may cause them to clear up, as they contain no morbar and no bacteria, as a rule; they constitute 21 per cent of liver-abscess cases in the Calcutta post-mortem records. Two or more large single abscesses also formed 24 per cent, being almost invariably fatal, especially when treated by the open operation. Single large liver abscesses formed 52 per cent of the fatal cases when they were treated by the open operation, but are less frequent now in the post-mortem room, owing to their mortality having been reduced. Including recoveries, the proportion of large single abscesses to admissions was 70 per cent, the rest being multiple. In several hundred Calcutta cases, in those opened through the chest wall the mortality was 73 per cent, in right lobe abscesses opened through the abdominal wall in the right hypogastrum it was 59 per cent, and in the rarer small left lobe abscesses opened in the epigastrium it was only 12 per cent: a most important difference, which must be taken into account in estimating the results of any given line of treatment. In cases opening spontaneously through the lungs, the mortality before opacuantha and emetine were generally given was 46 per cent, but is now very much less. The rare cases in which the abscess discharges into the stomach or bowel do well as a rule without operation.

In addition to the site of the abscess, the following factors influence the prognosis. If the open operation is adopted, especially in hot damp climates with germ-laden air, the larger the abscess cavity the worse the prognosis, on account of the exhausting discharges following the inevitable secondary bacterial infection of the cavity. If aspiration and emetine injections are used, the size of the cavity is of comparatively little moment, some liver abscesses containing six pints



of pus having been successfully dealt with in this way. A very high leucocytosis of over 30,000 usually indicates the hopeless multiple small abscesses. The continuance of actual dysenteric symptoms coincidently with acute suppurative hepatitis has the same serious significance. Great emaciation and an alcoholic history are also unfavourable points.

Recent improvements in treatment have altogether altered the outlook in this disease in two important directions, namely, in enabling such a serious complication of amoebic dysentery as abscess in the liver to be prevented easily, and also to be treated more successfully after it has developed through neglect of proper treatment in the early pre-suppurative stage of amoebic hepatitis. The researches of the writer showed that amoebic hepatitis while still in the pre-suppurative stage, can be detected by the blood changes and rapidly cured by ipecacuanha or, better still, by emetine and the occurrence of the dangerous suppuration averted, and this success, together with the establishment of the fact that such abscesses are nearly all free from bacteria when first opened, further led him to adopt repeated aspiration of an already formed abscess, combined with the use of the specific drug against the amoeba, in place of the open operation, a method which allows the death-rate from tropical liver abscess to be reduced from one third to one fourth of its former figure. The reduction by these methods is shown by the following figures. From 1904 to 1906 the deaths in the British Army in India averaged 95 yearly, but have steadily fallen since the writer's paper was published in 1907 until in 1913 (the last year before the war) they numbered only 11, one seventh of the former rate. In the European Hospital, Calcutta, the number of deaths yearly averaged 5 during the six years ending with 1906, and have fallen steadily since, to reach nil for the first time in 1915.

*Leonard Rogers.*

**ANEMIA, APLASTIC.** This condition is apparently due to an exhaustion of the bone marrow or to its inability to respond to calls upon it. It follows severe septic and toxic conditions; in some of these the anaemia is aplastic from the beginning, so that regeneration never takes place; in other cases, regeneration may first occur and then fail. Sometimes it has followed pernicious anaemia. We have known cases occur after repeated or continued hemorrhage. In many instances no causal condition can be discovered, and in these we may suppose that an inherited vulnerability or weakness of the marrow renders it unable to respond to any extra demand on its functions. In most cases, however, aplastic anaemia is to be regarded as the terminal phase of a serious disease. The only possible chance of a favourable outcome would be the discovery of a removable cause. This, however, is a remote contingency. As a rule, a fatal termination may be expected in a few weeks or months. In one of our cases there was a history of anaemia for only three weeks before admission to hospital: the red corpuscles numbered 1,300,000 per c.mm. Death

took place ten days later: the red cells had decreased to 800,000. Another case gave a history of progressive anemia for two years: his red-cell count was 625,000. Death occurred in seven weeks, the count having fallen to 340,000 per c.mm. Among the signs which indicate that a fatal outcome is imminent are a low red-cell count and a low leucocyte count, especially a diminution of the granular cells.

If nucleated red cells have been present, and either diminish or fail to increase in number as the red-cell count becomes progressively lower, we would suspect that the anemia was aplastic. In both severe secondary and pernicious anemia we usually expect to find that the nucleated red cells become more numerous in the blood as the corpuscular count drops. The occurrence of hemorrhages is an unfavorable indication, and an attack of intercurrent disease renders a fatal issue doubly certain.

G. L. Goodall.  
A. Goodall

**ANEMIA, PERNICIOUS. (SO PERNICIOUS ANEMIA.)**

**ANEMIA, SECONDARY.** Secondary anemia may arise from a great variety of causes, and practically the only condition in which the prognosis is not more influenced by the causal factor than by the bloodlessness is post-hemorrhagic anemia.

**Acute Post-hemorrhagic Anemia** may be immediately fatal. No other condition causes so much anxiety to the patient. Pallor, giddiness, and faintness may be noticed before much blood has been lost. As soon as the blood-loss has become severe, the pulse becomes low in tension, small in volume, and irregular. All of these symptoms are readily recovered from.

More serious are hiccough, nausea, and vomiting. Persistent syncope is a very grave indication. Fibrillary tremors and delirium are of even more serious omen, and after convulsions have occurred recovery rarely follows.

If the hemorrhage is checked before a fatal result takes place, the patient is not yet out of danger. The blood is diluted by fluid from the tissues and its respiratory value is thereby diminished: it is also possible that the resulting hydramnia leads to a destruction of some of the less resistant corpuscles.

The maximum severity of the anemia is therefore not reached till some days after the actual hemorrhage, but the danger to life is not so great as during the initial loss of fluid. A return of syncope and nervous symptoms at this stage would be a serious indication. It is hardly necessary to discuss immediate prognosis in the case of actual hemorrhage, since the matter is determined at once. When a serious hemorrhage has been arrested, it may be of vast importance to be able to estimate the subsequent course of events.

The suddenness of the hemorrhage is a factor. If blood be lost slowly, or in two or three repeated hemorrhages, the patient has a better chance of life than if the same, or even a less, quantity of blood were lost rapidly: as, in the former case, there is more time for

the replacement of even the body fluids and blood pressure to be reestablished and for some amount of regeneration of blood to take place. Infants and young children bear the effects of hemorrhage badly, but in the cases which survive regeneration is very rapid after two or three days.

Elderly and weakly persons will obviously be worse subjects for a hemorrhage than the middle-aged and robust.

In cases which do badly, the appetite almost entirely fails, there is nausea and sometimes sickness. The heart beats feebly and irregularly, fainting occurs, with or without change of posture, and fatal syncope ensues. Patients are querulous and irritable, and permanent damage may be done to the nervous system. Among the most distressing consequences is blindness, sometimes due to optic neuritis, sometimes to an irreparable lesion. The loss of vision is usually partial, and may be either a general amblyopia, or a scotoma, often central. Such results are fortunately very rare.

It is sometimes asked how much blood can be lost without a fatal issue ensuing. This question can hardly be answered; so much depends upon the suddenness of the hemorrhage and the age and strength of the patient. It may be said that if a robust adult is still alive by the time a hemorrhage is arrested, the chances are greatly in favour of his complete recovery.

We can recall the case of a housemaid who was suddenly the subject of a large menorrhagia. This was repeated the following day. A blood examination showed red corpuscles 100,000 per c.mm.; haemoglobin something immeasurably low—less than 5 per cent. This case gave rise to great anxiety for several days, but the patient made an uneventful recovery. We hardly expect ever to see this case paralleled.

The rate of blood-regeneration varies with the severity of the blood-loss and the condition of the patient. A robust patient will replace a blood loss of 30 to 50 per cent in a month or six weeks. Several months might elapse before such a hemorrhage was made good in an elderly or weakly person.

It is often desirable to know the limits of anaemia which justify surgical intervention. Mikulicz long ago laid it down that operations should not be performed when the haemoglobin percentage was under 30. This appears to us to be as just and reasonable as any arbitrary rule in medicine can be. The cases where operation is demanded are chiefly those in which the operation is calculated to arrest hemorrhage. We can quote the following. In one instance hysterectomy was performed for bleeding fibroids after the haemoglobin percentage had fallen to 21. In another such case, the blood-examination before the operation revealed red corpuscles 2,000 = 0, haemoglobin 30 per cent, leucocytes 15,000. A fortnight later the corresponding figures were 2,000,000, 50, and 7500. It should be remembered that, in skilful hands, hysterectomy is practically a bloodless operation.

The blood examination may give some guidance to the eventual outcome of hemorrhage. A leucocytosis beginning from eight to twelve

days after the bleeding, indicates two things: first, that the hemorrhage has been at least moderately severe, and second, that the marrow is showing signs of reaction.

The appearance of nucleated red cells about the second or third day is also an indication that the hemorrhage has been severe. Some evidence as to the progress of regeneration may be obtained by noting their relationship to the degree of anemia. A moderate number is to be expected in all severe anemias.

Their absence after repeated search, in a case of severe anemia, would indicate a slowness or deficiency of regeneration on the part of the marrow.

**Chronic Secondary Anemia.** The least complicated condition is that due to repeated hemorrhages. Among the common causal factors are bleeding piles, menorrhagia or metrorrhagia, gastric and duodenal ulcer, and worm infections. These are all curable conditions, and so far as the anemia is concerned, it is imperative that treatment should be sufficiently early and energetic to forestall such a loss of blood as would leave the patient with a hemoglobin percentage of 40 or 30. As already seen, the latter is about the lowest limit at which surgical operations are practicable. If it is impossible to deal with recurrent bleeding, fatty degeneration of the organs will ensue. The heart becomes feeble and irregular, appetite and digestion fail, edema becomes evident, there may be petechial hemorrhages and nervous symptoms. Death occurs from heart failure or from failure of tissue nutrition. A falling leucocyte count and a disappearance of nucleated red cells will indicate that the case is becoming one of aplastic anemia (q.v.).

Anemia due to improper nourishment and unfavourable surroundings is not usually very severe, and is easily curable when the environment is improved. Chronic secondary anemia is also associated with variety of toxic conditions—sepsis, typhus, syphilis, malignant disease, and exhausting diseases such as nephritis, chronic catarrh of the alimentary system, and so forth. In many of these, the anemia may become so pronounced as to be an element to be considered in estimating the outcome of the disease, but in all cases it would be taking an incorrect perspective to attempt to gauge the severity of the condition from the anemia, rather than from the broader point of view of the influence of the causal condition.

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**ANEMIA, SPLENIC, OF ADULTS.** In estimating the prognosis of a case of splenic anemia, it is advisable to try to distinguish between true splenic anemia or Pautrier's disease, due to an overgrowth of fibrous tissue in the spleen and at a later stage in the liver, and primary splenomegaly or Gaucher's disease, where the essential lesion is a proliferation of endothelial cells in the spleen. The latter condition is to be suspected, especially in young subjects, when other relatives of the family have been similarly affected, when there is a peculiar grey pigmentation of the skin, and when anemia (in the initial stages) is

held. It may be noted, in the last place, that a very few cases have been reported as splenic anemia by competent observers have apparently recovered without operative interference. Coetz records the case of a girl who had been delicate from birth. At the age of five years an enlargement of the spleen was discovered. The number of red and white corporcles was normal. Hemoglobin was reduced to 70 per cent. There were repeated attacks of hematemesis, and a child had to be relieved by tapping on several occasions. The child increased in size, but bronchopneumonia, and eruptions occurred. At the age of fourteen an attack of hematemesis occurred but the spleen had by this time diminished in size. No further symptoms occurred, and three years later the spleen could not be felt and the child appeared to be in perfect health. One of us has recently seen in almost exactly similar case.

Winkler reports the case of a man of fifty, whose spleen had been enlarged for at least four years. He had suffered from hematemesis and melena, and the red cell count fell to 4,800,000 per c.mm. Under treatment the number of corpuscles rose to 4,800,000, and the patient claimed to work although the spleen remained large. Most of such cases have been treated with arsenic, or arsenic with iodides.

There is also a youth of seventeen, suffering from splenic anemia in an early stage, came under the care of one of us. Gastrointestinal symptoms were very pronounced, and treatment directed towards the alimentary canal led to what has apparently been a complete recovery.

Such favourable results as the foregoing are by no means common. Bitchitt sometimes follows the application of X-rays to the spleen, but it must be admitted that in the majority of the recorded cases their use has not influenced the course of the disease. We can recall the case of a girl of seventeen who had a remission of symptoms for five years after a course of X-ray treatment. Symptoms then returned and ascites was formed. The further application of the rays failed to do good. Another case is that of a lady, aged fifty, with an enlarged spleen. She has had many exacerbations, but since the application of X-rays she has had a remission of six months' duration.

When a case is severe, or when the disease appears to condemn a patient to a life of more or less complete invalidism, the problem of prognosis divides itself into the question whether removal of the spleen can be safely accomplished. The outstanding fact in this connection is that a large number of thoroughly successful cures have been reported. Immediate benefit has frequently followed in cases previously deemed fatal. A few unsuccessful cases have also been reported, and the presumption is that a good many more have been left unrecorded. Cases have died of hemorrhage or shock immediately after the operation; others have been carried off by pneumonia, and yet others have died of various gastro-intestinal symptoms after a few days. Armstrong collected 332 cases of splenectomy for splenic anemia. Complete recovery followed in 22 instances; a fatal result from hemorrhage or shock occurred in 9 cases; 1 patient

— splenectomized. At the discussion on the subject, reported in the *Proceedings of the Royal Society of Medicine*, June, 1933, 6 cases of splenectomy were reported; in all six the patient recovered and the tumour disappeared. The great majority of successful splenectomies have been in young subjects. In 3 recent cases under the care of me, which were all at the stage of large spleen with commencing ascites, with no ascites and no other contra-indication, splenectomy was performed. The operation was fatal in each case. But in another case operated on six years ago there has been complete return to health.

On dealing with cases of splenic anaemia it should be remembered that the course is usually extremely chronic. Little change may be manifested for years. Even a downward tendency is seldom progressive. Exacerbations may be followed by long remissions, and the patient may continue to show little change. The standard of health after an exacerbation is likely to be lower, but lost ground is usually recovered. The number of leucocytes per cmm. serves as a useful prognostic indication. It is always diminished, but as long as it does not drop below 4000 the case is usually doing well. We have seen it drop to 240 shortly before death.

The greatest danger lies in the possibility of intercurrent disease, and this is the usual cause of death. The possibility of sudden haemorrhage, too, is always a source of danger. Haematemesis, ascites, and oedema close the normal history of the disease.

The risk of haemorrhage increases with increasing anaemia, and therefore, in cases where splenectomy is thought desirable, the operation should not be too long delayed.

Another risk of delay is that the result of an intercurrent affection may diminish or abolish the feasibility of surgical aid. We have seen one such case, where fibrosis of the lung followed an attack of pneumonia and rendered the performance of splenectomy out of the question.

When operation is contemplated, and the presence of ascites might be regarded as a bar, the effect of a preliminary tapping might be tried. We had one case, a boy of sixteen, suffering from splenic anaemia of the Feucher type, in whom a single tapping kept the patient free from ascites for two years. It ultimately returned, and the patient died of cardiac failure; he suffered also from mitral stenosis. In the later stages of Banti's disease, splenectomy combined with a Talum or Diamond-Morison operation might offer the chance of anchorage, if success has been recorded by Tansini.

In the early stages the best treatment is probably the prolonged administration of arsenic, with careful attention to the gastro-intestinal tract, and the use of x-rays. If no good result is obtained, splenectomy should probably be considered at an earlier stage than has hitherto been the case. But one must always warn the patient and so friends that the operation is in itself a serious one, and it should only be performed by an experienced surgeon.

In splenectomy (Gardner), the course may be very prolonged. In Gardner's own case the spleen had been enlarged for twenty-five years. The condition is more common in young subjects, and most of them are cured off by intercurrent affections. The data regarding splenectomy are very scanty. A few successful cases have been recorded, and there appears to be no alternative which offers a reasonable hope of success.

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**ANEMIA, SPLENIC, OF INFANCY.** This condition usually occurs in children between the age of ten months and two years, and these limits are very seldom overstepped. It is not yet settled whether the splenic anemia of infants is a mere secondary or symptomatic anemia, or a special form occurring in infants. The latter is probably the correct view. Although the cause and concomitants may vary, the clinical picture and the blood-changes are constant and definite. It is associated with rickets in the great majority of cases. The estimation of prognosis is not easy. Recovery takes place in a large proportion, probably the majority, of cases. More cases die of a complication, i. e. of the anemia itself. Pneumonia most frequently determines a fatal outcome. The severity of the rickets or other causal condition, and the general condition of the patient, are the chief guides to prognosis.

Marked emaciation, severe gastro-intestinal disturbance, or any complication, adds to the gravity of the outlook. Petechial hemorrhages or other manifestations of purpura are particularly unfavourable. The size of the spleen gives no indication of the severity of the condition. The examination of the blood yields useful prognostic indications. The most serious is a very marked reduction in the number of the red corpuscles; counts below 2,000,000 per c.c.m. indicate dangerous possibilities, and this is especially the case if the colour index is low. The number of nucleated red cells in the circulating blood appears to have no relationship to the severity of the anemia or the gravity of the prognosis, nor is it a matter of practical significance whether the majority of the erythroblasts are normoblasts or megakoblasts. A high leucocyte count, e.g., over 60,000, is to be regarded as a serious indication. The presence of a few myelocytes has no special significance, but a large number, or an abnormally high percentage of lymphocytes, is of more serious import. Fowler lays stress on the grave significance of a high proportion of transitional forms. Other things being equal, the more nearly the leucocyte picture approaches that of a simple polymorph leucocytosis, the more favourable is the case.

The best of all prognostic indications will be provided by the response to treatment. If a case begins to improve, a favourable outcome may reasonably be expected. Good hygienic surroundings,

and treatment directed towards the amelioration of the general health and the removal of the causal condition, are more likely to be followed by good results than more specific measures.

Arsenic and iron are not so clearly indicated as in most other anemias. They may do good, but they should be employed with caution. The application of *x* rays, in our experience, does more harm than good. Splenectomy is not to be entertained. The enlargement of the spleen persists long after the anemia has been cured. A greatly enlarged spleen may not become impalpable till after a year has elapsed.

Cowan has reported two cases in which the condition appears to have passed into the adult form of splenic anemia. G. L. Gulland  
A. Gulland

**ANESTHETICS.**—The data required for arriving at an accurate forecast as to risk to life under anesthetics and analgesics are at once difficult to obtain and still more difficult to apply to any individual case.

**Factors other than the Patient.** **THE ANESTHETIC.** If we employ the statistical method, an examination of the figures upon which conclusions are based as regards any given anesthetic reveals their fallacy. For example: Although it is true that the death-rate under *chloroform* is put at about 1 in 2000 when statistics collected from various sources are added together, yet, if we accept this estimate as approximately true, we do not learn anything about the expectancy of life in any given case. If we analyze the figures which make up the total, and study the question of the person administering the anesthetic, we find that the expert's return of deaths falls enormously below the maximum. In different countries, again, we are given widely different figures. Those of the late Col. Lawrie, in the case of a considerable number of operations upon natives in India, present a far lower death- and danger-rate than those of other men of experience in other countries. We learn that he restricted the employment of anesthetics, selecting cases which were peculiarly favourable to the method employed, and he avoided the profound narcosis called for in modern surgery during prolonged operations. The figures, therefore, are not concurrent with those obtained under ordinary conditions.

In the case of *ether* we find equally discordant results. One fact stands out prominently—that in countries or districts in which chloroform is mainly used, while to employ ether is the exception, the death-rate under the former is lower than in places in which ether is most in favour and chloroform is seldom relied upon.

The actual quality of the anesthetic cannot be ignored. When impurities exist, danger prevails. Preparations allowed to be exposed to light and air for a considerable time become altered in their chemical composition, and various by-products of decomposition develop.

**THE ANESTHETIST.**—In individual hospitals we find that the death-rates differ; and when we investigate the possible reason for this, we find that the death-rate varies directly as the type of the anesthetist.



When the administrator is a student who has a brief tenure of office, the results are unfavourable; when special men undertake the duties of anaesthetist, and remain in office for a long time, or when expert anaesthetists are employed, the death-rate is lowered. We may conclude, then, that one factor of importance is the anaesthetist. When he is well trained, and gives his undivided attention to his work, the safety of the patient is greater. Nor is this due merely to the hypothesis that such an individual adopts the best methods.

**The Anesthetist Employed.** These methods vary within the widest limits; and while one person will extol one type of procedure, another will prefer one which differs from the other *in toto et in parte*. If we compare the results obtained by the two men, they being expert in their particular systems, we find their results practically identical. But if their methods are pursued by a large number of students, most of them lacking in experience and judgement, and liable to errors of technique, we discover that methods do really constitute an important factor in making for danger or safety, for the incidence of death is favourable with some methods, unfavourable with others.

Returning to the administrator as a factor, we find, further, that few experienced men at the present day adopt one anæsthetic or one method to the exclusion of all others, and so the important element of judgement, itself the result of wide experience alike of failure and success, comes to play an important part; and the *selection* alike of the anæsthetic and the method intervenes and modifies the incidence of danger.

**The Patient as a Factor.** THE CONDITION OF THE PATIENT. — Age, sex, altitude to a less degree, physique, temperament, e.g., height of pulse, intercurrent pathological states tending to depress the patient's resistive power, each and all influence the incidence of danger under anæsthetics. There are various diseases or acute illnesses which make for danger when certain anæsthetics are used, although perhaps they may not interfere with the employment of another agent. Let us note this case by illustration. Nitrous oxide gas is regarded, and rightly so, as being the least dangerous of the general inhalational anæsthetics; and yet, if it is employed for a patient suffering from some obstructive disease, blocking his air-passages, e.g., angina Ludovici, the safety to the patient's life is infinitely greater than would be the case if chloroform, an anæsthetic at the opposite pole to nitrous oxide gas, as regards safety, had been employed. The inexperienced man would probably select nitrous oxide gas for such a case, pursuing general principles, and kill the patient; the experienced man would select the chloroform, and save the patient.

The fatal result method tells us in this particular type of case. It would be recorded as a death due to nitrous-oxide gas; and although such was actually the fact, yet it does not in any way demonstrate that this anæsthetic, as such, is less safe than chloroform; indeed, the opposite is certainly true. It further happens that in many cases the condition of the patient is so serious that it becomes absolutely

necessary either to deny him the benefit of an anæsthetic, and often by so doing increase his risk through shock, or to select an anæsthetic or analgesic which is peculiarly free from risk to life. Under such conditions, many may die, and the statistical method would, by recording such deaths against the practically innocuous anæsthetic which was selected, create a spurious death-rate for it. Statisticians, as obtained from death certificates in various countries, are certainly incomplete. Many deaths due to an anæsthetic are recorded as 'heart failure,' or some similar condition. Again, in the case of coroners' inquests, the patient who dies through stress of the operation is often assumed to have died from the anæsthetic if he was under its influence when death occurred.

**THE NATURE AND GRAVITY OF THE OPERATION.**—This is another factor, which has made itself evident in the illustration just given. Now, in all the statistics at present in our hands, the grand totals merely reveal the actual number of deaths occurring under any given agent: no account is taken, either of the method adopted, itself often so important as the anæsthetic: of the experience and ability of the administrator: of the nature of the operation—for example, whether it was upon the air-passages, and so likely to cause special dangers under an anæsthetic: of the severity of the operation, its duration, and the degree of trauma it necessitated: of the condition of the patient as regards resistive power: or of the presence of intercurrent toxæmia, asphyxia, shock, and so on.

The only exact method of arriving at the incidence of danger of anæsthetics is by experiment, but here again the plan supplies less information than we need in the present investigation. It tells us that any given anæsthetic, or succession or mixture of anæsthetics, acting under known conditions of time and circumstance, upon normal individuals, will produce certain results. We can estimate the progressive effects of increased concentration, or of limitation of oxygen and carbon dioxide: but although we can crudely reproduce a few pathological conditions, we cannot with certainty learn by this means what are the effects of the interaction of either anæsthetics or analgesics upon diseased tissues. The perversion of the nerve-controls existent in cases of exophthalmic goitre—the congestive conditions grouped under the term lymphatism: those conditions which underlie the fatal, so-called delayed chloroform poisoning: these are incapable of experimental reproduction in a form which would enable us to estimate the incidence of danger when anæsthetics are in use in their presence.

We must, however, consider as the first step in arriving at a prognosis in any type of patient under any anæsthetic, the accepted physiological behaviour of the anæsthetic towards normal individual: and next, since pathological states are but variants from the physiological, we can deduce the probable effect of any given anæsthetic when acting upon a patient with a known morbid lesion. For example: we know that intranasal oxygen lowers the actual oxygen content of the blood and hence of the tissues: further, that at a point this declension will

injured tissue (play on). Now, if post-surgical lesion of the patient leads to a rapid, although lowered, oxygen content of the tissues, the administration of iron-sulphate is probably contra-indicated; and if the anaesthetist employs it we should look for a much speedier recuperation of asphyxiation in the normal person. In this case the choice of the method would come to our aid; for by employing an appropriate mixture of anaesthetic with oxygen, the danger of extreme cases would be averted. Thus we see that we cannot separate the anaesthetic problem from the method of its employment, if we seek to arrive at a precise prognosis or incidence of danger in any one type of cases.

A further difficulty is encountered in our inquiry when we pass from the *class* of patients to any *individual* member of the group. Although we may continue to the peculiarities of the group, yet he will in very many cases have developed a part from these which is apt to invalidate my general statement as to his immunity from danger. We have to deal with two entities, the conscious and the anesthetized; and in the bridging over the passage between perceptive sentence and anaesthesia, the period of induction is the scene of the crucial reaction of the patient towards the anaesthetic, as well as the physiological reaction of the drug towards the patient. It is the danger of fear shock, which in pre-anaesthetic days—as indeed at the present day—occasionally proved fatal, which becomes most formidable when we have to decide between the use of an anaesthetic which abolishes consciousness, and an analgesic, whether local or spinal, which prevents perception of pain, but fails to remove the fear lest pain will come. When some persons experience no such dread, others faint even though no actual pain from trauma has occurred.

A remarkable example of the interaction of the nervous system on the induction of anaesthesia has been made evident during the present war by the experience of giving anaesthetics to wounded soldiers. The phenomena occur mostly in the cases of shell shock and neurasthenia, but they also develop when these conditions are absent. The men are usually terrified, struggle maniacally, and require a greater amount of anaesthetic than is usual for persons of their weight and physique. But the fact which makes prognosis more grave in this case is that both heart failure (? cardiac inhibition) and respiratory arrest, leading to cessation of pulmonary ventilation, are frequent in their occurrence. These grave complications occur even in the hands of expert anaesthetists who have been careful to avoid overdosage—i.e., giving an amount of a drug, or a percentage strength of a drug, which would in ordinary circumstances cause danger. Here is a distinct type of person for whom the prognosis is unfavourable. The type in its manifestations resembles those classed as neurasthenics, the 'highly nervous,' alcoholic degenerates, and those subject to sudden death through trivial exciting causes as in status lymphaticus, hyperthyroidism, and its congeners.

After-effects. The problem before us has to be studied from a different aspect. The dangers connected with ether anaesthesia are not ended when the operation has been completed. The after-effects, both mental and bodily, may either prejudice consciousness, or produce actual and grave pathological conditions such as emphysema or pulmonary, renal, or hepatic lesions; and these may even prove fatal.

If we consider these general aspects of the subject, it remains to discuss those factors which we have shown to make for the incidence of danger or its avoidance, to indicate how far these dangers can be lessened, and to point out by what means they can be best prevented or mitigated.

The factors making for safety or danger during anaesthesia or analgesia are:

1. (a) The anaesthetic, or (b) the analgesic itself.
2. The method of employment.
3. The experience and knowledge of the person giving the drug.
4. The condition of the patient.
5. The nature and duration of the operation, and the intercurrent conditions, such as trauma, and the shock arising as a result thereof.
6. Post-operative effects.

**1a. Anaesthetics.** The chemical and physical properties of the known anaesthetics determine the following law as regards their safety or the reverse: All drugs containing one of the haloid elements—chlorine, bromine, iodine—which are protoplasmic poisons, are more dangerous than those in which the haloid is either absent or replaced by oxygen. The danger increases directly with the amount of the chlorine, etc., present. The lower the boiling-point and the greater the specific gravity of the liquid, the greater the danger. The gaseous is safer than the liquid, and the liquid than the solid—a law which follows from the preceding one asserting the greater safety of the highly volatile over the less volatile drug.

Hence we should expect that the order of safety of the commoner anaesthetics would be as follows: nitrous oxide; ether; ethyl chloride; chloroform; ethyl bromide. Clinically, we find that for normal anaesthetics this order is correct; while experimentally we obtain practically identical results. Treated statistically, the incidence of death is: chloroform, 1 in 3000; ethyl chloride, 1 in 13,000; ether, 1 in 27,000; nitrous oxide, 1 in 200,000; mixtures of nitrous oxide and oxygen, uncertain, but a very low rate prevails. The figures given for nitrous oxide and its mixture with oxygen apply only to cases in which this anaesthetic is employed in minor surgery; when it is used for prolonged periods for major surgery it is far less safe, but we have no complete collection of statistics. These figures, however, cannot be accepted as being more than rough approximations. In the case of ethyl chloride the estimate given is probably much too favourable to that anaesthetic.

While comparing the effect of chloroform and of ether upon the tissues, we are led to believe that the former was seven times more dangerous. This is important, in deaths due to anaesthetics when they arise from overdosage—as opposed to what may be called mechanical conditions—are brought about mainly through the poisoning of the centres in the medulla oblongata. But, as has been pointed out above, the incidence of death is largely dependent upon the condition of the patient before such as to be affected adversely by particular anaesthetics, and so it is necessary to consider briefly what are the distinguishing actions of the commoner anaesthetics, and then bearing upon pathological lesions of the systems concerned with the processes of life.

*Chloroform* produces haemolysis, as does ethyl chloride in a less degree. Chloroform also diminishes the activity of glandular secretion, and ethically acts as a protoplasmic poison, destroying tissue life. Its effects upon the tissues vary directly with the nature of the latter; the nervous tissues suffer most, the heart muscle more than the voluntary muscles, and the latter more than the involuntary; the liver, with the vessel valvulae of the viscera, then the kidneys. This is perhaps best understood by stating that if the various tissues are subjected to chloroform-containing fluids, the percentage strength required, firstly to inhibit function, and ultimately to destroy the tissue's power of functioning, is lowest in the case of the highly-organized tissues, such as nerve cells and fibres, while in the case of other tissues, higher and higher strengths or percentage values have to be used to inhibit or destroy. The diminution of chloroform is comparatively slow, and any interference with the functional activity of the renal excretories, such as progressively occurs as chloroform inhibits their action more and more, tends to the accumulation of the anaesthetic, and its storing up in the tissues, with disastrous effects. Where, however, care is taken to avoid such a strength of vapour as produces the inhibition of tissue function, this danger is avoided. The dominating features of the action of chloroform are: depression of the activity of the heart, lowering of blood-pressure, and lessening of pulmonary ventilation and so of gaseous interchange during respiration. All these effects are progressive, but being a function of the strength or percentage value of the vapour employed, are more or less under the control of the administrator, as he can and should lessen the strength of the vapour inhaled after induction is complete, and through the maintenance of anaesthesia.

*Ethyl chloride and Amylene Chloride*, so far as we know, behave similarly; but as they are seldom employed for any but brief periods, little is definitely known of their prolonged effects. As ethyl chloride is far more volatile than chloroform, the prognosis is more favourable in the case of the former than of the latter.

*Ather* causes haemolysis, but unless asphyxial complications are permitted, its effect is slight in this direction. It stimulates all the cells except those concerned in the urinary function. The secretions

of the mouth and respiratory tract are markedly increased. In the agents employed in anaesthesia, it produces at first excitation of function, and then inhibition, but not destruction, of the protoplasm. Hence, even if the inhibition is permitted to extend to a dangerous degree, the tissues recover their power of function when favourable conditions are re-established. Ether acts powerfully upon bacteria. It possesses a great avidity for fatty material, and, so it is believed upon experimental evidence, tends to destroy phagocytes by damaging their essential fatty environment: hence phagocytosis is lessened or destroyed until the ether is eliminated and the phagocytes are able to re-assert their function. Owing to its ready volatilization, ether rapidly dissociates itself from the tissues: its elimination requires considerable absorption of heat, and hence it occasions a fall of body temperature. It certainly causes some tissue irritation, revealing itself in catarrhal conditions: especially is this so in the case of the lungs and kidneys. The extent of this action, so far as the renal structures are concerned, was investigated by me with the aid of Dr. G. Schum Levy, and the conclusion at which we arrived was that, provided the amount of ether perfusing the renal vessels was not excessive, interference with function was slight. The comparison of chloroform and ether in this connection is valuable. The former anæsthetic is less prone to mitigate albuminuria, although more apt to increase its amount if pre-existent. Ultimately, chloroform tends to cause necrobiosis of renal epithelium, while ether does not: though it must be admitted that this deleterious result only follows excessive quantities of the former anæsthetic. As ether increases the activity of the circulation and speeds up the heart, it induces an increase of blood-pressure. In this way the prognosis of ether, although in most cases favourable, is less so when there exists disease of the heart or arteries, e.g., arteriosclerosis, since it increases the danger of rupture of a cerebral or other vessel. As it will in some cases produce water-hæmorrhage of the lungs through its irritant action, it is dangerous in cases in which a tendency to the outpouring of secretion in the lungs is present. In this connection may be mentioned the supposed danger of ether pneumonia, especially when an abdominal operation has been performed. Dr. William Pasteur has, however, shown that the cause of this lung trouble, assumed to have been due to ether, are in fact the result of trauma, which brings about massive collapse of the lung.

*Nitrous oxide* resembles ether in its stimulating action upon cells. This is followed by inhibition of function. It unquestionably possesses a specific action,\* and does not superinduce unconsciousness either by depriving the tissues of oxygen, or by splitting up and causing hyperoxidation (apnoea). As to some extent it replaces oxygen in the hæmoglobin of the erythrocytes, and probably in the fixed cells.

its effect is commonly associated with a superadded asphyxial effect. True, however, is concomitant rather than essential, so that when it is obviated the power of nitrous oxide to induce insensibility is in no way hindered. It would thus appear that this anæsthetic, when used for brief periods and when concomitant asphyxia is prevented, has an extremely favourable prognosis. In cases in which excessively high blood pressure exists, or where there is marked impediment to respiration, *etc.*, in *anæmia Ludovici*, its use would have a serious prognosis.

MIXTURES OF ANÆSTHETICS, such as the A.C. (1 volume of alcohol to 9 of chloroform), the C.E. (2 of chloroform to 3 of ether\*), and the A.C.E. (1 of alcohol, 2 of chloroform, and 3 of ether), act variously and variously according as they are administered by one method or another. In hot weather, chloroform and ether mixtures given by an open method produce mainly an ether effect at first, and later a chloroform effect. A closed or semi-closed method promotes a chloroform effect, modified by the dilution due to the other ingredients of the mixture. It is not safe to assume that true antagonism exists in such mixtures, since the component anæsthetics evaporate individually and at different temperatures. Further, they possess a various coefficient of "spread" when sprinkled upon an absorbent surface, such as lint or gauze, and the rate of evaporation may be taken roughly as varying directly as the spread and inversely as the wetting. While the heavier vapours sink towards the reclining patient, the lighter rise and escape into the atmosphere of the room. Schäfer, however, has demonstrated that the alcohol-chloroform mixture is, in fact, more stable, so that a certain amount of antagonism is existent. This was assumed in the case of the A.C.E. mixture also, and it is probably true, though to a less extent, although the ether component acts as a diluent, not as an antagonist, to the chloroform. It will be observed that when alcohol, ether, and chloroform are shaken together, heat is generated, a fact which appears to indicate a more intimate association than exists in simple solutions. In the case of mixtures, the risk to life—*i.e.*, the prognosis—is influenced more by such extraneous conditioning factors as temperature, method of administration, amplitude of respiratory movements, than in the case of single anæsthetics. This is because no administrator can be sure what is the actual percentage strength of chloroform vapour being inhaled at any given moment.

The employment of *mixtures of the vapours* themselves, by some method such as that suggested by Gwathmey, removes many of these objections. Such elaborations as Schleich's or Wertheim's solutions are too infrequently employed to need analysis.

*Gaseous mixtures*, such as that of nitrous oxide and air or oxygen, fall into another category. Here the oxygen or air merely supplies

\* The term "ether" is here used in its old sense, *i.e.*, diethyl ether, and not in the modern sense, *i.e.*, ethyl ether. For example, a mixture of 2 volumes of chloroform to 3 volumes of ether, would consist of 2 volumes of chloroform to 3 volumes of diethyl ether.

the necessary aeration and so obviates tissue asphyxia, hence permitting extensive employment of nitrous-oxide gas. The hyperpnea so commonly existent with the methods employed lessens the carbon-dioxide content of the blood, leading to acipne conditions; so that the addition of carbon dioxide gas to the nitrous-oxide-oxygen mixture finds favour with some persons, and is employed for prolonged operations. The simplest method of supplying carbon dioxide is by allowing *partial re-breathing*, and this is provided for by Teter and others in their apparatus for prolonged administration of these gases for the purposes of major surgery.

*Nitrous Oxide and Oxygen in Major Surgery.* The prognosis when this method is adopted is far less favourable than its sponsors have in the past claimed for it. Dr. J. F. Baldwin\* has collected statistics of deaths in the U.S.A. which demonstrate a very high mortality-rate. In 1200 or 1300 observed cases, this writer states that the mortality in major operations was 1 per cent. The large number of deaths he records in his paper occurred when the anæsthetic was given by men possessed of expert knowledge and wide experience in its use. The deaths appear to have been mainly due to heart failure, and not, as is commonly taught, to gradual asphyxia. There seems little doubt that the cardiac collapse which occurred was led up to by the abnormal condition of the blood in the pulmonary circulation, which imposed a stress upon the heart which it could not withstand. The method would, therefore, prove peculiarly perilous for patients with various heart conditions such as would weaken the resiliency of the organ.

Such combinations as amyl nitrite and chloroform, somnifarm (ethyl chloride, methyl chloride, and ethyl bromide), and ethylform, a more dangerous variant of the last, need merely to be mentioned as extremely unsatisfactory agents.

**ALKALOIDAL BODIES USED IN ASSOCIATION WITH GENERAL ANÆSTHETICS.** Those most commonly in use are atropine, morphine, scopolamine, omnopon, strychnine. We may add chlorbutyl, although this is not alkaloidal.

*Atropine.*—The use of this drug, gr.  $\frac{1}{3}$ , given hypodermically one hour before inhaling an anæsthetic, has revolutionized the methods of etherization. Its action checks the excessive secretion of the buccal and respiratory areas, and so removes one of the great drawbacks of ether. The dose has to be varied according to circumstances. In some persons, persistent throat dryness follows its use. Children, as a rule, tolerate atropine well. A further advantage of atropine is that it lessens the irritability of the pneumogastric nerves (Schäfer), and so minimizes the danger of vagal inhibition of the heart under chloroform. Holscher's observations appear to prove that much of the post-anæsthetic chest trouble is due to the aspiration into the air-passages of saliva and mucus impregnated with the anæsthetic; hence, lessening this secretion by atropine diminishes the risk; further,

\**Med. Rec.*, 1916, July 16, 178.



ance, which with the morphine mixed with the *essence* of the vapour of the anaesthetic, produces a certain contraction of the stomach and causes vomiting, atropine has no effect. Although atropine materially lessens the nausea and vomiting due to the anaesthetic, it fails in a few cases, especially if repeated.

*Morphine-Scopolamine.* There can be no question that although morphine and atropine are commonly employed together, these drugs act better and more safely when combined with scopolamine. During the Franco-Prussian war this mixture was in extensive employment, but was discontinued, as the prognosis was bad owing to the frequency of respiratory collapse. This, however, was in the case of chloroform. The pharmacological law which recognizes that several drugs exert a synergic action in some directions, while they antagonize in others, holds with regard to these alkaloids. Thus, the respiratory centre, which is depressed by morphine is stimulated by the atropine bodies, while scopolamine acts concurrently with morphine in producing depression of the consciousness. Scopolamine is a dangerous drug when used by itself; its undesirable qualities are lessened or removed, however, when it is associated with morphine and atropine. The outstanding qualities of these drugs are that they soothe the nervous part of the patient, and they lessen the amount of the general anaesthetic required. The disadvantages are that they disperse to some extent the stimulus of anaesthesia by interfering with pupillary afference, that prolonged induction of breathing is more shallow and the thoracic excursions are diminished, and they induce a prolonged and profound sleep consecutive to the operation, and thus, although highly beneficial to the patient, requires special and heedful watching, lest respiration of the head, falling back of the tongue, trickling of blood into, or accumulation of mucus about, the glottis, lead to interference with respiration. Their use presupposes that the patient has been carefully examined to ascertain if there is any contra-indication to the use of morphine. In local or spinal analgesia, the use of these drugs is obviously beneficial; but it needs caution in the case of the caudal injection, lest the action of the stovaine or novocain, travelling somewhat high, should interfere with the medullary centres already drugged by the morphine which has been injected.

*Omnopon.* The difficulty of standardizing the preparations of morphine has led to the adoption of a mixture of opium alkaloids with a morphine action, under the name of *omnopon* (*panitopon*). Dr. Salk has shown that the chlorides of these alkaloids are capable of being standardized, and so a definite dose with a known morphine effect can, it is asserted, be obtained. This substance is employed in a similar way to morphine, in association with other alkaloids.

The dangers of ether in the direction of pulmonary and renal sequelae, and those of chloroform in that of cardiac entrenchment, are diminished by using these alkaloids adjuvantly; and this is markedly so in the case of irritable heart conditions, such as different forms of tachycardia. The use of these alkaloids would increase the danger in all states in

which the respiratory system is hampered, either through cerebral or somatic causes. Hence, in operations upon the brain or spinal cord if chloroform is to be used, also in cases in which cyanosis or flatulency is present, unless when the latter is due to cardiac insufficiency, then use is detrimental.

When the general anesthetic selected for a prolonged operation is carbon dioxide in combination with oxygen, it is obligatory to use the M.A.S. (i.e., morphine, atropine, and scopolamine) injection to deepen anesthesia. Hence prognosis in these cases is difficult to gauge, since the respiratory centre is rendered more susceptible to the morphine action.

*Strophanthine* given hypodermically just before an anesthetic with the view of antidoting chloroform, but it does not accomplish the object intended, it is probably detrimental, and when associated with morphine produces little if any beneficial effect, although it prolongs anesthesia, and causes the muscular rigidity of the patient to be emphasized. It is strychnine is of any value in the small doses usually adopted, only in the direction of stimulating the respiration.

*Chloralhydrate* (gr. xv), given thirty minutes before the anesthetic, determines drowsiness, and certainly diminishes the risk of sickness.

**C. Analgesics.** The dangers of *cocaine*, both in endermic injection, intrathecal injection, and when introduced into the urethra, are so well known that most persons have relinquished its use.

*Novocain* is probably the safest drug for local and regional analgesia, if properly sterilized and employed with the addition of adrenaline.

*Stovaine* seems less employed in local analgesia, owing to its damaging effect on the tissues; but it is certainly one of the safest of the drugs used in intrathecal injection. It produces some hemolysis, and it is not free from the liability of being followed by oculomotor paralysis and other dangers.

*Topoanum* and *alypta* have their advocates, but probably neither is as safe as stovaine for spinal analgesia. The question of combining these drugs with adrenaline is discussed under another caption (see *Methods of Employment*).

The prognosis as to danger in the use of local and spinal analgesia is extremely difficult to estimate, as so much depends upon the method employed and the condition of the patient, and these are variants in all cases. This fact renders generalization of little practical value. We know, however, that these methods, especially the intrathecal injection of drugs, have inherent sources of danger, since when the analgesic has once entered the tissues it is impossible to abrogate its action. Slight errors in technique also matter more in such procedures than in inhalational methods. Assuming experience, absolute asepsis, and careful regulation of the dose, the danger to life is probably not great in the hands of experts, and the sequelae are not necessarily serious. It is, however, impossible, in the present state of our knowledge, to promise total immunity from them, or to forecast the degree of their severity.

Statistically, the death-rate under spinal analgesia is given by various authorities as follows:

## MORTALITY OF SPINAL ANALGESIA

Holte	708	8
P. Petersen	7807	20
Rehn	2000	6
Zdunobsky	4679	12
Wagnerslet	16300	14
Stroop	22717	16
Total	54211	106

This gives on the average a mortality of 1 in 500. Too much importance must not be attached to such figures, as many of the Continental surgeons state that they have used the method in thousands of cases without a death.

The danger of mental shock incident to local and spinal analgesia cannot be overlooked. Profound physical and mental depression, and even coma, have followed these methods, although the patients felt no pain. The prognosis made upon statistics, which as has been indicated above is not wholly reliable, is less favourable when these methods are adopted than when a general anæsthetic is given. In recent times surgeons have adopted, for certain operations such as those on the liver and that for removal of the rectum, a combination of spinal analgesia and general anæsthesia. The prognosis, although less favourable from the standpoint of the anæsthetic, may, as regards the patient's ultimate relief, be more so, as the method is alleged to render the manipulations easier and more complete relief may thus be obtained.

A study of the elaborate tables and papers of fatalities issued by the British Medical Association in 1900<sup>2</sup> shows that comparatively few of the deaths, recorded with sufficient precision to admit of exact classification, are due wholly and solely to the anæsthetic. The factors adopted by the workers on this committee were—the anæsthetic, the operation, and the state of the patient at the time of the operation. Although the number of cases examined was comparatively small, 25,920, yet it is sufficiently large to form a fair basis for comparison. However, the last two factors, the operation and the state of the patient, which may at first sight appear to be constants, are in fact not so. This is shown by the consideration that, for patients whose

more fatal, extremely unfavourable, the safest anaesthetics are used sparingly, so that these agents are employed under desperate circumstances, with results which give for such anaesthetics a less favourable incidence of fatality. A further point which has to be considered, especially when comparing the results of general anaesthesia with spinal and local analgesia, is that whereas the statistics of the latter comprise every type of administrator, including many who are quite inexperienced and even devoid of medical knowledge, the same does not apply to local experts whose care and attention are unquestionable, and whose technique is as good as our present knowledge of anaesthesia permits; nor is this knowledge slight, since the stage of experimental groping has passed, and methods and technique are generally settled.

Opinions again are in absolute conflict about what pathological conditions contraindicate the spinal method. It may be useful to attempt to fix the consensus of views. The method is recommended as being absolutely contraindicated for operations below the navel, especially in acute appendicitis cases; also when acute or serious pulmonary or pulmonary disease exists and the lungs are waterlogged, and in severe glycosuria, and gangrene of the extremities.

Whether patients with serious cardiac lesions, with excessive blood pressure, or with pronounced albuminuria, should have the spinal method is very doubtful. The decision should only be made by scrutiny of each case. Whereas, formerly, the old and feeble, suffering from chronic albuminuria, were regarded as good subjects for spinal anaesthesia, this view is not at present universally held. In cases of intestinal obstruction complicated with stercoraceous vomiting, the spinal method was looked to as a way out of a dangerous *impasse*. Unfortunately, several deaths have occurred through local drowning of spinal analgesia, the features of which were identical with those occasionally met with when general anaesthesia was employed. When feasible, local analgesia is undoubtedly safer than is the spinal method for such patients, but it fails to remove the distress arising from handling the viscera.

Unless dangers of sepsis are omitted, local analgesia offers few disadvantages, except that it is only applicable in comparatively few cases, unless we are willing to inflict a certain amount of pain, pain which is sometimes severe. Its best use is undoubtedly when combined with light narcosis, whether by alkaloids or nitration. For attaining this end, Crile's method of *anti-association*, i.e., the local and regional injection of analgesics, and the employment of a general anaesthetic, e.g., nitrous oxide and oxygen, gives a good prognosis. It is said to be especially the case in exophthalmic goitre. It must be remembered that persons who were subjects of the *status lymphaticus* find that when a local analgesic has been injected, even though no general anaesthetic had been given. Another danger which is not always recognized is that nervous persons, and those whose mentality is unstable, are liable not only to serious neurasthenia, but even to delusional

mania, as sequelæ of a trivial operation performed under local analgesia. Also after pain is stated to be more severe when local analgesia has been employed.

To sum up: In serious conditions it is best to restrict spinal analgesia to patients who are not good subjects for the methods of general anaesthesia, unless the greater facility of obtaining muscular relaxation by the former method gives the surgeon a better chance of performing an operation in the success of which the patient's life is involved. Local analgesia, unless by regional methods, is dangerous in septic cases: it is valuable for small and superficial operations: its success in exophthalmic goitre is at least doubtful, unless associated with a general anaesthetic, as in Crile's method mentioned above.

**2. Methods of Employment.** Since the dangers arise from overdosage, or from using an anaesthetic by some method which embarrasses the circulation, respiration, the nerve centres, or the metabolism of a patient already suffering from disease of one or other of these systems, the method selected makes for safety if it gives the administrator absolute control of the dosage of the anaesthetic, or for danger if it fails in this regard and further imposes upon the patient an increased disability. Hence, dosimetric methods of giving chloroform, always desirable, are essential in operations upon persons with feeble circulation (cardiac disability), in cases of goitre or lymphalism, and in operations upon the central nervous system.

Suffocative conditions contra-indicate the employment of ether or nitrous oxide, since these anaesthetics provoke venous engorgement of the air-passages, as well as the adoption of closed methods. Thus, the use of nitrous oxide or ether for a patient with angina Ludovici will probably kill him, since a speedy tracheotomy under the circumstances is impossible.

Posture becomes an integral part of the method in operations upon the thorax when an abscess cavity opens into a bronchus, since turning a patient upon his sound side may lead to filling his unaffected lung with fluid.

Open ether methods are at the present time regarded as peculiarly safe: but if used without atropine, they promote excessive secretion, and are apt to bring about excessive stimulation, which in its turn leads to exhaustion of the nerve centres and finally to collapse. The prognosis of ether collapse is worse than that of chloroform, but it must be clearly understood that this statement applies only to cases in which no sudden overdosage has been employed.

Infusion methods (ether), while of great value in prolonged exhausting operations and in cases of profound blood-loss, are liable to cause oedema if excessive quantities of saline are allowed to enter the circulation.

Hedonal, when infused, unless in cranial surgery, is dangerous, since the effect persists for hours, and patients may die before the drug is eliminated: they incur special risks from medication in bed, and from even slight hæmorrhage, since the blood may pass into the

air-passages. Such dangers are peculiarly apt to arise in all operations upon the mouth, nose, and upper air-passages. In these cases, whether chloroform, infusion of ether or hedonal, or colonic etherization is adopted, the method used must enable the patient to retain his laryngeal reflex, otherwise foreign material will invade the lungs. It is urged in favour of the insufflation and pharyngeal methods, that such an accident is impossible; and were the technique of these plans less difficult, there is no doubt that one or the other would give the patient the best chance of avoiding these accidents.

The method of prolonged nitrous-oxide administration, with or without oxygen, whether by the nasal route or by one of the many 200 apparatuses provided with a safety valve, is less safe than when employed for one brief inhalation. A severe strain is imposed upon the respiration; and the heart and blood-vessels, unless healthy, are overtaxed as the blood-pressure becomes raised.

Intratracheal insufflation, so far as we know at present, presents great possibilities; but even slight errors of technique may cause serious interference with the pulmonary circulation, through prolonged plus pressure being maintained in the lungs, although obviously this is not a necessity of the method.

The methods of colonic etherization are valuable, both for operations on the air-passages and on the thorax, lungs, and pleura. They prove most dangerous unless the air-ways are kept patent, and also when the colon has been weakened by disease, and especially if ulceration has existed. If liquid ether enters the bowel, serious proctitis will ensue; and excessive injection of the vapour has caused meteorism, and even rupture of the bowel. The ether-in-oil (75 per cent) method of Gwathmey is yet on its trial; it has been recently shown to be less free from danger than was originally supposed. Patients at times remain unconscious for many hours, nor has the method been free from fatalities.

The danger of intermittent dosimetric methods in the use of chloroform has long been recognized, but recent work has shown that unless complete anaesthesia is induced, cardiac fibrillation is produced. Vandell Henderson believes the condition is really due to asphyxia; but whatever theory we adopt to explain the phenomena, there is no doubt that methods which bring about this condition are fraught with grave danger to the patient. However, chloroform given by a dosimetric system is certainly safer than when an open method is employed. The depth of narcosis can be controlled by dosimetry, since it is as easy to employ a high as a low percentage value of vapour. It expects to restrict the strength to values of 2 per cent or less, if no convincing evidence exists which proves these values are the safest. In some instances it may be requisite to employ a vapour of higher percentage strength, but the prognosis of any strength above 2 per cent is certainly not favourable.

With regard to the methods of giving ethyl chloride, it may be said that the open plan much used by Hornibrook in Melbourne is reputed

safer than closed methods. Prolonged use of this anaesthetic presents much the same dangers as does chloroform, unless careful dosage is adopted.

*Spinal and Local Analgesia.* Broadly speaking, injection above the lumbar region is far more dangerous than at the place of election between the spines of the second and third, or third and fourth, lumbar vertebrae. Experience points to the danger of the method being increased if adrenine is combined with the analgesic, and to the absence of any commensurate benefit from prolongation of the period of insensibility to pain. The relative dangers of heavy or light fluids in the use of intrathecal injection has hardly been worked out. It is assumed that the drug used is 'fixed' in the tissues in 15 to 20 minutes, and so the inverted or Trendelenburg posture is reputed to be safe, provided the head is flexed forward. The prognosis is, however, less favourable when this position is allowed in cases of spinal analgesia.

In local or regional analgesia, on the other hand, adrenine together with novocain lessens the dangers, provided the quantity of adrenine is strictly limited. That adrenine is a dangerous drug has been shown by Goodman Levy and others, especially when used in conjunction with cocaine in nasal surgery. This is peculiarly the case when chloroform is also used and light narcosis is maintained: cardiac fibrillation appears to occur, with a fatal result.

3. **The Administrator.** This factor has been already dealt with in the last part of the article. It may be added, however, that the modern methods of producing anaesthesia have become complicated by the introduction of somewhat intricate apparatus, familiarity with the employment of which needs special and prolonged training. The administrator whose armamentarium is restricted to the older methods may be competent in their use, but his inexperience in present-time methods makes for the disadvantage of the patient and a bad prognosis in two ways. The character of the operation may demand for its ultimate and complete success that an unusual method of producing anaesthesia should be adopted. If the inexperienced man undertakes the administration, his chances of mastering the intricacies of the method are poor, while if he prefers to employ an older and less satisfactory method, he may hamper the work of the surgeon, and so produce a condition of things which does not improve the prognosis of the case.

#### 4. **The Physical and Mental State of the Patient.**

*Extremes of Life.* The rule of giving chloroform to persons up to six years of age, and to those over sixty is a survival of the myth that children and women in labour enjoy immunity from danger from that anaesthetic. As a matter of fact, children are peculiarly liable to danger, owing to their proneness to lymphatism and to post-operative toxæmia (delayed chloroform poisoning, or acidosis).

As regards old age, two points have to be carefully weighed. A person advanced in years must have considerable stamina to have attained his age, and so is usually a good subject. Indeed, age and

this is the second and more important point—must be reckoned less by years than by the healthiness of the tissues, especially of the lungs and blood-vessels.

To return to the question of children, it is beyond the scope of our present purpose to discuss whether lymphatism—*status lymphaticus*—exists as a pathological entity; it is proposed to discuss the symptoms and pathological conditions grouped under these headings, and to indicate their bearing upon the question of the safety or danger of anaesthesia.

*Status lymphaticus Lymphatism.* This condition is commonly overlooked in life, but of late years post-mortem examinations have shown certain lesions, not only in infants and children, but even in older persons. The lymphatic follicles and glands throughout the body are enlarged, the heart is commonly small, and the aorta is sometimes markedly diminished in calibre. The chronic enlargement of the tonsils and the presence of post-nasal adenoid growths produce imperfect pulmonary ventilation, so that the child suffers from lack of complete aeration of its blood and tissues. There is frequently a persistent thymus, but it is very doubtful whether this, save in most exceptional cases, can cause mechanical interference with breathing. Its presence may be seen sometimes as a shadow in a skiagram, though the absence of the shadow does not disprove its presence. Some enlargement of the thyroid gland is present in about 50 per cent of the cases examined. It is believed by some authorities that the condition is associated with a toxæmia, due to internal secretion of the ductless glands, which renders the heart peculiarly liable to failure. The fat of the body is increased, the skin is said to be harsh and liable to pigmentation, and the mental outlook is perverse: thus, although the child is often mentally bright, he is irritable, easily annoyed, and incapable of much self-control or prolonged exertion; hebetude and introspection taint his mental attitude. Clinically, the dominating symptom is the appalling liability to sudden death from heart failure without adequate cause. The prick of a hypodermic needle, the entry into a bath, sudden cold, may claim him as a victim. Into this group come infantilism, cretinism, and cognate conditions.

There seems little doubt that although the incidence of deaths associated with this condition is small when compared with the incidence from other states, yet, given a pronounced case of lymphatism, the former incidence is great, the catastrophe ensuing upon mental shock, fear, pain, or overdosage. The chief danger appears to arise in the large number of cases which show no marked symptoms in life; nor can one say definitely that every case of a child with enlarged hypertrophied tonsils and glands may not belong to the type, even though his symptoms are ill-defined. That thousands of such children pass through the ordeal of anaesthesia without scathe goes without saying. While we know that the use of a local analgesic (tropicocaine) in a usually safe dose has been associated with the death of a lymphatic patient. It must be borne in mind that one type of lymphatic patient



is marked by respiratory danger, the other by circulatory catastrophe. The 'sudden death' of the German writers is designated *white death*, while the less sudden fatality of primary respiratory origin is known as *blue death*.

It is probable that, in estimating the share of danger from the anæsthetic, we have to consider not only whether one or another drug is more dangerous, but whether, owing to the dyscrasia, all drugs are dangerous unless we are keenly alive to the fact that such delicate persons cannot withstand the same doses and concentrations of anæsthetics as are well within the zone of safety for the ordinary individual. It is less that the anæsthetic is dangerous, than that it is the way the anæsthetic is presented to the lymphatic patient, which courts disaster. Although chloroform is associated with a majority of these deaths, it is not proved that it is, indeed, the most perilous. It must be remembered that chloroform is the anæsthetic of choice and the one most usually employed for young persons and for operations upon the upper respiratory tract, and that it is such persons who suffer from lymphatism and usually require this type of operation. It is, however, probable that chloroform is dangerous in status lymphaticus owing to the fall of blood pressure it entails, since it is this decline in blood-pressure which is peculiarly prone to cause death in such cases. When an inexperienced anæsthetist is administering the anæsthetic, ether or an ether mixture is safer, and offers the best chance of success, but it should be given after a hypodermic injection of atropine. Death associated with lymphatism has occurred during the use of most of the general anæsthetics, and even when local analgesia has been adopted. Where chloroform is selected, it should be given in the mixture containing one volume of alcohol to nine volumes of chloroform, with high dilution of air or, better, of oxygen, and complete anæsthesia should be obtained before the operation is commenced. It adds to the patient's safety if all asphyxial complications, fear, and roughness are rigidly prevented.

*Acidosis Post-operative Toxicemia Delayed Chloroform Poisoning.*  
Deaths following what appeared to have been a normal anæsthesia, obtained by chloroform, by ether, by ethyl chloride, or by a mixture of these, have been imputed to the prolonged effect of the anæsthetic upon the glandular structure of the liver and the kidneys, as well as on the muscular structure of the heart. The onset of events is marked by uncontrollable vomiting between the twelfth and forty-second hours after the inhalation: the vomit is foul and watery, greenish in colour at first, but brown later. There is marked restlessness or delirium, with intervals in which the patient is apathetic, and this apathy may end in fatal coma. The urine is scanty, and commonly contains albumin and diacetic or isoxybutyric acid. The breath has the apple-like smell of acetone. The patients are usually young, commonly poorly nourished infants or children: neither the gravity of the operation nor the duration of the anæsthesia appears to count. In a large number of patients whose urine was examined before the

anaesthesia and subsequently to the operation, diacetic acid was found to be present before operation, and only a few of these developed severe symptoms. Indeed, it has been demonstrated that mere change of dietary, restriction (starvation) or improved feeding, is associated with diacetism. The pathology of the condition is certainly obscure, and not a few instances of septic changes in the organs have been advanced as cases of 'delayed chloroform poisoning.' Opie, indeed, has produced fatty changes similar to what is described as 'delayed chloroform poisoning,' by means of bacteria (*B. coli* and *Streptococcus pyogenes*). On the other hand, Leonard Guthrie and others have certainly demonstrated that the lesions—destruction of the glycogenic function of the liver, degeneration of the parenchymatous tissues of many organs, and marked fatty degeneration in the organs of the alimentary tract—occur without the incidence of sepsis, syphilis, or other distinctive disease. Association with cyclic vomiting has been suggested, but although probable, it cannot be considered proved. Most authorities agree that the perversion of the hepatic function leads to failure of metabolism of carbohydrate foods, consequent upon which is destruction of glycogen and some damage to the tissues, with liberation of fatty acids. The condition is, however, uncommon, and even those who have had wide hospital experience have seen few cases, unless we group all patients who incur prolonged post-operation vomiting as suffering from the appalling perversion of metabolism witnessed in acidosis. That the anaesthetic is but one factor in producing this toxæmia is obvious, but that it may act in this way is equally certain. Experiments on the lower animals have demonstrated that repeated inhalation of anaesthetics, and excessive strength of their vapours, as well as accumulation of the anaesthetic in the tissues, produce destructive tissue effects quite similar to those described above. The association of this toxæmia with diabetes and glycosuria is more than probable.

To estimate the prognosis is difficult, since we cannot be sure that children with normal urine will not subsequently develop acidosis; but when they are weakly, have suffered from cyclic vomiting, are febrile, and presumably suffer from sepsis, it is certainly grave unless the anaesthetic can be postponed for a few days and the carbohydrate deficiency counteracted by rectal injections of dextrose or glucose. Such rectal feeding (glucose 5j in saline 5vj), given every three or four hours, is excellent both before the anaesthesia and as soon as the vomiting appears. It has been suggested that the intravenous infusion of saline containing 6 per cent of dextrose offers even a better means of supplying the requirements of the organism. Whether the commonly adopted method of introducing large quantities of alkalis is of much value is open to question: it does no harm, but at best it is only treating a symptom, and not removing the cause of the pathological perversion of metabolism. As has been stated above, diacetic acid is too commonly present in the urine of all patients for its discovery before operation to veto the employment of an anaesthetic, although

it would indicate the selection of ether, if that agent is otherwise appropriate, and enforce the necessity for careful limitation of the quantity of the anesthetic given.

Beesly has pointed out that acetouria is virtually always present in the cases which are septic, but that chloroform increases the danger of fatality. In the appendix abstracts cases when chloroform was given, 14 died; in 24 when ether was administered, 2 died. It must be borne in mind that acidosis is the result of many conditions, and so these have to be differentiated. Thus, it may be (a) symptomatic; (b) due to the use of various drugs; (c) associated with diabetes; (d) associated with cyclic vomiting; (e) associated with inhalation of chloroform, and to a less degree with that of other anesthetics, e.g., amesth (Erick); (f) associated, as it commonly is, with infancy.

*Uremia*, whether it be accepted as merely symptomatic of physical depression or not, is a very important factor in estimating the dangers of general anesthetics. It is stated that when the haemoglobin falls below 50 per cent of its normal, chloroform, and even ether, become dangerous; Mickulicz accepts 30 per cent below normal as dangerous. Yet the danger of *uraemia* when the haemoglobin content is unduly low does not impress those who see such perils lurking in haemolysis produced by anesthetics, for haemolysis certainly occurs as a result of trauma *per se*. It is probable that Snow's dictum is correct, and that when a patient is judged to be fit to undergo an operation, he is also fit to be subjected to anaesthesia. The main points which need attention are—the limitation of the amount of the anaesthetic which is given, and the careful selection of the method. Haemolysis is less, of course, when analgesia is employed; and if the condition of the poorly nourished nervous system is deemed to be satisfactory, the spinal method or local analgesia should replace inhalation. There is, however, a risk in these cases, too often ignored, of the super-vention of psychic shock and consequent circulatory catastrophe.

The danger of chronic, as opposed to acute, anaemia is greater, especially if the blood drain in the latter case is due to repeated and severe haemorrhages, such as occur in metrorrhagia. In the first case, behind the condition is some serious dyscrasia, probably a perversion of the blood itself; in the latter, it is a mere temporary numerical loss of erythrocytes. When the surgical aspect of the case permits of delay, pre-operation treatment is advisable, and especially is this the case with young persons. An infusion method offers us the obvious advantage in these cases of combining anaesthesia with a supply of a physiological fluid which is competent to counteract the deleterious depletion of the circulating fluid.

*Exophthalmic Goitre*. The incidence of danger in these cases is so great, that many Continental authorities, who enjoy an experience of somewhat crude methods of anesthetizing, discountenance the use of general anaesthesia, substituting a local analgesia. But danger is not obviated by this procedure, since psychic shock is not removed, and it is this condition which makes for a fatal result. Unless the

elaborate method of Crile, 'stealing the thyroid,' is adopted, and local analgesia is combined with the employment of both hypnotics (scopolamine, morphine, and atropine) and the nitrous-oxide-oxygen mixture, we have to decide whether chloroform or ether should be employed. Crile's method, unless carried out in its entirety and to the last detail is not satisfactory: and in this country it is difficult to isolate a patient from her friends, to maintain the mystery as to the date of operation, and ultimately to perform it without a formal consent. A fatal result, which is always possible, would give rise to grave questions of responsibility which needs must be carefully faced beforehand.

The choice of the anæsthetic resolves itself into that of the method. Undoubtedly a preliminary drowsing with suitable hypnotics is advisable, whether local or general methods are pursued. Local systems are admitted to fail when the thyroid is being dislocated, and this increases the danger. Chloroform with oxygen is only safe when a dosometric method is employed, as a serious fall of blood-pressure spells disaster. Ether, even if guarded by atropine and given by an open method, often causes dyspnoea in goitre cases, owing to the large excess of bronchial secretion it excites. It has a further disadvantage in that its stimulating effect cloaks the signs of shock, and often leads to the performance of a more extensive operation than the patient can bear. As soon as the ether effect has passed, profound collapse sets in, and death is liable to occur. This calamity is especially likely to ensue when ether has been given in unstinted quantity, as by the open method.

*Serious Lesions of the Nervous, Pulmonary, Circulatory, Renal, or Metabolic Systems.* In estimating the incidence of fatality among patients suffering from the above, we have to consider, less the actual disease, than the effects which it has brought about in the physical well-being of the patient. If, in the case of disease of the nervous system, we recognize that there is, or may be, pressure about the *cornu Amolii* or the medullary centres, we know that any profound anaesthetization of the respiratory centre will make for extreme danger. Thus, the prognosis in cases of cerebellar tumour, when much pressure exists, is bad, while that in cases of cerebral tumour and spinal disease needing laminectomy is serious—proportionately so according to the height of the segment of the cord which is subjected to pressure. The danger is probably less when chloroform is employed than when ether is used. Again, when well-marked arteriosclerosis exists, there can be no doubt of the danger of using a general anæsthetic given by an open method which involves rise of blood-pressure, since it promotes a grave risk of a cerebral hæmorrhage. Three conditions of blood-pressure give an unfavourable prognosis: (1) Unstable conditions of the circulation, such as arise in children, in exophthalmic goitre, in the anæmias, and also in severe neurasthenia; (2) Excessively low blood-pressure, found in prolonged wasting disease, after severe hæmorrhages, and during traumatic shock; (3) Extremely high

blood-pressure. In conditions (1) and (2) the prognosis is fairly good if ether can be given, especially in association with oxygen, while asphyxial complications are absent. In (3) the danger to life is greater when ether or nitrous oxide is used, and when the blood-pressure is still further raised by such conditions as interference with respiration. Apoplexy has occurred not infrequently as a result of these anaesthetics being given. Equally perilous in cases of advanced pulmonary, bronchial, or pleuritic disease would it be to employ an anaesthetic which would increase respiratory difficulty, and so throw back a strain upon a heart probably taxed already to its utmost capacity. A mere cardiac valvular lesion, when compensation is complete, or even renal disease confined to one kidney, need not, with care, involve the patient in greatly enhanced risk under anaesthesia. The danger to life when anaesthetics are given to patients suffering from angina pectoris with cyanosis is considerable, but not necessarily fatal.

*Septic Conditions.* It has been said that the pathological lesions seen after septic fever and after chloroform toxæmia are closely akin. This fact induces the anaesthetist to employ ether in acute septic cases, either by inhalation, insufflation, intravenous infusion, or colonic-absorption methods. Probably septic states of the thoracic walls and contained viscera alone furnish exceptions to this contention. However, as Graham has shown that phagocytosis is delayed by ether, even that anaesthetic is not without its risk, while spinal analgesia may prove dangerous in marked septicaemia, although safe in localized disease such as 'acute appendicitis.' If ether is employed, the injection of 5 oz. of pure olive oil per rectum, as soon as the patient is carried back to bed, has been shown to assist the rapid return of the power of phagocytosis.

#### 5. The Nature and Duration of the Operation and Intercurrent Conditions associated therewith.

*Shock—Blood pressure—Body Temperature.* It is impossible in this place to go into any lengthy discussion of surgical shock. From whatever cause it arises, we know that trauma in certain regions, and involving certain structures, appears to bring about conditions which are commonly grouped under the term 'shock,' often associated with surgical procedures which in themselves do not seem serious and do not involve any great 'insult to tissue.' Such operations are those which involve the opening of the large somatic or cranial cavities—laparotomies, craniotomies, opening of the thorax, exploratory operations on the brain and spinal cord. Further, when viscera, and especially certain serous membranes, are dragged upon and dislocated, such shock eventuates. In the case of serous membranes, Professor Vandell Henderson contends that the loss of carbon dioxide produces acapnia, a determining cause of heart failure. Undoubtedly the opening of such cavities leads to changes in the haemodynamics of the body which may gravely prejudice the carrying on of the normal circulation. This is indicated, for example, by the rapid

recovery of the patient when the abdominal walls are closed. We know that shock may be regarded as loss of body heat and fall of blood-pressure, and hence it becomes necessary that the anæsthetic, and method of using it, should be so safeguarded as to prevent an additional declension of either blood-pressure or body temperature. Since elimination of the anæsthetic, if from the lungs and kidneys, predicates abstraction of heat, it follows that the less anæsthetic there is employed the less will be the drain on the body heat.

A fall of blood-pressure is usually dangerous, but if the initial blood-pressure is high, or if it is desired to prevent any engorgement of the vessels, as in cranial and spinal surgery, chloroform is adopted to facilitate the surgeon's work by lowering the blood-pressure. The addition of oxygen removes the danger of the lessened activity of the respiratory centre. Hemorrhage antecedent to, or involved in, an operation is best met by introducing saline *pari passu* with the anæsthetic; hence we adopt ether infusion, colonic etherization with tissue infusion, or some kindred method.

Prolonged operations are often necessary, and may prevent the use of spinal methods; and their dangers as regards anæsthetics are either excessive fall of blood-pressure leading to profound collapse, or undue stimulation followed by even greater collapse after the anæsthetic has ceased to be used; while an after-danger exists owing to the cooling and shock engendered by the elimination of the large amount of the anæsthetic which has entered and become segregated in the tissues. The first danger is that of chloroform, the second is that of ether. The two conditions being compared, we find that the chloroform collapse is more rapidly and more readily surmounted than is its counterpart due to ether. In prolonged anæsthesia such dangers can be avoided by careful moderation of the dosage. As time goes on, especially if traumatic shock and hemorrhage occur, extraordinarily little anæsthetic is needed, and this minimum should never be exceeded.

The 'mixed method' of using scopolamine-morphine and atropine before the general anæsthetic, is most valuable in such cases, as it allows the anæsthetist not only to lessen the dose required for induction, but practically to maintain anæsthesia without inhalation. If this is overlooked, and the anæsthetist employs a large quantity of the anæsthetic, the patient is subject to grave risks. Overdosage causes extreme shock at the time of the operation, and collapse after its completion.

*Severe or Persistent Vomiting.*—It is often necessary to subject a patient to an operation to relieve a condition which itself causes or has caused severe and persistent vomiting. Further, it is often necessary to perform an operation upon viscera interference with which commonly brings about serious after-sickness. Vomiting, at all times troublesome, may actually determine death through exhaustion, since sleep and immobilization are necessary in order that traumatized tissues may heal. Therefore, in selecting the anæsthetic

and in that we should take into consideration the likelihood of after vomiting, and adopt measures to minimize the dangers arising from it. Patients vary within wide limits in their liability to vomiting.

The types of vomiting may be roughly grouped as follows :

*a.* Catarrhal. This arises from irritation of the gastric mucous membrane. It is commonly due to swallowing mucus and saliva saturated with inhaled anesthetic. Children, delicate women, 'bad sailors', the obese, and dyspeptics are most prone to this trouble. Unless the patient is imphily feeble, the prognosis is favourable, as the condition soon passes off.

*b.* Head vomiting. This arises from circulatory conditions, when not due to operative procedure on the brain, and can be obviated by avoidance of the lowered head position. Unless there is obvious necessity for adopting the dorsal decubitus, a half-sitting posture lessens after sickness. This condition is especially liable to occur after spinal analgesia, and is very distressing, but it is not in our experience dangerous.

*c.* Visceral reflex vomiting. Operations, with or without general anaesthesia, upon the appendix, kidneys, or uterus, are peculiarly liable to produce serious vomiting; especially is this so in regard to the kidneys.

Probably both (*b*) and (*c*) fall into the category of toxæmia in many cases, and are closely allied to the so-called delayed chloroform poisoning. As with all patients who are the subjects of toxæmia, the prognosis is favourable or the converse according as two factors are recognized and dealt with: traumatism by handling and dragging upon viscera, and excess in the quantity of the anesthetic given. A careful study of the conditions influencing sickness and general 'upset' after anesthetics, made by the present writer, brought out very clearly the following fact. Whenever undue venosity of the blood was present, vomiting and severe after-collapse were developed. This condition may exist *ab initio*, as in the case of chronic bronchitis, when bronchitis, emphysema, and a dilated feeble heart are dominating the organism; in toxæmias, such as cholæmia, meningitis, septicæmia; or it may arise through exhaustion of the central nerve controls through collapse following excessive stimulation, or through the employment of unnecessarily large quantities of the anesthetic or too concentrated a vapour. The prognosis is worse in the case of ether than in that of chloroform, since very large quantities of the former are given during the operation, and it is only after its completion that the collapse is observed.

Speaking generally, the prognosis as regards vomiting after general anaesthesia is favourable. Avoidance of 'irritant to tissue,' maintenance of body temperature, minimizing the amount of the anesthetic, and avoiding the swallowing of mucus by giving atropine or chlorbutyl before the inhalation, with a correct placing of the head—lateral posture during operation, half-sitting posture later—will prevent serious sickness. The dangers in severe cases arise from the stomach

Withholding all nourishment, and from absence of sleep. Here rectal or muscular injections of saline and dextrose, and the use of morphine in suitable cases, will be efficacious. Morphine, however, when given after chloroform will sometimes cause sickness, and in a dangerous way. The patient recovers from the anaesthetic, without nausea or sickness, and seems extremely well for twelve or twenty-four hours, when severe vomiting comes on and is at times very troublesome.

Vomiting after spinal analgesia is not infrequently severe and prolonged, especially if much encephalalgia exists. Although it is extremely severe in a few cases, the condition is transitory and amenable to treatment.

*Stercoraceous Vomiting.* A much more dangerous condition may arise in cases of intestinal obstruction. The contents of the stomach and intestines are regurgitated, rather than vomited by muscular effort, and usually the flow commences as soon as the muscular tonus of the cardiac and pyloric orifices becomes lessened by the anaesthetic. It occurs both when general anaesthesia and spinal analgesia are employed. Unless it is possible to prevent aspiration of the material into the air-passages, the prognosis is most unfavourable. Even intubation is not a complete safeguard, although it should be used when practicable. As the back-pressure remains constant, when the stomach is emptied the intestinal contents still flow into it, so that the best method is to maintain a constant irrigation of the stomach, and have the shoulders and head of the patient kept high during the operation. The laryngeal reflex should be kept active. In very serious cases, intubation of the larynx with forced respiration, as obtains in intratracheal insufflation, or the method of a preliminary tracheotomy suggested by the present writer,<sup>1</sup> may be employed.

**6. Post-operative Effects.** It is unnecessary to dwell upon the immediate, and usually slight, after-effects of anaesthesia or analgesia. The more serious ones, i.e., those threatening life, which occur within forty-eight hours or so after the operation, are respiratory, circulatory, nervous, metabolic, and renal. These have all been dealt with in the preceding sections, but may be summarized on this place.

In persons previously affected by bronchitis, inhalation of unwarmed vapour of ether or chloroform may determine a recrudescence of the disease. It is most common with the former, partly because the vapour is more irritating, and partly because it lowers the body temperature from 0.5° to 3° F. during a prolonged inhalation. Bronchitis following chloroform is, as a rule, more severe, and associated with greater tissue destruction. Prolonged administration of nitrous oxide and oxygen in major surgery, unless the gases are warmed, may cause bronchial trouble, but it is an infrequent complication. It has been shown that when much bronchorrhoea is caused, the fluid, mucous, and bronchial secretions are aspirated and enter the smaller bronchi, setting up irritation. Tight bandaging, by impeding



facial movements, prevents these fluids being expelled, and a pneumonic inflammation is initiated, since pneumococci are usually present in the mouth. A Dr. William Pasteur has shown, many cases of so-called "ether pneumonia" are really instances of massive pulmonary oedema due to trauma affecting the diaphragm. Pneumonia of a "toxic" type is liable to follow profound narcosis when operations upon the tongue, jaws, or upper air-passages have been performed, and is due to aspiration of blood, particles of growth, pus, or contaminated saliva and mucus. Such complications will usually reveal themselves within a week of inhalation. In this connection, the observations of Mikulicz published in a report issued in 1898 may be recalled. Having noticed the frequency of post-operative pneumonia after the use of ether, he replaced that anæsthetic in his clinic by chloroform. However, he soon found that the incidence of pneumonia was rendered greater by the change. Mikulicz then replaced chloroform by local and regional analgesia. To his surprise he found that post-operative pneumonia became more frequent still. Thus, out of 144 laparotomies, he lost 27 patients from lung complications. It follows that the prognosis in severe cases is more favourable when ether is used. That the lung complications attributed to anæsthetics are in fact due to infection from the abdomen, possibly through the lymphatics, appears to be more than probable.

*Prophylaxis.* Before the operation, the teeth, mouth, and nasal passages should be assiduously cleansed, and unhealthy gums painted with an iodine preparation. If the breath is foul and the stomach unhealthy, lavage and careful asepticizing of the alimentary tract with salol or other means may be pursued. Atropine, given hypodermically, will lessen or prevent bronchorrhœa and salivation. The anæsthetic vapour should be warmed and moistened, and given so that the laryngeal reflex is active subsequently to full anæsthesia (third degree of narcosis) having been obtained by the induction. After the operation, the patient's body temperature must be maintained, and he must be protected from draughts as he is conveyed back to bed.

Hydrothorax and œdema affecting the bases may follow the exhibition of ether by inhalation if the kidneys are diseased and albuminuria exists. It may be associated with acute œdema of the tongue and larynx, and is usually fatal. If an iodine quantity of saline is introduced by the method of ether infusion, pulmonary œdema is a serious danger; and hence strict limitation of the amount must be practised, especially if renal inadequacy exists.

Persons suffering from angioneurotic œdema are in serious danger lest the air-passages should suddenly become involved. I have met with one such case, and gave chloroform while tracheotomy was performed. Both local analgesia and ether are contra-indicated for these cases.

All anæsthetics, when inhaled in great quantity, especially if the oxygen content of the blood is not kept at about its normal during

administration, may cause fissile cooling, catarrh, irritation, and embolosis after the operation. The law is certainly true that the deleterious effects of an anæsthetic are, in severity and frequency, a function of the amount taken. If the vapour as it enters is warmed, some of its deleterious effects are removed.

Post-operative headache, back-ache, vomiting, oculomotor paralysis, and paralysis of the bladder and rectum, may follow spinal analgesia. We do not know for certain whether these arise through irritation of the analgesic or through alteration in the amount of the cerebrospinal fluid. Their occurrence is rare, but at times these sequelæ are alarming. Some surgeons regard them as evidence of errors of technique; but even so it is not possible to avoid them entirely, nor should we minimize their gravity when they arise. The possibility of acute jaundice or delusional mania consecutive to operations undertaken under local analgesia must be remembered. Such cases are rare, and the ultimate prognosis is favourable, though the condition causes great distress to the patient's friends.

REFERENCE.—Buxton, "Facial Vomiting during Anæsthesia, a Suggested Method of Obviating its Danger," *Brit. Med. Jour.*, 1910, April 23.

Dudley W. Burton.

**ANEURYSM, ABDOMINAL.** It is needful to remember that aneurysm of the abdominal aorta and its branches is an obscure disease, hard to detect in early stages; so that when the physician meets with a case in which there is no doubt as to the presence of an abdominal aneurysm, the sac is already large. Unhappily, the newer method of diagnosis by skiagraphy does not give us much help in the discovery of aneurysms below the diaphragm as it does in those situated within the chest. The stealthiness of the early stages of the disease is prejudicial to the patient's chance of recovery; a sac that can be felt is not likely to be cured.

**General Outlook.** I do not know of any proved example of complete and final cure of an abdominal aneurysm large enough to be diagnosed as such. Of course there are examples of what appeared to be a pulsatile swelling connected with the abdominal aorta failing to kill the patient; but these are usually cases of atheroma, and not of real aneurysm. Again, it is not an unusual experience to encounter healed abdominal aneurysms in the course of a post-mortem examination; but these are small, as a rule, falling far short of the size which must be attained if the sac is to be detected clinically. Moreover, abdominal aneurysms are not seldom multiple; in the patient who dies from rupture of one sac, another may be found completely obliterated by lamellæ of clot. True cure of abdominal aneurysm diagnosed during life is therefore almost, if not quite, unknown.

In spite of this, patients may live for a considerable time after the onset of symptoms: in one of Nimmeley's series, collected from the St. George's Hospital records, the duration of the case extended over nine years; while one of the Guy's Hospital patients, whose case was tabulated by J. H. Bryant, lasted twelve years. These are,

however, exceptions to the general rule; and the average expectation of life from the onset of symptoms, judging from the 86 cases included in these two series, is not more than fifteen months. The shortness of this period, as compared with that of thoracic aneurysm, is no doubt largely due to the greater difficulty of diagnosis; it cannot be related to the greater extent of danger to the abdominal variety, for there is not the same risk of injury to vital structures that there is in aneurysm within the chest. An aneurysm of the abdominal aorta is usually limited to the retroperitoneal tissues, and it is into these tissues, in the great majority of instances, that the fatal rupture which terminates most cases occurs. The course of abdominal aneurysm is short because its earlier stages are not productive of symptoms.

**Sudden Death.** In almost two-thirds of Nimmeley's cases, in all of which the diagnosis was verified by post-mortem examination, the end came suddenly. In nearly all of these it was due to rupture, usually into the retroperitoneal tissues, rarely into the peritoneal cavity. It is this predisposition to rupture that makes an abrupt termination rather more frequent here than in aneurysm of the thoracic aorta; for, curious as it may seem when we reflect upon the varied opportunities presented to the thoracic aneurysm of rupture into neighbouring hollow viscera, it is the abdominal aneurysm, limited as it is by the parietal peritoneum lying in front of it, that bursts the more readily. In many instances the end is dramatically sudden, no warning of its approach being given until the patient drops dead. In others, a period of collapse sets in abruptly, with or without pain, a few hours before death. It is therefore essential to remember that when a patient with abdominal aneurysm faints away, it is likely that his hours will be few, particularly if severe pain accompany the onset of the faint. It is the more necessary to bear in mind this liability to concealed hemorrhage, because it is so rare to find bleeding from an abdominal aneurysm declaring itself in the form of hæmatemesis, or melæna, or other external hæmorrhage.

**Features of Prognostic Significance.** Everything that predisposes to activity on the part of the patient is prejudicial to recovery or prolongation of life. This factor counts for less, however, than in thoracic aneurysm, probably because the pain of abdominal aneurysm is so crippling as to reduce nearly every one of its victims to a state of complete invalidism. For this reason, neither the age nor the occupation of the patient seems to have much bearing on his expectation of life, if we may judge from the records of cases. Sex, again, is of little importance, or at least it is difficult to assess any importance which may attach to it, for abdominal aneurysm is a rare disease in women.

Apart from such evidences of rupture as have already been mentioned, there is no help to be gained from the nature of the symptoms and physical signs in arriving at an accurate prognosis. It is true that, in a very few cases, surgical treatment has achieved satisfactory results; but the number of these is so small that it is impossible to generalize

to the features which promise success along these lines further than to say that extirpation is only possible when it is a branch of the aorta, and not the aorta itself, that is implicated. Such aneurysms, e.g., of the renal or hepatic arteries, are diagnosed with the greatest difficulty, and are oftenest found by accident or through exploratory laparotomy, so that there are no indications to enable the clinician to forecast a successful result.

**Influence of Treatment on Prognosis.** The question that we would like to be able to answer is, Does any more radical method of treatment yield better results than the usual plan of rest in bed, with strictest diet, and drugs?

*Proximal ligature* of the abdominal aorta has been practised, both in aneurysm of the aorta and of its branches, in each case with immediately fatal results. The hepatic artery has once been successfully tied on the proximal side of an aneurysmal sac; but this aneurysm is extremely rare and seldom diagnosed. Moreover, in three other cases, this operation was fatal. Aneurysm of the iliac artery within the abdomen and pelvis has been attacked by proximal ligation in 33 instances where the results have been recorded; recovery ensued in 9, the operation killing the remainder.

*Extirpation* is clearly impossible in nearly every kind of intra-abdominal aneurysm. It has, however, been successfully carried out in the treatment of aneurysm of the renal artery, the kidney being excised together with the sac.

*Incision*, the method introduced by Macewen, cannot, as a rule, be safely undertaken except after incision of the belly wall. It is true that in Macewen's case this precaution was not taken, and the result was nevertheless satisfactory, the patient being alive and at work two and a half years later; in other cases, however, death has followed immediately after needling.

*Introduction of wire* into the sac, Moore's method, has been practised 10 times for abdominal aneurysm, death following more or less immediately in all but 2 instances. Corradi's modification consists in the passage of a *galvanic current* through the wire introduced into the sac. This procedure has been put to the test in thirteen instances of abdominal aneurysm. The best result was in one of Finney's cases, the patient dying, three and a half years after operation, from rupture of the sac. In one other case the patient did well, dying eight months later of dysentery. The fate of a third patient is unknown, but cure was improbable. In the other cases, death followed within a few days.

It appears, therefore, that all surgical methods hitherto devised introduce an unjustifiable risk without offering any certain advantages to counterbalance it. One or two other plans of a somewhat less dangerous nature have to be considered.

*Prolonged proximal compression* through the abdominal wall, the method introduced by Murray, of Newcastle, and successfully applied by him to one patient who was alive six years later, has its limitations,

and also involves certain risks. In the first place, there are but few cases of abdominal aneurysm in which the aorta can be compressed on the proximal side of the sac, which generally lies too near to the costal border to leave room for compression. In the second place, the pressure which is necessary if it is to be effective, is such that it introduces a risk of injury to the bowel and other abdominal viscera, and fatal results have already been produced in this way. A preliminary laparotomy might remove this risk, but it introduces fresh disadvantages, so that this method cannot be said to promise better results for most patients with abdominal aneurysm.

*Gelatin injection.* There is, lastly, this method of Lancereaux. Though good results have followed in a few instances, no improvement has been recorded in the majority of published cases. There is some risk of tetanus following the injection, though this has been circumvented by more careful sterilization of the gelatin. It is to be feared that this method does not improve the patient's prospect of cure.

It seems, therefore, that we must be content, for the present at any rate, with the ordinary medical treatment, along the lines introduced by Tuffnell—absolute rest, reduction of diet and particularly of fluids, and administration of potassium iodide in full doses. This does not promise any great likelihood of cure, but it is at least free from risk; and since the patient is already invalided by pain, it does not impose any great restriction upon the activities which he would otherwise be free to pursue.

*Carey F. Coombs.*

**ANEURYSM, INTRATHORACIC.**—Aneurysm, and fusiform diffuse dilatation of the aorta, must be considered apart, since the factors influencing prognosis are totally different in the two affections. This article, therefore, is devoted to a summary of the prognostic factors of sacculated aneurysm within the thorax.

The outlook in a patient afflicted with this disease depends on the balancing of two factors: the rate of growth of the aneurysm, and the rate of coagulation within the sac. Increase in the size of any aneurysm threatens to end the patient's life by hæmorrhage; to this, in the case of aneurysm within the chest, are added the various disabilities and dangers involved in pressure on vital or sensitive organs and tissues.

**General Outlook.** Does *complete recovery* ever occur? In quite a number of autopsies, 'healed' aneurysms of the thoracic aorta and its branches have been found, but these were not detected during life. A few cases have been recorded in which an aneurysm, unmistakably present and even projecting through the thoracic wall, has become solid and remained so for periods of over ten years. The longest duration of which I can find any record was in a case quoted by Osler, in which the patient lived over twenty years after the condition was first diagnosed. So favourable a result as this is, however, highly improbable, even in these days of early diagnosis by radiography.

As to the *average duration of life* from the onset of symptoms, de Havilland Hall's recently published figures are of value, since they

white to patients whose position in life enabled them to take every precaution. In 27 cases carefully followed up, the average duration of life amounted to about three years. It is more than probable that this period, brief as it is, is too long, if patients be included who are obliged to work.

In estimating the expectation of life that can be held out to any given patient, therefore, it is fair to take this as a basis: that though he may live for ten or fifteen years from the moment of discovery, it is not likely that he will last for more than three years.

**Sudden Death.** Thoracic aneurysm is one of the notorious causes of sudden death. To the dangers never absent from a heart whose coronary arteries are diseased—as they are in a majority of cases of aneurysm—are added those of rupture, with rapidly fatal hemorrhage; and, in a few instances, those of aortic insufficiency.

In de Havilland Hall's experience in private practice, about one-third of his patients died suddenly.

This sudden termination may be due to cardiac failure or to rupture. The omens pointing to the former possibility are not different from those of chronic cardiac disease generally: paroxysmal cardiac pain, dyspnoea on exertion, the alternating pulse, and physical signs of aortic regurgitation, all enhance the risk of an abrupt failure of the contractile power of the heart. In de Havilland Hall's Westminster Hospital statistics, over 40 per cent of the deaths are due to cardiac failure. Aneurysms pointing externally rarely burst suddenly; indeed, leakage of blood into the subcutaneous tissues may continue for quite a long while in such cases without foreshadowing rupture, and the patient may die eventually of exhaustion or some such cause. Aneurysms of the intrapericardial aorta are particularly liable to burst into the pericardial sac: this is immediately fatal, but in most cases the diagnosis has not been made. Fatal hemorrhage occurs more frequently in patients who present evidences of pressure on the trachea, bronchi, or oesophagus, than in those who do not show these signs. The rupture may also pour its blood into the mediastinal tissues: this also is more likely to happen if the sac arise from the transverse or descending part of the arch. Curiously enough, patients in whom the aneurysm bursts into a great vessel—superior vena cava or pulmonary artery—often survive the immediate shock of the catastrophe and live for weeks or months. A common direction of rupture is into the left pleural sac: this is particularly apt to occur in aneurysm of the descending aorta, and kills quickly.

**Features of Prognostic Significance.**—The age of the patient has a little bearing on the outlook: the older the patient the better the prognosis. "Healed aneurysm is rarely seen in a man under forty" (Osler). This is partly due to the quieter life of elderly men, partly, perhaps, to the fact that the younger the man in whom an aneurysm has appeared, the more likely is it to be due to active syphilis of the aorta. And the more active the syphilitic process, the sooner will the aneurysm burst.

The sex is of some importance: women carry aneurysms without final misadventure longer than men, presumably because they are subjected to less physical strain.

The *occupation and social position* of the patient is a consideration which influences the prognosis along the same lines: the man who can take things quietly, and rest as much and as long as he needs, stands a far better chance than the man who must work or starve. Of course, there are extraordinary exceptions: men with large aneurysms have been known to work at laborious occupations for years, but the great majority are not so fortunate.

Most thoracic aneurysms are syphilitic in origin, and result directly from spirochætal infection of the aortic wall. Unhappily, it is not always possible to detect this morbid process in the pre-aneurysmal stage, and once the aneurysmal sac has reached such dimensions that it produces symptoms, the aortic wall is injured beyond repair: yet *early diagnosis*, such as is now possible by means of radiography, does undoubtedly improve the patient's chance. This comes about in two ways: vigorous mercurial treatment, if instituted as soon as the diagnosis is made, prevents extension of the aortic disease; and the patient also comes under restraining influences in time to obviate, or at any rate to postpone, disaster.

The *site of the aneurysm* has a most important bearing on the patient's hope of survival. Something has already been said about this in considering the risks of sudden death. Broadly speaking, it is the aneurysm that springs from the ascending extrapericardial portion of the aorta that lasts longest: its tendency is to extend to the right into the lung, or forward by erosion of the chest wall, and in spreading in either of these directions it encounters structures of relatively little importance: the pain that is caused by injury of intercostal nerves wears the patient's strength down; but when the aneurysm bulges forward as a definite tumour consisting mainly of solidly packed clot, it is astonishing how long life may last. Even when the swelling has attained a very large size, the patient may carry it for months, or even years. The writer recollects one such case, in which the aneurysmal sac presented over the greater part of the right front, below the right costal border, and also below the inferior angle of the right scapula; and yet the patient survived in hospital for several months and died eventually of exhaustion, though the sac had leaked through the front of the chest wall for weeks. One of the worst things that can happen to an aneurysm arising from this part of the arch is rupture into the superior vena cava: this often leads to death in a few days, though, in one case seen by the writer, the patient survived for several months after the rupture occurred. Rupture into the pulmonary artery is less immediately fatal, especially when the communication is established gradually, as it is in some cases.

The most quickly fatal form of aortic aneurysm is that which arises from the intraperitoneal portion: this type shares with coronary aneurysm a peculiar predilection for rupture into the pericardial sac,

a calamity which is fatal at once, or in a very short time. Possibly earlier diagnosis might help to avert this; but even with the *x* rays it is not easy to be sure of the presence of this type of aneurysm, and while it is still comparatively small, the fatal rupture is apt to occur.

Aneurysms springing from the transverse aorta are especially dangerous on account of their proximity to vital organs, and to hollow viscera into which rupture may occur. Approximately one-third burst, especially into the trachea, left bronchus, or œsophagus, or into the left pleural sac. The danger of rupture may be apprehended, therefore, when the physical signs point to the existence of pressure in these directions; and particularly if the sac appears to be dribbling into one or other of the hollow tubes. Apart from the danger of rupture, there is that of interference with important functions: asphyxia from pressure on the trachea may end the patient's life; the œsophagus may be compressed and swallowing hindered; or—more probable still—pressure on the left bronchus may lead to retention of secretions, with bronchopneumonia or some other form of pulmonary infection. Any evidence pointing to such occurrences is of the gravest import, for pulmonary infections of this type do not take long to kill.

Aneurysms of the descending portion of the arch and the descending intrathoracic aorta are very apt to rupture, especially into the left pleural cavity: in Dr. Oswald Browne's statistics, collected from St. Bartholomew's Hospital, this was the end of more than one-third of the cases of descending thoracic aneurysm. Next after this comes rupture into the œsophagus or left bronchus. The sac that bursts in these directions is often quite small: the writer recollects making an autopsy in a case of fatal hæmorrhage into the œsophagus from an aneurysm no larger than a walnut. When the difficulties of diagnosis, and therefore the improbability of early treatment, are taken into account, it is easy to see why the prognosis is so gloomy in cases of descending thoracic aneurysm.

Dissecting thoracic aneurysm, curiously enough, often spares its victim for years after the etiological rupture has taken place. A case of survival for thirty years is on record, and there are others nearly as long.

Aneurysms arising from the great vessels, in the intrathoracic portion of their course, have yet to be considered. It might appear that the prognosis would be more favourable in such cases, since they seem to offer a possibility of surgical attack. As a matter of experience, however, the outlook is no better than in the case of aortic aneurysm. The sac so often arises close to, if not actually at, the point where the vessel leaves the aorta, and the aorta itself is so frequently the seat of advanced syphilitic disease, and even of a second aneurysm, that little more chance of successful treatment is offered than in the case of aortic aneurysm.

Lastly, there are one or two general considerations.



*Multiplicity of Aneurysms.* The possibility of this must never be forgotten. Occasionally, the sac which is obvious may be undergoing solidification, while another undetected aneurysm, or a new pouch of the primary sac, may be spreading in a different direction. Before a favourable prognosis can be given, therefore, every effort must be made to exclude the presence of a second sac.

*Situation of Haemorrhage.* Speaking broadly, haemorrhage to the surface, whether direct or through a hollow viscus, is less deadly than internal bleeding: it may stop itself by the fall in blood-pressure which it induces: whereas, in haemorrhage into a closed space, there is not only loss of blood, but also disturbance of internal pressure, to be considered. Rupture into the pericardial sac, for example, is fatal, not because it deprives the patient of blood, but because it embarrasses the heart.

*Evidence of Solidification.* The most favourable omens in any case of thoracic aneurysm are those which point to solidification by deposition of fibrin: they are limitation of pulsation, hardening and shrinkage of the sac, and increase in the density of the x-ray shadow. Unhappily, it is not possible to study these processes satisfactorily in many cases: only those which are pointing through the thoracic wall can be palpated: but when, in such cases, the tumour is becoming harder and throbs less, the outlook is relatively favourable. Even so, the possibility of spread in another direction must be kept in mind.

**Influence of Treatment on Prognosis.** Is it possible to say that the outlook is improved by the adoption of any particular line of treatment? The results achieved by the various plans of treatment in use must be compared in order to answer this question.

First, there is what may be called the *ambulatory plan*. The patient is restrained from severe exertion, but he is allowed to walk about and do his business, provided it does not entail heavy labour: drugs, usually potassium iodide in full doses, being given meanwhile. Remarkably good results are achieved in some cases, particularly when the patient is a reasonable being, and able to regulate his life wisely: but over against these successes must be set a large number of failures, including a considerable percentage of sudden deaths from rupture. It is impossible to form a definitely calculated estimate of the expectation of life to be offered to the patient who chooses this plan, or is obliged to be content with it: but the writer, judging from out-patient experience, would, on an average, place it at something within two years.

Second, the *Tufnell plan* must be considered. This term includes absolute and prolonged rest, with restriction of diet, especially in the matter of fluids: convalescence is jealously guarded, and there is no eventual return to heavy bodily work. Here again it is very difficult to supply figures, for a large number of patients undergo treatment which is a compromise between, or combination of, this plan and the preceding one. De Havilland Hall's figures, relating to 27 cases, show that the average expectation of life in patients who have followed the

fulfill plan for as long as they could endure it, and have subsequently ordered their lives as peaceably as they might, is about three years from the onset of symptoms. Remarkable successes are sometimes achieved by this plan, provided the period of absolute rest be repeated from time to time as symptoms dictate; and from a survey of the available facts, the writer is inclined to claim that a higher percentage of survivals over five years is to be found among patients undergoing this than among those following any other method.

Third, the *gelatin treatment*, introduced by Lancereaux, was rather discounted at first by the fact that it was followed by tetanus in a few cases. This, however, can be avoided; and the method has been fairly tried. Kingston Fowler's results, in 12 cases treated along these lines at the Middlesex Hospital, did not, in his opinion, show any superiority over those attained by other methods.

Lastly, *surgical methods* remain to be considered. Attempts at extirpation of an intrathoracic sac arising from the aorta have, without exception, been immediately fatal. According to Monod and Vanverts, who examined records of 77 recent cases of innominate aneurysm treated by distal ligation of the common carotid with the subclavian or axillary artery, temporary improvement followed in 57 per cent, immediate death in 14 per cent, and the remainder were classed as failures.

Of late years American clinicians have given a thorough trial to wiring methods, i.e., treatment by the introduction of wire into the sac of the intrathoracic aneurysm, with or without the passage of a galvanic current through the wire. Even when due allowance is made for the desperate nature of the cases to which such a plan is likely to be restricted, the results cannot be regarded as encouraging. In Eshner's table of 38 cases, death followed, in exactly half, within a month of the operation; but 1 patient survived for twelve years. Of Hall's 22 cases, 1 lived for five years; and of Finney's 23 cases, 1 lived for three years. Regarded from the prognostic view, therefore, it does not seem that longer life can be promised to the patient who submits to this operation.

To sum up, the truth is that the outlook in any case of thoracic aneurysm is bad; the average expectation of life is not more than three years, and even this brief period is not likely to be attained if the sac be projecting backwards from the transverse or descending aorta. Life is more likely to be prolonged if the patient is able to submit himself to the ordeal of complete rest with restriction of diet, and if the diagnosis be made early.

Carey F. Coombs.

**ANEURYSM OF PERIPHERAL ARTERIES.** Although spontaneous cure of a peripheral aneurysm has been known to occur, it must be very rare. In these days of surgery it is almost invariably the practice to operate instead of waiting to see what nature might do; but in the pre-antiseptic era various methods of natural cure, by extension of clot from the sac, 'plastic arteritis,' pressure of the sac

on the artery, etc., were described, and in a few cases an aneurysm has been known to slough away *en masse*.

Further, aneurysms are not always progressive, but may last for years without appearing to do any harm. In the end, however, the recorded cases all required treatment for severe symptoms. The writer has seen a catenal aneurysm in a woman who had had it for many years and suffered little or no inconvenience, and was therefore unwilling to have it operated on. They are more rapidly progressive in the young and vigorous than in feeble old persons with a reduced circulation.

The life of a patient with an aneurysm is, however, always in jeopardy. Sooner or later it is liable to rupture into the subcutaneous tissues or externally, causing rapid death from loss of blood, or such grave disintegration of the cellular planes as may lead to the necessity for amputation. Occasionally suppuration may take place. The deadly nature of the disease is emphasized by the fact that even in the infancy of the surgical art, before anesthetics or antiseptics had robbed it of its terrors, when nothing but the direst necessity led the surgeon to abandon the expectant method and perform a major operation, there were a number of well-established methods for the operative treatment of aneurysm. Apparently the condition used to be commoner than it is now. We must allow due weight to the experience of these early surgeons, that the policy of letting an aneurysm alone usually led to disaster; but what was the exact frequency of such disaster we have no figures to show, nor are we likely to have in the future.

Aneurysm following gunshot injury is somewhat more favourable. During the first few weeks, at any rate, some of the cases improve; thus an arteriovenous aneurysm may be converted into the much less serious aneurysmal varix.

*Treatment by Compression* has almost been given up, except where operation is quite impossible. It is painful and tedious (the average time in 26 cases was nineteen days). It only cures a minority of the cases; thus Barwell found that of 148 instances of popliteal aneurysm treated by compression between 1870 and 1880, 68 succeeded and 80 failed. It may reduce the prospects of success of the subsequent ligature by dilating up the collateral circulation.

*Treatment by Operation.*—We are greatly indebted to the excellent studies of the literature by Monod and Vanwerts for our knowledge of the end-results of the various methods of treatment of aneurysm. They have done their best to eliminate the usual fallacies of statistics collected from recorded cases instead of consecutive hospital series, but it is probable that successes and new methods figure a little too prominently even in their carefully-compiled tables.

In a study of 440 recorded cases, they found that after proximal ligation about three-quarters were cured, 12 per cent failed, and 6·5 per cent suffered from gangrene. There was often persistent pain from adhesions of nerves to the sac.

Of cases treated by extirpation, 90 per cent were cured, and 4 per cent developed gangrene.

Of 105 cases treated by Matas' method of aneurysmorrhaphy, conserving the artery if possible, 85 were cured and 12 died.

Their results may be set out in tabular form thus :-

## ANEURYSMS OR OLD ARTERIAL HEMATOMATA.

Method	Cases	Cured	Died	Gangrene	Failure
		per cent	per cent	per cent	per cent
Ligature	138	74	7	6.5	12
Extirpation	205	90	3	4	1.5
Antyllus	41	80	17	2.5	0
Aneurysm, oblit.*	62	88	8	7.5	0
Op. conservativ.†	46	73	20	0	22

\* Matas' obliterative aneurysmorrhaphy.

† Matas' reconstructive methods.

(The per centages do not always total exactly 100, because they are expressed in round figures, and one of the 2 aneurysm cases also died.)

The following tables are quoted by Tschernichevski from various sources to illustrate the frequency of occurrence of gangrene after various older methods of operation :-

Method	Aron		Loz		Bull		
	Cases	Gangrene	Cases	Gangrene	Cases	Gangrene	
	per cent		per cent		per cent		
Monod and Vinwerts	(Ligature -	10	0	68	11.7	78	10.2
	(Antyllus -	5	0	19	5.2	24	4.1
	(Extirpation	32	0	145	6.2	177	5
Wolff	(Ligature	12	16.6	71	19.7	83	19.3
	(Antyllus -	2	0	5	20	7	14.2
	(Extirpation	11	0	44	18.1	55	14.5

After aneurysmorrhaphy, gangrene occurred in 3.3 per cent, and recurrence in 2.7 per cent, of 149 cases extracted from the literature by Gardner (1910).

We shall now take up the principal arteries in turn.

**Popliteal Aneurysm.**—Of 20 cases treated by the older methods in the London Hospital, ligature in Scarpa's triangle gave the best results, but the literature quoted above shows that extirpation is better on the whole.

Monod and Vinwerts compare the older methods of treatment with the conservative operation of Matas, as shown in the following

Table (in some cases the result is not known, hence the tables appear not to balance):

Operation	Cases	Cures	Deaths	Amputations	Recurrences	Failure
Conservative operation	38	32	88.8	0	0	1 11.1
Non-conservative operation	206	180	87.3	5	24	14 6.8

Gangrene has, however, been known to follow aneurysmorrhaphy. It will be seen that the proportion of cures is about the same: the ligature and extirpation methods run more risk of gangrene, whereas the Matas operation is more likely to be followed by recurrence.

**Femoral Aneurysm.** Here again the cures are about the same with the older and the newer methods, and one has to balance risks of recurrence against risk of gangrene.

Monod and Vanwerf have obtained the following statistics from the literature:

Operation	Cases	Cures	Deaths	Amputations	Recurrences	Failure
Conservative operation	34	31	91	2	5.8	0
Non-conservative operation	166	149	90	11	7.2	7 4.3

The authorities differ as to whether, if ligature is adopted, it is wiser to tie the common femoral or the external iliac, the former being more likely to cure the aneurysm, and the latter more likely to avoid gangrene. No doubt, when feasible, the best of the non-conservative operations would be the Antyllian or extirpation.

**External Iliac Aneurysm.** This rare disease may be treated by ligature of the common iliac artery by the intraperitoneal route, by extirpation, or by aneurysmorrhaphy. Matas gives the results as follows, using only post-1880 evidence, but the data are not very clearly set forth:

Method	Cases	Cured	Deaths	Amputations	Failure
Ligature	21	?	10	7	?
Extirpation	5	4	0	1	0
Aneurysmorrhaphy	7	4	3	1	1

Of the 7 patients treated by Matas' method, one became gangrenous and died, another relapsed and ruptured, and a third died of pulmonary embolism. The others appear to have been cured.

Monod and Vanwerf report 9 cures and 10 deaths after various operations.

**Gluteal Aneurysm.** There appear to be no reliable figures relating to the treatment of this condition which do not go far back into pre-antiseptic times, and are therefore valueless. Delbet reports 12 out of 11 cases cured by the operation of Antyllus. Bergmann teaches that cure can often be obtained by the injection of ferric chloride, and Vanwerts declares that ligation of the internal iliac gives excellent results.

**Subclavian Aneurysm.**—Monod and Vanwerts report:—

Method	Cases	Cures	Failure	Death
Proximal ligation	63	44	9	10
Extirpation	11	10	0	1

For many years a curious fatality hung over the operation of tying the first part of the subclavian, and the first 19 cases all died, but the last 10 French cases have all recovered (up to 1911).

**Axillary Aneurysm.**—Using once more the statistics of Monod and Vanwerts:—

Method	Cases	Cures	Deaths	Improvement	Failure
Conservative operation	6	4 (66.6%)	1 (16%)	1 (16%)	1 (16%)
Non-conservative operation	63	51 (81%)	3 (4.7%)	2 (3%)	5 (8%)

The non-conservative operations include ligation of the subclavian, extirpation, and the method of Antyllus, whereof extirpation, when possible, is the best.

**Innominate Aneurysm.**—It is very seldom possible to apply a proximal ligation, but a considerable number of cases have been treated by tying the carotid and subclavian arteries. In the older literature there was a heavy mortality from sepsis and hemorrhage, and out of 120 cases only 7 cures resulted (Jacobsthal); but Vanwerts is able to quote 77 recent operations, whereof 14 per cent died, 57 per cent improved, and 19 per cent failed.

**Carotid Aneurysm.**—Monod and Vanwerts could only find one case of aneurysmorrhaphy, which was fatal. The results of the older methods may be set out thus:—

Method	Cases	Cures	Deaths	Failure
Ligation	16	13	0	3
Extirpation	17	14	3	0
Incision	3	2	1	0
Aneurysmorrhaphy	1	0	1	0

**Arteriovenous Aneurysm.**—This is usually the result of a stab or bullet wound, and, as Makins has pointed out, it is wise to wait some months after the latter injury before operating. Mere proximal ligation may reduce it to an aneurysmal varix, but will not be curative; the essential point is to separate the artery and the vein. Vinwerts has collected 15 cases of quadruple ligation of the artery and vein each, above and below; 3 became gangrenous, and 9 were cured. EXTIRPATION, practised in 117 cases, gave 95 per cent of cures, and 17 per cent gangrene. Nowadays arteriorrhaphy might well be tried.

Gangrene is of course more likely to follow operation on the common femoral or popliteal than on the vessels of the arm or the superficial femoral.

**Aneurysmal Varix.** In the great majority of cases this does no harm, and a bandage is sufficient treatment. If it is necessary to do anything, the best results have followed ligation of the artery above and below; simple proximal ligation is futile. Arteriorrhaphy would be worth a trial.

No figures are yet available, on a sufficient scale, to show the end-results of treatment of aneurysms following gunshot injury in the Great War, but in general terms it may be stated that in early cases operated on within a few weeks for urgent symptoms the outlook is worse, and in later cases better, than in spontaneous aneurysm. Apparently aneurysmorhaphy has very seldom been found suitable. Excision has been the method of choice.

REFERENCES. *Koch's Surgery*, 1909, vol. V, article 'Aneurysm'; Tsehermichowski, *Deut. Zeits. f. Chirurg.*, 1913, June, 1; Monod and Vinwerts, *Rev. de Chirurg.*, 1911, 663.  
*A. Fenelle Short.*

**ANGINA PECTORIS.** When we say of a patient that he is suffering from angina pectoris, we mean that he is troubled by bad attacks of cardiac pain, which constitute a prominent feature of his case. An account of the prognosis in angina becomes, therefore, an account of the prognostic significance of a symptom, and not a summary of the menaces contained in a definite disease. Angina pectoris will here be spoken of as a symptom of organic disease of the heart; mutative attacks will be alluded to at the end.

True angina is always evidence of one thing—impaired contractility in the wall of the left ventricle. This is often (but not always) associated with interferences in the supply of blood to the myocardium, through the coronary arteries. Now inadequacy of contractile power in the ventricular myocardium is a serious matter, and any lesion that can produce it is a veritable shell in the engine-room. The first statement to be made, therefore, is that angina is always a grave symptom in any case of cardiac disease. Its appearance in a patient who has never shown any previous evidence of a lesion of the heart must always call for a minute investigation of the case from every point of view, to ascertain the precise nature of the injury that is causing it. On the other hand, when a patient who is known to

carry a damaged heart has his first paroxysm of angina the prognosis is made graver than before simply because it shows that the vital part of his heart, the muscle of his left ventricle, is becoming unequal to the demands which are made on it. It must be added that the very occurrence of angina introduces into the case a risk of sudden death; this point will be examined in detail later. The average period elapsing between a first attack and the patient's death is not easy to ascertain.

**General Outlook.**—In order to determine the outlook in any given case of angina, four points must be examined: (1) *The nature of the cardiac lesion*; (2) *The circumstances provoking the attacks*; (3) *The nature of the attack itself*; and (4) *The condition of the heart after the attack is over.*

1. *The Cardiac Lesion.*—Angina pectoris occurs in connection with a acute as well as with chronic disease of the heart, but far more frequently with the latter; probably because any acute disease which injures the myocardium severely enough to cause angina will quickly go to a fatal issue. From the prognostic point of view, a classification which divides the myocardial states responsible for the occurrence of angina into those which are primary and those which are secondary, is of more value than a division into acute and chronic lesions. The primary conditions are those in which the myocardium itself is diseased; the chief examples of these are endocarditis, cardiac syphilis, alcoholic degeneration of the myocardium, and acute infection of the myocardium in such diseases as rheumatism and typhoid fever. The secondary causes of angina are those in which the myocardium is relatively free from disease, yet unequal to some abnormal circulatory strain thrown upon it, the chief examples of which are disease of the aortic valves and high arterial tension. Even this classification has only a limited value, for the two classes overlap at certain important points; for instance, cardiac syphilis and disease of the aortic valves frequently coincide; so also do endocarditis and high blood-pressure. Nevertheless, the classification is of some service in the present connection if it emphasizes the fact that the outlook is graver in those cases where angina is directly connected with disease of the myocardial tissues than in those where a fairly healthy myocardium is confronted with a task too heavy for it.

In determining the nature and seriousness of the cardiac lesion responsible for anginal attacks therefore, it is necessary to gain an idea of the state of the myocardium, the arteries, the arterial tension, and the valves of the heart. All signs pointing to gross disease of the myocardium make the prognosis graver; such signs are feebleness of the pulse and heart-sounds, emphysema and gallop-rhythm, the alternating pulse, dyspnoic attacks too readily provoked, oedema of the ankles. On the other hand, if the impulses be powerful and thrusting, and indicative of hypertrophy of the left ventricle, and signs of some extraneous cause such as aortic incompetence or high



arterial tension be present, the prognosis is better, and particularly where the extraneous cause is one that can be modified and reduced by treatment (high arterial tension), or is, at least, not progressive (post-rheumatic incompetency of the aortic valves in an adult). Of course, very high tension that does not yield in the least to treatment is a grave cause of angina, for it is likely to be progressive. Again, angina as a symptom of aortic insufficiency is of far more sinister import when associated with syphilitic disease of the aortic valves than in cases of post-rheumatic valvular disease; for in the former case there is sure to be progressive myocardial disease associated with the valvular lesion; whereas, in the latter (provided the patient be over twenty), the risk of direct myocardial injury is remote, and such myocarditis as may occur tends towards recovery and is not progressive. The aortic incompetency of general atheroma lies midway between the two; the myocardium is directly attacked through disease of its nutrient arteries, and it will become worse, but not rapidly so, as in the case of syphilis. Sometimes, of course, the prognostic import of the angina is overshadowed by that of other findings, as when signs of aortic aneurysm are discoverable.

A general rule applicable to all cases of angina, however, is: The worse the myocardium, the worse the prognosis. The marks of a bad myocardium are to be found partly in the patient's own statement, partly by physical examination, and partly by inference.

2. *The Circumstances Provoking Anginal Attacks.* These circumstances are of various kinds; the chief are exertion, emotion, meals, and external cold. In a number of cases no provocation is discoverable, the attack coming on while the patient is at rest in bed. Two obvious generalizations spring into the mind at once, or rather, two aspects of the same generalization. The first is that the more readily the attacks are provoked, the worse the prognosis. There is much less menace in angina which comes on in the middle of a sprint to the station than in that which brings to an abrupt termination an attempt to walk up a barely perceptible incline, even though the former be the severer attack. The second is that if the provocative cause be a controllable one, the outlook is by so much the better. Obviously the man who only gets angina after overloading the stomach is in a better case than the one whose attacks are provoked by all sorts of causes, and by no apparent cause at all. In this sense, it is better to have one cause for the attacks than many; for example, the man who only gets attacks when he stoops to do his boots up can foresee his danger and circumvent it by taking care, while he who never knows what petty excitement or effort may throw him into peril cannot be so precisely forewarned, and thereby forearmed. In this connection, the patient's temperament is important; the headstrong man, who will not be advised, must expect evil consequences if he will not curtail his activities and live within the limitations of his myocardium. If he can and will avoid such circumstances as have been found to provoke attacks, the prognosis is better.

3. *The Nature of the Attack itself.* Here it must be acknowledged that *a priori* reasoning is singularly apt to mislead. The severe attack is not necessarily more dangerous than the slight one. Patients have been known to live for years after a tremendous bout of prolonged agony of mind and body, while others sink rapidly after an attack which was so slight as to be misinterpreted at the time. The one line of inquiry into the nature of the attack which goes to the root of the matter is that which seeks to discover whether or no there are evidences of grave myocardial embarrassment during the paroxysm. Thus, the prognosis is worse if the attack be accompanied by respiratory changes (grouped breathing or 'cardiac asthma'); so, also, if the pulse become slow and there are evidences of heart-block, or if the patient faint during the paroxysm. Such data are of much more importance than the severity and distribution of the pain. One point that gives some help is the effect of vasodilators; attacks that are readily relieved by the exhibition of nitrites are less portentous of evil than those that are refractory to treatment, presumably because the angiospastic factor, the one which is neutralized by nitrites, is less threatening than the myocardial, which is influenced only indirectly by this form of treatment.

4. *The State of the Heart after the Attack.* This is of the greatest significance. Here, again, it is the condition of the myocardium that matters; has it been definitely and perceptibly worsened by the attack, or by the changes which provoke it? Two or three examples will serve to illustrate this point. A strong man of over seventy had for some time been getting shorter of breath, but there had been no pain till one day after walking up a very gentle incline; even then it was not very severe, and soon passed off under treatment. However, the heart-sounds were feebler after it than before, the patient was bluer and more breathless, and the feet began to swell; in a few days he died rather suddenly in his arm-chair. In another case, a patient with aortic regurgitation of the atheromatous type, who had survived years of anginal attacks, one, at least, so severe and obstinate as to necessitate the use of chloroform, died within a few days of a comparatively slight seizure of pain, which was followed by the development of a pericardial rub with quickening of the pulse. A third patient, who had been troubled with severe angina for over a year, had a sudden attack in bed one day; on the following day his cardiac dullness had perceptibly increased, and a pericardial rub was heard; a day later he died suddenly in bed. In this last case the right ventricle was found ruptured at the autopsy. Anything which points to the myocardium having taken a downward step during the attack points also to an active degeneration in progress, and therefore to an early termination. Signs of pericarditis are particularly ominous, for they are manifestations of some gross change in the cardiac muscle, such as infarction or rupture.

So much, then, for the general outlook in any patient with anginal attacks; it all turns on the state of the myocardium before, during,

and after the attack, and the degree of overstrain needed to bring out that inadequacy of which angina is a symptom.

There are, however, two other questions which we must be ready to answer: the likelihood of sudden death, and the probability of recurrences of that attack.

**Sudden Death.** Patients who have had sleep bouts of angina do not ask about the risk of sudden death: they have tasted its bitterness already, and know so much of the danger that they do not care to know more. The relatives, however, not seldom want to know "whether he is likely to go off in an attack"; and this is not unreasonable, for the patient looks more than half dead if the paroxysm be at all severe. Further, writers of fiction and of medical text-books have insisted so much on the association between angina and sudden death that the two ideas have become inseparably linked in the public mind. Now, while it is perfectly true that in a few dramatic instances the heart stops during the paroxysm, it is equally noteworthy that a considerable majority of those who are subject to angina do not die during the attack. This having been explained to the friends, it is advisable to give a rather fuller explanation of the risks of sudden death implied in anginal attacks: that although the onset of cardiac pain must not be regarded as necessarily threatening imminent death, yet the very occurrence of such attacks is a warning that the muscle of the heart is barely equal to its work: that it may fail abruptly or suddenly with or without forewarnings of pain: and that death is apt to follow attacks of pain after an interval of days or hours. The actual imminence of sudden death, in any given case, depends entirely on the conditions found to underlie the patient's liability to angina: those points to which attention has been directed as giving a key to the general prognosis in any given case will also assist in an estimation of the risk of sudden death.

**Recurrence.** Another question that the patient may dare to ask for himself after the first attack bears on his liability to a return of the experience. Now he may be quite truly assured that it is possible that he may never have it again, particularly if that which provoked the first attack be some avoidable circumstance, such as going out insufficiently clad on a frosty day, over-eating, and the like. A surprisingly large number of persons have only one attack, or else a few attacks at long intervals: while some go through a series, and come out into smooth water again. Such good fortune falls especially to those whose heart is in fair condition, but overtaxed by a high arterial tension, or by leaking aortic valves and a laborious occupation: and only to such of these as are willing to go softly. Indeed, it is here that the whole philosophy of angina comes in. Pain is a warning, a protective phenomenon, which says to its victim, "Don't do that again": if the anginal patient will listen to this advice, he may escape further punishment. Where, however, the heart is the seat of syphilis, or the arteries are profoundly degenerated, the friends must be warned of the likelihood of recurrences, and of

all that we have seen implied in them. Moreover, it is well to bear in mind the fact emphasized by Mackenzie, that cessation of pain is not always a good prognostic sign; if accompanied, as it sometimes is, by the onset of mitral insufficiency, with anasarca and increasing dyspnoea, the patient may be regarded as having entered on the last stage of his journey, even though he may never again have any suspicion of angina.

**Pseudo-angina.** A final word remains to be said about the shadowy group of cases designated 'pseudo-angina,' 'toxic angina,' and so on. Chloruretic women are liable to attacks of pain which is more or less obviously cardiac; and over-smoking may bring on the same kind of trouble. Obviously, such attacks, which do not depend for their origin on organic disease of the heart, do not carry with them any menace to the patient's life; moreover, they will cease to occur when the cause has ceased to operate. The whole difficulty of prognosticating truthfully in such cases, then, lies in diagnosis of the cause or causes of the attacks. The task is to find out whether or no we are dealing with a sound myocardium; if the physical signs and other circumstances (the patient's age and his position, consumption of tobacco, nature of attacks, and so forth) point away from serious disease of the myocardium, then the prognosis is good.

Indeed, this is the whole secret of successful prognosis in cases manifesting angina pectoris. It is a symptom of myocardial inadequacy, and the prognosis varies directly with the state of the myocardium: *good heart muscle, good prognosis; bad heart muscle, bad prognosis.*

*Carey F. Combs.*

**ANKYLOSTOMIASIS.** — By ankylostomiasis we mean the anemia produced by a large number of ankylostomes in the bowel for a considerable period of time. In addition, about 80 per cent of healthy persons in many parts of India harbour a few worms without any appreciable harm, but may be a source of infection. When from several hundred to several thousand are present for months, they produce serious and sometimes fatal disease if not detected and efficiently treated in time. In Porto Rico, Ashford estimated that about 30 per cent of the total mortality was due directly or indirectly to this scourge, while the general health of a much larger proportion of the people was seriously affected. It is not possible to give any figures of the case mortality, as it varies so much with the severity of the infection and the circumstances in which the patient is placed for obtaining treatment.

In advanced cases with general anasarca, sometimes including ascites, the prognosis is grave, as even removal of the worms may leave the patients too debilitated to recover, and they easily succumb to any intercurrent disease such as pneumonia, etc. In typical cases the red corpuscles may commonly be reduced to under 2,000,000, and the haemoglobin to about 20 per cent, the colour-index being

always low, yet recovery may take place under careful treatment. Extremely low blood-counts, together with excessive dropsy, loss of digestive power, and albumin in the urine, are of grave prognostic significance, and any complication, such as malarie adds to the gravity of a case. There are few diseases in which the prognosis is so rapidly improved by adequate treatment with one of the effective vermifuges; but in advanced cases caution is required in giving large doses of the more drastic remedies, such as thymol and beta-naphthol.

*Leonard Rogers.*

**ANTHRAX** The outlook in cases of malignant pustule is much better now than in days gone by, and has been still further improved by the introduction of antitoxic sera such as Schavy's and Mendez's. In the years 1850-1886, Koch reported a mortality of 39 per cent, and in 1905 Legge estimated the English mortality as 26.5 per cent (261 cases), and the German as 13 per cent (116 cases). Since that time Henemann has collected statistics which show a marked improvement, and give us some guide as to the relative value of different methods of treatment. He collects from the literature:

268	cases treated by various ointments and lotions	9.3	per cent died.
814	" " " excision, cautery, caustics	7	" "
1073	" (Buenos Aires) treated by Mendez's serum	4.2	" "
80	" treated by Schavy's serum	3.7	" "

The mode of obtaining these figures probably makes them too favourable, as literature reports are notoriously apt to publish the successes and let the failures drop into oblivion; but many years ago Lengyel and Koranyi, in a consecutive series of 116 cases treated surgically, were able to report a death-rate as low as 9 per cent, so probably it is fair to take the mortality in the serum cases as 5 per cent, and in those treated by excision as 8 to 10 per cent.

The disease is nowadays becoming uncommon in most parts of England. During the Great War my colleague, Captain Kirby, at a casualty clearing station, treated 5 cases successfully with serum, without excising the wound.

Much depends, of course, on the time at which the patient is first treated, these good results being only obtained in early cases. If the patient dies, it is usually in five to eight days, and spontaneous cure is said to be quite uncommon. It would be difficult to verify this statement nowadays, because every case seen would be treated.

When oedema is very great, the prognosis is unfavourable, and wounds of the head and neck are more than twice as dangerous as those of the limbs. When the temperature is high and the patient shows marked signs of systemic infection, recovery is unlikely.

Woodworkers' disease, that is, a general infection either of the lungs or intestine without a skin pustule, is happily rare, but is extremely fatal.

REFERENCE—Henemann, *Dtsch. Zeits. f. Chirurg.* 1912, 309.

*A. Rundle Short.*

**ANTRAL EMPYEMA.**—(See NASAL ACCESSORY SINUSES.)

**ANTRUM, GROWTHS OF.** (See JAWS, TUMOURS OF.)

**ANUS, IMPERFORATE.** Many years ago, Harrison Cripps made a study of the operation mortality in this condition under various circumstances. He pointed out that although the prognosis, apart from operation is, of course, hopeless, except in cases where the rectum opens into the vagina, yet occasionally the children may survive for a surprisingly long time; one infant at St. Bartholomew's Hospital, whose parents refused operation, was still alive a month later, vomiting feces three times a day!

MORTALITY IN NINETY-EIGHT CASES TREATED BY DIFFERENT OPERATIONS.

Operation	Cases	Deaths
Dissection from the perineum	37	14
Puncture from the perineum	17	14
Coccyx resected	8	5
Openag into vagina	14	1
Iliac colostomy	16	11
Lumbar colostomy	3	2
Miscellaneous	3	3

A study of 37 cases of this condition, treated at St. Thomas's Hospital, shows how few of the infants grow up to adult age in reasonable comfort. An exception must be made in favour of little girls with imperforate anus and recto-vaginal fistula. These survive, and at a later period a plastic operation can be performed. It will be very difficult to get control without strapping, however. The writer has seen one such patient treated with fair success.

Of the 37 cases referred to, 20 died in hospital: 2 of peritonitis, 5 of shock, and 13 after laparotomy or colostomy. Of the 17 who left hospital alive, 10 have been lost sight of. Of the other 7, 2 died, aged nine and twelve months respectively, of deaths probably unconnected with the anal condition; 1 died, aged two months, of 'wasting'; 1 died, aged four months, of intestinal obstruction; 1 died, aged three years, after operation to close a colostomy; 2, aged nine and seven years respectively, are still living, one quite well, the other with a recto-urethral fistula.

Cripps gives case-histories of a number of successful recoveries.

It is probably fair to conclude that about half the patients operated on die almost at once, and that about half of the survivors die in early infancy. A quarter of the total might survive, as far as the anal trouble is concerned, but some of these are in permanent discomfort. The most favourable cases are those with only a mere septum separating

the bowel and the anus, but it will be seen that one child lived to the age of three years even with a left iliac colostomy.

REFERENCES: Cuppes, *Diseases of the Rectum and Anus*, 3rd ed.; St. Thomas's Hosp. Rep., 1911, 156.  
 1. Rendle Short.

**AORTA, DILATATION OF.** Either in relation to thoracic symptoms, or in the course of routine examination, it is no uncommon experience to find evidences of diffuse dilatation of the aorta. The introduction of skiagraphy has done much to enlighten us as to the frequency with which the thoracic aorta is dilated. While it would be out of place to enter fully into the pathogenesis of this condition, it is essential to have some understanding of the factors which enter into its production. These are two, the *dynamic* and the *degenerative*.

**Dynamic Origin.** The simplest example of this kind is to be found in post-rheumatic insufficiency of the aortic valves; here there is little question of any degeneration of the aortic wall; for though the rheumatic process is liable to injure this structure, it seldom does so to any intense or abiding extent. Yet in many cases of long standing aortic regurgitation, there are the clearest evidences of a diffuse enlargement of the arch of the aorta; so much so, indeed, that many writers have recorded such cases as examples of "rheumatic aneurysms." The explanation is not hard to find; each ventricular systole throws an excess of blood into the aorta and overdistends it. Clearly, there is no question of prognosis here apart from that of the disease itself.

**Degenerative Origin.** This type of dilatation, on the other hand, is perfectly exemplified in syphilis of the aorta. Here we have to deal with an actual and progressive disease of the aortic wall.

**Mixed Origin.** A combination of the two factors is encountered in cases of aortic dilatation combined with high arterial tension; in such cases the aorta stretches, partly because it is subjected to an abnormal tension from within, partly because it is, in most cases, at any rate, the seat of a dystrophic process. Even here, however, the latter factor is of minor importance; the fact that the aorta is dilated is of far less weight in regard to prognosis than the fact that the arterial pressure is raised.

It is clear, from this brief account of the etiology of aortic dilatation, that its bearing on the outlook of any given case is that of its cause, and it will be more profitable to refer the reader to the articles dealing with cardiac syphilis, arteriosclerosis, high arterial tension, and aortic regurgitation, than to encourage any attempt to forecast the future of a case without reference to the origin of the dilatation.

Carey F. Combs.

**AORTIC DISEASE.** (See HEART, VALVULAR DISEASE OF.)

**APHASIA.** The prognosis depends upon the underlying cause. Most cases of aphasia are the result of organic lesions of the cerebral cortex. Some of them are due to embolism from cardiac lesions;

others, the majority, are due to arterial thrombosis; whereas cerebral haemorrhage is relatively uncommon as a cause. In embolic cases, the arterial obstruction usually reaches its maximum at once, and does not tend to extend. In thrombosis, on the other hand, there is a tendency for the lesion to spread and become more extensive, corresponding to the amount of disease in the cerebral arteries. Cerebral thrombosis occurring in the early half of adult life is most likely to be syphilitic in origin; whereas, after middle life, arteriosclerosis may occur, not only from syphilitic disease, but also from senile arteriosclerotic changes. Syphilis should always be looked for by the various tests at our command, since syphilitic cases have a better prognosis, if promptly treated, than non-syphilitic ones. Cerebral abscesses (most commonly in the left temporal lobe) and meningitis are among the less common organic causes of aphasia; whilst cerebral tumours are still more infrequent, producing aphasic symptoms either by direct infiltration of the speech centres or, more usually, by compression.

In many cases of aphasia from organic disease, there is a co-existent right-sided hemiplegia, more or less profound according to the situation and extent of the brain lesion. It is important, however, to remember that it is the cortical part of a brain lesion which is mainly responsible for the aphasic symptoms, and that deeper-seated lesions of the white matter may produce the most profound hemiplegia without any evidence of aphasia.

In organic lesions which are still advancing (e.g., in spreading vascular lesions of any sort, in cerebral abscesses, meningitis, or tumours) aphasia is not likely to improve; on the contrary, it tends to get worse. But in cases where the organic lesion has come to a standstill (e.g., after an attack of cerebral embolism or thrombosis, after successful evacuation of a cerebral abscess, or after relief of pressure by removal of a cerebral tumour (provided the tumour has not infiltrated the speech centres, but only compressed them) the speech centres, or so much of them as remains undamaged, may gradually resume their function; whilst the subsidiary speech centres in the opposite side of the brain may, by education, undergo development.

The degree which such compensatory activity of the speech centres may attain is very variable. The prognosis is best in children; under the age of five or six years, provided no profound dementia be present, compensation practically always occurs, and the aphasia usually clears up completely. In old age, on the other hand, the probabilities of re-education of subsidiary speech centres are very remote, and little or no improvement is to be looked for. In early adult life, or middle age, individual variations are so great that an accurate prognosis in any particular case is well-nigh impossible. Patients with word-deafness are more difficult to re-educate than those with word-blindness. The co-existence of word-deafness and word-blindness in severe degree renders re-education impossible, while the absence of both word-deafness and word-blindness, as in simple motor aphasia, renders the prospects relatively much more favourable.



**Temporary Aphasia.** A transient aphasia, usually slight in degree and evidenced mainly by a difficulty in naming objects, may arise from debility or exhaustion in an otherwise healthy person. In other cases, the condition is due to temporary slowing or stasis of blood in diseased cortical arteries: such attacks are to be regarded as warnings of threatened thrombosis, and call for energetic treatment of the arterial disease, especially if it be syphilitic in origin. Temporary aphasia also occurs from localized arterial spasm, the patient recovering suddenly and completely within a few hours. We also meet with it in general paralysis of the insane as part of a 'congestive attack.' Certain cases of migraine are preceded by an aura of temporary aphasia, usually accompanied by a subjective sensation of tingling in the right arm, face, and tongue, and followed by left-sided headache. Aphasia may also be present, for a short time, after the occurrence of an epileptic fit, doubtless owing to temporary cortical exhaustion. Lastly, we may have temporary aphasia in mania, from toxic affection of the speech centres.

*Purves Stewart.*

**APLASTIC ANÆMIA.**—(See ANÆMIA, APLASTIC.)

**APOPLEXY.** (See STROKES.)

**APPENDICITIS: Acute and Chronic.**

#### ACUTE APPENDICITIS.

**Results of Operation.** In the year 1912, 936 cases of appendicitis were admitted to the London Hospital. Among them were 38 cases which for one reason or another were not operated upon: 2 of these were moribund when they were admitted and died shortly afterwards. I have excluded these 38 patients, and completed a series of 1000 cases by adding 102 others, 74 men and 32 women, who were admitted to the hospital at the beginning of 1913.

Of the 1000 cases, 698 were operated upon during the attack, 302 during the quiescent stage. Of the patients who were operated upon, 32 died, which gives a mortality in all cases of 3·2 per cent. The mortality in the 698 acute cases was 1·3 per cent. Among the 302 operations performed between the attacks there were 2 deaths, a mortality of 0·7 per cent. These patients were suffering from actinomycosis of the appendix: death was due in both cases to extension of the disease, and did not follow immediately upon the operation.

Avilkie reports that 1469 cases of acute appendicitis were operated upon in the Edinburgh Royal Infirmary from October, 1910, to September, 1915. The total mortality was 7·3 per cent.

Stillman reports that in 965 cases of acute appendicitis operated upon at the Roosevelt Hospital, New York, during the years 1910-1915, there were 16 deaths, a mortality of 1·8 per cent.

These results compare well with the latest German statistics reported by Zander, who found that out of 308 cases of acute appendicitis

operated upon in the years 1911, 1912, and 1913, 30 died, a mortality of nearly 10 per cent.

I have divided up the 698 patients who were operated upon at the London Hospital during the acute stage into four groups, according to the condition found. In the first group are placed those patients who had general peritonitis; there were 80 of these, 16 of whom died, giving a mortality of 20 per cent. In the second group are 211 patients who had an abscess; 204 recovered and 7 died, giving a mortality of 3.3 per cent. In the third group are those who had local peritonitis only, including those cases in which the peritonitis was diffuse but did not involve the whole of the peritoneal cavity; these numbered 123 with 6 deaths, a mortality of 4.8 per cent. Finally, in the last group are placed those patients in whom the inflammation was limited to the appendix and there was little or no evidence of local peritonitis; in this group are 284 patients, 1 died; a mortality of 0.3 per cent.

Table A. — PRESENT MORTALITY IN OPERATIONS FOR APPENDICITIS.

	Total	Recovered	Died	Mortality
During quiescent stage	302	300	2	0.7
During acute stage:				
General peritonitis	80	64	16	20
Abscess	211	204	7	3.3
Local peritonitis	123	117	6	4.8
Inflammation localized to appendix	284	283	1	0.3
Total	698	668	30	4.3
Grand Total (all cases)	1000	968	32	3.2

From these statistics we can form some idea as to the prognosis in the different forms of acute appendicitis if the patient is submitted to surgical treatment; and for easy reference I have collected them together in *Table A*. It is, however, far more important to draw attention to the way in which the prognosis varies according to the time at which operation is undertaken. I found on examining the statistics of the London Hospital, that out of 162 patients who were operated upon during the first twenty-four hours of an attack, only 2 died, giving a mortality of 1.2 per cent; of cases operated upon during the second twenty-four hours of an attack, 152 in all, 6 died, a percentage of 3.9 per cent; whereas of those in whom operation was postponed until the third day of the attack, 115 in all, 10 died, or 8.7

per cent. I do not think that any deductions can be drawn from the death-rate of the cases operated upon from the fourth to the ninth days, as the numbers are so small. But attention may be drawn to the fact that of the 58 patients operated upon on the fourth day or later, only 4 died. If *Table B* is examined for details of these cases, it will be seen that 40 were cases of abscess, and in 14 the inflammation was limited to the appendix—in other words, that in 54 cases the condition was well localized. There was therefore much less danger in operating upon them than in cases which were not so localized.

*Table B.*—MORTALITY OF OPERATION ON THE DIFFERENT DAYS OF THE ATTACK.

	R.	D.	R.	D.	R.	D.	R.	D.	R.	D.	
1st day	99	1	5	0	13	0	13	1	160	2	1.2
2nd day	62	0	9	1	25	1	20	1	146	6	3
3rd day	40	0	10	5	15	2	12	5	105	10	8.7
4th day	22	0	10	1	10	0	6	1	48	2	4
5th day	12	0	5	0	17	0	3	1	35	1	2.8
6th day	5	0	1	0	11	0	1	0	21	0	0
7th day	9	0	0	0	23	1	6	2	41	3	9.8
8th day	1	0	1	0	6	0	0	0	10	0	0
9th day	2	0	1	0	7	2	1	2	9	4	30
10th day											
or later	11	0	3	1	10	0	0	0	57	1	1.7
Day not stated	11	0	8	0	12	1	2	0	36	1	2.7
Total	283	1	117	6	201	7	61	16	668	36	1.3

These statistics illustrate the value of early operation, during the first twenty-four hours of the attack if possible, and the cases are sufficiently numerous to justify the statement that operation during the first twenty-four hours is attended with extremely little risk; operation during the second day with considerably more risk, though it is still small; but if operation is postponed until the third day, the prognosis is much more serious.

Some may argue that the results obtained in the operations on the tenth day or later are strongly in favour of postponing operation. The reply of course is that it is generally impossible to tell in which cases the inflammatory process will become localized and operation may be deferred with safety. I would once more point to the total mortality of 3.2 per cent in this series, compared with the total mortality of 15.2 per cent in another series of 4000 cases which I collected in 1905; at that time operation was very rarely performed in the first stages

of the attack, but was postponed as long as possible in order to allow the attack to subside, or failing this, to allow the inflammation to become localized.

The earlier statistics illustrate the results of postponing operation, the present ones the result of operating early.

If all cases could be left with safety until the tenth day, the general mortality would be still lower than it is; but unfortunately they cannot, and it becomes our duty to remove the appendix at a time when the risk is reduced to a minimum, that is, during the first twenty-four hours, a procedure which offers the prospect of a mortality of only 12.2 per cent.

**Complications of Acute Appendicitis.** Unfortunately it is by no means rare for the patient's convalescence to be delayed by certain complications which may arise during the attack. Thus we find that out of 698 patients operated upon during the acute stage, in 85, that is, 12.2 per cent, various complications arose. Among them were 25 cases of fecal fistula, 22 cases of secondary abscess, 17 pulmonary complications, and 12 cases of intestinal obstruction; 3 patients had more than one complication; for example, of two of the cases of plural effusion, one was associated with a subdiaphragmatic abscess and the other with bronchopneumonia and the patient with empyema also had a subdiaphragmatic abscess.

That 12.2 per cent of all patients operated upon during an attack of appendicitis, or one in eight, should suffer from complications is very unsatisfactory, but even so it is a great improvement on former results.

The explanation of this improvement is easy; there can be no doubt that it is due to operating early instead of postponing it until the patient has developed an abscess or general peritonitis. For on investigating the 85 cases in which complications arose, we find that in all but six there was an abscess or peritonitis, general or local; in the great majority an abscess or general peritonitis. Of the 6 cases in which the inflammation remained localized to the appendix, 4 was a case of intestinal obstruction in which the appendix itself formed the obstructing band, and probably became gangrenous in consequence of the cutting off of its blood supply by the stretching of the appendix and its mesentery.

**Secondary Abscess.** Secondary abscesses form a large proportion of the complications, for, as will be seen on reference to *Table C*, a secondary abscess developed in no less than 22 of the 85 patients, apart from the four patients who had a subdiaphragmatic abscess. The majority occurred in the pelvis, in the rectovesical pouch, as a natural consequence of the routine adoption of the valuable Fowler's position, which causes all free fluid in the peritoneal cavity to gravitate to the pelvis.

But the number of these cases of secondary abscess is unnecessarily large, for it is due, I think, to inadequate drainage. A few years ago there was a tendency to leave drainage tubes in too long; more recently



MICROCOPY RESOLUTION TEST CHART



28 25

32 22

36 20

1.8



APPLIED MAGE

the pendulum has swung to the opposite extreme, and drainage is not continued long enough, and in fact in some cases not employed where it is necessary. I will remember my disgust on visiting my wards one afternoon, to find that three cases of acute appendicitis, which I had operated on a few days previously, had each developed a pelvic abscess, thanks to a misguided enthusiasm which led a new house surgeon to remove prematurely the drainage tubes which had been placed in the rectovesical pouch. Fortunately the prognosis is good—none of the cases of secondary abscess proved fatal.

Table C. COMPLICATIONS WHICH OCCURRED AMONGST 698 CASES OPERATED UPON DURING THE ATTACK.

Secondary abscess	22
Subdiaphragmatic abscess	4
Local fistula	25
Embolosis	1
Pulmonary complications	
(1) Empyema	1
(2) Pleural effusion	1
(3) Bronchopneumonia	7
(4) Focal pneumonia	2
(5) Bronchitis	3
Intestinal obstruction	17
Pericholecystitis	12
Cystitis	2
Uremia	1
Hematemesis, hematuria, pyuria	1
Total number of complications	88
Total number of patients affected	85*

*Subdiaphragmatic Abscess.* A subdiaphragmatic abscess occurred 4 times. In 1 case it was associated with clear fluid in the right pleura, and in the other cases with a right empyema. All four occurred in old-standing cases; in 2 there was general peritonitis, and operation was not performed until the fifth and sixth days of the attack; in 2 there was an abscess. All the cases recovered.

These results are unusually good. Holtmann quotes Korte, who collected 60 cases, with a mortality of 33.3 per cent. Barnard collected 76 cases: 40 lived and 36 died, a mortality of 47.4 per cent. Of these, 12 were not operated on, and they all died. Of the 64 who underwent operation, 24 died, a mortality of 37.5 per cent. But of the 24 consecutive cases operated upon by Barnard himself, only 17.7 per cent died, a proportion which is a truer representation of the mortality of subdiaphragmatic abscess at the present day. This is largely due to

the pioneer work done by Barnard in this direction, and also to further advances in our methods of diagnosis and treatment.

We must regard a subdiaphragmatic abscess as a serious complication. For although the four cases mentioned above all recovered, the number is too small to justify any deductions as to the mortality of this condition; nevertheless the fact that they all did recover is encouraging. (See also SUPRADIAPHRAGMATIC ABSCESS.)

*Faecal Fistula.*—A faecal fistula is far more likely to occur in a patient who is operated upon late in an attack than in one who has been operated upon within the first forty-eight hours. It may result from any of the following causes:

1. Direct extension of the gangrenous process from the appendix to the caecum or ileum.

2. Imperfect occlusion of the appendix stump. This may occur in cases in which only part of the appendix has been removed, as the proximal part could not be discovered, or it may occur in those cases in which an invaginating purse-string suture, placed in the wall of the caecum round the insertion of the appendix, has either cut through the inflamed and oedematous tissue or given way.

3. Actual tearing of the intestine at the time of operation.

4. Patches already ulcerated and eroded, which, when freed from the adhesions which support them, perforate.

5. The pressure of a drainage tube on the intestine. In cases of prolonged suppuration, this pressure, combined with sepsis, may give rise to ulceration of the intestine, with subsequent formation of a faecal fistula.

Most of these fistulae can be avoided by early operation; the following case may be given as an example.

About two years ago I operated upon a boy of 18, thirty-six hours after the onset of the attack. The appendix was gangrenous, and continuous with it was a gangrenous patch on the caecum the size of a five-shilling piece. The appendix was removed, the gangrenous part of the caecum invaginated, and the patient made a rapid and uninterrupted recovery. If an early operation had not been undertaken, a faecal fistula would have been inevitable.

Of the 25 cases of faecal fistula, there were only 4 in which the operation was performed within the first forty-eight hours. In the great majority of cases the faecal fistula followed an old-standing abscess. In the present series, faecal fistula occurred 25 times in 698 acute cases, or 3.6 per cent.

As regards prognosis, it appears, therefore, that in acute cases 3.6 per cent of patients will develop a faecal fistula. If, however, the operation is undertaken within the first twenty-four hours, or even the first forty-eight hours, the chances of a fistula forming are so slight as to be negligible. Of the 25 patients with faecal fistula, 3 died.

The fistula itself, as a rule closes spontaneously, in the majority of cases within fourteen days. It is rarely necessary to operate, but if the fistula persists, the question of operation must be considered.



*Thromboses.* This is another complication which is met with less frequently than formerly. Thrombosis of the femoral veins occurred 4 times, twice on the right side and twice on the left.

The symptoms usually occur from two to three weeks after the beginning of the illness. There is first a slight rise of temperature, the following day a little pain in the affected limb along the course of the vein, with probably slight edema of the foot, and the next day the edema becomes more marked.

The first case was that of a boy with a retrocaecal abscess, who had been ill for five days before his admission to the hospital; the second case, a man of 45, had an abscess and had been ill for ten days; in the third case, a man of 53, there was no abscess, but the operation was a difficult one and there were many adhesions. The fourth case was a man of 65, who had general peritonitis with a gangrenous appendix and who had only been ill for a day and a half. In the last case there is little doubt that the age of the patient and his feeble circulation predisposed to thrombosis. All four patients recovered.

In considering the prospect of a case of femoral thrombosis, one must remember the danger of its giving rise to pulmonary embolism, and bear in mind Hoffmann's statement that out of 39 patients who had femoral thrombosis, pulmonary embolism occurred in 22.

The ultimate prognosis of thrombosis of the femoral veins is good in young subjects, although the leg will probably remain oedematous for many months. Wearing an elastic bandage, and massage after a due interval, cause great improvement.

*Pulmonary Embolism.* In connection with thrombosis we must consider the extremely important condition of pulmonary embolism. In 1000 cases of appendicitis, Hoffmann reported 39 cases of thrombosis of the femoral veins, and no less than 22 of these gave rise to pulmonary embolism, 18 of the 22 cases proving fatal. McWilliam, in 685 acute cases, found 4 cases of pulmonary embolism, of whom 3 died, on the third, ninth, and tenth days. If we take these two reports together, we see that out of 26 cases, 21 died, a mortality of 80.8 per cent.

Garre and Quincke allude to the varying mortality of pulmonary embolism in the statistics of different authors. They quote the following:

Lothrisson found	52 deaths out of 61 cases	85.3 per cent
Allanus	10 .. .. 23 ..	43.5 ..
Gebale	11 .. .. 11 ..	79 ..
Wyder	8 .. .. 12 ..	66 ..

The difference is probably due to the inclusion of slight cases by some authors, while others only included cases in which the symptoms were pronounced and severe.

Pulmonary embolism is, perhaps, the greatest tragedy of surgery, and any treatment which is likely to prevent this calamity should receive most careful attention. Hoffmann has obtained remarkable

results by making the patient stand up out of bed, even if only for a minute, the day after operation, and this is repeated on subsequent days. If it is quite impossible for the patient to stand, passive and active movements of the lower extremities are instituted and, later, massage. His statistics embrace all cases up to the year 1912, and this treatment was begun in the year 1908. After the introduction of this treatment there were only 3 cases of thrombosis and emboli, compared with 36 in the previous years, and none of these three had been made to get out of bed the day after operation. This is most suggestive, and the treatment is worthy of very careful consideration.

The mortality of severe cases of pulmonary embolism appears to be about 75 per cent, but as was pointed out by Sir Douglas Powell, in all probability many of the cases of bronchopneumonia, empyema, and pleurisy which arise as complications of appendicitis, are really embolic in origin. Fortunately, we can say that at the present time, with modern methods of treatment, fatal pulmonary embolism is an extremely rare complication of appendicitis.

In 4 cases the pulmonary artery has been opened and the clot removed by Trendelenburg's operation. The most successful case was a woman operated upon by Kruger; she lived for five days and a quarter after the operation, and died from purulent pleurisy.

*Other Pulmonary Complications.* Pulmonary affections form a large proportion of the total number of the complications, viz., 17 out of a total of 88. Reference to *Table C* will show the relative frequency of the different conditions, bronchopneumonia heading the list, and pleural effusion coming second.

Empyema only occurred once, and then was in association with a subdiaphragmatic abscess.

Pleural effusion occurred in 4 cases. In one, the patient had been ill three weeks and had a subdiaphragmatic abscess. The second patient was operated upon for general peritonitis on the third day of the attack, and developed double pleurisy and bronchopneumonia. Both of the other two patients had local peritonitis, and the fluid was on the right side of the chest.

In the 8 other cases of bronchopneumonia and lobar pneumonia there was an abscess or peritonitis in 6. Bronchopneumonia developed in one case of acute appendicitis in which inflammation was limited to the appendix; and in another similar case, in which there were adhesions and free fluid in the peritoneal cavity, the patient had right lobar pneumonia.

A patient, age sixty-four, who had a perforated appendix and was operated upon four days after the beginning of the attack, died from bronchitis and heart failure.

These results are striking evidence of the relation between late operation and pulmonary complications, and indicate the prophylactic value of operation during the first twenty-four hours of the attack.

*Intestinal Obstruction.* Intestinal obstruction is a grave and not uncommon complication of appendicitis. I find that it occurred 12

times that is in 4.2 per cent of all cases, or in 1.7 per cent of the acute cases.

The obstruction may be either paralytic or mechanical. In the paralytic variety or ileus, there is paralysis of the intestine with resulting symptoms of intestinal obstruction. In my present series there were 5 examples of this condition, and 4 of them died. In its milder forms it is commonly met with, and therefore it is possible to assume that there were other cases in which ileus was present to a slight degree but no mention has been made of it. When ileus occurs in an attack of appendicitis it is always of grave prognosis, but less so when it occurs early in an attack than later. In the former condition, particularly when it is present before operation, it is often possible to overcome it by appropriate treatment. But when it occurs in the later stages, the prognosis is very grave. Much can be done to relieve the patient by turpentine enemata and the hypodermic administration of pituitary extract. Esmerin in  $\frac{1}{2}$  gr. doses, very two hours for four doses, is often effective, and may be combined with injections of strychnin.

An allusion must be made here to ileus duplex, a condition recently described by Sampson Handley. He says that in certain cases of pelvic peritonitis, paralysis and consequent obstruction occur in two separate portions of the intestines lying in the pelvis—firstly in the lower two or three feet of the ileum, extending to within two inches of the ileocecal valve, and secondly in the lower part of the pelvic colon and upper part of the rectum. The affected coils are empty, passively contracted, and motionless; the bowel wall is swollen and oedematous. Handley recommends that an anastomosis should be made between the ileum above the affected part and the ascending colon, and that a caecostomy should be performed at the same time.

Mechanical obstruction occurred in 7 cases, of which 5 recovered and 2 died. It may be due to the presence of adhesions, producing a kink in a piece of intestine, or adhesions may take the form of a band, and form a loop round a piece of intestine and so ensnare it; or a loop of intestine may pass underneath the band and become strangulated in that way. Lastly, the appendix itself is not very uncommonly the immediate cause of intestinal obstruction. I recently operated upon a patient in whom the tip of the appendix was adherent to the root of the mesentery; it had formed a loop, and through this loop a piece of intestine had passed and was tightly gripped. Not only was the intestine gangrenous, but also the appendix itself. When the appendix forms the constricting band, the prognosis becomes rather more serious, as not infrequently the stretching of the appendix has cut off its blood supply, and gangrene has followed, with resulting general peritonitis. In these cases the primary condition appears to be that of intestinal obstruction, with secondary gangrene of the appendix.

I have found 44 cases of intestinal obstruction in 2387 cases of appendicitis, a proportion of 1.8 per cent, which is not very far from the

proportion of 12 per cent in my cases. Among these 44, there were 14 cases of ileus, 7 of which recovered and 7 died. In the other cases, the appendix itself formed the constricting band in no less than 6; of these only 2 recovered, and 4 died.

The frequency with which intestinal obstruction occurs depends largely on the time at which the primary operation is performed, as is the case with nearly all the other complications of appendicitis. It is interesting to note that in all of my 12 cases either an abscess or general peritonitis existed. None of these cases had been submitted to what is known as early operation, that is, within the first twenty-four hours, or even the first forty-eight hours. The real secret of successful treatment of intestinal obstruction in appendicitis is to prevent its occurrence.

The prognosis is grave. Out of the 12 cases in the present series, 6 recovered and 6 died, while out of Ruge's cases 23 recovered and 21 died—a total of 29 recoveries and 27 deaths, giving the high mortality of 48.2 per cent.

In discussing intestinal obstruction due to appendicitis, one must bear in mind the possibility of an attack of appendicitis leaving behind it bands and adhesions, which may cause intestinal obstruction at a later date.

*Jaundice.* Speaking generally, when jaundice complicates an attack of appendicitis, the prognosis is grave.

Hoffmann has recorded 11 cases; in nearly all of them there was acute perforative appendicitis; in several, diffuse peritonitis or extensive abscesses. He regards jaundice as a sign of very severe illness, especially if it appears early in the attack.

Reichel thinks that jaundice may arise from the spreading of infectious material, and therefore advises that in the case of an abscess, one should be content with opening it and nothing more, when the disease has existed forty-eight hours. Eight of his 18 patients who had jaundice recovered—a mortality of 55.55 per cent; but of Alchhoff's 11 cases, 11 recovered and only 3 died.

Jaundice may be due to various causes and may appear at various stages of the illness. The following are the principal causes:—(1) Simple catarrhal jaundice; (2) Toxiæmia; (3) Direct extension of the inflammation from the appendix to the gall-bladder and biliary ducts; (4) Pylephlebitis; (5) The so-called delayed chloroform poisoning.

1. *Simple Catarrhal Jaundice.*—I recently saw a case of this sort in which the patient's illness began with vomiting; catarrhal jaundice shortly followed, and next day pain began in the right iliac fossa. Operation was performed within thirty-six hours and an acutely inflamed appendix removed. The jaundice followed the usual course of catarrhal jaundice and subsided in the usual way, after a brief period in which the stools were clay-coloured, the urine contained large quantities of bile pigment, and the skin and sclerotics were deeply tinged with yellow. This is the least serious form, and may be met with in

varying degrees; in some cases there is merely a slight and evanescent tingeing of the sclerotics, but in others, as in the case just described, the patient may pass through a typical attack of catarrhal jaundice.

2. *Toxæmia.* The second class consists of cases in which the jaundice appears to be the result of toxæmia. A good example of this kind has been described by Hollander. The patient had well-marked jaundice with an appendix abscess. The abscess was opened and drained, and a gangrenous appendix removed. The jaundice disappeared within two or three days. In consequence of his experience in this case, Hollander suggests that when jaundice is present in cases of acute appendicitis, it indicates that the appendix is gangrenous. There are also mild cases in which the jaundice appears in the early stages of the attack and passes off shortly after operation; they probably belong to this class also.

3. In the third class are placed cases in which there is a *direct extension of inflammation of the appendix to the gall-bladder*, and numerous adhesions are found about the gall-bladder.

4. *Pylephlebitis.* The fourth class is composed of cases which are still more serious. I refer to those in which the jaundice is due to portal pyæmia or acute pylephlebitis. These cases are fortunately rare. In the 1000 cases which I collected in 1905, there were 4 of pylephlebitis, all of which died. In the present series there were 2 cases, one of which was due to actinomycosis.

It is, however, important to remember that jaundice is not always present in these cases. In neither of the 2 reported by Bidwell, one of which recovered, was there jaundice.

The diagnosis of the condition is generally easy. The usual history is that of an attack of acute appendicitis, the formation of an abscess, and after a varying interval, the onset of rigors, and a few days later, the appearance of jaundice. A little later still, the liver may enlarge and become tender. It is interesting to note, however, that this is by no means invariably the sequence of events. I remember a patient who was, some years ago, in the London Hospital under my care with jaundice, enlargement of the liver, and tenderness in the region of the gall-bladder. There was a history of an acute attack of pain on the right side of the abdomen three weeks previously; the temperature was raised. A diagnosis was made of acute cholangitis secondary to gall-stones; but operation proved that the patient had pylephlebitis with a small retrocecal abscess and a perforated appendix.

I have been rather struck, in the few cases which I have met with, by the comparatively mild local signs of appendicitis; but this cannot be taken as the rule, for in 7 cases reported by Hoffmann, 2 followed acute appendicitis, 3 after incising an abscess, and 2 after operation for diffuse peritonitis. Sasse, however, reports 2 cases in which the appendicitis was of such a mild type that the patients were not confined to bed; but about ten days after the beginning of the attack they developed symptoms of pylephlebitis, and died a few days later. The gravity of the condition lies in the fact that, as a rule, the liver is

red with small abscesses, and so is beyond surgical treatment. Of Hoffmann's 7 cases, in only 2 was there an abscess sufficiently large to be incised; one of these recovered, but the other patient died. In my own experience I have had 2 cases which recovered, one of them a patient with a large abscess, which was drained, and the other a case of considerable interest, in which, on exposing the liver, I found numerous small abscesses the size of a pea or less; the *Staphylococcus pyogenes aureus* was found in pure culture, a vaccine was prepared, and the patient made a good recovery.

While the prognosis in cases of pyelohelicitis is necessarily grave, it is not hopeless; an exploratory operation should be performed, and the condition found dealt with by drainage where possible, otherwise by vaccines. It goes without saying that in these cases the primary focus of the disease, namely, the appendix, should always be removed.

With regard to prophylactic treatment, Wilms has published a very remarkable case in which he ligatured the efferent veins leading from the appendix. This patient had had five rigors; but after the veins were ligatured the rigors ceased and the patient made a good recovery, without gangrene of the intestine or any interference with peristalsis. Sprengel attempted to carry out a similar operation in a patient upon whom he had operated and from whom he had removed a gangrenous appendix thirty-six hours after the beginning of the attack. Nine days after removal of the appendix the patient had a rigor, and subsequently, two or three every day. Sprengel's attempts at ligature were unsuccessful, and a fecal fistula developed at the lower end of the small intestine, probably due to gangrene through interference with the circulation. As he points out, the operation is likely to be difficult enough in a normal subject in the absence of inflammation, if there is no mesentery to the colon, and where there is a large amount of subserous fat; but if, in addition, the structures round the appendix are acutely inflamed, it becomes almost impossible to isolate the veins; and even if the veins are secured, the danger of ligaturing the arteries as well, and so giving rise to gangrene, is very great.

5. *Delayed Chloroform Poisoning.* In the last class I would place cases of so-called delayed chloroform poisoning. This most distressing condition I have met with in varying degrees on several occasions, but fortunately have only lost one patient through it. This was a considerable number of years ago, shortly after attention had first been drawn to the disease.

The patient was a little girl of eleven, upon whom I operated and removed an inflamed appendix within thirty-six hours of the onset of the attack. Chloroform was given and the operation was straightforward, but twenty-four hours afterwards she began to vomit. The vomit at first consisted of ordinary gastric contents, but later it contained altered blood and became coffee ground in character. With the onset of vomiting her mental condition became a little clouded;

later she became delirious and, finally, comatose. Jaundice set in thirty-six hours after the operation, and at the end of forty-eight hours was well marked; it was not limited merely to the sclerotics, but extended over the whole body. The breath smelt strongly of acetone, the temperature was slightly raised, the pulse-rate steadily increased in rapidity and became proportionately weaker, and the respirations towards the end were irregular and approximated to the Cheyne Stokes rhythm. The abdominal condition appeared to be entirely satisfactory; the abdomen moved well on respiration, was soft, and there was no distention. She died sixty-four hours after the operation.

This was a typical case of so-called delayed chloroform poisoning. The first symptom is usually vomiting, which comes on for no obvious reason about thirty-six hours after the operation, and the case is frequently fatal within forty-eight hours from the onset of the vomiting. I must, however, point out that jaundice is not present in all these cases.

It is not necessary to enter here into the various theories. Guthrie, however, says that children who suffer from cyclical vomiting are particularly liable to be victims of post-anesthetic poisoning, and that the administration of an anesthetic on the eve, or during an attack, of cyclical vomiting is attended by grave risk, and should be avoided if possible. With regard to prophylaxis, it is particularly important in the case of children not to starve them, and not to purge them too violently before the operation. Dextrose and soda bicarbonate should be given before and after the operation. With regard to the prognosis in these cases, many of them recover after prompt treatment by the administration of large quantities of dextrose and soda bicarbonate, and the mortality is far less now than it was before attention had been drawn to the condition and the proper treatment realized.

*Pylephlebitis.* This has been discussed at sufficient length in Class C, above. Apart from a case of actinomycosis, there was only one case in the present series, and this fortunately recovered. Jaundice, although present in a certain number of cases, is not necessarily a feature of pylephlebitis.

*Gastro-intestinal Hemorrhage.* Melena or hæmatemesis occurring in a patient suffering from acute appendicitis is a matter of grave importance, all the more so as in the majority of cases it is impossible to relieve the condition by surgical methods. In some cases the hemorrhage comes from a duodenal ulcer, in others from the stomach, either from a gastric ulcer or from numerous small erosions; in other cases again, it may be impossible to say where it comes from, even on post-mortem examination.

About twelve months ago I operated on a patient who was suffering from an attack of appendicitis with a large pelvic abscess. He had been ill for two weeks. At the operation I removed the appendix and drained the abscess. All went well until five days after the operation, when he suddenly collapsed: his face became blanched and his pulse

almost imperceptible. He improved under appropriate treatment, and shortly afterwards passed an offensive motion containing a very large quantity of altered blood, during the subsequent week he had several similar attacks, though less severe. All this time he had melæna, frequently three or four motions in the twenty-four hours. The question of operation was raised, but negatively, as his condition was such that any operative interference would almost certainly have proved fatal, apart from the fact that it was impossible to decide the source of the hæmorrhage. Fortunately it gradually ceased, and he ultimately made an excellent recovery.

Hoffmann reported 7 cases of severe gastro-intestinal hæmorrhage. In 3 patients there was general peritonitis at the time of operation, in 1 there was an abscess, and the other 3 were operated upon at an earlier stage. Only one patient recovered; of the other 6 cases, in 2 the hæmorrhage came from a recent gastric ulcer; in another there was serious erosion of the gastric mucosa; in a third the post-mortem showed no cause for the severe hæmorrhage; one patient died from hæmorrhage in a few hours, seven days after a smooth appendicectomy in the acute stage—there was no post-mortem examination; the seventh case was a boy who was making a straightforward recovery from general peritonitis, and died suddenly from severe hæmorrhage—the post-mortem examination revealed a duodenal ulcer, with erosion of the splenic artery.

In 1908 Schwabach collected 28 cases of gastro-intestinal hæmorrhage after operations for appendicitis, and added 2 of his own; 17 patients died and 13 recovered. The mortality in his series was directly proportionate to the severity of the appendicitis: 9 patients had diffuse peritonitis—they all died; 8 patients had an abscess with localized peritonitis—5 died and 3 recovered; 6 patients had acute appendicitis with only slight peritonitis—of these, 3 died and 3 recovered; 7 patients were operated upon during the quiescent period—these all recovered. One-third of the cases occurred in children. Schwabach thinks that the hæmorrhage is the result of thrombosis in the venous and arterial circulation in the omentum and mesentery.

Fortunately this is a rare complication; it only occurred once in my present series of cases, and the patient recovered. If, however, a patient who has been operated upon for acute appendicitis has an attack of gastro-intestinal hæmorrhage, the prognosis becomes grave in direct proportion to the severity of the appendicitis.

With regard to treatment, if from the previous history of the patient there is good reason to suspect the existence of a chronic duodenal or gastric ulcer, and his general condition is satisfactory, surgical intervention is strongly indicated.

*Hæmaturia.* Hæmaturia is a rare but interesting complication of appendicitis, and its pathology is still somewhat obscure. Slight hæmaturia may be caused by the rupture of an appendix abscess into the bladder, but the amount of blood is, as a rule, very slight, and there is but little difficulty in making the diagnosis. On the other



hand, a number of cases have been reported in which hematuria occurred on several occasions after an attack of pain in the right side of the abdomen, and the condition was supposed to be one of renal colic. It was only later, when symptoms of appendicitis definitely declared themselves, that the true diagnosis was made, and the patient was cured by removal of the appendix.

Cases of hematuria in appendicitis may be roughly divided up into two main groups. In the first may be placed those cases in which the appendix does not lie in contact with any part of the genitourinary tract, and in the second those in which the diseased appendix is actually in contact with the kidney, ureter, or bladder. In 6 out of 15 cases described by von Frsch, the appendix was adherent to the lower part of the ureter.

As a general rule, the hematuria follows an attack of pain in the right side of the abdomen, and in a few cases the colic and hematuria are brought on by violent exercise. Occasionally the hematuria is preceded by little or no pain.

The following case described by Hammerley is fairly typical. A lady had attacks of vomiting, with shivering and colic, every three months. Two days after the beginning of each attack, blood appeared in the urine, and on one occasion the urine appeared to be almost pure blood. The attacks were brought on by unusual bodily exertion. On examination, nothing abnormal could be detected, apart from a movable right kidney: the kidney was not painful or enlarged. There was no tenderness in the appendix region. Ultimately an attack occurred which was associated with a rise of temperature, and tenderness in the right iliac fossa was present for the first time. The appendix was removed, and was found to be lying behind the caecum, adherent to the right kidney and ascending colon. The patient had no further attacks of colic or hematuria. A somewhat similar case in which the colic and hematuria followed exertion has been described by von Frsch.

Another remarkable case has been reported by Carlöss. A woman had typical attacks of renal colic, with a history of previous severe pain in the right side. She was relieved after the passage of blood in the urine and a little gravel. The kidney and ureter were explored with a negative result. A week later the patient died from a perityphlitic abscess. The post-mortem examination showed that the appendix was lying on the back of the abdomen and hanging down over the pelvic brim in the region of the ureter.

In other cases, as in a boy under my care some years ago, hematuria may supervene without any severe attack of pain. I saw my patient, a boy of twelve, during his second attack of hematuria. No tenderness was to be made out on abdominal examination: the kidney was not enlarged; there was no rise of temperature. On examination with the cystoscope, blood was seen coming from the orifice of the right ureter. On examination of the urine, the *Bacillus coli communis* was found in pure culture. The hematuria rapidly subsided. Two months

later I operated upon him for what was supposed to be the first attack of appendicitis, but on removing the appendix I found it to be the seat of old-standing disease. In this case the appendix was not in contact with the kidney, ureter, or bladder. The patient recovered well and had no further hæmaturia.

It is interesting to note that in the majority of cases nothing abnormal is to be found in the urine apart from the blood. This is found in varying quantities, and it is not uncommon to find blood casts in addition to altered blood corpuscles. The most striking feature of the condition, however, is the way in which the hæmaturia clears up after removal of the appendix, and does not recur.

As for the explanation of the hæmaturia, in some cases there can be no doubt that there is a direct spread of the infection to the kidney, as in a case reported by Seelig, in which a pyelophytic abscess and a gangrenous appendix lay on the kidney.

In cases in which the appendix is adherent to the ureter, it may cause venous congestion and consequent bleeding from the mucous membrane of the ureter, or inflammation and swelling of the mucous membrane, which may give rise to obstruction of the ureter and so predispose to acute pyelitis and hæmaturia, as in the cases recorded by Himmer.

These two theories will not, however, account for cases in which the appendix is not in contact with any part of the urinary tract. They must probably be explained either on the ground that there is a toxic nephritis, or that the kidney is the site of emboli or thrombosis. Von Frisch thinks that the hæmaturia is probably due to embolism or thrombosis, the presence of blood casts supporting this theory; he suggests that a retrograde thrombosis may take place, owing to the free communication between the veins of the capsule of the kidney, the veins of the peritoneum, the lumbar, and the retroperitoneal veins.

Although the theory of toxic nephritis will not hold good in the majority of cases, owing to the rapid recovery of the patient from the attacks, and the way in which no trace of albumin, no casts, nor renal epithelium is to be found in the urine subsequently, still it may occur occasionally.

The prognosis in the hæmaturia which is usually associated with appendicitis is excellent, as these cases clear up as soon as the appendix has been removed, leaving no trace, as far as we know, of any after-effects. On the other hand, if the hæmaturia supervenes whilst the patient is gravely ill from an acute attack of appendicitis, particularly if it is complicated by an abscess or general peritonitis, the prognosis is more serious.

**Bacteriology.** There is no doubt that the great majority of cases of appendicitis are due to the *Bacillus coli communis* and *Streptococcus pyogenes*, either separately or together. In most cases the former is to be found alone, in others the *Bacillus coli* and *Streptococcus* in pure culture. Other organisms, both aerobic and anaerobic, are sometimes

found, but they usually play a subsidiary part and only represent a secondary infection.

The prognosis in the case of a streptococcal infection is, as a rule, more serious than in the case of infection by the *Bacillus coli*. Kelly states that the *Streptococcus pyogenes* is especially associated with cases of very severe infection, and is the usual cause of extensive and rapidly fatal peritonitis. This fully bears out my own experience, and I have frequently found it present in cases of severe infection, with gangrene of the appendix and possibly extension to the caecum. Those cases in which the temperature remains raised for a week or ten days after removal of the appendix, in spite of apparently satisfactory drainage, are not uncommonly due to streptococcal septicaemia. If the abdomen is explored, but little pus will be found, and what there is is present in small loculi. If the adhesions are broken down to let out these small collections of pus, there is a great danger of faecal fistula.

**Pregnancy.** There has been a good deal of discussion on the relation between pregnancy and appendicitis, and the influence of the one upon the other; but the number of cases that have been reported is comparatively small, and it is therefore difficult to draw any satisfactory conclusions. In the present series there were only 2 patients who were pregnant, one three months and the other six months. In one the appendix was inflamed, without the formation of pus or peritonitis; the wound healed by first intention, and the patient made an excellent recovery. In the other case the illness was of longer duration, and there was local peritonitis at the time of operation; but the patient recovered, pregnancy being undisturbed.

If a patient recently recovered from an attack of appendicitis becomes pregnant, is she likely to have a recurrence of the appendicitis during her pregnancy? Apart from the ordinary probabilities of a recurrence of an attack of appendicitis independently of pregnancy, we have to take into consideration the altered intra-abdominal conditions. These have given rise to a good deal of speculation on the part of various authors, with the result that exactly opposite opinions have been held. On the one hand, we can say that the constipation which is so frequently present in pregnancy is a predisposing factor, and would favour an attack of appendicitis. On the other hand, the connective tissue in the lower abdomen becomes looser and all the parts more vascular, which would not favour such an attack. But when we take into consideration the actual facts, we see that the number of women who suffer from appendicitis during pregnancy is extremely small. For example, among the 4000 cases of appendicitis which I collected in 1905, there were 309 females, and 6 of them were pregnant, a proportion of, roughly, 2 per cent. In the present series there were 394 females, 2 being pregnant, a percentage of about 0.5 per cent. This proportion is somewhat larger than that which obtains in the statistics of Sonnenburg and Krogius, quoted by Rensvall. Sonnenburg, among 2090 cases of operation for appendicitis on both

sexes, had 4 cases of pregnancy, and Krögnig, in 900 cases, had 1 of pregnancy. Renvall also quotes Fraenkel, who, out of 10,000 gynaecological and obstetric cases, had only 4 cases of appendicitis associated with pregnancy, and Schauta, who had 4 cases out of 30,000.

Now although it is obvious that when the total period of the pregnancies of any one woman is taken, it forms only a very small part of her life, the number of pregnant patients in the above statistics is so exceedingly small that it suggests that pregnancy does not have any particular influence in predisposing to an attack of appendicitis. Further, Renvall found that attacks of appendicitis, whether primary or secondary, depend but little, or not at all, on the month of pregnancy, because the number of cases which occurred in the second and third months, when the uterus can exert no pressure and no traction on the appendix, was proportionately equal to those which occurred in the later months of pregnancy. We may therefore consider that the influence of pregnancy on the incidence of appendicitis is not proved.

We next pass on to consider the probable course of events in a patient who has an attack of appendicitis during her pregnancy. First of all, one can say without hesitation that if operation is performed in the early stage, that is, within the first twenty-four hours, the prognosis differs very little from that in a patient who is not pregnant, and the same holds good for a certain number of cases of abscess, namely those which do not come into contact with the uterus. If, however, the uterus forms part of the wall of an appendix abscess, the prognosis becomes more serious. The great danger, of course, is the possibility of miscarriage or labour: for the rapid diminution in the size of the uterus will break down the adhesions and flood the peritoneal cavity with the pus which escapes from the abscess. Several cases have been reported in which the patient died from general peritonitis, the result of a ruptured appendix abscess, two or three days after labour.

With regard to the effect on the pregnancy, a simple appendicitis does not necessarily predispose to abortion or labour. On the other hand, if an abscess has formed, the prospects are not so good, for if it lies in contact with the uterus there is a considerable probability that it will bring about miscarriage or labour, a probability which becomes a certainty if there is general peritonitis. At the same time it must be remembered that abscesses have been evacuated without disturbing the pregnancy.

Lastly, with regard to the child: in nearly all cases in which appendicitis puts an end to the pregnancy, the child is born dead, or dies within a few hours of its birth. An interesting case has been reported by Pinar, in which the *B. coli communis* was found in pure culture in the vessels of the umbilical cord. Krögnig also reported a case in which the *B. coli communis* was found in pure culture in the organs of the fetus, in the placenta, and in the large uterine veins.

What then is the best line of *treatment* to adopt in a patient who becomes pregnant shortly after an attack of appendicitis? If the attack was a severe one, I think that she should be advised to have

the appendix removed as soon as possible, for appendicectomy in the quiescent stage is attended with very little risk to the patient and is not likely to disturb the pregnancy. In this way, the danger of a recurrent attack during her pregnancy will be avoided, an attack which might be compounded by abscess or general peritonitis, and which would possibly prove fatal to both mother and child. If, however, the attack was a very mild one, and therefore a recurrence less likely, and if the patient would be within reach of surgical aid during the whole of her pregnancy, then one might wait for a further attack to develop, on condition that operation should be performed as soon as the diagnosis has been made.

If an attack of appendicitis occurs during pregnancy, the safest course for both mother and child lies in immediate operation.

**When to Operate.** We now have sufficient data to discuss the vexed question, when to operate in appendicitis. There is a steadily growing consensus of opinion that operation should be performed in all cases of appendicitis as soon as the condition is diagnosed. For at the beginning of an attack it is frequently extremely difficult, and generally impossible, to give a prognosis and to say whether the patient will get well without operation or not. From time to time various methods and tests have been announced which it was hoped would indicate the necessity for operation or not; but none of them have been found to be absolutely reliable. First there was the question of leucocytosis. Then there was the test administration of castor oil: if the patient was not worse after the castor oil, operation was not performed; if he was, operation was considered to be indicated—a very dangerous method, one which should never be used in private practice, and extremely rarely in hospital. Oehlerker drew attention to the fact that the viscosity of the blood increases in proportion to the severity of the attack, and shows in an especial degree how widely the peritoneal cavity is involved. The more extended the peritonitis, the higher the viscosity; but it does not tell how far the appendix itself is diseased; for example, an appendix may be gangrenous, but if it lies on the outer side of the caecum and there is little or no peritonitis, the blood may only show a very slightly increased viscosity.

Then again, at one time it was said, "If the patient is not improving at the end of forty-eight hours, operate." My reply to this is, of course, that one should not wait until the end of the first forty-eight hours, but, once the diagnosis has been made, operation should be performed immediately. To emphasize this, we need only point to the figures given above, which show that the mortality in patients operated upon during the first twenty-four hours is 1.2 per cent, during the second twenty-four hours 7.9 per cent, and during the third twenty-four hours 8.7 per cent.

It may be objected that it is not necessary to operate upon all cases of appendicitis, and that many of them will subside without any operative interference whatever. This is perfectly true. The crucial point, however, is that, in most cases, we cannot tell at the beginning of an

attack whether it is going to be a catarrhal one, or whether gangrene will set in. Any surgeon who has a fairly wide experience of operating on these cases can readily call to mind patients who presented symptoms and signs of a comparatively mild attack of appendicitis but in whom a gangrenous appendix was found at operation. Kummell, in discussing the importance of early operation, mentions that out of 237 cases upon which he operated during the first forty-eight hours of the attack, 115, nearly 50 per cent, showed a gangrenous or perforated appendix.

Then again, apart from the very small mortality of operations performed during the first twenty-four hours, a point of great importance is this, that by operating early and removing the diseased locus, the chances of complications supervening are greatly diminished. This is particularly the case with such complications as ileus and the other forms of intestinal obstruction, thrombosis of the femoral veins, pylophlebitis, and so on. For example, if we compare my 1905 series of cases with the present series, we find that the number of cases of fecal fistula has been reduced from 19 to 25, and of thrombosis of the femoral vein from 12 to 4. There were only 17 cases of pulmonary complications as opposed to 15 in 1905, and 2 cases of pylophlebitis as opposed to 4. Further, with very few exceptions, all the complications in the present series occurred in patients who, at the time of operation, were suffering from either abscess or general peritonitis.

Another point in favour of early operation, apart from the prevention of such grave conditions as the formation of an abscess or general peritonitis, is that, in the great majority of cases, it is possible to close the wound and obtain union by first intention. When an abscess or general peritonitis is already present, this is not possible, and we have to face the possible development of a ventral hernia, apart from the prolonged stay in bed which is necessitated by these conditions.

Lastly, another point of considerable importance in the prognosis is the fact that appendicitis is essentially a disease where relapse is the rule, and freedom from recurrence is the exception. The only cure is operation; medical treatment may be successful in tiding the patient over an attack, but the probability that further attacks will supervene is very great. Of 233 cases collected by Karnstrom, 70.2 per cent had further attacks, 60 per cent in the first year, 20 per cent in the second, and 20 per cent subsequently. Of 1933 cases, Kummell found that 989, or 51.1 per cent, had had previous attacks.

When operation is performed in the early stages, the appendix can always be removed, and thus the possibility of further attacks is obviated.

**Recurrence.** The question of recurrence must be considered from three standpoints: First, the probability of recurrence in a patient who has an attack of appendicitis, mild or acute, without abscess formation; second, the recurrence of symptoms after appendicectomy; and third, recurrence after an abscess when the appendix has not been removed. Statistics which are compiled at the present day have not

the same value as those of five or six years ago, owing to the greater frequency of operative interference. For nowadays, not only is it the rule for a patient who has an attack of appendicitis to be operated upon, either immediately or at the conclusion of the attack; but also many cases of chronic appendicitis, where there has never been an acute attack, are recognized and treated by operation.

The great tendency to recurrence is pointed out by Hoffmann, who found that of 2334 cases operated upon for appendicitis, no less than 1202, that is 51.4 per cent, had had previous attacks, and this, he says, was the minimum, for in a large number of cases there was no mention as to whether the patient had had a previous attack or not.

I have already referred to Karczewski's conclusions; we there see that, of patients who are going to have recurrent attacks of appendicitis, 80 per cent will have them within two years. But at the same time it must be borne in mind that attacks may recur after as many as eighteen, twenty, or even twenty-two years have elapsed.

It seems possible that as the attacks are repeated they become less severe. In 1905 I found that of 299 patients who had an appendix abscess, 187 had had no previous attacks. This is still more striking in the case of general peritonitis. Of 35 cases in which allusion was made to the presence or absence of previous attacks, in no less than 31 the patients had not had appendicitis. Three patients had had one attack, and 1 patient had had two attacks. That is to say, in 88.6 per cent it was the first attack.

*Table D.* CASES OF ABSCESS AND GENERAL PERITONITIS ADMITTED TO THE LONDON HOSPITAL FROM JULY 1, 1900, TO AUG. 15, 1904, AND THEIR RELATION TO PREVIOUS ATTACKS OF APPENDICITIS.

	Number of Cases	Number of previous attacks of appendicitis				Total of cases
		None	One	Two	Three	
Abscess	499	200	187	67	19	26
General peritonitis	101	66	31	3	1	0
Total	600	266	218	70	20	26

These figures are, of course, small, and deductions from them must be made with some reserve; but it is reasonable to assume that the adhesions which result from the first attack tend to limit the inflammation in subsequent ones to the immediate neighbourhood of the appendix.

If the patient has had one undoubted attack, an operation for the removal of the appendix should be undertaken as soon as convenient. In the present state of our knowledge it is impossible to say with

certainty whether a patient will have further attacks or not; but unless the recent attack was a very mild one, of brief duration, with little pyrexia or general disturbance, it is probable that he will. If it was a severe one, changes will probably take place in and around the appendix, resulting in a stricture, kinking, adhesions, etc., which predispose to a recurrence, and therefore operation is strongly indicated.

An exception may perhaps be made where the patient has had numerous fairly acute attacks of appendicitis, perhaps six or seven, and each has been less severe than the preceding one. If these cases are operated upon, it is usual to find the appendix partially destroyed, great fibrous thickening of the submucous coat, and the lumen almost or entirely obliterated for a great part of its extent. Adhesions are commonly met with which shut off the appendix more or less completely from the surrounding peritoneal cavity. A patient with an appendix in this condition is unlikely to have a very serious attack, and therefore, if strongly opposed to operation, he may be treated on medical lines. At the same time one must bear in mind the pathological conditions in the upper abdomen which are frequently associated with, and apparently caused by, chronic inflammation of the appendix. If there are symptoms of dyspepsia the appendix should certainly be removed, lest worse befall.

*Recurrence of Symptoms after Appendicectomy.* Sir Frederick Treves went fully into this question in 1905, and made a valuable contribution to the subject by analyzing the cases of 45 patients who consulted him because they were no better for the operation, or still had "attacks" which had been unaffected by the removal of the appendix. In the following table he gave a list of the patients who consulted him, and the varying conditions which gave rise to their symptoms.

*Table E.*—PATIENTS WHO COMPLAINED OF IMPERFECT RELIEF AFTER THE REMOVAL OF THE APPENDIX IN THE QUIESCENT PERIOD.

Appendix imperfectly removed	2
Ovarian trouble coexisting	9
Persisting or relapsing colitis	8
Persisting local pain	7
Neurasthenia or hypochondriasis	5
Continued attacks due to gallstones	3
" " colic	2
" " movable kidney	2
" " stone in kidney	1
" " an unexplained cause	1
Tender mass in the right iliac fossa	5

45

Reference to this table shows that in a large proportion of the cases the symptoms were not caused by appendicitis, but by various other conditions such as gall-stones, colitis, etc., and consequently the failure of the operation was due to an incorrect diagnosis.

In 2 cases the whole of the appendix had not been removed, and the patient had further attacks in the stump which was left.



In 5 cases the symptoms were ascribed to neurasthenia and hypochondriasis.

In 5 other cases a tender swelling appeared in the right iliac fossa some time after the operation. In 3 of them the tender swelling was a fecal mass; in 1 it was inflammatory, and disappeared in a few weeks; in the remaining case it was due to tuberculous glands.

At Sir Frederick Treves's request I wrote to 363 London Hospital patients who had had the appendix removed in the quiescent stage. Among other questions, I asked if they had had any further attacks resembling those which they had had before the operation. There were 242 replies: 231 said that they had been quite free from pain; 11, a proportion of 4.5 per cent, said that they had had further attacks.

Among the patients who had the appendix removed during an operation for general peritonitis or abscess, the percentage was rather higher, as out of 407 patients who replied, 6, or 5.6 per cent, complained.

It is not surprising to find a higher percentage of imperfect relief in the latter circumstances, on account of the gross intraperitoneal disturbance, and also because of the increased difficulty of removing the appendix in the case of an abscess, especially if there have been previous attacks.

In 2 of the patients to whom I wrote, a second operation was necessary to remove the remains of an appendix which had been incompletely removed at the first operation; in one of them, removal of the appendix was originally attempted during a quiescent period, in the other, during an operation for abscess.

While giving adequate weight to the above investigations, it is important to remember that they were made twelve years ago, and that since then we have made enormous strides in our knowledge of appendicitis, and in its diagnosis and treatment.\* We may therefore reasonably suppose that a considerable proportion of the causes which were responsible for the lack of success of the operation, as illustrated by the table drawn up by Sir Frederick Treves, are no longer operative. Consequently, with proper care in the selection of cases, added to modern technique, the operation undertaken in the quiescent stage should be completely successful, and afford entire relief in probably not less than 97 per cent of them.

*Recurrence after an Abscess.* I now turn to those cases of appendix abscess in which the pus is evacuated but the appendix is not removed. In 1905, at the discussion before the Royal Medico-Chirurgical Society, the general feeling was that if a patient had an appendix abscess, his chances of having a further attack were very slight; and it was even said that if a concretions was found in the pus, there would be no further attacks. Credit must be given to Battle for so vigorously

\* Litt., *The Present Position of Appendicitis*, *Lancet*, 1914, Jan. 31, p. 295.

advocating removal of the appendix in all cases of abscess, if it could not be done easily at the time the abscess was drained, he advised an operation during the quiescent stage.

At the present time it is the usual practice, when operating upon an abscess, to remove the appendix unless there is great difficulty in doing so; but at one time it was the rule to be content with opening the abscess, and not to remove the appendix unless it actually presented itself during the operation.

From the statistics which were brought forward at the above meeting, I have been able to collect the following cases in which an abscess formed and was evacuated without the appendix being removed, and in which the question of further attacks was investigated. From St. George's Hospital there were 15 cases; 2 of them had further attacks, after which the appendix was removed. Peerce Gould brought forward 74 cases—41 occurred in his hospital and 33 in his private practice; 4 of the former and 4 of the latter had subsequent attacks of appendicitis for which the appendix was removed. Battle operated on 54 cases of appendix abscess which recovered, and no less than 42 had further symptoms necessitating appendectomy. Together this gives a total number of 140 cases, 49 of which, that is, about 35 per cent, had further attacks.

For the same meeting, I wrote to and had replies from 433 patients who had had an abscess or general peritonitis in whom the appendix had not been removed; 24 of them said that they had had further attacks, a proportion of 5.6 per cent. Taken by themselves, these replies would not be of much value, unsupported as they are by medical evidence; but the result coincides so closely with that found in the above 140 patients, 35 per cent of whom had so much trouble with the appendix after the abscess had been drained that a further operation was necessary, that their insertion here is justified.

Hoffmann reported that out of 78 cases of appendix abscess, 44 had trouble subsequently in the form of abdominal disturbance or pain, and that in a certain proportion there were further definite attacks of appendicitis.

An interesting paper was published by Dodds Parker in 1912. He recorded 17 cases of appendicitis with abscess formation in which the appendix was removed when the attack had subsided. In none of these cases was the appendix destroyed or its lumen obliterated, but in all of them there were adhesions, kinks, and scars, which of course predisposed to further attacks.

**Sex.**—It has long been recognized that the male sex is more liable to attacks of appendicitis than the female, and numerous statistics have been published to illustrate the incidence of appendicitis in the two sexes. In the 1905 series, I found that of the 1000 cases, 682 were males and 318 females, the males forming 68.2 per cent of the total. Of the 898 cases which were operated upon in the London Hospital in 1912, 515 were males and 383 females, a percentage of 57.3. Added together, in 1898 cases there were 1197 males, that is, 63.1

per cent. This agrees closely with the results obtained by MacCarty, who compiled 2586 cases reported by four different writers, of which 61.7 per cent were males.

In order to obtain still larger numbers, I collected all the cases admitted to the London Hospital during the years 1901-1912. I found that there were 3652 males and 2426 females, a total of 6078. This means that the male patients formed almost exactly 60 per cent of the cases, and coincides remarkably with Kelly's investigations, for he found that in the Johns Hopkins Hospital the proportion of men to women was as 60 to 40.

The preponderance of the male sex is not limited to adults only; the same holds good in the case of children. In 1912, 99 children were admitted to the London Hospital suffering from appendicitis; 61 were boys and 38 girls, a male percentage of 61.6.

Why the male sex should be more subject to appendicitis than the female is not known, though numerous explanations have been offered, ranging from an alleged additional blood-supply in the female sex through a branch of the ovarian artery, to a greater exposure to injury and the excessive use of tobacco in the male sex.

As to the severity of the attack, although men are more frequently subject to appendicitis, the attacks appear to be more serious in the female sex, and are attended by a higher mortality; for example, of the 515 men, 11 died; of the 383 women, 16 died, giving a male mortality of 2.7 per cent, while the female mortality was 4.2 per cent. This suggests that although the male sex is more frequently affected, roughly in the proportion of 6 to 4, the attacks are more serious and more frequently fatal in the female sex.

**Age.** The age at which appendicitis occurs varies within wide limits, although as we shall see presently, there is a very definite period of life when the disease is especially common. In the present series the youngest patient was 10 months old, and the oldest 72 years; both recovered. The oldest patient, however, that I know of, was a gentleman of eighty-four, upon whom I operated and from whom I removed a gangrenous appendix. He made an uninterrupted recovery. On referring to *Table F*, it will be seen that of 1000 cases, 117 occurred in children up to the age of ten, 339 between eleven and twenty, and 275 between twenty-one and thirty—that is, 611, or 61.1 per cent, occurred between the ages of eleven and thirty, and 731, or 73.1 per cent, before the age of thirty-one.

As regards mortality; it has long been said that the mortality is especially great in the earlier and later periods of life, and it is interesting to see that the results obtained in the present series bear this out. Among 117 cases under eleven years of age there were 7 deaths, a mortality of 6 per cent. Between eleven and twenty there were 339 cases, with 9 deaths, a mortality of 2.7 per cent, and between twenty-one and thirty, 275 with 10 deaths, a mortality of 3.6 per cent. We next come to the period between thirty and fifty; here the results are very remarkable, as in 233 cases there were only 3

deaths, giving the low mortality of 1.3 per cent. It is always dangerous to draw conclusions from statistics unless the figures are very large and all causes of error have been excluded as far as possible; still, one cannot help feeling it is very suggestive that out of 233 cases there should only be a mortality of 1.3 per cent.

Table V. MORTALITY OF APPENDICITIS AT DIFFERENT AGES.

	R.	D.	R.	D.	R.	D.	R.	D.	R.	D.	R.	D.	R.	D.
0-10	10	12	0	40	0	13	3	33	0	12	4	110	7	6
11-20	20	78	1	107	1	55	0	59	2	31	5	330	9	2.7
21-30	30	103	0	76	0	27	2	51	4	8	1	265	10	3.6
31-40	40	56	1	12	0	15	0	29	0	7	0	159	1	0.6
41-50	50	28	0	14	0	5	0	21	1	3	1	71	2	2.7
Over 50	13	0	1	0	2	1	11	0	3	2	3	33	3	8.3
Total	300	2	283	1	117	6	201	7	64	16	968	32	3.2	

Over the age of fifty, the numbers are so small as to be of little value. There were 36 patients, 3 of whom died, giving a mortality of 8.3 per cent. One is not surprised to find that the mortality in people of advanced years is greater than that in young people and those in the prime of life. It only stands to reason that a patient who is getting on in years, and is possibly troubled with some deficiency in the pulmonary, cardiac, or renal organs, should be more likely to fail to respond to treatment, and should succumb from heart failure or pulmonary complications.

#### CHRONIC APPENDICITIS.

**Chronic Appendicitis and Conditions associated with it.** So far I have dealt only with the prognosis in acute cases. Chronic appendicitis must also be considered, not only in relation to the possibility of further acute attacks, but also in relation to other more remote effects. The so-called appendix dyspepsia is now a well-recognized clinical entity, and of late the medical profession has realized the frequency with which chronic inflammation of the appendix is associated with important pathological conditions in the upper abdomen.

**Appendix Dyspepsia.** It is now generally recognized that chronic inflammation of the appendix may give rise to symptoms simulating ulcer of the stomach or duodenum, or gall-stones; and a definite diagnosis between these various conditions can be made in the great

majority of the patients, if the case is properly investigated, and a full account of the symptoms obtained and thoughtfully considered. The writings of Paterson and Moynihan should be consulted, particularly the article by Moynihan in the *British Medical Journal*, January 29th, 1910, and the article on "Appendix Gastralgia" in Paterson's book, *The Surgery of the Stomach*. I may, however, touch briefly on the principal features of this condition. The most frequent symptom is pain or discomfort in the epigastrium, coming on at a varying time after food, sometimes immediately, in other cases not until two hours or more have elapsed. It is frequently associated with distention and regurgitation. Unlike gall stones, the character of the food makes little difference. An important point of differentiation between the dyspepsia due to the disease of the appendix, and other kinds, is that in the former the symptoms are practically continuous with very little variation, whereas in the latter the patients nearly always have intervals of weeks, or even months, in which they are comparatively free from pain. Occasionally, but in my experience it is rather exceptional, the pain is referred from the epigastrium to the right iliac fossa; tenderness in the right iliac fossa is occasionally met with, but may be entirely absent. Exercise such as cycling, and particularly golf, is liable to bring on the pain, or, if present, to aggravate it. Moynihan has drawn attention to the fact that pressure on the appendix region may produce epigastric discomfort. Conversely, I have had a number of patients who complained of pain in the right iliac fossa when pressure was made upon the epigastrium. A somewhat alarming symptom, which is by no means uncommon, and which I have met with in a fair proportion of my cases, is haematemesis.

An interesting feature in these cases is the comparatively small number of patients who have had previous severe attacks of appendicitis, so that in many cases the patient has no reason to suppose that his appendix is at fault. Harold Barclay recently drew attention to this in an article in the *American Journal of Surgery*. In 11 cases he found only 5 with a direct history of previous attacks.

Sherren divides cases of appendix dyspepsia into two groups. In the first he places patients operated upon for intractable indigestion, in whom, after the upper abdominal organs had been explored, the appendix was removed. In this group there were no local symptoms or physical signs indicating disease of the appendix. In the second, he places patients operated upon for attacks of abdominal pain diagnosable as due to the appendix, in whom there was a history of long-continued indigestion. The condition of these cases twelve months or more after operation was as follows. In the first group, out of 52 cases 36 were absolutely well, 6 were almost well and complained only of a little flatulence at times, 2 were "better," and in 8 there was no improvement. In the second group, out of 42 cases, 36 were cured, 3 much improved, and in 3 there was no improvement.

*Gastric and Duodenal Ulcer.*—It would appear that appendix dyspepsia is a preliminary stage only, and if it is neglected, gastric

a duodenal ulcer may supervene. This is only reasonable when we consider that in many cases, on opening the abdomen, the pyloric portion of the stomach is seen to be in a condition of spasm (Movinhan); this causes delay in the emptying of the stomach and so predisposes to chronic catarrh. Then again, hematocytosis is generally recognized as being by no means uncommon in appendix dyspepsia, and in one case Paterson observed multiple erosions of the mucous membrane of the stomach. That gastric and duodenal ulcers are associated with chronic diseases of the appendix, cannot be denied. As long ago as 1908 Mohrert found that in 64 per cent of a series of gastric-ulcer cases there were inflammatory changes in the appendix. Paterson says that among his cases of duodenal ulcer extending over three years, there was obvious disease of the appendix in 66 per cent. Movinhan, taking a short series of 14 cases of duodenal ulcer, examined the appendix in 12, and in 80 per cent found evidence of long-standing disease in it. McCarty and McGrath report that in 52 operations for gastric and duodenal ulcer, 20.9 per cent of the appendices which were removed were partially or completely obliterated. In my own experience, it is the exception to find a normal appendix in the presence of a gastric or duodenal ulcer.

*Gall-stones.*—These, too, apparently come into relation with chronic appendicitis. In several cases where the symptoms have been those of chronic cholecystitis, I have found adhesions round the gall-bladder with some congestion of its mucous membrane, and a chronically diseased appendix. Here again, McCarty and McGrath have some very interesting statistics. In 57 autopsies on cases of cholecystitis, the appendix was partially or completely obliterated in 52 per cent. They further draw attention to the fact that of 365 cases of cholecystectomy, in 23.2 per cent the symptoms began at or under 25 years of age, a period when appendicitis is extremely common, and in 43 per cent there was a history of pain and soreness in the appendix region. The appendices were only removed in 59 of the above cases, but 69 per cent of these appendices showed undoubted signs of disease. They suggest that the sequence of events is, first, a chronic appendicitis; secondly, cholecystitis; and, finally, gall-stones.

It is now generally recognized that the appendix may play an important part in diseases of the upper abdomen, and that no operation for gastric or duodenal ulcer, cholecystitis, gall-stones, and possibly pancreatitis, is complete without examination of the appendix, and its removal if diseased.

The explanation is not quite clear, though there are numerous theories. Payr and Mohrert think that a gastric ulcer may be caused by emboli from thrombosed veins in the appendix and its mesentery. Another explanation is that these lesions result directly from intestinal stasis, caused by adhesions and kinking of the intestine, the infection spreading along up the small intestine to the stomach and duodenum. This may be so, and the propounder of this theory, Sir Arbuthnot Lane, has explained the disappearance of the gastric or duodenal

symptoms after appendectomy on the ground that the removal of the appendix relieves the obstruction of the lower end of the ileum. Lane, however, considers that the appendicitis is a secondary and not a primary condition. It seems to me that the explanation may lie in the action of the ileocecal sphincter. It is possible that an appendix which is in a state of chronic inflammation may so interfere with the ileocecal reflex, from the alteration in the character of its secretion, or from loss of contractile power in consequence of fibrosis or adhesions, that there is an abnormal delay in the passage of feces from the small into the large intestine. MacLaren had the opportunity of watching a patient who had the anterior wall of his cecum through an explosion. He observed that there was a considerable flow of alkaline, glutinous mucus from the appendix orifice and cecal surface shortly after food was introduced into the stomach, and that it was greatly increased just before the contents of the ileum passed through the ileocecal valve into the cecum. Cannon found, in his experiments on rats, that if the cecum is irritated by the injection of codon oil, the passage of the chylent from the stomach to the intestine, and from the small intestine into the colon, is considerably delayed. In further support of this theory, we find that in many cases of appendix dyspepsia the duodenum is dilated.

The experiments of Bond have clearly demonstrated that in the presence of obstruction, minute foreign bodies can be carried in the opposite direction to the normal flow in the case of mucous canals and gland ducts, and one may conclude that in intestinal stasis, micro-organisms can ascend up the small intestine to the duodenum and thence to the stomach, or along the bile ducts to the gall bladder or to the pancreas.

Whatever the value of these theories may be, the fact remains that a patient who is suffering from chronic inflammation of the appendix is liable to have gastric or duodenal ulcer, or gall-stones, quite apart from the danger of a further attack of appendicitis.

The prognosis, therefore, for a patient who has had one attack of appendicitis is somewhat as follows: Over 50 per cent of patients have further attacks, and of these, 60 per cent have further attacks within twelve months, and 80 per cent within two years. There is also a possibility of appendix dyspepsia, gastric or duodenal ulcer, or gall-stones supervening. It is not possible to give statistics to prove the frequency with which the latter complications arise. One can only say, in accordance with the statistics already referred to, that in probably 75 per cent of cases of gastric and duodenal ulcer the appendix is considerably diseased, and that in 175 cases of gall-stones and cholecystitis, McCarty and McGrath found its lumen obliterated partially or completely in nearly 50 per cent, and consequently we may assume that there was evidence of disease, less pronounced, in considerably more. In addition, we have to remember the numerous cases of appendix dyspepsia which have come to operation before these serious complications have supervened.

*Colitis*.—Lastly, there is a certain number of cases of colitis which are the direct result of chronic inflammation of the appendix. It may be taken as a general rule that appendicitis only is indicated provided the colitis was immediately preceded by a definite attack of appendicitis; under these circumstances the prospect of a cure of the colitis is good. This favours the theory that the diseased appendix is continually discharging colonies of virulent bacteria into the cecum which come and keep up the colitis. If on the other hand the colitis appeared first and the appendicitis seems to be secondary to it, there is little prospect of curing the colitis by removing the appendix.

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*Hugh J. H.*

**ARSENIC POISONING.**—In the outlook of poisoning by arsenic, much depends on whether the poisoning is acute or chronic. In the



former, the combination of violent purging with sanguineous stools, urgent vomiting, collapse, cyanosis, suppression of urine, convulsions, and coma, form a clinical grouping from which recovery is all but hopeless.

If the case is less acute, it is important to bear in mind the fact that remissions may arise in the symptoms, leading to false hopes, and that such patients not infrequently pass into a fatal relapse. If the patient recovers, convalescence is frequently tedious, and later on, arsenical nervous phenomena may appear. The chronic form of poisoning may result from the continuous ingestion of the drug over long periods, or may follow a single large dose. The drug may, however, be taken in large quantities over very prolonged periods, as among the natives of Styria, without harmful effects arising. Signs and symptoms of peripheral neuritis have arisen as long as two months after a single large dose. Women are said to be more susceptible to nervous phenomena than men, though in both sexes advancing age increases the liability to affection of the nervous system.

Children tolerate arsenic well. In chronic cases in which keratosis has appeared, it should be remembered that epithelial cancer sometimes develops. Apart from this, the skin lesions generally get well in time if the patient is removed from any further intake, although in some cases pigmentation may remain permanently.

*J. R. Charles.*

**ARTERIAL TENSION, HIGH**—It is convenient to give some little consideration to this subject as apart from that of atherosclerosis, but most of the facts relating to this syndrome will be found under the latter heading.

The pathological facts on which prognosis should be based are: (1) Renal disease as the cause of three-quarters of all cases of high tension; (2) The tension cannot rise beyond a certain point without wearing out the circulatory tube, either at the cardiac or the peripheral end; (3) The risks are therefore those of uræmia, cardiac failure, and cerebral hæmorrhage. Janeway's analysis of 100 fatal cases of hypertension (170 mm. or over) showed that death was due more or less directly to cardiac failure in 50, to uræmia in a like number, and to cerebral hæmorrhage in 11. In de Havilland Hall's 20 cases, on the other hand, there were 7 cardiac, 7 apoplectic, and only 3 uræmic deaths.

The duration of life in Janeway's cases varied from four months to eleven years, and averaged a little less than four years. The particular kind of death did not have much bearing on the duration of life.

The conditions on which prognosis is founded in individual cases are three: (1) *The height of the pressure*; (2) *The cause or causes*; and (3) *The general symptoms*.

1. **The Height of the Pressure.** The following facts illustrate the first point. Examination of a large series of insurance figures

showed that the mortality in persons with a systolic pressure exceeding 150 mm. Hg was 35 per cent in excess of the average, while that in persons whose pressure was 170 or over was no less than four times as heavy as that of the average man. To quote de Havilland Hall *et al.*, he found that of a number of persons followed up for a definite period, the mortality rates worked out as follows:

MORTALITY ACCORDING TO TENSION.

Below 120	5.7
120-140	3.5
141-160	3.0
161-180	26.3
181-200	41.6
Over 200	53

These figures suggest that pressures up to 160 in middle-aged people do not matter much, but that after that the prognosis grows rapidly worse as the figure rises.

In assessing the importance of the normal systolic pressure, there are several modifying circumstances to be taken into consideration. The normal rises with advancing years. A rough and ready way of remembering this is to add the patient's years to 100, the result being his normal pressure: thus, the pressure at the age of forty should be 140; this gives rather high results for the later decades, but otherwise it will serve. Again, sex makes a difference: the average tension is 10 or 20 mm. lower in a woman than in a man of the same age. In a nervous subject there is always a risk of getting too high a reading, and some instruments, such as the Pachon oscillogometer, give artificially high results. We have not here entered into the question as to which is the more significant, rise in the systolic or in the diastolic pressure, because the whole matter is still unsettled, and for the present it is better to limit the term 'high tension' to cases of raised systolic pressure. It must also be remembered that a definitely rising pressure is of graver import than a stationary one, and that we should particularly fear those crises of hypertension that are liable to arise in cases of granular kidney, often without apparent cause, for they bring into the case a special risk of cerebral haemorrhage. Conversely, a fall in tension is anything but welcome when it is accompanied by threatenings of cardiac breakdown.

2 **The Cause or Causes.** As to the importance of causes it must never be forgotten that in the great majority of hypertensives the kidneys are the seat of progressive disease. The more obvious these renal lesions are to the clinician, the worse the outlook. If, however, there are contributory causes such as excess in tobacco or food, too much stress, and so on, factors that are in some degree susceptible

of removal. The prognosis is a little alleviated; but it must be confessed that even when everything has been done that can be done, the high pressure tends still to persist and to rise relentlessly.

3. **The General Symptoms.** There is no need to go fully into the symptoms, since the calamities that are to be anticipated—cardiac failure, uræmia, and cerebral hæmorrhage—are dealt with in appropriate articles. The only point that need be made here is that each of these catastrophes is often foreshadowed by events which may appear trifling in themselves, but which have a great significance when looked at as foreshadowing the final downfall. The cardiac symptoms that belong to this category are those that indicate failure of contractility: increasing breathlessness, periodic dyspnoea, swelling about the ankles, precordial pain on exertion, and the bruit de galop. The likelihood of an apoplectic seizure is also often hinted at, and not obscurely, by two sets of phenomena—hæmorrhages elsewhere (nose, retina) and cerebral symptoms (headache, vertigo, mental obtusation, transient palsies, and so on). The transient palsies are of the gravest significance: temporary aphasia, hemianopia, strabismus, hemiplegia, and such like, are to be accepted as very direct forewarnings of danger in persons with a raised blood pressure. Polyuria, early morning headache, and eye symptoms are, according to Janeway, precursors of mania.

*The effects of treatment* on high tension are disappointing. In favourable cases, dieting, purgation, and systematic moderate exercise, with restriction of mental stress, may keep the pressure from rising; but once high pressures of 180 mm. and over are reached, it is almost impossible to get them down again. Even the nitrates are often ineffectual. The experiments of Matthew and others demonstrated this very clearly. They further proved that the most useful of the nitrates for continued reduction of high tension was erythroltetranitrate, but that, owing to the headache which this is apt to produce, it cannot often be used continuously. Under these circumstances sodium nitrite in frequently repeated doses will be the most useful vasodilator, and it may be possible to effect and to maintain a lowering of 10 or 20 mm. The fall in pressure produced by nitroglycerin and by nitroethyl amyl is too fleeting to be of service for reduction of a persistently high pressure. Potassium iodide cannot be relied on to depress tension, and the effect of venesection is also very brief.

*Caro T. Coomb.*

#### ARTERIES, WOUNDS OF. (See HÆMATOMA, ARTERIAL.)

#### ARTERIOSCLEROSIS.

**General Outlook.** This is a most difficult matter to write about in a case of arteriosclerosis. It is inevitable that, in this article, there should be some overlapping of others, that dealing with high blood pressure, in particular; so far as may be, however, my purpose is to indicate what is to be feared for a patient in whom the arteries are found to be sclerosed. Now the practitioner's attention is directed

to this condition under two sets of circumstances. First, in the course of a general examination—for life insurance, for example—it is found that the radial artery is tortuous and hard, beaded it may be, the brachial artery amply palpable, the abdominal aorta cord-like and throbbing; in a word, general arteriosclerosis is accidentally discovered. In the second type of case, the patient complains of cerebral, cardiac, or peripheral symptoms, and the physical examination reveals the source of these in a progressive arterial degeneration. In the first case, the disease is discovered at an early stage, before it has begun to produce tangible interferences with function; in the second, these interferences have already begun. In any case, chronic arterial disease threatens life and health in one way, by spoiling the nourishment of various organs and tissues; the three gross manifestations of this process are cerebral softening, cardiac failure, and sceleré gangrene. There is, of course, the risk of cerebral hemorrhage to be considered; but this is so closely connected with high blood-pressure that it will only receive brief comment in this article.

In any given case there are three things to consider: (1) *The etiological factors*; (2) *The stage of development* to which the disease has attained; and (3) *Its distribution*.

**I. Etiological Factors.** Confronted by arterial degeneration in a patient, we naturally want to know the reason; and two aspects of this question present themselves to the mind. Sooner or later, arterial degeneration is the common lot of man, provided he lives long enough; in other words, the tunica media of the arterial tube tends 'normally' towards decay after a certain age. It is said (Adams) that this downward process begins at about thirty-five; at this time the katabolic leanings of the cells of the arterial media begin to gain the upper hand. Now the rate of downward progress appears to depend on two sets of factors, the *congenital* and the *acquired*. Of these it is difficult to say which is cause and which effect; the writer inclines to the belief that arterial degeneration is always the outcome of toxic agencies acting on a tissue, the tunica media, whose vulnerability varies with certain inherited characteristics at present undefined. Of these toxic agencies, some, as we shall see, are perfectly obvious, others less so. It follows, therefore, that in estimating the prospects of arterial sclerosis in any given patient, we must take into consideration: first, the kind of arteries he inherits; second, the existence or non-existence of any toxamias to which his arterial decay may be partly ascribed.

*Congenital.* It is probable, though not proved, that a poorness of arterial make-up is inherent in certain families; that, in these, the medial cell is particularly open to malign influences. At all events, there are families whose members seem doomed to suffer early arterial degeneration without obvious cause.

Assessment of the familial factor is conducted along obvious lines: the age at death of the patient's forebears, their fitness for work during the decade when men commonly begin to wear out, the cause of

death, all have to be passed under review. The kind of history to make a man regret his choice of ancestors is that in which generation after generation has decayed mentally at, or soon after, sixty, or in which a similar liability to cardiac breakdown has displayed itself. The family doctor often enjoys a great advantage here: he recollects how the father of the patient was an old man at fifty-five, and assesses the prospects of the present generation accordingly. The first definite question to be answered in any given case, then, refers to the quality of blood-vessel which the patient inherits.

*Acquired.* The acquired factors leading to arteriosclerosis are some of them obvious, while others are but dimly perceptible. Among the obvious ones are certain toxic substances, of which lead is the most conspicuous example. Some of the more obscure causes hang together in an indefinite kind of group—over-eating, excess in meat, mental or muscular stress, high arterial tension, renal disease.

We ought to consider next, then, whether any such cause is discernible: it is, whether it is operative at the time of examination or no; and whether, if operative, it can be brought to an end. It is easy enough to ask these questions, and just as difficult to answer them categorically. Take the most definite of all, lead: does it indeed act directly on the arterial media, or only through the renal lesions which it causes? Perhaps the way to approach this from the prognostic viewpoint may best be illustrated by examples of the two extremes. A young man with abnormally palpable arteries, but no evidence of renal disease, may look forward with confidence to the future if he be removed forthwith from the risk of further poisoning. On the other hand, a man of sixty, with pronounced arteriosclerosis and quite definite signs of renal lesion, cannot expect any great improvement in his outlook, even though he leave his injurious work forthwith. This is tantamount to saying that the prognosis in a case of phthisis depends not merely on arterial, but also on other, lesions; but that so far as the arterial changes are concerned, the fact that the cause is one whose further operation can be prevented is all in favour of the patient.

Of other definite chemical substances known or thought to act deleteriously on the arterial media, two of the luxuries of life come instantly to the mind, alcohol and tobacco. There is, at the present time, a tendency to belittle the part played by alcohol in the processes of arterial disease; none the less, it is fair to consider the arteriosclerotic patient, whose alcoholic excesses have been noteworthy, with the assurance that abstinence will be good for his arteries; yet it is probable that the effect on the outlook is not great. As for tobacco, it is very difficult to see daylight here. On the one hand, we have the well-known effect of nicotine on the arterial walls—a fact which Josue and others have used experimentally to such good purpose, backed up by many clinical experiences of coincidence between arterial disease and excess in tobacco; on the other hand, there must be reckoned statements like those of Herz, of Vienna,

who made a collective inquiry into the etiology of arteriosclerosis in Austria, and found that the disease was not particularly common, even in districts where the women smoke pipes and the habit begins in childhood. It is, at any rate, permissible to forecast a good effect from cessation or moderation of smoking, where this has been excessive and no other factor is definitely discernible. The same may be said of tea-drinking in excess.

Passing from these poisons, we come to those of definite bacterial origin. Among these, typhoid fever stands out prominently. Comelmann's researches showed that the arteries of persons who have had this disease are thicker than those of persons who have not. In syphilis, again, a similar change may be observed, quite apart from the local arteritis which is provoked by this infection. If, therefore, we find evidences of early arterial degeneration in a comparatively young subject who has had typhoid fever, their significance, so far as length of life is concerned, is probably slight; that which caused them is no longer operative (always supposing there is no reason to believe the infection to be persistent). In the case of the syphilitic, on the other hand, the outlook is less reassuring, for it is not easy to be sure that the infection is no longer active. If the patient underwent thorough treatment, and if the Wassermann reaction be negative, it is probable that syphilis is no longer operative as a cause of arteriosclerosis, the prognosis being good so far as this factor is concerned. Of the other infections we know less, and they do not enter into the assessment of expectation of life in arteriosclerosis.

Yet another group of toxic agencies has to be considered, those of endogenous origin. Certain of these, which are relatively definite, may be considered first. Arterial disease is associated with glycosuria, and here the cause overshadows the effect, so far as prognosis is concerned; we do not estimate the chances of our glycosuric patient in terms of his arteries, but in terms of his output of sugar and the degree to which this can be controlled. It may, however, be remarked that the progress of arterial change in such persons is relatively slow, and that the outlook is therefore better than in some types of arterial degeneration. Mitchell Bruce found that cardiovascular degeneration in glycosuria ran an average course of over twelve years from the onset of symptoms. That gout plays a part in causing arteriosclerosis is also clearly proved. If, therefore, an arteriosclerotic patient be definitely gouty, and other causal factors are not apparent, the prognosis varies according to the amenability of the parent disorder; should the gout yield to dietetic and other measures, the arterial changes will progress but slowly. These are well-defined morbid entities; but they merge insensibly into other categories which are not so easy to understand—those of renal disease, mental and muscular stress, over-eating, and hypertension. So far as this article is concerned, the last of these may be dismissed in a word or two: high tension is not a disease, but a symptom arising from a variety of causes, and when it coincides with arteriosclerosis

it is probable that the two constitute different aspects, the one anatomic and the other physiological, of one and the same process. In any event, it is more convenient to consider such cases under the caption of high tension, as I have done in the articles in this book. Arteriosclerosis as complicating renal disease will also be considered under the same heading. It is not quite proper, however, to dismiss all the factors named above in this way: for though arteriosclerosis is seldom provoked by over-eating or stress, apart from high tension, yet this latter may be relatively slight, and the arterial change comparatively prominent. Excess in food is an extremely common and important cause of arterial degeneration; this is often apparent in persons who eat large masses of food in general, and red meat in particular. There is no factor which can be cut out with greater confidence of bringing about improvement in the patient's condition; consequently, the arteriosclerotic person who over-eats, and yet consents to a genuine correction of his evil ways, stands a far better chance than one who is inextinguishable. As to stress, it is pretty clear that it is mental and not physical overstrain that tells; indeed, as French has suggested, much of the premature arterial decay of city men is to be referred to over-work of some arteries (cerebral and alimentary), in contrast with under-work of those supplying the skeletal muscles; and if such persons can be persuaded to work and eat less, and to take regular physical exercise, the prognosis is thereby ameliorated. Finally, it is possible to analyze the stress factor a little further, for Mitchell Bruce distinguishes between emotional and intellectual expenditure, and finds that it is the former that is especially hard on the arteries. Now this brings us to the furthest point to which it is legitimate to press the toxic analogy: it is probable that over-eating causes arteriosclerosis through the agency of toxins, and it is possible that stress, even of the emotional, acts in the same way, but it is also very certain that emotional strain is a matter of temperament. Here we come to the fact that there are cases of arteriosclerosis in which it is possible to tell the patient that it is folly to continue to live as he is living—over-eating, under-exercised, constantly devoured by anxiety and excitement—and to say that if these causes be removed his life will be prolonged, and arterial decay slowed down; and yet the patient may be so constituted temperamentally that he simply cannot stop. He may amend his diet; he may even lessen his work and take to golf; but he does not stop worrying. Hence, temperament is an important etiological factor in the prognosis of arteriosclerosis: it is a potent cause, and yet, at the same time, one which is as difficult to combat as it is for the Lithuanian to change his skin. In people of the worrying, anxious kind, therefore, arteriosclerotic changes are less easily checked, and, on that account, of graver import than in persons who take life quietly, and who will readily consent to profound alterations in their manner of living.

Summing up what has been said as to the importance of etiology

in prognosis, we find that arteriosclerosis is more likely to run a favourable course if it is largely dependent on some causal factor which can be removed.

**2 Stage of Development** A second factor of importance, in arriving at a forecast of the future awaiting the arteriosclerotic person, is the stage at which it is first found that the vessels are not normal. It is tempting to divide the progress of arteriosclerosis into chapters, but this is of no value so far as our present purpose is concerned—and the importance of the epoch at which the arteriosclerotic patient comes under observation is best realized by contrasting the outlook at the two extremes of the malady. Ignoring for the present the pre-sclerotic stage of Huchard, which is best considered under the caption of high blood pressure, we find that the earliest stage of arteriosclerosis to come under notice is that in which thickening of the vessels is encountered accidentally, in persons who present themselves for examination on account of other symptoms or reasons. In such cases there are no subjective evidences of arterial disease, or, at least, none that have struck the patient as noteworthy. Now, it would be rash in the extreme to offer a prognosis in such cases, as a rule none is asked for, and even when it is, it is seldom that one can give an opinion that is of much value. In extreme cases, severity of the outlook is easily perceived: e.g., in a patient of forty who has arteries thicker than most men of sixty, and whose forebears have died young. Here the prognosis is clearly bad enough to justify a statement to that effect, if the physician thinks any good can be done by it; if any contributory cause can be traced, such as excess in meat, it may, indeed, have a salutary effect on the patient if the prospects be hinted at, together with the amelioration that is likely to accrue from a reform of the diet. But in the majority of such cases, if we are asked for an opinion as to the patient's future by himself or his friends, and we have no evidences of arteriosclerosis apart from what can be felt with the finger, it is possible only to say frankly that the vessels are thicker than they ought to be; that this is by no means a certain sign of curtailment of the expectation of life; and that reasonable living is even more necessary than in the average individual, since this alone can avert such menace as is implied in the existence of arterial change. Sometimes it is possible to form a rather more accurate opinion of the patient's chances by seeing him several times, at fairly long intervals, e.g., six months; if such systematic observations enable one to detect the beginnings of visceral change, as a result of the arterial lesion, the task of prognosis is lightened.

At the other extreme of the sclerotic process, the patient comes under observation suffering from the organic effects of the disease. Of these effects, three stand out pre-eminent: cardiac failure, softening of the brain, and peripheral gangrene. Each of these will be considered under its appropriate heading, so that we need not regard them in detail, or from any point of view other than that of arterio-



sclerotic phenomena. From this standpoint, their importance is that they prove the disease to have reached an extreme stage—so extreme, that the vessels no longer perform their function of supplying nourishment to the organs dependent on them. Now the principle running through the whole prognosis of arteriosclerosis is its incurability; the disease may be retarded, possibly arrested, but it is impossible to put the clock back. It follows, then, that these phenomena are evidence of the final development of incurable arterial disease, and the prognosis, so far, at all events, as the injured parts are concerned, is unreservedly bad.

Between these two extremes there are all shades of cases in which there are symptoms referable to arterial disease. From the prognostic standpoint, these are chiefly of importance in so far as they prove that the disease has reached a stage at which it interferes with the nutrition of the parts supplied. Some of these phenomena are of special interest, and may therefore be considered in detail. The simplest to understand is transient dyskinesia of the limbs. The most familiar form of this is seen in the lower limb—in intermittent limp—the legs are comfortable while at rest, and able to carry their owner for short distances, but after a walk of varying distance cramps come on, and the limb suddenly gives way, sometimes so suddenly that the patient falls to the ground. Similar troubles may afflict the arm, rendering it painful and useless when it is put to the performance of unusual tasks. Such phenomena are, perhaps, most clearly seen in obliterative arteritis, but they do also occur in connection with ordinary arteriosclerosis. Their significance lies in the unmistakable evidence which they afford that the arterial disease has reached an advanced stage, and that absolute occlusion is not far off. Attacks which are probably similar in origin are seen in connection with the brain; such are transient hemiplegia, squint, aphasia, amnesia, and even hemiplegia. These are to be regarded as evidences of advanced arterial disease, and as precursors of permanent injury to the substance of the brain. The same may be said of angina pectoris, and the less definite grades of cardiac pain; the coronary channels are becoming inadequate to their duty of supplying blood to the myocardium. Attacks of abdominal pain, with meteorism, have been described as 'abdominal angina,' and referred to disease of the mesenteric vessels. All these paroxysmal phenomena are therefore of the gravest import, for they bespeak a stage of arterial disease which can scarcely go further without permanently cutting off the food from the parts which the arteries supply.

Apart from such attacks, however, there are less striking symptoms which, none the less surely, portend advance in the arteriosclerotic process to the point at which adequate blood-supply is threatened. Such are vertigo, stumbling speech, slowed cerebration, persistent headache, and sleeplessness; breathlessness on exertion, puffiness of the ankles, and muffling of the cardiac sounds; impairment of sensation in the periphery of the limbs, and increasing muscular weakness.

All these are to be interpreted as signs of progressive arterial degeneration when they are associated with palpable thickening of the surface arteries; and, as such, they add to the gravity of the prognosis, for they show that the disease is becoming effective as a hindrance to the proper nutrition of the organs and tissues of the body.

Summing up what has been said as to the significance of the stage of the disease in regard to prognosis, we find that arteriosclerosis tends to progress towards the point at which it cuts off blood supply from certain parts of the body; and that we must be on the look-out for evidences of the earlier phases of this interference with nutrition.

3. **Distribution.**—One other aspect of the disease must be taken into account in working out the prognosis of any given case, namely, the distribution of the arterial changes. It is obvious that these are of much greater significance when they attack the vessels responsible for nourishing a vital organ, such as the brain, than when it is the

that is threatened. Arteriosclerotic lesions of the brain are more hopeless in regard to recovery than any others; even in the most favorable cases of cerebral thrombosis of the scintle type, the patient never quite the same again, and usually his downfall is progressive and resistless. The cardiac lesions are less hopeless, perhaps, but more dangerous to life. Distinct evidences of abdominal arteriosclerosis are rare at any stage, and the data on which to base a general statement are, therefore, scanty; but it can be safely said that such phenomena as do point to this form of the disease are only very rarely followed by grave consequences, such as mesenteric thrombosis.

A first remark is this; that a calamity due to arterial degeneration in one part of the body predisposes to the occurrence of others. The most conspicuous example of this association is seen in the cerebral symptoms which are apt to follow close on cardiac breakdown due to arterial disease. Rest in bed pulls the heart through, but the brain remains injured.

**Summary.**—In any individual case of arteriosclerosis, the factors to be considered are: (1) The patient's arterial heritage; (2) The presence of toxic or stress causes, and the possibility of their removal; (3) The stage of the disease; (4) Its distribution.

*Carey P. Coombs.*

**ARTHRITIS DEFORMANS.**—We shall consider separately the progress of (I) Rheumatoid Arthritis; (II) Osteo-arthritis.

#### I. RHEUMATOID ARTHRITIS.

The prognosis of rheumatoid arthritis must be made at present on broad and general lines, for we have to realize that a considerable change in the attitude toward the nature of the condition has taken place in recent years. There is a general feeling that some infective process is the exciting cause of the condition, or, what is probably more correct, that a variety of infective processes are concerned. The tendency now is to lay much emphasis upon the infection, and, from the point of view of investigation, this attitude seems to offer

the best chance of making advance. Nevertheless, when we come to consider prognosis, we must admit that in many cases no causal infection has been demonstrated, and must further bear in mind that the individual constitution—whatever the nature of rheumatoid arthritis may be—has probably an important bearing upon the course of the illness. It would be, then, a mistake to lose sight of possible fallacies in the present state of our knowledge. Thus, for example, a patient may be suffering from some degree of pyorrhœa alveolaris, but it does not necessarily follow that this is the determining cause of an associated rheumatoid arthritis. The writer's experience must be that of many others in finding that a patient has had clear evidence of rheumatoid arthritis at a time when the teeth and gums were in excellent order, and yet some years later, with failure of health, both teeth and gums have become diseased, and the rheumatoid arthritis is still in evidence.

In other cases, radically conditions have been corrected, but no obvious change in the course of the disease has followed. It would be the first to allow that the primary step in the study of such a case is a search for some local focus of infection, but is not prepared yet to admit that its discovery has necessarily solved the problem of the origin of the disease. Although encouraged by such a discovery to hope that a means of diminishing the severity, or even of arresting the course of the disease, had been found, he could not confidently assure his patient, on the evidence at present available, that such a happy event would follow.

Then, again, we must admit that in a considerable number of cases we can find no focus. This is certainly no proof that the condition is not infective; for, when all is said, the demonstration of an obvious local focus, though of the greatest importance, is an example of a somewhat crude method of infection. We do not always find gross local foci in cases of tuberculosis, or of pneumococcal infection, or of the rheumatic, for these infections may gain access to the system without a great parade at their site of entrance.

Dr. James Lindsay's statistics upon this question of infective foci are of interest.

In 138 cases in females:

No focus was found in . . . . .	65
Vaginal discharge in . . . . .	36
Pyorrhœa alveolaris in . . . . .	19
Otorrhœa . . . . .	7
Gastric ulceration . . . . .	5
After childbirth . . . . .	4
Rhinorrhœa . . . . .	1
Chronic tonsillitis . . . . .	1

Thus, in almost 50 per cent of these cases, no infective focus was forthcoming.

The prognosis then must clearly be laid on broad lines, to some of which consideration will now be given.

**Predisposing Causes.**—1. *The family history* is doubtless of some importance for we cannot but believe that the occurrence of the disease in several generations and members of the same family points to a weakened resistance to the infection, if there be one, or to some mysterious metabolic perversion if the fault should be there.

2. *The question of age incidence* introduces the usual difficulty of deciding what is to be called rheumatoid arthritis, and upon which there is no agreement at present possible: but we find that the disease in early life is likely to be more virulent, whereas in more advanced life the natural tendency to degenerative lesions in the joints favours chronicity and crippling.

3. *Sex.* The liability to rheumatoid arthritis in females is undoubtedly greater than in males: but when it occurs in the male it may be equally severe.

4. *The mode of onset* is of some importance. There is a group of cases in which rheumatoid arthritis begins acutely and affects many joints, producing rapid destruction. Among these cases, often called acute rheumatoid arthritis, are some of the worst examples of the disease. These are easily recognized by the fever, general toxæmia, and extensive and severe lesions. On the other hand, when they are less severe, although there may be much damage, the eventual recovery may be fair, and no second attack need necessarily occur. In any case, the illness will certainly be long and recovery slow.

5. Another very important group begins with acute symptoms affecting a few joints, or possibly only one. The onset is to this extent acute, but the general illness slight. In this group the cause is often obscure and the tendency to further attacks very decided. The most experienced may make grievous mistakes in prognosis here, because there is at present nothing certain to guide the opinion. The first attack was mysterious, and the cause equally so. Accordingly, we find such patients coming to us a year or two later hunch crippled, and complaining that they were told at the time of their first attack that if they did so and so, and underwent such and such a course of treatment, they would be cured in six months. The essential point to remember is that when an arthritis of mysterious origin occurs and shows a tendency to be recurrent, the prognosis must always be tinged with caution. In another group the onset is even more gradual, with mysterious pains and vasomotor changes, and these may prove to be most intractable, and end in complete disablement. Once again, the unknown factors in the disease baffle accurate prognosis.

6. *Occupation.* It is probable that occupation is of very considerable importance in prognosis. The writer has been struck by the great severity of the disease in school teachers. The heavy-wearing head of the board schools, the effort to be of rather more importance than one can afford to be, and the struggle to get the necessary qualifications to reach this position, seem to combine in undermining the resistance to this disease in the most deadly fashion.

Again, there can be no doubt that long and anxious nursing of a

near relative, or any other conditinal nerve-strain, may antedate it most acutely, rheumatoid arthritis, or greatly aggravate the course of the disease if it has already commenced.

7. *Surroundings* are also important. There seems no doubt that cold damp houses, a low-lying, swampy country, and a heavy clay soil foster the chronicity of this disease. A favourite garden may do much harm to a delicate patient who is threatened with rheumatoid arthritis. Damp, changeable climates, such as our own, are generally agreed upon as favouring the disease.

8. *Diet.* According to Penherton, in rheumatoid arthritis there is a speeded metabolic intolerance to carbohydrates, and in less degree to proteins.

It is clear, therefore, that in making a prognosis we must take a broad survey of the general position, as well as pay close attention to the special point in the particular case. Bearing in mind, therefore, these general indications, we come next to the prognosis in the particular case, and find that this is a complicated problem. The danger to life in general terms, and with rare exceptions, is indirect rather than direct—the joy of living is destroyed far more often than life itself. There are, nevertheless, two important points in the prognosis; one concerned with the general constitutional disturbance, the other with the local arthritic lesions.

Cases in which profound toxæmia is evident in the sallow pallor, general depression, bouts of fever, loss of strength, tachycardia, and vasomotor changes, are among the most serious. In such multiple arthritic lesions, sometimes of great extent, are coupled with profound muscular wasting. In such, too, grave signs of organic lesions of the spinal cord occasionally develop. In every direction treatment is embarrassed by the loss of strength and hope, by the distress on movement, and by the spontaneous neuritic pains. Among them are some of the most terrible examples of human suffering that are known in the field of medicine.

A paper by Nathan (*Amer. Jour. Med. Sci.*, Nov., 1916) appears to the writer to afford some suggestive information for guidance in prognosis. He produced an experimental polyarthritides in animals, and on examination of the vertebral columns found loci of endosteal and periosteal inflammation which had produced epidural and perispinal exudations. These lesions necessarily caused pressure upon and irritation of the nerve-roots. He pointed out that the neuralgic pains, muscular wasting, and vasomotor changes present in many severe cases of rheumatoid arthritis could not be explained as reflex results from the arthritic changes—an opinion with which the writer is in full accord. Arguing from his experiments, he attributed these phenomena to lesions in the vertebral column in man comparable to those in animals, and held that the prognosis in cases with well-developed and continued radicular irritation was bad. It is clear, if the phenomena are the results of such lesions, that the irritation to nerve-roots must be persistent unless the inflammatory loci disappear.

On the other hand, if the condition yields to treatment and the arthritic lesions are not too far advanced, we know that in young subjects after a prolonged illness sometimes remarkable recovery may occur. Joints which only show active periarthritic lesions are not beyond hope, but it is when the atrophic shrivelling of the tissues supervenes that we realize that recovery of the affected parts is not possible.

The less virulent but mysteriously relapsing cases are of most uncertain prognosis, and number among them many cripples, and hopelessly crippled patients, who live for years toiling against mere existence. Yet we see in this group many cases in which the troubles cease mysteriously as they appeared, and then there may be further recovery, with a greater or less degree of infirmity, when hope has been almost abandoned.

## II. OSTEO-ARTHRITIS

The entity of this condition apart from rheumatoid arthritis has been the subject of considerable divergence of opinion. Eminent authorities have dwelt upon these distinguishing features—the character of the lesions, the lesser degree of muscular atrophy, the absence of muscular contracture and severe constitutional symptoms. Such differences cannot be explained by the age incidence, for osteo-arthritis may occur in childhood. A. L. Garrod has analyzed 100 of these cases, and points out that while rheumatoid arthritis is most frequent between the ages of twenty and forty, osteo-arthritis occurs most often between forty and sixty. In this series 83 per cent were females.

The prognosis unfortunately is very uncertain, for there are, as in rheumatoid arthritis, elements in the causation which we are not able to explain. We are not confident as to the extent to which infection takes a part, or clear as to the nature of such infection or infections. Again, we are not clear as to the part taken by the metabolic processes of the individual. So far as one dares to hazard an opinion in such a difficult problem, the writer inclines to the belief that disordered metabolic processes are of more importance in osteo-arthritis than in rheumatoid arthritis.

Such lesions as Heberden's nodes may remain the sole manifestation, and save for their unsightliness they are of little importance. Osteo-arthritis of the knee-joints, so common in women about the menopause, frequently quiet down under treatment, and though a menace to the stability of these joints, may run a favourable course. Unfortunately in some cases the disease breaks out in other important joints, and we find, for no obvious reason, our first more cheerful prognosis completely upset. We are, however, justified in urging that no step should be omitted for combating the disease, for it is by persistent efforts that the most favourable results have been obtained. Even if we believe that remedies have no specific action, all efforts to maintain the general health and to control obesity must be helpful.

So, too, must be efforts to maintain the nutrition of the muscles, to spare the joints in acute exacerbations, and to encourage them in periods of quiescence. We cannot pretend to remove bony outgrowths or restore ulcerated cartilage by medicines.

On the other hand, the prognosis may be made more serious if ignorant attempts are made to 'work' the joints. Passive movements need the greatest judgment, for no one can calculate the amount of disease that may be present in such important structures as the crucial ligaments of the knee-joint. Again, courageous patients may, by ill-advised persistence in active movements when the arthritis is acute, cause themselves great suffering, and fan the flame of the disease.

Osteo-arthritis of the hip-joint is generally recognized as most recalcitrant to treatment. This form is commoner in males than in females. In these cases the elements of injury and overstrain are more apparent; but we must also remember that experiment has shown that intravenous injection of the diplococcus of rheumatism has produced this solitary lesion in animals. Ritche attaches special importance to strain upon the joint when at its utmost limit of action, and suggests the probability of small hemorrhages. Edgewell is of opinion, and this is a point of much prognostic importance, that there is a preliminary period of villous arthritis. If this is the case, a great distinction between rheumatoid arthritis and osteo-arthritis is broken down, for the changes must commence in the synovial membrane, and not in the bone and cartilage; further, if the disease can be attacked in this early stage, and due rest be given to the joint before the bony lesions commence, the prognosis must be much improved. When the disease is fully developed, difficulties in treatment are apparent. The inaccessibility of the joint, the gross lesions, the influence of the weight of the body bearing on the altered surfaces of the articulation, and the mysterious lack of resistance in the affected tissues, are among the most apparent of these. Fortunately Nature sometimes comes to the rescue, and by fixing the joint and thus entirely destroying its function, puts an end to the advance of the disease, leaving the patient in comfort with a weakened limb. In carefully chosen cases, chelotomy, as Sampson Handley has demonstrated, may produce an excellent result.

A short space may be devoted to a condition in childhood looked up on by many as a form of rheumatoid arthritis, but first clearly defined by G. E. Still. It is a multiple peri-articular arthritis with enlargement of the spleen and lymphatic glands. The condition is a very striking one, and the recurrent attacks of fever are most suggestive of the presence of an infection. The writer more than once has seen such a case improve in the most remarkable way while under careful supervision, and then, without any discoverable reason, drift back to the last stage of emaciation and illness while in precisely similar surroundings. The prognosis of the characteristic cases is very serious, great crippling results, and death may occur. In some of

the fatal cases, general pericardial adhesion has been found, the result of a pericarditis unsuspected during life. No treatment appears certainly to influence their course, although liquid paraffin and other intestinal disinfectants seemed for a while to do good in a few cases.

There appear to be transitional cases of less severity, some of them approaching closely the character of subacute rheumatism, and these may improve after several years, and eventually make a good recovery. Some of them seem to the writer to be associated with damp, low-lying districts, and the correction of this danger favours the outlook. The first steps that he would insist upon in any case of this kind would be removal from damp surroundings, and attention to the teeth and any nasal or other discharge.

**The Influence of Treatment upon Arthritis Deformans.** This is a question of much importance, and there can be little doubt that the great emphasis that at the present time is laid upon the infective element in the condition must eventually lead to much clearer views upon the value of numerous methods now in use.

If the condition is infective, there are two main indications for treatment: one to attack the infection, the other to promote the constitutional resistance. The first aims at destroying the focus of infection and counteracting the morbid effects already at work. It is clear from the pathology of the disease that many of the changes are inflammatory in nature, and run through the usual phases of such changes. There is the period of activity and the period of retrogression, and that of more or less perfect healing. Unfortunately, in many cases we do not know the nature of the infection, and the prognosis is the more serious on this account. It is rational to remove possible foci and to give proper rest to the tissues while the infection is active. It is also rational to treat cases with vaccines if the nature of the infection is known, and this method is really one of unbounded efficacy: but seeing that vaccines are often used without a conviction of the nature of the infection, and only on the hypothesis that some focus which has been singled out contained the real agent, the prognosis in many cases is not certainly improved, and more accurate details are still needed before we can estimate the improvement in the outlook resulting from such methods. The evidence of reliable data is urgently required. If the infection is thought to be located in the large bowel, then high douches are rational: but here again there seems good reason to think that the intestinal symptoms are frequently not the primary focus, but are a part of the general disorder, and so again the prognosis from this point of view remains uncertain until we can get more reliable data.

There are numerous methods of treatment directed to the damaged joints. It cannot be too much insisted that if the disorder is infective the best methods do not deal with the cause of the disease. When Nature is conquering the local infections, then these measures, properly applied, favour the rapidity and completeness of recovery, but it is



difficult to see how a hot bath, or massage, or Vix or Arlyx douches, or peat or lingo baths, can do more than assist a process of recovery—and to this extent improve the prognosis. Whether kataphoresis has real power in directly attacking local foci of infection must still be regarded as uncertain.

When we turn to internal remedies, we see once more that some are used to attack the supposed site of infection, as, for example, glycerol carbonate and other intestinal disinfectants, while others are used to strengthen or alter the patient's general condition. Among these latter remedies we find alteratives, including mineral waters, and tonics—such as iron and arsenic, quinine, etc.

In such diverse conditions as those we are considering, it is eminently possible that in some cases of osteoarthritis, internal treatment by drugs or by waters may be helpful, for in these metabolism seems certainly at fault; on the other hand, where the infection seems predominant, it is difficult to see how water drinking will help, unless the minute traces of radium are to be looked upon as antibacterial. Radium water has come into prominence in the last few years, and the latest accounts give a bright vision of its future. The writer cannot yet be in a position to make a statement as to the influence of this method of treatment upon the prognosis. Doubtless its value will soon be appraised—but at the time of writing there seems to be no justification in what is striving to be a balanced opinion upon prognosis, for the assertion that a great advance has been made in the management of the disease. We can understand how much the prognosis may be improved with clear evidence of damp and cold surroundings, we are able to substitute warmth, dryness, and cheerful company, for then we are certainly assisting the best of all healers—Nature.

There is another group of remedies which aim at altering the nervous influence, and success must largely depend upon how much of truth there is in the view that rheumatoid arthritis is largely the result of disordered innervation. Such methods as blistering the spine come into this category. We cannot escape from the fact that some have had great successes, and thus bettered the prognosis; yet we have met with patients who have fled from the stringent blister none the better, but rather the worse. Here, again, we need more definite details and indications before we can appraise the value of such methods in the question of prognosis.

Yet another line of treatment sees in the disease disturbance of the internal secretions, and strives by thyroid or ovarian extract to supply a possible lack of the normal supply.

One point stands out clearly with regard to treatment, and this is that the prognosis is not infrequently made decidedly worse by overzeal. If we are to accept as a working basis that the condition is an infection, the patient must be studied as an individual, and the stage of the infective process must be recognized, and this, too, with the humble knowledge of our ignorance of the exact nature of the

defection. Forgetfulness of these points leads to our seeing a weakly patient reduced to the last stage of debility by an avalanche of therapeutic methods, some of them not apparently rational, and then the outlook is definitely rendered more gloomy. There can, however, be but little doubt that with the more complete understanding of rheumatoid arthritis, the prognosis is slowly improving, and that the most encouraging field for this improvement lies in the determined study of possible sites of infection, and in the adaptation of the various imperfect remedies at present at our disposal to the particular individual, and to the particular phase of the illness.

The metabolic side of the problem of arthritis deformans has received a new impetus from the admirable papers by Pemberton published in the *American Journal of the Medical Science* from 1912 onwards. This writer uses the term rheumatoid arthritis, but applies it in the sense in which arthritis deformans is used in this article. Among his conclusions are the following: (1) The disease is preventable; (2) In most instances it can be arrested; (3) It must be grouped with gout and diabetes, for in it he finds a limit of tolerance for carbohydrates and proteins. Taking this standpoint, he first ascertains the caloric value of the patient's ordinary diet, and then proceeds to limit the carbohydrates and proteins on the lines of the Allen method for diabetes. He finds both hypertrophic and atrophic arthritis respond, and for the large group of cases in which no causal focus of infection can be found, he claims special value for these measures; and he holds that when an infection is demonstrated, this affords no contra-indication, provided that the focus is also attacked. When, under the strict regime, the arthritis subsides, the diet is relaxed, but in most cases a restricted one will be found to be necessary if relapses are to be prevented. He maintains that the ordinary carbohydrate foods can cause the disease, which is not dependent on faulty elimination by the kidneys or bowel, or due to intestinal 'putrefaction.' In 17 cases, representing practically all the varieties of the disease, 10 are said to improve, and 3 only stopped short of a gratifying convalescence. These papers are full of detail.

In this country, probably the clearest lead upon diet is given in the general statement that severe rheumatoid arthritis requires cautious nourishment. From a study of Pemberton's papers, it seems clear to the writer that if a step is to be taken to advance from this generalization, special 'homes' will be needed in which the intricate details of dietary must be studied on the lines which in America have attracted so much research. The danger of underfeeding in rheumatoid arthritis is so well established that he can see no other alternative than to re-investigate this most difficult problem by laborious investigation of the entire question in well-equipped institutions. It is clear that Pemberton is not advocating underfeeding, but a diet restricted in special directions and based upon accurate study of the particular case. One cannot deny that along these lines improvement in prognosis may be effected.

P. J. Poynton

**ARTHRITIS, SEPTIC.** (*See JOINTS, INFECTIONS OF.*)

**ARTHRITIS, TUBERCULOUS.** We shall first examine some general considerations in the prognosis of tuberculous joint disease, and then discuss the end-results of the various methods of treatment, for particular joints.

**General Outlook.** The following factors are of great importance in arriving at an accurate prognosis: the age of the patient; the presence of phthisis or other lesions elsewhere; the presence of septic infection; the onset of acute general tuberculosis; the social position and carefulness of parents.

With regard to the age, we may say generally that children usually recover, while adults show little tendency to improvement apart from excision of the joint, except in mild, early cases where the diagnosis is likely to be precarious.

Concerning the second and third propositions, no comment is needed except to say that even septic sinuses do not necessarily make the prospects of recovery hopeless. Albuminoid disease is now rarely seen.

The gravest risk is that of acute generalized tuberculosis, and the early signs of this, such as fever (not accounted for by the state of the joint), vomiting, drowsiness, etc., should be regarded as a warning that the end may be near.

In early, well-treated cases, restoration of a movable joint is occasionally seen, but this is the exception and not the rule. In general, there is more or less complete fixation, especially if septic infection has supervened. Further, tuberculous hip leads, in many cases, to very decided shortening of the limb.

Although the majority of patients with a tuberculous joint eventually get "cured," it is important to realize the limitations with which the word should be used. Even when there is no pain, swelling, or other symptom for years, it by no means proves that the bacilli are all dead. Strain, pregnancy or lactation, forcible bending of the joint by a bone-setter, or much more trivial causes, may lead to a recrudescence of the trouble.

**Hip-joint.**—A few years ago, the eventual mortality of this disease was put at 30 per cent, but nowadays it is undoubtedly less. Watson Cheyne found a death-rate of 42 per cent in 77 cases, but some of the patients had phthisis; excluding these, the fatalities amounted to 8 per cent. No cases were fatal which were aseptic throughout.

The duration of treatment must be long. Thomas used to estimate that it took seven years to cure with his splint; Cheyne considers this excessive. The amount of shortening is usually about one and a half inches; it depends, of course, on the stage at which the disease can be brought to a standstill; there will be no permanent shortening in quite early cases.

The prognosis in relation to treatment is very important. Some evidence was advanced at a recent debate of the Royal Society of

Medicine that tuberculin is helpful; Butler Harris reported 10 cases improved by it; Maynard Smith quoted 19, of which 16 were previously doing badly, where tuberculin rapidly improved all except 3.

There is no doubt that, given prolonged early treatment in special institutions, the immense majority of children with tuberculous hips can be cured without operation, and may recover a fairly useful limb. Of 150 cases at the New York Cripple Hospital, 107 were cured with little or no deformity, although excision was only performed 4 times. At the Alexandra Hospital, London, 900 cases were treated without excision, and only 1 died (Bowly). Gauvain reported a long series treated without operation at the Alton country cripple home with excellent results; of 336 cases of tuberculosis of various joints, only 1 died.

Of course, it is not possible to obtain results as good as these by conservative measures in ordinary hospital practice; but very few British surgeons are disposed to regard excision with favour at the present time, except, perhaps, in adults.

Stiles, one of the principal supporters of the formal excision, gives his results in the following table:—

RESULTS OF EXCISION FOR TUBERCULOSIS (STILES).

Joint	No. of Cases	Good	Fair	Poor	Useless	Died	Amputated
Hip	60	19	4	3	3	12	19
Knee	64	24	5	1	12	4	18
Elbow	54	10	15	1	1	6	21
Ankle	29	9	4	1	6	3	6
Total	207	62	28	6	22	25	64

It will be seen that the death-rate, immediate and remote, is high; most of the fatalities were due to generalized tuberculosis. Stiles's cases were all children. The average shortening was one and three-quarter inches; the maximum was five and a half inches. Of the eyes followed through, 23 out of 40 got a good or useful limb.

Thompson gives results of 40 cases operated on at Guy's Hospital between 1896 and 1903; eventually, 6 of these died and 8 required amputation, so that 35 per cent were a failure; in 11 cases sinuses were still present; in 15 the disease had become inactive. Deformity was usually marked, but utility good; there were 13 fixed joints, 10 mobile, and 1 flail-like. Seven were earning fair wages.

We may conclude, therefore, that, after excision, a good result is likely to be obtained in only about half the cases.

There is, again, a very real danger of lighting up fatal acute miliary tuberculosis. Death took place from this cause, soon after the

operation in 2 of Stiles's and 3 of Watson Cheyne's cases. Young has shown that out of 48 patients with tuberculous hip who died of meningitis, death followed operation in 46.

**Knee-joint.** Figures relating to the prognosis of tuberculosis of the knee-joint treated conservatively do not appear to be available; but a general opinion may be expressed that the prospects as to life are better than in tuberculosis of the hip, but the prospects as to local recovery scarcely so good. In adults, if there is well-marked swelling, and evidence of extensive disease in and about the joint, the prospects of recovery, apart from operation, are not promising; but mild early cases without much pulpy swelling often do well. In Garre's clinic at Breslau and Bonn, the end-results of 86 cases treated conservatively (rest, heliotherapy, and iodoforn injections) have been published by Els. Two fifths of the patients were under ten years of age. Approximately half (53 per cent) obtained a good result; 45 per cent were not satisfactory, and the rest died.

We have some statistical evidence concerning the end-results of excision, both in children and adults. Stiles performs excision in children whenever the articular cartilages appear to be destroyed, or an abscess forms outside the joint. Arthroctomy is falling into disrepute, because the joint produced may be weak and painful.

It will be observed that in 63 operations there were 4 deaths, 1 within a month from generalized tuberculosis, and the others later; 4 death was from measles. Of 45 cases followed through, 29 got a "good" or "useful" result, but subsequent amputation was necessary in 42. Of 30 joints examined, 29 were fixed and 1 slightly mobile.

The two principal troubles are shortening and flexion. The average amount of shortening was a little over two inches; in 5 it exceeded three inches; a little shortening, up to one and a quarter inches, does not necessitate a high boot. In 5 cases a subsequent wedge-shaped resection was needed on account of angular deformity, and in another there was flexion to ninety degrees. The results are not always as good as this. Thus, in a study of 89 cases of excision of the knee, found 3 with over six and a half inches of shortening and marked angulation, 25 had been subjected to re-excision, and 3 to a third excision.

The results of excision in adults have been published by Seldowitsch, of Petrograd, as follows. In 57 cases followed through, 35 obtained firm, painless, bony ankylosis with excellent function; 10 were improved; 2 were no better; 4 had subsequently to be amputated; 6 died (epidemioma 2, general tuberculosis 2, meningitis 1, cachexia 1).

In the Breslau and Bonn series, excision was performed in 268 cases (114 under fifteen), the indications being evidence of bony disease complicated by abscesses or fistulae or severe contractures or luxations. The immediate results showed 2 per cent deaths, 88 per cent recoveries, 6 per cent little or no better, and 4 per cent needing amputation. Examined a year later, out of 188 cases, 14 had died, but 84 per cent showed a good result.

We may conclude, therefore, that after excision for tuberculosis of the knee, about two-thirds, both children and adults, get a very good result, rather better in adults than children; but that great care and care are necessary in children, or the results may be deplorable. The mortality, immediate and remote, is about 8 per cent.

**Ankle and Foot.** In Stiles's series, 29 ankles were excised, 3 dying subsequently. Out of 23 followed, 13 got a 'good' or 'useful' ankle, and 6 required amputation. The average shortening was three-quarters of an inch.

Spring has published the results of a series of 222 cases of tuberculosis of the foot and ankle treated in Carré's clinic at Boshu and Bonn, tabulated for the 1913 Congress. Conservative measures similar to those mentioned above for the knee joint had to be given up in 111 cases, but in the remaining 108 they gave good results in 75 per cent, and is, about a third of the whole. Excision of the astragalus was adopted in 75 cases, of which 49 obtained a good (often a very good) result. The prospects of success are much better in children than in adults, but even over twenty years of age the majority did well. Amputation was necessary on 15 occasions; of these, 30 were soon able to return to work.

We may conclude, therefore, that conservative treatment of the foot or ankle may succeed in about a third of the cases, and excision in about two-thirds.

**Shoulder-joint.** Evidence concerning the exact prognosis is not forthcoming. Stiles operated on so few cases that he gives no figures. The majority of the cases occur in adults, and so it is not usually worth while to try prolonged rest, which may not succeed after all. Watson Cheyne, therefore, advocates excision in adults, except in mild early cases. A fairly mobile useful shoulder generally results, and the period of disability is very greatly shortened. According to Fraser, children often develop pulmonary tuberculosis on the same side as the diseased shoulder, and for that reason the prognosis as regards life is worse than in knee or hip cases.

**Elbow-joint.**—Here the usefulness of the arm depends very much upon the position: ankylosis at a wide angle is most inconvenient. In practice, a more useful joint is usually to be obtained by early operation, which will probably ensure mobility. This is especially true if abscesses or sinuses are present, because, in that case, very prolonged fixation would be necessary to get a cure by conservative means. According to figures quoted by Watson Cheyne, 75 per cent of the patients treated by excision get a good joint, and the remaining quarter may have a stiff or a flail joint in about equal proportions.

Stiles excised the elbow 54 times; 6 patients died subsequently (three months to two and a half years) of generalized tuberculosis. Apart from these, 25 out of 27 obtained a 'good' or 'useful' joint; in 10 there was considerable power and mobility, in 6 ankylosis, and 7 were flail. The shortening averaged one and a half inches. Only 1 patient required subsequent amputation.

**Wrist-joint.** In children, with proper conservative treatment, these cases practically all get well, with some permanent stiffness (Marsh). In adults, also, the patient is likely to get the best results by prolonged fixation, except when the whole joint is badly disorganized with septic sinuses. The hand left after excision is usually much crippled on account of the shortening of the bones compared with the tendons, and amputation is often preferable. Exact figures are not available.

**Dactylitis.** In children, in the great majority of cases, fixation and conservative treatment end in a cure (Cheyne). Amputation is seldom required. In adults, the course is so slow and the prospect of benefit so uncertain that amputation is to be preferred.

**Sacro-iliac Disease.** Although exact figures cannot be quoted, it is generally admitted that the prognosis in this affection is grave. Most of the cases occur in adults, and phthisis is often present. The great majority die after a chronic illness. In young subjects, recovery may occur, but often with oblique deformity of the pelvis (Cheyne).

Whelan, of Dublin, points out that better results may be obtained by earlier diagnosis, and that the sciatica and gluteal pain, together with a skiagram, give definite evidence before the classical signs develop. He obtained an excellent result by early operation in one case, and a fair result in another.

REFERENCES.—Watson Cheyne, *Tuberculous Disease of Bones and Joints*; Stiles, *Bull. Med. Jour.*, 1912, ii, 1376 (and discussion); Marsh, *Joint Diseases*; *Proc. Roy. Soc. Med.*, 1912, discussion, Children's Section, 65, 76; Saxe, *Jour. Amer. Med. Assoc.*, 1910, 2128; Thompson, *Gen. Hosp. Rep.*, 1905; *J.S. Brit. J. Ann. Chir.*, 1913, lxxxvii, 51; Syring, *Ibid.*, 88. —A. Rendle Short,

**ASCITES.** Since ascites is not a disease, but the result of various pathological conditions, its prognostic significance in any given case depends on its cause. As, however, it may be a late or even terminal phenomenon in some conditions, its recognition renders the prognosis of the causal disease very grave. The commonest condition associated with ascites is some form of heart disease; out of 224 cases in which a quart or more of ascitic fluid was found after death, 89, or 39 per cent, were due to cardiac disease, the next most important cause being some form of intra-abdominal new growth, in 44, or 19.6 per cent (Cabot). In adhesive pericardium, ascites may be due to chronic peritonitis (polyserositis), and then persists for long periods; but in ordinary cases of chronic cardiac failure the onset of ascites shows that the disease has reached an advanced stage. Again, in portal and hypertrophic lobar cirrhosis of the liver, in chronic splenic anaemia with subsequent hepatic cirrhosis or Banti's disease, and in chronic malaria, the advent of ascites is a very grave indication. That the prognosis of ascites depends on the cause is shown by the different outlook in ascites due to malignant disease and to tuberculosis of the peritoneum respectively. The various forms of ascites are referred to incidentally throughout this article, but some of the more important forms will now be mentioned briefly.

The three conditions—uncomplicated cirrhosis, cirrhosis complicated by simple chronic peritonitis, and simple chronic peritonitis—stand in this order as regards the gravity of the prognosis. Thus the average duration of life after the appearance of ascites in thirty-one cases of uncomplicated cirrhosis was 188 days, in twelve cases of cirrhosis complicated with simple chronic peritonitis, 288 days, and in nine cases of uncomplicated simple chronic peritonitis, 624 days (Ramsbottom). In the ascitic form of tuberculous peritonitis, the outlook is better than in all other forms of ascites except those associated with the presence of an innocuit uterine or ovarian tumour which can be removed. The ascites due to gummas in acquired syphilis of the liver rapidly diminishes without tapping under efficient antisyphilitic treatment, and the prognosis is good. But in the rare cases of ascites due to congenital syphilis, whether in very early life or later, when the lesions of delayed congenital syphilis (gummas, cicatrices, and lardaceous disease) have developed, the outlook is very serious. As mentioned elsewhere (*see* LIVER, Cirrhosis *or*), cicatrices and so-called syphilitic cirrhosis are not influenced by antisyphilitic remedies.

**Medical Treatment.**—The influence of diuretics on the prognosis depends on the effect they exert on the underlying cause. Thus, they may diminish or remove the ascites by improving the circulatory conditions in the cardiac or cardio-renal diseases which are responsible for the effusion, though even here their action is somewhat capricious and uncertain; but in chronic peritonitis and indignant disease of the peritoneum little benefit can be expected. Diuretics are disappointing in the presence of considerable ascites, and are often more effective shortly after paracentesis, when, from removal of pressure on the renal veins, the kidneys are better able to respond to stimulation.

A salt-free diet (dechlorinization) is more likely to do good in renal cases, and a restricted intake of fluids (dry diet) should succeed better in cardiac and cardio-renal ascites than in other forms. The Karrel cure, consisting of 800 c.c. of milk only, given in equal quantities four times daily, has given good results (Goodman). Purgation is usually disappointing, though besides removing fluid it may exert a detoxicating action, especially in cirrhosis. Excessive purgation may seriously impair nutrition, and in the past such vigorous treatment may have hastened the end. When ascites diminishes as the result of administration of iodides, the underlying cause is almost certainly syphilis, and the prognosis is therefore very good.

**Operative Treatment.**—In ascites associated with innocuit ovarian or uterine tumours, operation renders the outlook extremely good; but this association is not very frequent. Ascites was found in 10, or 50 per cent, of 20 cases of ovarian fibroma, in 31, or 7.9 per cent, of 391 multilocular ovarian cysts, and in 55, or 7 per cent, of 723 uterine fibromyomas (Cabot<sup>1</sup>). In papilloma of the ovary ascites is frequent. In all these conditions removal of the tumour cures the ascites, and Cabot<sup>1</sup> points out that it may also cure a concomitant pleural effusion.



In the case of tuberculous peritonitis the question whether simple laparotomy or medical measures give the best results has been extensively discussed by surgeons and physicians, who have brought forward elaborate statistics to support their respective lines of treatment (*vide* FERNICOUR'S PROGNOSIS). An obvious advantage of laparotomy is that a local focus of tuberculous disease, which may give rise to re-infection and relapse after partial or apparent cure, may thus be detected and removed.

Out of W. Mayo's 26 cases in which tuberculous Fallopian tubes were removed, 25 recovered permanently, and in 7 of these simple laparotomy had previously been performed from one to four times for the cure of tuberculous peritonitis. The operative treatment of the ascites of portal cirrhosis is referred to elsewhere (*see* LIVER, Cirrhosis, p. 61).

Paracentesis can hardly be regarded as a form of treatment which directly influences the prognosis of ascites; it is a necessary means of obtaining relief from mechanical obstruction rather than a curative measure. The risk of peritoneal infection or hæmorrhage (from wounds of the deep peritoneal or other vessels), or of direct damage to the abdominal viscera from the insertion of a trocar and cannula, is almost negligible. Repeated paracentesis, however, may set up some chronic peritonitis and so perpetuate ascites or finally give rise to other lesions, such as the backward pressure of heart disease. In hepatic cirrhosis death from coma sometimes follows soon after tapping, but this is because the ascites is a terminal event, and is seldom the result of the paracentesis.

*Frequency of Tappings.*—On the whole, frequent tapplings are rather favourable than otherwise, as they show that the condition is chronic and may thus exclude malignant disease. In chronic simple peritonitis in which ascitic life is longer than in other conditions, repeated paracentesis may be necessary; an extreme instance of this is Rumpf's patient, who was tapped 300 times in sixteen years. Another remarkable example of ascitic life was that of a woman who was tapped 299 times in nine years, sometimes twice a week, the causal disease being papillomatous disease of the ovaries (Pyc-Smith). While rapid re-accumulation is not necessarily of evil omen, its occurrence in cirrhosis at such a rate as to require a fresh tapping after two or three days' interval, especially if accompanied by hæmatemesis and melæna, may be due to portal-vein thrombosis, which is extremely likely to precipitate a fatal issue. Ascites may be a terminal event, and therefore of very grave significance. Thus, in uncomplicated cirrhosis, tapping is seldom required more than twice, and the prolongation of life is shorter than in cirrhosis complicated with chronic peritonitis, in which more tapplings are required, and in chronic peritonitis. In some cases of fatal cirrhosis, ascites does not require tapping. The prognosis, however, is not necessarily bad because tapping is not required, for in tuberculous peritonitis it is seldom called for, and in syphilitic disease of the liver, antisyphilitic treatment may be followed

or rapid disappearance of the fluid. The introduction into the peritoneal cavity at the end of paracentesis of a dilute solution of iodine in some instances prevented or delayed re-accumulation, but its effect is not sufficiently constant to be relied upon.

**In Individual Cases.** Age bears on the prognosis in so far that, apart from cardiac disease, ascites in children is nearly always due to tuberculous peritonitis, in which the outlook is fairly good.

The association of jaundice with ascites is infrequent except in malignant disease, and in cirrhosis, and is therefore a bad prognostic; when jaundice almost certainly points to malignant disease. Oedema of the feet may precede the onset of ascites in cirrhosis, and is then a bad sign, but in the backward pressure of heart disease this sequence is of comparatively little importance. Extensive ascites may induce oedema of the feet mechanically, by pressure on the inferior vena cava, and in rare instances gives rise to a pleural effusion (Cahot), and these results may disappear if the ascites is cured. Association of oedema and ascitic effusions should not necessarily cause more anxiety than the presence of ascites alone; for it is sometimes seen in simple chronic peritonitis, and cases of tuberculous peritonitis thus complicated may do well. On the other hand, it may occur in cirrhosis, usually in tuberculous pleurisy, and in wide-spread malignant disease. Fever is not uncommon at the onset of tuberculous peritonitis, good if it is only when persistent that it causes serious anxiety as to the future of the case. In cirrhosis the onset of ascites with fever points to a rapid course or to some complication, such as tuberculous infection, especially of the peritoneum. In ascites due to acute syphilis, any associated fever is easily removed by efficient antisyphilitic treatment. Albuminuria has not any special bearing on the prognosis of ascites; for the ascites of chronic renal disease may clear up; chronic simple peritonitis, in which ascites lasts for long periods, may be associated with chronic renal disease; syphilis may give rise to both ascites and albuminuria; and in some instances albuminuria may be directly due to the pressure of the ascitic effusion on the renal veins. The presence of sugar in the ascitic fluid occurs in cases of cirrhosis with haemochromatosis, the glycosuria usually appearing about a year before death, and so is a bad prognostic. On the other hand, transient glycosuria may occur from alcoholic excess in cases of cirrhosis with ascites due to concomitant chronic peritonitis. The presence of melanin in the urine, which is easily established by the occurrence of a dark colour after the addition of a few drops of nitric acid or of ferric chloride, proves that there is a malignant neoplastic growth, almost certainly in the liver.

**Physical Characters of the Ascitic Fluid.** Clear ascitic fluid is met with both in conditions, such as hepatic cirrhosis, backward pressure from cardiac disease, and occasionally malignant growth, in which the outlook is grave, and also in tuberculous peritonitis, in which the prognosis is comparatively good. In cirrhosis there is often a yellow tint due to bile, and this may also occur in cardiac disease,

so that this indication is somewhat ambiguous. Generally speaking, without the assistance of a cytological examination (*ab initio*), these make a very apprehensive—do not justify an optimistic—the prognosis. Turbid ascitic fluid points to tubercle inflammation and is also seen in less favourable cases of tuberculous peritonitis. In milky ascites, the prognosis is grave: out of 173 collected cases, 116, or 67 per cent, proved fatal; the mortality for the pseudo-chylous cases (70.4 per cent) being higher than that (66 per cent) of the chylous cases (Wallis and Scholbert).

Blood-stained ascites, which must be distinguished from an effusion of blood (haemoperitoneum), especially if the first tapping, suggests intra-abdominal malignant disease and thus makes the outlook extremely grave; but it may occur in portal cirrhosis, usually as the result of a previous tapping, and in association with ovarian cysts and uterine fibromyomas. Out of 31 cases of ascites due to ovarian cysts, 8 were blood-stained, and out of 55 cases of ascites due to uterine fibromyomas, 10 were blood-stained (Cabot). In those cases the ascites can be permanently cured by removal of the innocent tumour. A blood-stained ascites therefore does not always cause grave anxiety. A tumour ascites, which occurs in some cases of intra-abdominal malignant disease, and also in association with benign ovarian cysts, renders the prognosis serious but not certainly hopeless.

**Prognosis from Cytological Data.** A predominance of endothelial cells occurs in passive effusions, as in heart disease and cirrhosis, and, when ascites due to these causes is a late event, it is a somewhat grave sign. A high lymphocyte count usually points to tuberculous peritonitis in which the outlook is comparatively favourable; but in some cases of portal cirrhosis in which there is no evidence of tuberculosis in the abdominal cavity after death, lymphocytes are the predominant cells. The presence of multinuclear cells and of atypical mitoses strongly suggests malignant disease of the peritoneum. Fragments of villous growth make the prognosis good, as their presence shows that the ascites is probably due to implantation of ovarian papilloma on the peritoneum: for if the primary tumour is removed, the secondary implantations and the ascites disappear. If the opsonic index of the fluid for tubercle bacilli is lower than that of the blood, the cause is tuberculous peritonitis and the outlook fairly favourable, provided there is no reason to believe the case is one of cirrhosis with super-added tuberculous infection. When the Wassermann reaction is better marked in the fluid than in the blood (Estrocin and Parvy<sup>7</sup>), the cause is syphilitic disease, and therefore likely to be cured by specific treatment.

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**ASTHMA, BRONCHIAL.** This disease is not fatal in itself, but the prostrations may shorten life. The prognosis seldom if ever seems doubtful, although there is at least one instance on record in which artificial respiration was required. There are numerous cases of asthmatics having reached old age, but insurance records show that the majority do not live out their expectation. As a general rule, it may be stated that when the first attack takes place in early childhood there is a fair prospect that the disorder will cease when puberty is reached, but a number of cases have occurred in which asthma first developed at the age of four or five and continued at intervals to the age of seventy or over. If middle age is not passed before the first attack occurs, there is always hope of a cure. After the age of forty-five, however, the tendency is usually toward a progressive increase of the severity of the symptoms. The disappearance of all symptoms does not necessarily mean a permanent cure, for the disorder may be absent for many years and then reappear.

In estimating the prognosis in cases of asthma in which marked prostrations have become established, the most important factor is the determination of the cause in the particular patient. It has been shown by F. B. Talbot and others that there is a definite etiological connection between many cases of asthma occurring in childhood and the foreign protein derived from the food. The protein responsible is indicated by the sensitive skin test, and in many cases it appears to be egg albumen. If the offending food is removed from the diet, the general condition of the patient almost invariably improves, and a permanent cure results. In cases where it is impossible to remove the cause from the diet, immunity can be induced by giving increasing amounts of the protein in the manner described by Schloss. In some cases, both in childhood and adult life, the paroxysms can be definitely associated with particular climates, or particular odours, or some of dust. For example, some soldiers cannot be present when a horse is groomed, without suffering from an asthmatic attack; other persons have a paroxysm when they sleep on a feather bed. It may appear that this 'dust asthma' is also an anaphylactic phenomenon, and it has been found possible in some cases to isolate the allergin from the dust, and subsequently to produce immunity as in the case of food. In a small percentage of cases, asthma is mainly due to a bacterial infection, and in these the use of vaccines has been of considerable service.

In many cases of asthma the nasal mucous membrane is hyper-sensitive, and in these the attacks can frequently be stopped altogether by appropriate treatment, provided that the patient has not been a sufferer for long and has not acquired a 'habit.' In other cases, when it is impossible to remove the primary cause, treatment such as light cauterization of the nerve of the nasal septum appears to diminish the sensitivity of the nasal mucous membrane, and to give relief in a considerable proportion of cases. This relief may be transitory at times, but it would appear seldom to be permanent.

although it may extend over several years. The use of intranasal remedies, such as dilute preparations of cocaine, often give relief for similar reasons, but they seldom if ever produce a permanent cure. At one time it was thought that the removal of gross abnormalities in the nose of asthmatic patients would be attended with excellent results. These expectations have not been confirmed, and it is doubtful whether success is obtained in more than five per cent of these operations, whereas in a not inconsiderable number the asthmatic attacks are aggravated. Further, it is a curious thing that if a polypus is removed before the light cauterization treatment, the symptoms may become worse; whereas if the cauterization of the septal nerve precedes the removal of the polypus, good results may be obtained.

As a further argument of the importance of ascertaining the cause in each case, it should be mentioned that if the disorder appears to be associated definitely with gout, high blood-pressure, chronic constipation, or other pathological condition, appropriate treatment directed against the cause may do much to lessen the frequency of the attacks, although it seldom produces a lasting cure.

In all well-established cases, we have to take the question of the family longevity into account in estimating the prognosis, but in every case the most important factors are the amount of emphysema, the degree of bronchial catarrh, and the condition of the right heart. These complications all increase the tendency to asthmatic attacks, which in turn increase the severity of the complications, and so the patient lives in a vicious circle. By the relief of complications much can be done to prolong life. The introduction of appropriate curative treatment for bronchitis has helped to prolong the life of many asthmatics. In a number of instances considerable relief of the bronchial catarrh has been obtained, together with an increased immunity against particular organisms; hence longer intervals occur between the attacks of bronchitis, and consequently there is greater freedom from the paroxysms. Again, the use of 'pressure baths' for the treatment of emphysema has given considerable relief, and hence a longer life in some cases. In fact, it may be stated with some conviction that modern methods of treatment have tended, by the removal of the initial cause, or by the relief of serious complications, to do much to improve the general prognosis in persons suffering from asthma.

It may be of interest to add, that a person who suffers from asthma seldom develops tuberculosis, cancer, or Bright's disease.

*Arthur Latham.*

#### ATAXIAS.

**Tabetic Ataxia.** — As indicated elsewhere (*see TABES DORSALIS*), ataxia is a relatively late symptom of tabes, and in a large proportion of tabetic cases, if the malady be recognized in the early stage, ataxia need never develop at all. The symptom is best prevented by careful avoidance of physical over-exertion, and by systematic

exercises of the limbs, always stopping short of any sensation of fatigue.

Once ataxia has supervened, its intensity is proportional to the muscular hypotonia, and to the degree of impairment of joint sense and of kinesthetic sense.

The prospects of alleviation or cure of tabetic ataxia vary widely in different cases. The occurrence of optic atrophy seems to have a mitigating effect upon its incidence; thus, however, only applies to cases of moderate ataxia in which optic atrophy supervenes relatively early in the course of the disease. In some tabetic cases where ataxia has developed with great rapidity, rest in bed for a few weeks or months has a markedly beneficial effect; and the patient, previously unable to walk without support, may spontaneously regain to a large extent his powers of progression. In other cases again, where the ataxia has been slowly and steadily getting worse, an acute intercurrent illness, confining the patient to bed, may rapidly aggravate all the symptoms, so that he may pass from the ataxic to the so-called paralytic or helpless stage. In the majority of cases, however, the ataxia is slowly and gradually progressive. What is the prospect of improvement in this class of tabetic patients? Carefully devised exercises, under skilled supervision, can generally improve the ataxic symptoms, the amount of such improvement being dependent on the intelligence of the patient and upon the patience and ingenuity of the physician. It is not uncommon for a previously bedridden patient thus to regain the power of standing or even walking, with or without support. Or a patient in whom the gait is moderately ataxic may, as a result of these exercises, gain confidence to such a degree that he succeeds in correcting and concealing his ataxia, so as no longer to be an object of remark to the unskilled observer. Real cure of ataxia does not occur, but the acquisition of new modes of movement has a compensatory effect, and may to a large extent conceal the old ataxia.

**Family and Hereditary Ataxia.** Whether this be the type known as Friedreich's, Marie's cerebellar type, or the intermediate spinocerebellar variety, the ataxia has a slow and insidious onset in childhood and adolescence, the legs being affected earlier and more severely than the arms. The degenerative process being essentially progressive, the prognosis is unfavourable as regards relief of the ataxia, and it is futile to attempt re-educative exercises. The malady itself does not necessarily shorten life, and the patient may survive for many years, even when helplessly ataxic. The prognosis as to life depends upon the assiduity with which the patient is nursed and looked after, and upon the care with which intercurrent maladies can be avoided.

**Ataxia due to Focal Lesions of the Cerebellum.** This may be of vascular origin (as in thrombosis or hemorrhage), or inflammatory (as in abscess, acute encephalitis, or localized meningitis), or associated with cerebellar tumour. In such cases, the prognosis of the ataxia depends on whether the underlying cerebellar disease can be removed by surgical or mechanical means. If so, the ataxia may entirely

disappear, even in cases where a considerable amount of cerebellar tissue has been permanently destroyed.

**Ataxia due to Focal Lesions elsewhere in The Brain.**—In cases where ataxia is one of the symptoms of local disease in other parts of the brain (e.g., in the corpora quadrigemina, optic thalami, crura cerebri, etc.) the prognosis is, as a rule, unfavourable; since, even if the lesion happens to be a stationary one, compensatory action by other parts of the brain does not, as a rule, occur. *Purves Stewart.*

**ATROPHY, MUSCULAR.** (See MUSCULAR ATROPHIES.)

**BERI-BERI.** The mortality of beri-beri varies considerably in different countries. According to Castellani it is 2.5 to 3.5 per cent in Japan, 2 to 6 in Java, 19.7 in the Malay States, 48.6 in Hong-Kong, and 60 to 70 per cent in Sumatra. It is mainly dependent on the proportion of the wet or dropsical type, in which the death-rate is far higher than in the dry or paralytic variety. The great cause of death is sudden heart failure, especially seen in patients not kept in a strictly recumbent position during the acute stage, and in indignant cases it may carry off the patient in from a few hours to a few days. Even after apparent recovery, attacks of palpitation may continue to occur for a long time and even prove fatal.

Bad prognostic signs are extensive dropsy, especially with œdema of the lungs or hydropericardium, cardiac oppression, palpitation, dyspnoea, great increase in the pulse-rate on slight exertion, and vomiting.

The dry form of beri-beri is seldom fatal, but may leave deformities due to permanent paralysis of some of the muscles.

An infantile form of beri-beri has been described in the Philippines by Chamberlain and Vedder, which they state accounts for 56 per cent of the total infant mortality.

Extract from rice polishings is very effective in infantile beri-beri, and to a less extent in the adult form. Complete and prolonged rest in bed is the most important factor in reducing the mortality of the dangerous wet form. Recent discoveries relating to the dietetic origin of the disease have enabled it to be eradicated from among the Philippine scouts, and in gads, asylums, etc., by attention to diet alone. *Leonard Rogers.*

**BILHARZIASIS.** The urinary and rectal diseases produced by the bilharzia, although very distressing, have a low mortality, chiefly due to terminal septic infection of the bladder and ulceration of the rectum. If the patient is removed from the endemic area of the disease before it is too advanced, the ova generally cease to be passed within three years, and recovery takes place. *Leonard Rogers.*

**BLACKWATER FEVER.** Most authorities with much actual experience of the disease in the tropics look on blackwater fever as a complication of malaria chiefly prevalent in intensely malarious

parts of Africa and India, as shown by Stephens and Christophers, the mortality is variously estimated by different authorities, varying from 1 to 6.8 per cent by the Plehns, 21 by Koch, and 23 to 24 by Berenger-Féraud, up to as much as 50 per cent.

The severity in individual cases varies within wide limits, from a slight temporary hæmoglobinuria with little constitutional disturbance, to very extensive blood destruction followed by blocking of the renal tubules with hæmoglobin and fatal suppression of urine. Nearly four-fifths of the mortality, according to Daniels, is due to this kidney trouble. Great diminution or absence of urine is the most serious symptom, which will prove fatal if it lasts for two days, even decapsulation of the kidneys having failed to save such patients. Other grave symptoms are severe anæmia from rapid destruction of the blood, persistent vomiting and hiccough, diarrhoea, continuance of high fever, cerebral symptoms, and low tension pulse. Relapses of a fatal nature may occur in patients who have recovered from one or more attacks. Measures to increase the urinary flow, including saline and alkaline injections, do most to lessen the mortality. The work of Christophers and Bentley in the Duars in India showed that persistent prophylactic use of quinine in this very malarious district greatly diminished the occurrence of the disease, thus confirming its malarial origin.

*Leonard Rogers.*

**BLADDER, CALCULUS OF.** A stone may form in the bladder, or it may descend into the bladder from the kidney. A stone which forms in the bladder is likely to remain there until removed by operation. On the other hand, a stone which passes into the bladder from the ureter will, in a large proportion of cases (70 to 80 per cent), pass out by the urethra in the course of a few hours or a few days. The presence of urethral obstruction, such as enlarged prostate, or of atony of the bladder, as in tabes, or of a diverticulum of the bladder, will prevent the expulsion of the calculus, which remains and develops in the bladder.

Stone in the bladder is a painful malady, and it is seldom that the disease is allowed to run its course without an attempt at relief by operation. There are, however, cases where the symptoms are comparatively slight, so that the patient either disregards them, or, knowing that a stone is present, prefers the pain or discomfort to the risk of operative interference. Such stones may remain in the bladder for fifteen or twenty years, or even longer, and reach a great size. Eventually, however, and usually at a much shorter period than this an unrelieved vesical calculus causes death, either by ascending pyelonephritis, or by back pressure causing dilatation of the kidney and interstitial nephritis, or by a combination of the two. In the great majority of cases an operation is performed, and the prognosis of vesical calculus lies in the success or failure of the operative measures undertaken.

The following factors are important: (1) *The date of the operation:*



(2) *The presence of sepsis*; (3) *The presence of bladder complications*; (4) *The presence of kidney complications*; (5) *The result of the operation.*

1. **The Date of Operation.**—When a small calculus is lodged in the bladder, its removal is a simple matter, and the danger to which the patient is exposed is very slight. The operation can be performed under local anesthesia, so that the small danger of a general anæsthetic is avoided.

An evacuating cannula and bulb may suffice to remove the calculus from the bladder, or the use of a small lithotrite may be necessary. There should be no mortality for such an operation.

At a later stage, the size, number, and density of the stones, the presence of sepsis and of other complications, render the outlook for operation more serious. In the advanced stage, when the kidneys are diseased, operation of whatever kind is a serious undertaking, and is attended by a considerable mortality.

2. **The Presence of Sepsis.**—There are two classes of cases. In one, an aseptic calculus becomes infected either spontaneously or after the passage of instruments; in the second, the calculus develops in a bladder already infected.

The majority of calculi in the first class are composed mainly of oxalate of lime or uric acid, and they increase very slowly in size or number. When the urine becomes infected, and especially when the reaction of the urine becomes alkaline, a rapid increase in size takes place from the deposit of phosphates on the surface of the stone. Phosphatic calculi formed in an infected bladder develop very rapidly, a calculus of considerable size developing in a few weeks.

Sepsis affects the prognosis in two ways. The mortality of operations on infected stones greatly exceeds that of operations on aseptic stones; and secondly, the probability of recurrence after operation is much greater.

3. **Bladder Complications.** A healthy bladder, or one with a moderate degree of cystitis, will permit of an easily performed and complete litholapaxy, the mortality of which is very low and the probability of recurrence is slight. When severe cystitis is present, and the bladder is acutely spasmodic, litholapaxy becomes difficult and may be impossible, and lithotomy becomes necessary, with a higher mortality.

When the bladder is sacculated, or when a diverticulum is present, litholapaxy should not be performed, and suprapubic lithotomy is necessary. In such cases sepsis is always present, and it is difficult, and frequently impossible, to get rid of the infection. The prognosis is grave, for recurrence of the stone is probable, and ascending pyelonephritis may supervene. When a solitary diverticulum of large size is present, an operation for the removal of this will be necessary.

New growths of the bladder occasionally complicate calculus. In such cases the prognosis depends upon the nature of the growth, and upon the ability of the surgeon to diagnose its presence before attempting litholapaxy.

Bilharzial disease of the bladder is a grave complication of stone, met with in countries where bilharziasis is rife. Septic complications are common, and fistulae follow cutting operations with great frequency. Perineal lithotomy is the operation usually chosen by those experienced in such cases.

Enlargement of the prostate complicates vesical calculus by increasing the probability of renal complications, and, if the obstruction is left untreated, by favouring recurrence of the stone. Litholapaxy is possible when there is a moderate enlargement of the prostate; but it is unsafe, and may be mechanically impossible, when the enlargement is pronounced. The proper treatment of stone in the bladder with enlarged prostate is suprapubic prostatectomy with removal of the calculus.

**4. Kidney Complications.**—Infection of the kidneys is the most serious complication of vesical calculus, and is the commonest cause of death after operation, or when no operation has been performed. The infection takes the form of a pyelitis in milder cases, and a pyelonephritis in the more severe.

Stone in the kidney is a not infrequent complication. In many of these cases the stone in the bladder has developed on a small calculus passed from the kidney. In other cases the bladder is the seat of chronic cystitis from repeated descending infection from the kidney, and the vesical calculus forms in the infected bladder. Kidney symptoms may be absent or insignificant, and the presence of renal calculi and infection is very frequently overlooked. The prognosis in such cases is grave. An operation upon the kidney is required, in addition to that on the bladder, and nephrectomy may be necessary.

In such a case the presence of cystitis, if this cannot be cured, is a menace to the remaining kidney, from ascending infection.

**5. The Results of Operation.**—The operation chosen, and the results of operation, depend upon the factors which have already been discussed above. Litholapaxy is the operation of choice. Suprapubic lithotomy is performed when there are bladder complications, such as stricture, diverticula, bladder spasm, enlargement of the prostate, intractable cystitis, new growth of the bladder; when the size and hardness of the stone make crushing impossible; or when septic renal complications render bladder drainage advisable.

Perineal lithotomy is reserved for special cases, such as those with tone in the urethra complicating vesical calculus, and also for cases of bilharziasis.

The mortality statistics of litholapaxy are much lower than those of lithotomy, but they hardly give a fair index of the relative gravity of the two operations; for many surgeons reserve lithotomy for the more serious complicated cases, while performing litholapaxy in all simple ones.

Statistics collected by Keegan of stone operations in India show that the mortality in 10,073 litholapaxies was 3.96 per cent; in 7201 cases of lateral lithotomy it was 11.02 per cent, and in 147 cases of

suprapubic lithotomy 42.47 per cent. In the Indore Charitable Hospital Central India in the period 1881 to 1900, there were 500 lithiapraxy in boys, with 11 deaths, a mortality of 2.2 per cent; and 18 lithiopraxy in young girls, all successful.

The following figures show the results of 1960 stone operations performed at St. Peter's Hospital from 1861 to 1911:

RESULTS OF OPERATION FOR STONE IN THE BLADDER,  
(St. Peter's Hospital, 1861-1911.)

Year	No. of Cases	No. of Deaths	Mortality (%)
1861-73	118	100	15.25
1874-83	195	166	15.30
1884-93	362	332	8.29
1894-03	600	571	4.80
1904-13	578	559	3.28
1914-16	106	102	3.92

The death rate of lithiopraxy in the hands of various surgeons is as follows: Guyon, 2.7 per cent; Zuckerkandl, 3.6 per cent; v. Frisch, 2.6 per cent; Legner, 2 per cent; Freyer, 2.60 per cent. Watson collected from the literature 17,536 cases of lithiapraxy, with 426 deaths, a mortality of 2.4 per cent. The influence of age upon the result was shown by the following figures: Between one and fifteen years there were 2518 cases, with a mortality of 1.7 per cent; between sixteen and fifty, 719 cases, with a mortality of 1.6 per cent; over fifty there were 3395 cases, with a mortality of 1.4 per cent.

The mortality of suprapubic lithotomy is much higher: Zuckerkandl, 15.7 per cent; v. Frisch, 12.7 per cent; Earling, 17.8 per cent; Dittel, 15.6 per cent; Prendelsberger, 12.9 per cent; Guyon, 24.3 per cent; Neubohm, 7.15 per cent; Freyer, 12.75 per cent. Watson collected 3463 cases, with 436 deaths (13.2 per cent).

The high mortality of suprapubic lithotomy, compared with lithiapraxy, is due to the fact that all the grave cases were treated by lithotomy. When the same class of cases is treated by one or other operation, the results are less disproportionate. Thus Assenfeldt, in 164 cases of suprapubic lithotomy, found a death-rate of 3.6 per cent.

*Life Results of Operation.* Watson found 49 per cent of recurrence in 902 cases of lithiapraxy, and in more than two-thirds of these the patient were fifty years of age or over. Zuckerkandl found 42 per cent of operated cases recurred. There is no difference in recurrence after the operation between lithotomy and lithiapraxy, in the hands of an experienced surgeon. The use of the cystoscope immediately after the operation, or a few days later, checks the result, and provides an opportunity for the patient to depart with fragments unremoved.

Recurrence takes place most frequently from new formations of

phosphatic stone, usually in the subjects of enlarged prostate. Recurrence of oxalate-of-lime or of uric-acid calculi is much less frequent, but may occur from the descent of calculi from the kidney, or from new formation in the bladder. The latter is very rarely the result of fragments left behind at a crushing or cutting operation. The recurrent calculus, after removal of a uric-acid or oxalate-of-lime calculus, may be phosphatic, and is due to changes in the urine.

The effect of removal of an enlarged prostate upon the recurrence of calculi varies according to their composition and the state of the urine. Uric-acid and oxalate-of-lime calculi rarely recur; phosphatic calculi frequently.

*J. W. Thomson Walker.*

**BLADDER, EXSTROPHY OF.** There is some variation in the degree of extroversion of the bladder. In the common form the anterior wall of the bladder is deficient, so that the bladder mucous membrane is exposed and bulges above the rudimentary penis, and the urine is discharged on the surface from the uncovered ureteral orifices. The conditions of existence are miserable in the extreme. There is continual escape of urine, saturating the clothes, and leading to inflammation and excoriation of the skin of the thighs and buttocks. The child lives in a pungent atmosphere arising from decomposing urine, and his life is a burden to himself and to those around him. Associated deformities such as hare-lip, cleft palate, and spina bifida may be present, and contribute to a fatal issue in infancy or early childhood.

Progressive dilatation of the ureters and kidneys occurs. Ascending pyelonephritis is the commonest complication, and is the usual cause of death, which takes place, as a rule, during childhood or youth. Occasionally the patients survive till adult life, and even attain old age. A malignant growth may develop in the exposed bladder.

The operations performed for extroversion of the bladder are numerous, and their number is an indication of the poor results generally obtained. The principal symptoms against which treatment is directed are the incontinence of urine, the pain and discomfort, and the infection; and by the success in abolishing these the value of the different operations may be measured. These operations will be considered in three groups, as follows:

1. **Autoplastic Repair of the Bladder.** The ingenuity of many surgeons, among whom are Roux, Sedillot, Billroth, Thiersch, Wood, de Fort, and Legard, has been devoted to closing the bladder by flaps of skin; and Pozzi, in addition, attempted to form a fibromuscular shield in front of the reconstructed bladder, from the adjacent abdominal wall.

The mortality of these procedures is not great, but the results are not satisfactory. There is frequently failure to obtain healing in even the most carefully planned operation, and many secondary operations are required. Occasionally the bladder is covered in at a single operation. The total gain in a successful operation of this nature is that

the bladder mucous membrane is protected. The incontinence of urine continues, but the patient is enabled to wear a urinal, and thus some part of the misery is relieved. The infection, however, continues unabated and a stone not infrequently develops in the partly reconstructed bladder.

**2 Suture of the Margins of the Bladder, with or without Previous Operation on the Pelvic Girdle.** A few surgeons (Gerdy, Biffoth) have endeavoured to close the gap by dissecting and suturing the edges of the bladder wall. This operation has, however, been attended by no success.

In order to allow of the approach of the separated pubic bones, as a preliminary to closure of the bladder, Trendelenburg performed arthrotomy of the sacro-iliac articulations. The posterior ligaments of one synchondrosis are cut, and if this does not suffice to allow the pubic bones to come in contact, the other side is similarly treated, and the patient is suspended in a special apparatus for three or four months, when an attempt is made to close the bladder. The operation is a more serious one than any of the preceding, and the wings of the pelvis have been known to become separated again after some time. On the other hand, some successes have been obtained, and in three cases it has been claimed that the patient was continent after the operation.

Estor states that continence has been obtained in 63 per cent of the cases operated upon by this method. Short of this the mucous membrane of the bladder is protected, with resulting improvement in the pain and inflammation.

**3 Deviation of the Course of the Urine.** The number of operations of this nature is so great that only a few of the most successful can be discussed.

*a. Peters's Operation.* Catheters are placed in the ureters, which are dissected out, leaving a small ring of the vesical mucous membrane attached to each. The bladder is excised, and the rectum exposed extraperitoneally. The ureters are passed through the rectal wall, and the catheters are drawn through the anus, without suture. The catheters are left in position for several days. A disadvantage of this operation is that the sphincter action of the lower ureters is destroyed. In 4 cases, Peters obtained 2 good results, with 1 failure, and 1 death from pyelonephritis. Sherman collected 11 cases operated by this method; of these, only 2 died of pyelonephritis.

*b. Maydl's Operation.* The bladder is excised, leaving an area at the base which includes both ureteric orifices. The sigmoid colon is exposed, and the bladder base, bearing the ureteric orifices, implanted into this. Some surgeons have modified this by implantation into the rectum.

The immediate mortality of Maydl's operation varies from 5.5 per cent (Glosserud, 18 cases) to 26.7 per cent (Katz, 57 cases). In Petersen's collection, 31 patients recovered from the operation; 2 of these died of pyelitis within a year; while in 6 cases the operation was followed by fistula, which subsequently closed in every instance.

Surgeons are by no means unanimous in regard to the protective power of the ureteric orifices, thus implanted, against ascending infection. In experimental work on dogs, the mortality due to ascending pyelonephritis is very high. Clinically, some surgeons have recorded a high percentage of fatal cases from this cause. Panchet, out of 4 cases, had 3 deaths from ascending infection, occurring after twelve, fourteen, and fifteen months respectively. On the other hand, cases have been recorded where the patients were in good health some years after the operation. Thus, Resgotte records a case alive and well after three years, Frank 1 after four years, Maydl 2 after four and five years, Grambauer and von Eiselsberg each 1 after five years, Lwald 1 after nine years, Estor 1 after seven years, Tuller 1 after seven years, Fergue 1 after eight years, Wollter 1 after ten years, and Roux 2 after three and ten years respectively.

The presence of urine in the rectum does not appear to have caused any reaction, and inflammation of the mucous membrane is very rare.

After the operation continence is the rule. This may be established at once, or gradually develop. The rectum becomes dilated, and a considerable quantity of urine, which may be quite clear, is discharged voluntarily. Occasionally, from want of development of the perineal and anal muscles, continence is not established. This occurred in one case in Peterson's collection. The condition of the rectal sphincters should be carefully examined before embarking upon the operation.

Maydl's operation is the most successful of any of those performed for extroversion of the bladder, and is the only one in which a considerable proportion of cases shows continence, together with disappearance of the pain and discomfort, and an absence of ascending infection.

*Soubottine's Operation.* A rectovesical fistula is created, the rectum is opened along its posterior wall after removing the coccyx, and a broad vertical band of rectal wall, including the fistula, is raised on the anterior rectal wall, the edges being united so that a tube is formed, the orifice of which is within the anal sphincter. The gap in the anterior bladder wall is then closed.

Of this operation Estor says that it is as efficient in obtaining continence as that of Maydl, and has the advantage of separating the urine from contact with fecal matter. At the same time the operation is very complicated and may fail at some part. The infected bladder is retained, and may be a source of trouble from calculus or other cause. Further, damage is done to the anal sphincters, already weak in many cases. In creating the rectovesical fistula, the peritoneum may be opened and infected. Three cases operated on by Soubottine died of peritonitis. In the first 6 cases where the whole operation was performed at one sitting, 2 died; whereas, in 10 cases in which a more recent operation in successive stages has been employed, all survived. The functional result has been very satisfactory in these 10 cases; in all there has been voluntary micturition five or six times in twenty-four hours, the urine has remained clear, and ascending infection has not occurred.

*J. W. Thomson Walker.*

**BLADDER, GROWTHS OF.**—For the purpose of prognosis, growths of the bladder may be divided into two groups: (1) *Papillomata or benign growths*; (2) *Malignant growths*. It is true that there are tumours which possess the characters of both of these groups, and it is admitted that papillomata of the bladder displays features that differ from simple growths elsewhere. The grouping is, nevertheless, a practical one, and will be used while recognizing the pathological features which underlie it.

A number of varieties of growths, such as myxoma, fibroma, and myxoma, are found, but so rarely that they do not merit special discussion.

1. **Papilloma.** Papillomata are generally regarded as benign growths. In the bladder, however, they show certain characters which give them a place somewhere between the well-defined benign and the clearly recognized malignant growths. They have a very pronounced tendency to become multiple; the distribution of smaller papillomata around large growths, or of papillomata occurring at opposite points of contact of the bladder wall, suggest a special tendency to implantation; there is also a very pronounced tendency to recurrence of the tumours. A certain number of papillomatous growths, after retaining their benign characters for many years, infiltrate the submucosa and muscular layer of the bladder wall, and show signs of true malignancy.

In view of these facts, some authorities, such as Albarran and Imbert, and Grosserstein, regard all papillomata of the bladder as malignant. The present writer looks upon these growths as pre-cancerous, and as occupying a position in regard to malignancy somewhat similar to that of leucoplakia of the tongue.

The following are important points on which to base an estimate of the prognosis in a case of papilloma of the bladder.

*1. Duration and Complications.* The history of a case of papilloma may extend over many years, an operation then having been performed. A duration of ten or fifteen years has frequently been recorded, and Albarran collected cases with a history of symptoms lasting twelve, fourteen, and thirty years.

Certain complications may lead to a fatal result, and thus increase the gravity of the prognosis.

Excessive hemorrhage occurs in some papillomata. As a rule, the attacks of hæmaturia are at first separated by long intervals (six months, or even one or several years), but gradually the intervals become shorter, and the attacks more prolonged and more severe. Profound anemia may ensue, and indirectly lead to a fatal result. A serious complication of severe hæmorrhage is the formation of masses of clot in the bladder. Retention of urine results from the inability of the bladder to expel the clots. The danger of infecting this clotted bladder by passing a catheter is extreme; and if infection take place, severe cystitis and ascending pyelonephritis follow, and a fatal result is certain.

Obstruction of the outlet of the bladder occurs when masses of papillomata are clustered round the internal meatus, or when a single papilloma with a long pedicle acts as a ball-valve. In such cases the bladder is trabeculated and sacculated, and the ureters and pelvis of the kidneys are dilated. Infection of the bladder is specially liable to occur in such cases, and death from uremia is a common result of ineffectual instrumentation or of radical operation.

Infection of the bladder in papilloma rarely takes place spontaneously, and in this, papilloma differs from infiltrating growths of the bladder. The passage of an infected catheter or cystoscope is the usual cause. As already noted, it is specially liable to occur when obstruction is a feature of the case.

The prognosis in a case of infected papillomatous bladder is very grave, since the infection is difficult to overcome; and ascending pyelonephritis is a frequent and very fatal sequence.

Exhaustion accounts for a large proportion of deaths. It results from constant irritation and broken rest, from septic absorption, and from frequently recurring hemorrhage.

*1. The Results of Operation.* The best results of operation are obtained in early cases where the growth is small, single, or in moderate numbers, the bladder aseptic, and the kidneys healthy.

In order to operate in this early stage, it is absolutely necessary that those engaged in general practice should thoroughly grasp the grave significance of hematuria—the cardinal symptom of papilloma. It is unfortunate that the hematuria of vesical papilloma is unaccompanied by any other symptom, and that it is intermittent in character, with, at first, prolonged intervals between the attacks. As a consequence, the patient, and not uncommonly his medical attendant also, looks upon the disappearance of the hematuria as indicating the cure of the complaint.

It cannot be too frequently or too strongly urged that an attack of hematuria, however transient, is a matter of grave significance, and that the source of the hematuria must be traced and a definite diagnosis made: and that for this purpose, in the great majority of cases, the cystoscope is necessary. The absence in the urine of cells derived from the surface of the papilloma, and the absence or presence of cells derived from the kidneys or bladder, are insufficient data on which to base a diagnosis, however definite the clinical pathologist's report or opinion may be.

The prognosis for recurrence and for malignant transformation of the growth becomes graver as the duration of the papilloma is more prolonged.

The following results of operation on papilloma of the bladder may be noted:—

Endovesical operations by means of the operation cystoscope have been used by some surgeons. Their use is limited to the most favourable types of bladder papilloma, when the bladder is tolerant of intravesical manipulation, and the papilloma is not too large or too



extensive. Nitzs recorded 100 intravesical operations for papilloma, performed before 1902; of these 74 cases remained without recurrence, there were 18 recurrences, and 12 cases could not be followed.

Removal by suprapubic operation includes all classes of cure. Rubin collected 295 cases, of which 24 died, a mortality of 8 per cent. He found, however, that the mortality improved considerably in recent cases; thus, in the latest 150 cases, the death rate was 3.8 per cent. An examination by this author of the remote results in 145 cases, showed 33 recurrences, or 28 per cent. There were 82 cases without recurrence at periods varying from one to five years; in 18 cases there was no recurrence after a period of over three years.

Recurrences of papilloma take place after considerable intervals, such as four, six, seven, or eight years after operation. According to Legendre, the patient can never consider himself completely free from the possibility of recurrence.

As a rule, recurrence after operation in papilloma takes the form of small pleomorphic growths, at least of small size. The introduction of the high-frequency cautery, or cauterization of papillomatous growths, by Beer, of New York, has greatly improved the prognosis in such cases. The bladder, after an operation for papilloma, should be examined at intervals of three months at first, and later of six or twelve months, and, on the first appearance of recurrence, the small papillomatous bud is destroyed with the high-frequency cautery. Sufficient time has not yet elapsed since the introduction of this method to gauge the full effect on prognosis. It is certain, however, that by this means the number of secondary open operations will be considerably diminished; and, the treatment being applied in the earliest stage of a recurrence, the gravity of the procedure will be much less.

A certain number of recurrent growths, after operation for papilloma, have proved to be malignant. Burckhardt found that of 15 cases operated on for papilloma, and in which the growth recurred, the recurrent growth was malignant in 3.

**2. Malignant Growths.** The outlook in malignant growths of the bladder, when no radical operation is undertaken, is a certainly fatal one. The duration of the disease varies considerably. There are a number of cases where symptoms, such as haematuria, have existed for some years, as long as five or even eight years, and then a rapid advance takes place, the growth infiltrates widely, forming metastases, and death quickly supervenes. In such cases the total duration of symptoms, up to the time of death, may reach eight to ten years. The most common type shows a steady advance of symptoms, which terminate fatally in from one and a half to two years.

Malignant growths of the bladder are, in their earlier stages, admirably suited for radical operation in proper hands. Spread to lymphatic glands, and metastatic deposits in distant parts, take place only in the latest stage; and the prospect of cure by a well-timed and properly planned operation is, compared with malignant growths of other internal organs, extremely good.

The following factors directly influence the prognosis by their effect on the result of operation:

*a. The Nature of the Growth.*—The different varieties of malignant growths of the bladder vary widely in their rapidity of growth and tendency to recurrence after operation. The most chronic in its growth and the slowest to recur, is the epitheliomatous ulcer or cancer, which forms a depressed ulcer, and has the structure of a primary epithelioma. The nodular malignant growth varies considerably in its size, and also in the rapidity of its growth, and recurrence after removal; histologically, these growths show either the characters of a spindle-celled carcinoma, or they are formed of papillomatous masses so closely welded together as to be almost incompressible. Some malignant papillomatous tumours show rapid and luxuriant growth, and very rapid to recurrence after operation.

*b. The Extent of the Growth.*—Extension of a bladder growth may be intravesical, intramural, perivesical, or there may be glandular invasion. The intravesical extension is gauged by means of the cystoscope. A malignant growth of very large size is seldom worth while operating upon with the view to a local cure, as it will certainly have passed beyond the limits of the bladder and formed deposits elsewhere. The particular size of the growth which experience has taught me is suitable for partial resection of the bladder does not exceed a walnut (the area of a two-shilling piece as seen by the cystoscope). The tumour spread is almost always more extensive than the intravesical part would suggest; it is best gauged by the finger, after opening the bladder. The perivesical spread can only be estimated at operation. Extensive intramural spread, and perivesical encroachment of the growth, render the case unsuitable for partial resection of the bladder wall, and therefore affect adversely the prognosis.

*The Position of the Growth.*—A growth situated at or near the apex of the bladder is in the ideal position for resection. As the position of the growth, in different cases, approaches the base, it becomes more and less suitable for resection. The reason for this is not due to the increasing malignancy in growths at the lower part of the bladder, but to closer relation to the ureters, the trigone, prostate, and urethra. If a clear exposure of the lower part of the tumour can be obtained, and the surgeon does not allow himself to be hampered by an attempt to avoid the ureters or trigone, the middle and even the lower parts of the bladder are still suitable for resection; the lower part of the ureter being, if necessary, removed with the growth, and the stump protected in the bladder wound.

When the growth has encroached upon the trigone, or lies in close proximity to the urethral orifice, resection should not be performed. In 4 out of 5 of my cases of recurrence the growth was situated in close relation to the trigone and ureters, and in 2 of these the size was so considerable as to interfere with the manipulation at the lower part of the incision.

*c. The Condition of the Bladder and Kidneys.*—The greatest danger

at the time of the operation and after recovery from it, is sepsis. Malignant growths of the bladder have a special tendency to spontaneous infection. Over 40 per cent of all the cases that have come under my observation have presented the clinical picture of spontaneous cystitis, and were referred to me without a suspicion that a malignant growth underlay the cystitis. In 2 per cent of the cases the cystitis was so severe and persistent that operation had to be refused.

Cystitis is not only a danger to the patient from the pelvic cellulitis and other septic complications that may follow operation, but it gravely hampers the work of the surgeon, rendering the bladder cavity much smaller, and the bladder wall difficult to manipulate.

Ascending pyelonephritis may be present before the operation, and accounts for some part of the operation mortality. It is a serious danger during the early part of convalescence when the case is already septic, and may cause death many months or some years after recovery from the operation. It is not more liable to occur when a ureter has been transplanted: in 10 of the author's cases, resection of the ureter and implantation in the wound was necessary: in none of these cases did pyelonephritis develop.

#### RESULTS OF OPERATION FOR MALIGNANT GROWTHS.

*Palliative Operations.* These occasionally become necessary in order to treat symptoms. Apart from the relief given in this way, no permanent benefit is obtained. The patients survive from three to nine months, or, less frequently, a year.

*Removal of the Tumour.* Removal only, without any attempt to remove the tissues round the tumour, does not appear to prolong life. Rahn collected 57 cases, with 8 deaths, or 14 per cent. Of the 49 survivals, only 38 were followed. The most part were dead, or suffering from recurrence, within a year: 4 were dead of recurrence in one and a half, two and a half, or nine years: 6 had not shown recurrence after periods of one, one and a quarter, two, four, and four and a half years.

#### *Resection of the Bladder Wall.*

1. *Operation-mortality.* Rahn collected 96 cases, of which 21 died, a mortality of 21.8 per cent. Roysing collected 16 cases, with 3 deaths, a mortality of 18.7 per cent.

The following personal statistics may be noted:

Author	Number of Cases	Number of Deaths	Percentage Mortality
Brongersma	36	5	14
Heresco	4	1	25
Zuckerkauff	8	0	0
Thomson-Walker	30	3	10

ii. *End-results.* In 96 cases collected by Rahn, 75 survived the operation, but in only 52 was the late result known. Of these, 31 were

followed till recurrence appeared, or death supervened; this occurred in six months in 13 cases, twelve months in 11 cases, in the second year in 1 case, after three years in 2 cases, after four years in 2 cases. There were 21 cases without recurrence. Of these, 12 were followed for less than two years, while 9 were followed two years or over: 4 two years, 1 three years, 1 three and a quarter years, 1 four years, 1 five years, and 1 six years.

In Roysing's collected cases, 13 survived operation. Of these, 4 cases died of recurrence from four and a half to nineteen months after operation, and 1 died of cerebral tumour. The following cases are known to have survived: 2 one year, 1 seventeen months, 2 three years, 1 six years.

Brongersma gives the following results in his cases: 9 cases died from recurrence or metastases under two years, 1 died some months after operation from pneumonia, 2 were still under treatment, 18 showed neither recurrence nor metastases at periods varying from some months to seven years.

Kimmel reports that of 47 cases of bladder resection for malignant growth, 10 are well after six and a half, eight, fifteen, and sixteen years, and 1 died of recurrence ten years after the operation.

In 25 cases of resection by the author in which late information was obtained, there were 3 deaths from ascending pyelonephritis, and 6 recurrences, one of which was re-operated, and was well four years after the second operation. In 17 cases the patients were alive and without recurrence, as follows: six months after operation in 6 cases; twelve months in 3; eighteen months in 6; two years in 1; and four and a half years in 1. (Statistics, March, 1911.)

*Total Extirpation of the Bladder (Cystectomy).*—Of 39 cases collected from the literature, death occurred after the operation in 18, a mortality of 46.1 per cent. Only 10 cases could be traced, and in only 2 of these was the period after the operation longer than fifteen months: 1 was well five years afterwards (Hogge), and 1 sixteen years (Pawlik). Later statistics give an even higher mortality. Verhoogen and de Graeuve collected 59 cases of total cystectomy, with an operation mortality of 52.7 per cent. Of the 27 cases that survived the operation, 6 died in the first year, 7 died before the third year, and only 2 survived more than three years. Cystectomy must, at the present time, be looked upon as a desperate measure which holds out little, if any, prospect of cure.

J. W. Thomson Walker.

#### BLADDER, INJURIES OF. (See ABDOMINAL INJURIES.)

**BLADDER, TUBERCULOSIS OF.**—It is well recognized to-day that tuberculosis of the bladder is never, or only in the very rarest cases, primary, and that it results from extension of tuberculous infection from the kidney by way of the ureter, or the prostate or seminal vesicles. This being the case, the prognosis depends largely on that of tuberculosis of the kidney or genital organs; and to these

the reader is referred. (See KIDNEY, TUBERCULOSIS OF; LEUKODYSMIA; TUBERCULOSIS.)

There are, however, some points that may suitably be discussed here.

1. **The Course of Untreated or Unsuccessfully Treated Vesical Tuberculosis.** The course of tuberculous cystitis is slowly progressive, with periods of improvement and periods of relapse, dependent partly upon changes of diet and climate. At the commencement there may be a period of acute cystitis which subsides, a slight subacute cystitis persisting. More frequently, however, the onset is insidious, and the progress very gradual. After some years, the continual calls to micturate become very distressing, and the patient is worn out from loss of sleep. If septic complications are avoided, death takes place after some years from renal failure due to bilateral renal tuberculosis. More often there are septic complications, caused, almost invariably, by infection introduced by septic catheterization, or after drainage of the bladder by cystostomy. The condition of the patient, when this occurs, is distressing. There is constant desire to micturate, unsatisfied by the passage, with pain and scalding, of a few drops of urine every ten or fifteen minutes. The frequency and irritation continue day and night. During the day some method of collection of the urine becomes necessary, owing to the active incontinence which develops, and a rubber urinal is worn; during the night the rest is broken by the constant calls, and bed-wetting is frequent. Secondary phosphatic calculi form in the bladder, and add to the pain and distress. Eventually, exhaustion combined with septic absorption bring about a fatal result, or ascending septic pyelonephritis may cut short the course of the disease.

2. **The Origin of the Tuberculous Infection.** Where tuberculous cystitis is secondary to renal tuberculosis, the prognosis varies at different stages of the disease. In unilateral renal tuberculosis, tuberculous cystitis affects the prognosis but little. The removal of the affected kidney is followed in most cases by a disappearance of the vesical infection, and the result is hastened by a course of tuberculin. It is a peculiarity of tuberculous cystitis, however, that even when the tuberculous infection has been quite cured, some increase in the frequency of micturition remains. Another point of interest in regard to these cases is that tuberculous ulceration of the bladder may be present, demonstrated by the cystoscope, and yet the urine be absolutely clear to the naked eye.

In the later stages of renal tuberculosis, tuberculous cystitis is a serious complication, from the constant irritation and loss of sleep that it produces, and especially from the danger of sepsis and ascending pyelonephritis.

In tuberculous cystitis secondary to tubercle of the prostate and seminal vesicles, the prognosis is not so good as in the early stage of renal tubercle. The results of treatment of the disease of the prostate and seminal vesicles by operation are not satisfactory, and septic

complications are very frequent. Some cases react well to tuberculin, but in many the improvement is only partial and temporary.

3. **The Results of Treatment.** Removal of the source of the tuberculous infection, as for instance the kidney, is the basis of treatment. Where this is impossible, as in bilateral renal tuberculosis, or when it has failed, as in persistent tuberculous cystitis after nephrectomy for unilateral renal tuberculosis, more direct measures are necessary.

Tuberculin treatment is the most successful method, and the most favourable cases are those where the original focus of tubercle has already been removed. Where the infection is mixed, vaccines should be used alternately with the tuberculin injections.

Local treatment by washing, or by instillation of various drugs, is highly recommended by some authorities. The best known of these methods is the reputed instillation of 5 per cent carbolic acid recommended by Roysing. Good results are claimed for this treatment, but exact figures are not available. With all these methods there is a danger of introducing sepsis and producing a mixed infection.

*J. W. Thomson Walker.*

**BONE TUMOURS.** We have to consider the following growths of bone: osteoma, chondroma, sarcoma, carcinoma, multiple myeloma, thyroid cancer, and cysts. Epulis is discussed elsewhere (*see Jaws, Tumours*, etc.).

Several of the above can be dismissed with a few words.

**Osteoma.** Ivory osteoma, usually arising about the orbit or on the jaw, is a progressive tumour of extremely slow but steady growth, and does no harm unless it presses on important structures.

Cancellous osteomata and exostoses are usually capped by cartilage which ossifies at about twenty-one to twenty-four, when growth of the skeleton ceases, so that the exostosis attains its maximum at that age. Large sessile cancellous osteomata may, however, go on growing.

Complete removal is not followed by recurrence.

**Chondroma.** A pure chondroma, such as may be found on the fingers of young adults, grows slowly but progressively, is not dangerous to life, and does not recur after removal.

Large, rapidly-growing cartilaginous tumours on a bone are usually to be classed with the periosteal sarcomata undergoing degeneration, and are very malignant.

**Myeloid Sarcoma.** By this we mean a very vascular, usually deep-seated, central tumour expanding the bone, containing a great number of giant cells under the microscope. It must be remembered that a central tumour of bone is not necessarily myeloid; it may be a malignant sarcoma, but this is uncommon. The older literature, including much of that utilized in Butlin's *Operative Surgery of Malignant Disease*, is quite unreliable in its description of the exact nature of the growth. He collected from the literature the following cases of central sarcoma:—

**Humerus.** 10 cases; 3 died of recurrence or metastasis (two of which were myeloid); 5 well, one to three years; 2 well, over three years. In most of these, Berger's amputation was performed.

**Radius and Ulna.** 10 cases; 1 died of recurrence (probably not myeloid); 3 well, one to three years; 6 well, over three years.

**Femur.** 11 cases; 5 died of metastasis (3 of these were myeloid); 2 recurred *in situ*; 2 were well one to three years later; 5 were well over three years. Nearly all these were treated by amputation.

**Tibia and Fibula.** 20 cases; 2 died of metastasis or recurrence (round-celled sarcoma, not myeloid); 3 well from one to three years; 5 well over three years. Here again, nearly all were amputated.

It will be observed, therefore, that in five cases myeloid gave rise to fatal metastases, but that 23 were well one to three years after, and a further 22 were well over three years.

Coming to more modern investigation, we find that there is a general consensus of opinion that myeloid is practically an innocent tumour, and it is very unusual for metastasis to occur when the diagnosis has been made by a reliable microscopist. The writer knows of one recent case in which fatal secondaries appeared in the lung.

On the other hand, Bloodgood reports that 18 cases seen by himself are all alive and well; he added to this from the literature, and finds that of 26 treated by enucleating out, 5 recurred, but none formed secondaries; the other 21 were cured. Of 22 resected, 1 recurred and was amputated; the rest did well. Eyle reports 7 cases treated at the London Hospital by amputation, resection, or, in one case, scraping; all were well from one and a half to ten years after.

Eight cases treated in Bristol by resection or scraping out have all done well, except that local recurrence took place in two cases scraped out.

We may conclude, therefore, that the risk of metastasis in the lungs exists, but is quite small, that inadequate local operations may be followed by recurrence *in situ*, but that almost all cases can be cured by an adequate operation. Amputation is only occasionally necessary, as, for instance, if the bony shell over the growth is very thin, and so great a length would have to be resected as to make the limb useless.

The operation mortality quoted by Butlin relates to amputation; nowadays the risks are very small, probably not more than 1 or 2 per cent.

**Periosteal Sarcoma.** It is difficult to obtain accurate accounts of the prognosis of this disease from the literature, because so many statistics are hopelessly vitiated by the inclusion of cases of myeloid, or what is described as 'mixed round or spindle cells and giant cells,' which usually means myeloid. When this fallacy is eliminated, it becomes difficult to find cases of cure in patients with a genuine round- or spindle-celled sarcoma. The flat bones give better results than the long bones.

Kocher could only collect 15 instances of cure of periosteal sarcoma of the long bones, after amputation, in 1906. The more favourable

statistics of Wäch, Bergmann, and the Tübingen clinic all include endosteal growths.

Alexis Thomson records 5 periosteal sarcomas of the femur and 2 of the humerus treated by amputation (Berger's in the latter cases), but only one remained well, a femur patient being alive two and a half years after. Namerode published, in 1909, the end-results of 65 cases of excision of the *scapula* for sarcoma. They were as follows: 40 cases insufficiently followed; 35 cases died within two years; 7 cases well over four years. Death usually took place within a year (26 cases). In one case recurrence was as late as five years afterwards. The writer has seen an unpublished case of mixed-celled sarcoma well more than three years after removal of the blade of the scapula. The operation mortality in Namerode's series was about 40 per cent.

*Sarcoma of the Humerus* is terribly malignant. The mortality of Berger's operation since 1887 is about 5 per cent (Chavasse, Barling, Dent, quoted by Butlin). The only case of cure mentioned by Butlin in which the diagnosis was microscopically confirmed was a growth of the lower end of the humerus amputated in Göttingen, and well at least eight years afterwards.

*Sarcoma of the Femur* is common, and is very malignant. The mortality of amputation at the hip-joint was considered to be about 12 per cent, but is probably less at the present time. In Butlin's series of 68 cases, only 2 lived for three years; 1 of these had had a growth for seven years, and it is not certain that the other was a periosteal sarcoma.

A case treated by local removal at the Bristol Royal Infirmary in 1910, associated with repeated fractures in 1904, 1906, and 1909, was seen apparently cured in September, 1913. The microscopical report, by a front-rank pathologist, was fibrosarcoma.

*Sarcoma of the Tibia or Fibula.*—In a series of 35 cases, Butlin found 1 alive and well after seven years, and 1 well between one and two years. The patient apparently cured had had the growth for eight years before operation. A case at the Bristol Royal Infirmary treated by amputation was quite well when last seen, fifteen months later.

Recurrence is not usual in the stump, but the patient dies of metastases in the chest, with groin glands also invaded in many cases.

*Sarcoma of the Skull.*—Although of course the great majority of these cases are very unfavourable and proceed to a fatal termination in six to twelve months, with pressure on the brain, or an external fungating swelling, there are a few instances in which the growth appears to be less malignant in nature. One such, removed at the Bristol Royal Infirmary in 1904, recurred in 1908, and was then the size of a hen's egg; it was again removed, and four years later the patient was known to be well, and is almost certainly still alive, though out of England. The microscopical diagnosis was fibrosarcoma. In another case seen by the writer the growth, a spindle-celled sarcoma, was stationary for five years (further history not known) after injections of Coley's



fluid. Jacobson and Morris both record patients living for five or six years after the first appearance of the growth. Bergmann claims to have cured 5 (how long followed is not stated) out of 17 cases operated on. Some tumours of the skull are myeloid in nature, and may yield better results.

*Sarcoma and Carcinoma of the Jaws* are discussed elsewhere (see JAWS, TUMORS, etc.).

It will be gathered from the data given that sarcoma of the long bones is almost never cured by amputation, except when it is obviously very chronic, but that in the flat bones there is some slight prospect of cure.

The results in children are much the same as in adults. Rawling has collected cases in the literature of bone sarcoma affecting children under nine years. Of 59 cases, only 1, a patient with congenital sarcoma of the scapula treated by local removal at five months, was followed up and found to be cured several years after.

Two other methods of treatment call for some consideration.

Coley's Fluid. There are cases on record, one of which (a sarcoma of the orbit) the writer has seen, where a sarcoma has disappeared after an attack of erysipelas, and Coley has steadfastly maintained the value of his mixed toxins of erysipelas and *Bacillus prodigiosus* as a curative agency in sarcoma.

Although the treatment was at first adversely reported on by an American surgical committee, Coley subsequently convinced its members and won them over to his side. The results in England are not so favourable as in America, but the writer has seen a patient with sarcoma of the temporal region, explored, microscoped, and found inoperable, cured and followed for many years after the treatment; and a lad with sarcoma of the foot similarly treated has remained *in statu quo* for more than three years. There have been, of course, a number of failures besides.

Coley claims to have cured, and followed up for three or more years, 4 cases of periosteal sarcoma of the femur and one of the tibia; all except 1 femur case were also amputated. This patient eventually died, more than ten years after, of a mixed epithelioma-sarcoma in the seat of an x-ray burn. Eyc also reports a case of sarcoma of the femur amputated and treated by Coley's fluid, well two and a half years afterwards, but in 10 other cases the fluid did no good. In other situations (muscle, etc.), the injections are said to have cured over 100 cases of sarco. v., followed three years or more afterwards.

Personally, I do not think amputation of the arm, or of the leg above the site of election, worth performing in cases of sarcoma of the long bones. I prefer Coley's fluid as less mutilating and more successful.

Radium. In one case known to the writer, radium treatment has arrested the growth of a sarcoma of the femur, verified by the microscope, for three years, and the patient obtained a commission in the Army, but it is too soon yet to speak of radium cures.

**Carcinoma of Bone.** This is always secondary, usually to cancer of the breast, and in the humerus often leads to spontaneous fracture, and in the spine to great pain and pressure on the cord. The prognosis depends on whether there is evidence of growth in the lung or abdomen. Cancer of the bones may go on for months or years, but when the lung is obviously involved, it is fairly safe to say that the patient will not live six months, probably much less.

**Multiple Myeloma, Myelopathic Albumosuria, Kahler's Disease.** This disease, characterized by endosteal swellings in various bones and a peculiar albumose called Bence-Jones protein in the urine, is usually very malignant and runs a rapid course, killing the patient in about two years.

The writer has seen a case, however, under the care of Mr. Hey Groves, in which the disease was arrested naturally, and the patient was living and well after many years, but severely crippled by badly united spontaneous fractures.

**'Thyroid Cancer.'** In this curious condition a tumour appears on the skull or sternum, often pulsating, having the structure of thyroid tissue, and associated with an enlarged or cancerous thyroid. The English cases all died, but Goebel relates some successful removals of the growth in bone.

**Bone Cysts.** Cysts of bone are either of the nature of osteitis fibrosa which has developed central cystic cavities, or hydatid cysts, usually in the lumbar vertebrae or hip-bone.

Simple bone cysts of the former variety reach a certain size and then remain stationary throughout life, giving rise sometimes to spontaneous fractures. Bloodgood reports the results of operation on 38 cases treated by enucleating: 2 died of hæmorrhage, in another amputation was necessary for the same reason, and the other 35 did well.

Hydatid cysts of the spine are apt to enlarge progressively and press on the cord, but the results of operation are satisfactory.

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A. Rendle Short.

BRACHIAL PALSY. (See NERVE LESIONS.)

BRAIN, GUNSHOT WOUNDS OF. (See GUNSHOT WOUNDS.)

### BREAST, CANCER OF.

**Prognosis apart from Operation.** To foretell the duration of life in a patient with breast cancer is one of the most difficult problems which can confront the medical man. Indeed, in many cases no answer whatever can be given. This is not surprising when it is borne in mind that even in the worst cases the disease may run its course in three months, while at the other end of the scale the patient may live for thirty years

or more with a cancer which during the whole of that time shows some evidences of activity. But there are certain varieties of breast cancer in which a definite prognosis is possible.

*Acute Breast Cancer.* If the whole breast is involved in a large swelling which is everywhere adherent to the skin, if also the breast is fixed to the deep fascia, if enlarged hard glands are present in the axilla, and more especially if the skin over the tumour shows a red blush, it can be stated almost with certainty that the patient will be dead in six months, and that no operation is of the least use.

*Atrophic Scirrhus.* In certain cases in old people the nipple may be slightly indrawn, or a definite local depression may make its appearance at some point in the skin over the breast, while the whole breast becomes somewhat shrunken; no tumour can be felt in the breast, nor are the glands enlarged. Such a case is an example of atrophic scirrhus in its extreme form, and it is possible to assert that the patient will probably go on for a number of years without pain or trouble of any kind. Ultimately, however, and especially if the breast is too freely examined or massaged, it is probable that a tumour will develop, that the glands will become enlarged, and that the case will then slowly run the ordinary course of breast cancer. But if, as frequently happens, the patient is already old when the tumour is discovered, the probabilities are that she will die of some other condition.

In the less typical forms of atrophic scirrhus, a small hard lump is present which changes its character but little for extensive periods of time. In such cases a prognosis of some years' duration of life, say up to ten, may be given with probable approach to accuracy.

*Carcinoma during Lactation.* If a breast cancer develops during lactation, although it may make little progress so long as suckling is continued, it will probably grow rapidly when the milk ceases to be secreted, and the prognosis is a bad one.

*Mastitic form of Carcinoma.* As a rule, cancer of the breast forms a rounded lump which bears no relation to the anatomical outlines of the lobes of the breast, but there are certain cases where the cancer commences throughout the substance of one or more lobes. Such cases generally originate as a chronic mastitis. The tumour formed resembles, in its sector shape, the thickenings of chronic mastitis; that is to say, it marks out the limitations of one lobe or a group of lobes. The induration is, however, much more definite and tumour-like than is usually the case in chronic mastitis, and the axillary glands will probably be large and hard, but not tender. A diagnosis may be difficult, but this question does not now concern us. It must be recognized that this form of carcinoma, perhaps owing to its multicentric or diffuse origin, is of particularly bad prognosis, and that recurrence is likely to take place within a year after operation.

*Duct Carcinoma.* The recent work of Mr. Lenthal Cheate has shown that duct carcinoma is much commoner than has been supposed, and that it is probably almost as frequent as carcinoma originating in the acini; but the typical form of duct carcinoma of

the large ducts, which originates beneath the nipple in women of advanced years without causing retraction of the nipple, is a comparatively benign tumour and runs a somewhat slow course. The prognosis after operation is distinctly good.

*Ordinary Scirrhus.*—It is only in the exceptional forms of breast cancer that a definite opinion as to duration of life can be expressed. In the ordinary scirrhus of the breast not operated upon, cases which are apparently similar may live for varying periods. The younger, stouter, and more healthy-looking the patient, the shorter is life likely to be if no operation is performed. So long as the disease confines itself to the parietes of the body, and does not involve the visceral cavities, duration of life remains uncertain; but from my experience I can state with some confidence that when there are visceral deposits, whether in the chest, abdomen, or head, the patient's life is unlikely to be prolonged more than a year. Many die within six months after the first onset of visceral deposit. The process of permeation which carries breast cancer from its point of origin to one or other of the great visceral cavities is slow in operation, and probably subject to periods of alternate quiescence and activity. But once a serous cavity is reached, the cancer is in a far-spreading land of plenty. Its cells accordingly proliferate actively and soon attack vital organs.

*Causes of Death in Untreated Breast Cancer.* Although dissemination is the rule, a cancer of the breast may run its course without producing secondary deposits. In these cases the patient may die from exhaustion, hemorrhage, or sepsis.

When dissemination occurs, death often takes place from serous effusions caused by lymphatic obstruction, itself the result of widespread permeation. It is in this way that ascites, pleural effusions, and pericardial effusion are produced. Oedema of the lung, simulating a low form of pneumonia, is probably caused in the same way. Less frequently paraplegia due to spinal deposits, or cerebral growths, may be the cause of death. Hemorrhage from the primary growth may be directly fatal. The average duration of life in untreated breast cancer is stated by Campicke and Lazarus Barlow to be about four years.

**Prognosis as regards Recovery from Operation.**—Although the modern operation for breast cancer is apparently a severe one, it does not produce marked shock if care is taken, especially in regard to preventing chill during the operation. Even old persons stand it well. Nevertheless, in hospital practice there is a definite death-rate, mainly due to the risk of infection arising from the collection of mixed surgical cases in one ward. This risk may be placed at from 1 to 2 per cent. My personal experience in hospital practice includes the loss of cases from influenza (at the time of an epidemic), erysipelas, broncho-pneumonia, and pulmonary embolism. In a nursing home or private house, on the other hand, I have never lost a case, a fact which appears to show convincingly that the belief that a hospital is the safest place for operation is not borne out by experience.

**Prognosis as regards Recurrence after Operation.** It cannot be too strongly emphasized that the prognosis after an operation for breast cancer is largely dependent upon the thoroughness with which the operation is performed. Axillary recurrence, which is hardly ever seen after a thorough operation, is common after the inadequate ones which are the far too frequent handiwork of the 'occasional' surgeon.

As regards operation statistics, it may be doubted whether they are of great value, since they depend so largely upon the stage at which the case is first seen, upon the mode of selection of cases regarded as suitable for operation, and upon the thoroughness of the operation.

In my own series of cases—perhaps an unduly large proportion have been advanced ones; moreover, no case, however late, has been refused operation if there seemed to be any reasonable prospect of benefit. Of the cases I have been able to trace, rather more than 50 per cent have remained free from recurrence for three years and upwards. It is probable that further improvement on these results must be sought in the better education of the public to a recognition of the early signs of cancer. It would not be fair to attempt to improve them by a more rigid selection of cases, for the practice of operation for statistics is now rightly condemned by surgical opinion. Included in my series are two cases, which were both absolutely inoperable by all ordinary rules, in which the patients were able to do full work for periods of five and two years respectively after the operation.

Amongst the cases of breast cancer operated on by Dr. Halsted and his associates in the Johns Hopkins Hospital and other hospitals in Baltimore, the cures reckoned five years after the operation are about 40 per cent. If, however, the cancer is seen in such an early stage that the diagnosis can only be made by an exploratory incision, and if the complete operation followed immediately on the exploratory incision, 80 per cent of the patients remained well after five years. According to Bloodgood, who gives these statistics, the outlook is entirely different if the radical operation is not carried out at the same sitting as the exploratory one. Should an interval elapse between these two procedures, Bloodgood states that the probability of the five-year cure is reduced from 80 per cent to about 43 per cent. The experience of Bloodgood in this respect is not in accordance with my own. I do not believe there is much danger in the separation by a short interval between the exploratory and the radical operation, although it is desirable to combine the two.

The most favourable undoubted statistics of the operation for breast cancer are those recently obtained by Professor W. R. Rodman, of Philadelphia, and brought forward by him at the London Clinical Congress of American Surgeons in August, 1914. These statistics refer to 50 private cases operated upon three or more years ago. Of this number, 13 are dead, 4 has a recurrence in the mediastinum after three years of apparent good health and is accordingly reckoned among the dead, and the remaining cases, constituting 72 per cent of the total, are well after three years. As Dr. Rodman says, these

results could not be obtained in hospital practice. Private patients apply earlier, offer better resistance, and will keep under observation indefinitely, thus permitting a second operation if necessary. Several of his cases have been saved by second operation, a point in which his experience agrees with my own. Dr. Rodman adds that some of his cases were so early that a clinical diagnosis of cancer could not possibly be made until after histological examination. These results, which have not been equalled in this country, probably indicate that in the United States the public are better educated in regard to the danger of cancer, and, dreading operation less, seek advice in an early stage of the disease. The further improvement of English results depends upon the education of the public in this direction.

I may add that Dr. Rodman accepts my own conclusions as to the mode of dissemination of carcinoma, and that the operation he practises is in accordance with the conclusions of the permeation theory of dissemination.

**Prognosis after Recurrence.** It is too much the custom to abandon hope and sit with folded hands when, after an operation for breast cancer, recurrence has declared itself. It is true that in such cases the ultimate outlook is generally bad; but if the recurrence is recognized promptly and treated vigorously, it may be possible to prolong the patient's life for at any rate some years.

The modern operation for cancer, followed up by a prophylactic course of *x* rays, has practically abolished the irregular recurrences beneath the flaps, and in the immediate neighbourhood of the scar, which were so frequently seen before the centrifugal spread of the disease in the lymphatic plexus of the deep fascia had been detected. Now that the nature of the process of permeation is understood, it is possible to avert such recurrences by properly 'centering' the operation on the point of origin of the growth, and by paying special attention to the removal of a maximal circular area of the deep fascia—an area of which the point of origin of the growth must always be the centre.

After a well-designed operation, recurrence, if it takes place, will usually be found in one of two places: either in the upper intercostal spaces—second, third, and fourth—originating from glands of the anterior mediastinum which were already infected at the time of the operation, or it may be found in the supraclavicular glands. Submammary, cutaneous and fascial, subclavian, or visceral recurrence may also occur.

**Intercostal Recurrence.** The first variety of return may be described as intercostal recurrence. It is signalized by the appearance of fusoid nodules, at first inadherent to the skin, at the inner ends of one or more of the intercostal spaces mentioned. In such cases further operation is useless. But though such cases are apparently hopeless, they have been treated successfully by several methods. Halsted has used the actual cautery with success. I have employed for their treatment the method of secondary *x* rays, in which metallic particles

injected into the tissues, and subsequently exposed to *x* rays, become themselves the source of secondary soft *x* rays. An injection of a suspension of barium carbonate is made at the edge of the sternum in the infested space or spaces, and the area is subsequently vigorously *x* rayed. I have more than once seen the recurrence vanish under this treatment, which I began to use six years ago; sometimes, on the other hand, the disease proceeds on its course unchecked. One of my patients with this apparently hopeless form of recurrence has now been well over five years since the *x* ray treatment commenced. It is probable, however, that radium will become the agent of choice in the treatment of intercostal recurrence. A 50-migram tube of radium is embedded in or over the nodule for a period varying up to twenty-four hours. Within a few weeks the nodule often completely disappears, and the disease may remain quiescent for several years at least. It is too early to say whether a permanent cure may result. The application of radium to the surface of the skin is a much less effective method, and cannot be recommended.

*Supraclavicular Recurrence.* If the patient is seen at regular intervals subsequently to the primary operation, and is carefully examined, recurrence in the supraclavicular glands will be detected at a time when the glands are still freely movable and not of great size. In these circumstances there can be no doubt whatever that the right treatment is operative; but it is useless to perform a limited form of operation restricted to the parts below the omohyoid. The whole of the posterior triangle must be cleared of its glands, from the mastoid process down to the sternoclavicular joint, and outwards as far as the edge of the trapezius. The tissues containing the glands should be removed in one piece. The operation required is an extensive one, and it is necessary to open the carotid sheath, and to carry the dissection down to the near neighbourhood of the thoracic duct, removing all the tissues between the sternomastoid and the scalenus anticus. The operation is not one which should be undertaken by the inexperienced. My experience shows that freedom for five years or more may be hoped for, and that almost always the patient will be freed from the terrible prospect of a mass of growth fixed to the brachial plexus and causing agonizing pain. If the disease returns, it is likely to do so in a painless form within the chest. It is advisable at the time of operation to introduce one or more tubes of radium beneath the flaps, for a period of twenty-four hours, with due precautions to prevent injury to the skin flaps.

The foregoing remarks apply to early supraclavicular recurrence. If the glands are large, and especially if they are fixed, an operation is rarely advisable, and if it is performed, local recurrence is very likely to take place. In this event the recurrence will be a diffuse one, and the patient's condition is rather aggravated than improved by the operation.

*Submammary Recurrence.* If after an operation nodules appear over a region corresponding to the area of contact of the breast with

the chest wall, and if these nodules are adherent to the ribs and muscles but not to the skin, it may be inferred that at the time of the operation permeation had extended into the lymphatics of the intercostal muscles. Under these circumstances recurrence is of course inevitable, unless the prophylactic course of  $x$  rays is able to destroy the remaining cancerous foci. This form of recurrence, though unavoidable, is fortunately not common. It may be spoken of as subcutaneous recurrence.

*Cutaneous and Fascial Recurrence.*—The form of recurrence which follows inadequate operation for breast cancer is usually that known as local recurrence, in which nodules appear near or at the seat of the operation. If these nodules are cutaneous, i.e., fixed to the skin, they should be excised if they are near the scar; but if they occur at the periphery of the field of operation, or are fixed to the deep fascia, they probably indicate inadequate removal of the deep fascia, with widespread and inoperable extension of the disease in that layer. Under these circumstances the only treatment is by  $x$  rays, intensified by bismuth injections, and the ultimate outlook is a bad one.

*Subclavian Recurrence.*—When during an operation for breast cancer the subclavian glands are left behind, these glands are usually the seat of recurrence. This is a term which is extremely likely to occur in the practice of inexperienced operators. The subclavian glands are situated beneath the costocoracoid membrane, below the clavicle and above the pectoralis minor, at the extreme apex of the axilla. Recurrence in these glands is indicated by a lump deeply situated behind the pectoralis major and immediately below the clavicle. As this lump may become adherent in the later stage, simulating a deposit of cancer in the clavicle itself.

The prognosis in subclavian recurrence is a very grave one, though operation, if undertaken early, and followed by vigorous radiation, is not entirely hopeless, especially if it be combined with the use of radium.

*Visceral Recurrence.*—When signs of the return of the disease in the interior of the thorax or abdomen have made their appearance, it is possible to give a precise prognosis. Before the disease has reached the visceral cavities, a cautious man will often refuse to give any estimate of the duration of life; it may vary from a few months to twenty or thirty years. When the signs of visceral return are manifest, it is an almost invariable rule that the patient will die within a period not exceeding a year, and not usually exceeding six months. In such cases treatment is of no avail, though it has appeared to me that sometimes open-air methods or the lines of sanatorium treatment for phthisis have somewhat deterred the inevitable result.

#### **Influence of X-ray Treatment on Prognosis.**

*Prophylactic X Rays.*—A course of prophylactic  $x$  rays subsequent to the operation for breast cancer should never be omitted. It is known that, at any rate in some cases,  $x$  rays may cause the atrophy and disappearance of large masses of cancer cells. How much more



effective; therefore, they must be when applied to small undetectable groups of cancer cells which may possibly lurk in the tissues subsequent to an operation for breast cancer, especially since by the removal of the breast these microscopic groups are brought nearer to the surface instead of being protected by the whole thickness of the breast. But the value of  $x$  rays does not rest on *a priori* considerations. My own experience conclusively proves their value. In my series of cases, only four or five times has recurrence been observed in the skin or subcutaneous tissues; in all of these cases, with at most one exception, the patient for one reason or another had escaped the prophylactic course of  $x$  rays which I give to all my cases. The facts are rendered more striking when it is remembered how small a proportion the cases which escaped post-operative  $x$  ray treatment bear to the total number of cases.

The value of  $x$  rays in the treatment of masses of cancer cells of microscopic size is smaller, but an undoubted one; such masses are usually accompanied by widespread microscopic ramifications of the disease, which may very probably have extended deeply, even to the pleura, beyond the range of  $x$  rays. Consequently, though these nodules may shrink or disappear in such cases,  $x$  ray treatment is usually only of temporary value.

*Secondary X-Ray*.—Professor C. G. Barkla some years ago called attention to the fact that metallic particles bombarded by  $x$  rays gave off secondary  $x$  rays. He suggested the possible therapeutic application of this observation, and for some years past I have been employing injections of bismuth carbonate in cases of breast cancer to intensify the action of  $x$  rays by acting as a secondary source of them. I am strongly of opinion that the method is a valuable one, and that in certain cases it entirely alters the prognosis. The most striking of my cases was that of a patient in whom, three years after the operation for breast cancer, intercostal recurrence showed itself. This form of recurrence, so far as my previous experience went, seemed absolutely hopeless. I injected bismuth into the intercostal spaces, and  $x$  ray treatment was vigorously carried out by Mr. C. R. Lyster. The nodules completely disappeared, and at the present time (five years later) the patient remains quite well.

**Influence of Radium Treatment on Prognosis.**—Speaking generally, and bearing in mind that radium has a purely local action of limited range, its field of usefulness in cancer of the breast is restricted by the fact that, except in early cases for which operation is the only trustworthy treatment, the area of extension of the disease is too large to be dealt with by the amount of radium ordinarily available. Owing to this feature of the disease,  $x$  rays in a majority of cases provide a more suitable form of radiation. But if a recurrence is strictly local and limited, as is often the case, for instance, in intercostal recurrence, radium possesses one great advantage over  $x$  rays. It is possible to introduce the source of radiation into the centre of, or in close proximity to, the focus of disease, and thus to give a dose

of relation which could never be applied through normal structures such as the skin without grave injury to them. In old persons too feeble for operation, radium may be buried in the primary growth as a preliminary to *x*-ray treatment, especially if the growth is too massive to be penetrated by *x* rays from without. Radium is also suitable for the treatment of localized recurrent nodules which resist, or are not easily accessible to, *x* rays.

Marked and complete retrogression may occur in local masses of cancer cells subjected to radium, but only in rare cases can a cure of the disease be hoped for—namely, in cases where such a single mass of cancer cells is the only focus of growth present, and is unaccompanied by microscopic extensions of the disease in other parts.

**Influence of Pleural Adhesions on Prognosis.**—It is an interesting fact and one which should be taken into account in estimating prognosis, that obliteration of the pleural cavity checks dissemination to an appreciable extent. This I have been able to show by analysis of the statistics of the Middlesex Hospital cancer wards. Marked pleural adhesions were present in 37 of the 329 cases. Cancerous invasion of the pleura was present in only 11 of these 37 cases, or 29 per cent, while of the sum total of Middlesex Hospital cases 14 per cent showed pleural invasion. In 3 of these 11 cases the adherent pleura on the side of the growth had escaped invasion, while the opposite non-adherent pleura was cancerous.

Doubt may at first appear to be thrown on this evidence of the protective action of an adherent pleura by the fact that only 30 per cent of the cases with pleural adhesions were absolutely free from metastases, as compared with 33 per cent of the sum total of cases. But the protective action of an adherent pleura extends only to the thoracic cavity. It has been shown that in a large proportion of cases invasion of the abdomen occurs, not by way of the thorax, but directly through the epigastric parietes. Pleural adhesions do not check this process; perhaps, indeed, their resistance to the deep extension of the growth may accelerate the progress of fascial permeation, and so actually favour epigastric invasion. It is a most striking fact that 22 per cent of the 37 cases with marked pleural adhesions showed the abdomen invaded by cancer and the chest free, while only 12 per cent of a total of 329 cases showed a similar state of affairs. The converse inference is equally striking. While 22 per cent of the Middlesex Hospital necropsies show the thoracic cavity invaded and the abdomen free, only 5 per cent of the cases with pleural adhesions show a similar state of affairs. These facts are a strong indirect testimony both to the frequency of epigastric invasion and to the protection afforded by pleural adhesions to the thoracic cavity. Incidentally they provide a strong argument against the embolic theory, showing that invasion of the abdomen and invasion of the thorax are independent events.

The foregoing facts convey a therapeutic suggestion—namely, that if the pleural cavity on the affected side could be obliterated by

artificially induced adhesions, life might be prolonged. Unfortunately the injection of irritant fluids into the pleura is known to be attended by danger. In two cases in which there was evidence of early pleural involvement at the base of one lung I have injected radium emanation, and a sterilized suspension of bisulphite carbonate, respectively. In the latter case the injection was made as a preliminary to x-ray treatment. In neither case did any benefit result. W. Simpson *Hanley*.

**BREAST, SIMPLE DISEASES OF.** We shall consider the prognosis of (1) *Chronic mastitis*; (2) *Tuberculosis*; (3) *Fibro-adenoma*; and (4) *Paget's disease of the nipple*. None of these diseases involves any direct danger to life, and the interest of the prognosis centres around the possibility of the subsequent development of cancer.

1. **Chronic Mastitis.** In young women this condition presents no immediate danger. After the age of forty it is to be regarded with grave suspicion. Very convincing evidence has now accumulated to show that cancer of the breast, like cancer elsewhere, is invariably preceded by chronic inflammation. Bryant found a history of mastitis in 80 out of 360 cases of cancer. Microscopically, Beadles was able to demonstrate pre-existing mastitis in every one of 100 breasts removed for cancer at the Brompton Cancer Hospital, although in the majority of the cases no signs had been evident clinically.

Quite apart from the possibility that mastitis may give rise to cancer, there is the very serious question of the uncertainty of the diagnosis of a lump in the breast. It is a sound surgical rule, at any rate after the age of thirty-five, that any lump in a woman's breast is better out than in.

2. **Tuberculosis.** This is a very chronic disease, with no tendency to spontaneous cure. The breast eventually becomes riddled with abscesses, and in about 20 per cent of cases phthisis finally develops. It is wise, therefore, to effect an early clearance.

3. **Fibro-adenoma.** Generally speaking, a mobile, well-encapsulated lump in a breast, confidently diagnosed as fibro-adenoma, is safe enough, and for years it does not alter in size. Microscopically, however, it is common to find that a recently observed tumour shows fibro-adenoma becoming malignant. There are a few cases on record of even old-standing and encapsulated swellings undoubtedly innocent, eventually becoming carcinomatous. One of these is in the museum of St. Bartholomew's Hospital.

Removal of a genuine fibro-adenoma, verified as such by the microscope, is very rarely followed by recurrence.

4. **Paget's Disease of the Nipple.** This is not really a benign condition. If an apparent eczema of the nipple, in a woman over forty, fails to respond to treatment, and becomes red, raw, and angry, it is almost certain that the breast is already cancerous, though nothing can yet be felt. The tumour will become evident, generally in one to two years; but in rare cases it may be delayed for ten years. Fortunately the cancer is often of a slow type. The prognosis is, therefore,

that of scirrhus. If treated by early radical removal on the lines of the modern operation for cancer of the breast, the results are as good as in the most favourable types of scirrhus, but exact figures are not available. Radium and *x* rays will frequently anchorate the carcinoma, but will not prevent the onset of the cancer. *A. Rendle Short.*

**BRIGHT'S DISEASE.** (See NEURALGIA.)

**BRONCHIAL ASTHMA.** (See ASTHMA, BRONCHIAL.)

**BRONCHIECTASIS.** When this is the sequel of measles or of whooping-cough in childhood, and the dilatation is moderate, recovery, often complete, is probably the rule rather than the exception provided that death does not result owing to the severity of the primary disease. The more diffuse the bronchiectasis the worse is the prognosis, and consequently cases which are raised by pleural effusion, collapse of the lung, and especially unresolved pneumonia, usually run a short course than those due to chronic bronchitis.

The disease in a few cases runs an acute febrile course; but in the majority the tendency is towards chronicity, and instances are on record in which life was prolonged for forty to fifty years.

The prognosis in an individual case is difficult, for it is hard to estimate the risk of the complications which are usually associated with a fatal termination. The more immediate modes of death are tetanus, bronchopneumonia with septic absorption, hæmoptysis, pneumothorax, gangrene, tuberculosis, cardiac disease, metastatic abscess (especially cerebral abscess), and cardiac and renal complications. In connection with this point, Lebert's figures of the effect of the disease on the general health in 80 cases are interesting:

LEBERT'S 80 CASES SHOWING THE EFFECT OF BRONCHIECTASIS  
ON THE GENERAL HEALTH.

Condition	Number of Cases	Percentage
Good health	17	21
Slight but distinct disturbance of health	28	35
Marked disturbance without complication	15	19
Marked disturbance with complications directly resulting from the disease	3	4
Marked disturbance with accidental complications	*17	21

Lebert gave the following figures as representing the duration of the disease in 52 cases: Under one year, 21.1 per cent; one to two years, 7.7 per cent; three to five years, 39.7 per cent; six to ten years, 15.5 per cent; over ten years, 25 per cent.

In an individual case, the general nutrition and the amount of absorption of bacterial products, the age of the patient, the extent to which his functional and other circumstances allow of adequate protection and medical care, and the presence of complications, must be taken into account. If there is little evidence of absorption of bacterial products, if the patient is well nourished, and if he can be properly safeguarded, the prognosis is, on the whole, towards chronicity. When, however, the complications previously mentioned occur, and especially when there is septic absorption, the prognosis is grave. The effect of the absorption of bacterial products upon the nutrition, and hence the tendency to fatal complications, has been diminished by the effective use of creosote baths. Again, suitable treatment by vaccines, though it does not cure the disease, in some instances does tend to diminish the septic character of the expectoration and may render it odourless. Further, vaccine treatment appears not infrequently to reduce the number of intercurrent attacks of bronchopneumonia, pleurisy, and bronchitis, which do so much to undermine the patient's powers of resistance.

In generalized bronchiectasis, surgical measures are of no avail. Favourable results have been reported as the result of operation in cases in which there is a single dilatation, but in the majority even of these cases life is not prolonged by surgical means, and in not a few death may come sooner as the direct result. It is possible, however, that better results will be obtained by more modern methods.

*Arthur L. Coon*

#### BRONCHITIS.

**Acute Capillary Bronchitis.** This condition is always associated with some bronchopneumonia. It rarely attacks previously healthy persons, and is especially fatal to young children and old people. A severe attack in an infant may be fatal within twenty-four hours; an aged person may succumb in a few days.

In estimating the prognosis, we have to take into account the general surroundings and previous health of the patient. Unfavourable signs are failure of either the respiratory, circulatory, or nervous systems. Thus, the outlook becomes grave if there is recent dyspnoea, or lessening frequency of cough or cessation of expectoration owing to feebleness; cyanosis or other signs of right heart failure; delirium, coma, or convulsions.

**Acute Bronchitis of the Larger Tubes.** In mild cases the duration is as a rule from ten to fourteen days, but severe cases seldom last less than three to four weeks. Recovery is always slow if emphysema is present. There is a considerable tendency towards relapse, and the precautions taken to avoid this have much influence on both the immediate and remote effects. The disease is rarely fatal, save in young children and old people, in the acute asthmatic type, or when the disease is a complication of nephritis, heart disease, diabetes, chronic bronchitis associated with heart failure, or emphysema; but the mortality is largely affected by adequate treatment. Signs of

danger are: marked cyanosis, pulsating veins in the neck, great dyspnoea, short ineffective cough with cessation of expectoration, equal irregular pulse, cold clammy skin, and a tendency to sink down in the bed.

**Chronic Bronchitis of the Larger Tubes.**—In young people marked improvement often occurs, and in a fair proportion of cases all urgent symptoms eventually disappear. After middle age there are few complete recoveries. This is chiefly owing to the recurrence of acute attacks and the increase of emphysema, more especially when the disease is dependent upon or associated with cardiac or renal disease. The course of the disease is, however, usually prolonged. The intensity of the symptoms, and hence the duration of the disease, are much affected by climatic conditions and by the amount of care the patient can devote to his health. Much can be done by medical treatment, such as vaccine therapy, to ward off acute attacks and to lessen the cough and strain upon the heart, while pressure baths often have a favourable influence upon the emphysema.

*Plastic Bronchitis* affords a fairly good prognosis, and patients have been known to live for more than twenty-five years from the commencement of the symptoms. There is a tendency towards the development of ordinary bronchitis with its usual complications, and cases are recorded in which the casts have led to suffocation.

**Purulent Bronchitis.**—Epidemics of purulent bronchitis have been studied during the war both in France and at Aldershot. The cause of the disease appears to be the influenza bacillus. It is possible that pneumococci present in the lung develop a higher degree of virulence by symbiotic growth, and that the fatal termination, which may occur in as high a proportion of cases as 25 per cent, is due to a pneumococcal septicaemia.

*Arthur Latham*

**BRONCHOPNEUMONIA.** This disease is always associated with some capillary bronchitis. The prognosis is grave in every severe case, and the mortality may be as high as 30 or even 50 per cent. It is greatest in young children, and especially so below one year of age. In young infants, and in rickety or badly nourished children brought up under insanitary conditions, the probability of a fatal termination is always considerable. This is especially true of bronchopneumonia complicated by whooping-cough. The greater the extent of the disease the graver is the outlook. Primary cases have a lower mortality than secondary ones; thus, bronchopneumonia following bronchitis has a mortality only half as great as bronchopneumonia following diphtheria. The chief immediate dangers are heart failure, convulsions, and hyperpyrexia; that is to say, the amount of toxæmia in relation to the patient's strength, and the extent of the disease, are the determining factors. Convulsions at the commencement of the disease have not so much significance as those of a later period. The character of the pulse is usually a better guide than the rate of

breathing—a feeble, rapid, “rattling” pulse is of graver significance than rapid respiration.

Bronchopneumonia may in a few cases lead to enlargement of the bronchial glands to a sufficient extent to be a source of trouble later on, to bronchiectasis, or to tuberculosis. As a general rule, bronchopneumonia which is an immediate sequel to an acute infection, such as diphtheria, is seldom if ever tuberculous, even though it runs a prolonged course and gives rise to great suspicion. On the other hand, a bronchopneumonia which commences more or less insidiously is often tuberculous in its origin, and is then nearly always fatal.

It is impossible to give the average duration of the disease, as cases vary so much according to the patient's previous condition and power of reaction. In all cases there is a great tendency towards relapse, and much care is required in convalescence, especially with regard to exposure.

In my experience, the administration of 5 c.c. of fresh normal horse serum by the mouth in the early morning so long as fever continues has had a marked effect in reducing the mortality of this disease.

*Arthur Latham.*

**BULBAR PALSY.** Chronic bulbar paralysis of nuclear origin is, pathologically, the same disease as progressive muscular atrophy (*see Muscular Atrophies*), but affecting the motor nuclei in the medulla. Its course is slow and insidious, and the prognosis is always unfavourable, most cases succumbing within a year, or at most two years, from the onset of the bulbar symptoms. Sometimes the disease appears to be retarded, or even, for a few months, temporarily arrested, by the hypodermic administration of strychnine in full doses.

Sudden, so-called apoplecticiform, bulbar palsy is always vascular in origin: it is generally due to arterial obstruction, and especially to syphilitic thrombosis. Where the bulbar palsy takes several hours, or even a few days, to develop (a less common occurrence), the condition is dependent upon acute inflammatory changes in the medullary nuclei, exactly similar to those which occur in the spinal cord in acute anterior poliomyelitis. The prognosis as to life in these two classes of bulbar paralysis is relatively good if the patient survives the acute stage, since the lesion is not a progressive one. The actual bulbar symptoms, however, remain stationary, for the nuclear disease is irremediable.

Other cases of bulbar paralysis are due to infranuclear and extramedullary lesions, implicating the motor nerves of the bulbe below their nuclei of origin. Such cases occur in tumours, and in chronic meningeal affections, syphilitic or tuberculous. The symptoms develop much more slowly, and are often asymmetrical, and even unilateral, in distribution. Save in the cases of syphilitic origin, the prospects are unfavourable.

In **Pseudo-bulbar Paralysis**, where the patient has the same difficulty in articulation, deglutition, and phonation as in ordinary bulbar palsy, but without atrophy or fibrillary tremor of the affected muscles,

the cause is entirely different. The lesion in such a case is a bilateral supranuclear one, situated in the pyramidal tracts. The common history is that of a patient who has had an ordinary attack of hemiplegia, without bulbar symptoms: he may have repeated attacks of this sort on the same side, all without the slightest bulbar phenomenon; at last, however, he has an attack of hemiplegia, slight or severe, on the opposite side: at once bulbar symptoms supervene, articulation becomes slurring, and deglutition becomes difficult. The sequence of events is so characteristic, that when we meet with a hemiplegic patient who has pseudo-bulbar symptoms, we can confidently diagnose

bilateral pyramidal lesion. The prognosis in pseudo-bulbar palsy is less grave, as regards life, than in true bulbar palsy—since the pseudo-bulbar symptoms do not tend to get worse, and may even improve to a considerable extent. The real prognosis depends on the cause which has produced the bilateral hemiplegia. (See STROKES I.)

*Purvis Stewart*

**BURNS AND SCALDS.** A burn may of course vary in degree from the most trivial accident to an inevitably fatal destruction of an enormous skin area; but there are several points of importance which may guide us in prognosis.

**The Nature of the Burn.**—Skin area, not depth, is the determinant of the prognosis, except of course in rare instances where the abdomen can be opened. Thus a burn of the sixth degree involving the foot or lower part of the leg is not so dangerous as a widespread burn of the second degree involving the trunk and limbs. Third degree burns, involving the sensitive papillae of the dermis, are particularly depressing. It is probably true that burns of the abdomen are the most serious.

If one-half of the body surface is burnt, death is inevitable; in the great majority of cases, a burn of one-third will also be fatal. In hospital practice about a third of the cases admitted die; this of course varies with local custom, pressure on the beds, etc.

**Influence of Age.** Children and aged persons are decidedly the most liable to die from the shock of a burn.

**The Time Factor.** In the majority of the fatal cases, death takes place within forty-eight hours (128 out of 207 cases, Choyce), and no doubt most of these patients die from shock. Stupor, shallow breathing, prostration, and a quick weak pulse point to a probable fatal termination. There is, however, a curious group in which symptoms appear to be due, not to shock, but to some scorching change in the blood. Such cases may, for instance, develop signs of cardiac thrombosis two or three days after the accident, with dyspnoea, pain over the heart and very irregular pulse; duodenal ulcer is probably another evidence of the same blood changes. Recurring vomiting may be due to a similar cause, and is of very grave import.

If the patient survives the first few days, the prospect of recovery, but from complications, depends upon how effectually suppuration can be controlled. Pneumonia, pericarditis, and nephritis appear to be due in nearly every case to pyæmia from suppuration.



**The Effect of Treatment.** There is no doubt that careful treatment may make all the difference between life and death in a considerable number of the cases. Extensive lesions of the skin do not produce shock in animals or in man under an anæsthetic, and the shock of a burn is due principally to pain, and can be controlled by efficient doses of morphia. The early dressings ought to be rendered painless by chloroform or morphia, for this reason. Warmth is a very important factor in saving the patient's life. The blood changes are probably beyond our control. The writer has shown that in some cases of severe burn the specific gravity of the blood is much raised, and the administration of saline is urgently indicated.

If the burn is not so extensive as to be inevitably fatal, it is well worth while to take particular care to prevent sepsis later. If the injured area has been touched, it should be surgically cleansed under an anæsthetic. Reliable antiseptics, like oil of eucalyptus (1 in 20 in olive oil), improve the prognosis, and so does a boracic bath applied for several hours daily. But cases have undoubtedly been lost by drug poisoning. The incessant vomiting and dermatitis of boracic poisoning are not as well recognized as they should be.

**Complications.** *Pneumonia, pericarditis, and nephritis* can usually be prevented by proper asepsis. *Duodenal ulcer* does undoubtedly occur, usually a week or ten days after the burn, but it is rarer than was formerly supposed. Moynihan, in his classical study of duodenal ulcer, was able to find only the nicest handful of authentic cases. Out of 138 deaths from burns at St. Bartholomew's Hospital, Lockwood found only 4 duodenal ulcers, with 2 other cases showing perforation or hemorrhages. In a few rare instances the ulcer has caused death from perforation or hemorrhage. These ulcers are probably due to microscopical embolism of the duodenal arteries on account of the blood changes, followed by self-digestion by the juices of the stomach or pancreas.

*Tetanus* is not very rare as a complication of a burn, and particularly if it is earth-injected. Fourth of July tetanus following burns from fireworks is well known in America. Patients with earth-injected burns ought to be given a prophylactic dose of antitetanic serum.

*Contracture with deformity* is a very distressing late complication of burns. It only occurs if the whole thickness of the skin is destroyed. Something can be done to prevent it by liberal skin-grafting. The writer has seen one case in which it led to dislocation of the hip-joint.

*Keloid and epithelioma* may develop in the scar of an old burn. *Acute* burns appear to be particularly liable to undergo malignant change, several members of our own profession having fallen victims.

**Scald of the larynx.** Children who have been trying to drink from the spout of a kettle are liable to this accident. Unfortunately there may be no signs at all, or at most only a little hoarseness, for several hours, and lives have been lost by children being sent away from a hospital at this stage. A few hours later they are brought up again with laryngeal stridor, cyanosed, and struggling for breath.

when even an immediate tracheotomy may be too late to save the situation. With proper supervision and prompt interference, if necessary, there is no great danger. *A. Rendle Short.*

**CÆCUM, TUBERCULOUS.** This somewhat uncommon disease is usually diagnosed as carcinoma, forming, as it does, a hard tumour-like mass in the cæcum. We have not much information as to the natural course of the complaint. It is customary to remove the cæcum. The mortality after removal by operation is given as follows: Of 58 cases in the literature since 1900, 12 per cent died (Hartmann); of 130 other cases in the literature, 30 per cent died after excision, and 17 per cent after short-circuiting (Nikol'ski) of the cases of four surgeons since 1907, 25 per cent died (Einfeldstein). The last figure is probably a fair approximation to the truth.

If the patient survives operation, a cure usually results.

*References.*—Amkelstein, *Arch. J. Clin. Chir.*, 1903, July, 1936; *Med. Mag., Reichel's System of Operative Surgery.* *A. Rendle Short.*

**CALCULI, PROSTATIC.**—(See PROSTATIC CALCULI.)

**CALCULI, RENAL.**—(See KIDNEY AND URETER, CALCULI OF.)

**CALCULI, VESICAL.**—(See BLADDER, CALCULI OF.)

**CANCER.**—(See VARIOUS ORGANS.)

**CANCRUM ORIS.** This term should not be used for cases of very stomatitis unless there is black sloughing of the cheek. Interfered in this way, the prognosis is very grave—it is given by Keen as 75 per cent. Death takes place within ten to fourteen days. Even if the child recovers, there is usually a horrible deformity which will require much skill and many operations to remedy.

The outlook in a particular case depends on the extent of the ulcerating and on the degree of toxæmia. If the patient is already run out by measles or other illness, if there is a poisoned look, high fever, weak pulse, or coughing, death is almost inevitable. The best hope of recovery is in a case seen early, not extensive, promptly treated, and with little toxæmia. *A. Rendle Short.*

**CARBUNCLE.**—Although usually not a dangerous disease, it must always be borne in mind that a large carbuncle involves serious danger to life when it occurs in a vascular part, such as the lip or face; also in elderly, alcoholic, diabetic, or broken-down individuals. Spreading in spite of treatment, delirium, pyæmic abscesses, or rigors all mean a grave prognosis. Of cases sufficiently severe to be admitted to a hospital, about half die. *A. Rendle Short.*

**CARCINOMA.**—(See VARIOUS ORGANS.)

**CARDIAC SYPHILIS.** As this subject is largely covered elsewhere in this volume, by articles on aortic valvular disease, angina pectoris, and so on, a short note is added under this heading merely to coordinate the leading facts.

The effects of syphilis on the heart and aorta are threefold, in that the infection attacks the aortic wall, the aortic semilunar valves, and the myocardium itself through the medium of the coronary arteries. It is the relative severity of its attack on these three several parts of the circulatory apparatus that determines the prognosis. When it is the aorta that suffers most, and an aneurysm is produced, this throws so powerful an extracardiac bias into the situation that the whole outlook is practically conditional on the behaviour of the aneurysmal sac. Equally, therefore, when we speak of the prognosis in cardiac syphilis it is of the valvular and myocardial lesions that we are thinking. Here it may be remarked that timely recollection of the possibility of a syphilitic element in aortic regurgitation and obscure cases of angina and myocardial weakness, will stimulate investigation by means of the Wassermann reaction, searching for signs of cerebrospinal lesions, and so on, and discovery of information that will be of the utmost service for prognosis as well as treatment.

**Prognosis as to Life.** The life prospects of these patients have been analyzed by Dencke, of Hamburg. He found that about half died within two years of the initial diagnosis, about two thirds within three years, and about four fifths within four years. It is true that these figures—drawn from the histories of 124 patients, do not exclude cases of aortic aneurysm—but he shows that the outlook is only twice as bad when there is an aneurysm, with or without valvular incompetence, as it is in cases of aortitis without aneurysm, and further, that the prognosis is nearly as bad in cases of valvular insufficiency without aneurysm as it is when aneurysm is present. Mitchell Bruce found that the average expectation of life in cardiac syphilis, from onset of symptoms to death, was between five and six years.

The great proneness of these cases to a sudden end is notorious. One of the physicians at whose feet the writer sat as a student used to emphasize this by telling stories of patients who had died on the doctor's doorstep, "with a gummy in the heart and an iodide prescription in the pocket." In 74 fatal cases observed by Dencke, the end was sudden in no less than 33 (24) if deaths from bursting aneurysms be excluded. Of Mitchell Bruce's cases of cardio-aortic syphilis, aneurysms excluded, 50 per cent died suddenly. This insecurity of life is due to the fact that, as Harlow Brooks and others have shown, gross myocardial lesions are to be found in a large majority of all cases of cardio-aortic syphilis.

Apart from the development of aneurysm, the factors of danger in cardiac syphilis are, first, damage to the myocardium, and second, addition to its work by failure of the aortic valves. Of these the first is clearly the more important by far; so that in seeking to form an

opinion as to the prospects in any individual case, the most important data are those that bear on the condition of the cardiac muscle.

The evidences of ventricular disease may be local or diffuse. The former class includes the signs of acute obstruction of a coronary artery or branch—development of a pericardial rub following a severe attack of precordial pain with faintness; also signs of gradual coronary obstruction, or rather of its chief result, formation of an aneurysm of the heart; and heart block. Of these, the two first are the more immediately prophetic of sudden death, and indeed there is nothing of more ominous significance in these cases than the appearance of a pericardial rub, even where this has been preceded by no other evidence of infarction. Anything indicative of coronary obstruction carries with it a threat of sudden death. With heart-block it is a little different, for its appearance can only endanger the patient's life if it is accompanied by synopal or epileptiform attacks. Although the type of lesion conjured up in the mind by the term 'myocardial syphilis' is local, yet it must never be forgotten that these same local lesions are really the macroscopic expression of a widespread interference with the nutrition of the heart muscle by disease of the coronary arteries. Hence we must look out for and correctly interpret such symptoms as recurrent precordial pain on exertion, dyspnoea, puffiness of the ankles, alternating pulse, all these prove that the ventricular muscle is hard hit and likely to give out at no distant date.

Although it is true that the myocardial factor is in general the more important, yet there are cases of cardiac syphilis in which the valvular element suddenly takes the centre of the stage. These are the cases in which the aortic valve becomes incompetent quite abruptly, either as an obvious result of some strenuous effort, or without any definite provocation. It is, of course, a difficult matter in most cases to be sure that the valvular failure is really as sudden as it seems, but there is a good deal of evidence, both clinical and pathological, to support a belief in the occasional occurrence of rupture of an aortic cusp already weakened by syphilitic disease. Sudden addition of so grave a task to the work of an already unduly myocardium obviously introduces a new threat into the case. Death may be sudden, but more often the patient's expectation of life is reduced, in a frankly syphilitic

form, from a matter of several years to one of months. The myocardium, though presumably diseased, may adapt itself wonderfully to a new burden if the patient be rested and cared for in the meanwhile.

One other risk has to be borne in mind in cases of cardiac syphilis—that of the development of syphilitic lesions in other vital organs. One man recently under the writer's care with aortic dilatation and incompetence, of heretic origin, died rather suddenly of a large cerebral thrombosis. Dencke found death due to extracardiac causes in about 20 per cent of his fatal cases.

*As to the result of treatment,* Dencke found in his series that thorough treatment with antisyphilitic drugs doubled the patient's expectation of life. The best method of treatment is still a matter of discussion,



MICROCOPY RESOLUTION TEST CHART



APPLIED IMAGE INC.

From the prognostic point of view it may be stated that, as far as is known, thorough treatment with mercury, either by inunction or injection, together with iodides, gives results as good as those following the use of salvarsan, while most observers agree that the latter plan introduces a considerable element of risk, at all events in cases where the evidences of myocardial invasion are at all definite. Even those who advocate salvarsan say that repeated administration is essential and that mercury should be given as well; so that it seems as if the prospect of radical cure were no brighter with this than with the older remedy, adequately employed.

*Carey L. Combs.*

#### CARIES OF THE SPINE. (See SPINAL CARIES.)

**CELLULITIS.** The prognosis in cellulitis depends upon the location, the condition of the patient, and the extent of the disease. Of 889 cases at St. Bartholomew's Hospital, a good many years ago, when the condition was commoner than it is now, 41 per cent died.

Cellulitis of the neck (antrumuloxyen) is still a very grave affection, if at all extensive, on account of the danger of oedema of the glottis and pressure on, or infection of, the air passages. Unless promptly treated, it will usually be fatal.

A cellulitis of the scalp is likely to cause fatal meningitis in some cases; and cellulitis of the arm up to the elbow, or of the leg up to the knee, is a grave condition. If there is black slough, with emphysematous crackling, death will almost certainly take place. Other bad signs are pyæmic abscesses or repeated rigors, delirium at night, or dribbling.

An aged, broken-down, or alcoholic person is not likely to recover from a severe attack of cellulitis.

It is very doubtful if antistreptococæ serum saves many cases; but proper evacuation of the sero-purulent fluid, hot soaking, and, if necessary, amputation of a limb, are, of course, life-saving procedures.

Stiffness of the tendons may be a serious after-trouble of cellulitis of the arm.

*V. Rendle Short.*

#### CERIBELLAR ABSCESS. (See INTRACRANIAL COMPLICATIONS OF EAR DISEASE.)

#### CERIBRAL ABSCESS. (See INTRACRANIAL COMPLICATIONS OF EAR DISEASE.)

#### CERIBRAL EMBOLISM, HÆMORRHAGE, AND THROMBOSIS. (See STROKES.)

**CERIBRAL TUMOUR, MEDICAL.** (See also CEREBRAL TUMOUR, SURGICAL.) Once the diagnosis of intracranial tumour has been established, the prognosis must always be extremely grave. The duration of life, however, varies within the widest limits. Some patients die within a few days or weeks after the first appearance of

symptoms, whilst others survive for two or three years, or even for ten or twenty, though this latter is uncommon. The danger of sudden terminal coma, with death from respiratory paralysis, has always to be borne in mind: and although this termination may occur in tumours situated anywhere within the cranium, it is specially likely to happen when the growth is subtentorial in position. Tumours of the cerebellum, pons, and medulla are therefore relatively more dangerous than those of the cerebrum or those situated in the anterior or middle fossa of the cranial base. Frontal tumours have the longest survival period, as a rule. Sudden death may sometimes occur from spontaneous haemorrhage into a soft glomatous tumour, from rupture of an aneurysm, or from a cysticercus suddenly blocking up the aqueduct of Sylvius or the fourth ventricle.

In other cases, however, patients with symptoms of cerebral tumour show long remissions in their symptoms, or even intermissions, lasting months or perhaps years, during which many of the symptoms clear up, ultimately returning again and leading to a fatal termination. It is not uncommon for single symptoms, such as vomiting, visual troubles, fits, etc., to improve whilst the other phenomena persist. Such remissions and variations in the symptoms are partly explained by changes in the tumour itself. Sometimes a tumour changes its main direction of growth, so that parts of the brain which were originally directly compressed are, as it were, pushed aside, and are no longer directly attacked. In other cases, the tumour undergoes degenerative changes; or it may for a time cease to grow. In others, again, a cystic growth (e.g., cysticercus) may undergo absorption of its contents. In still other cases, where a comparatively small growth obstructs the downward current of cerebrospinal fluid through the ventricles, distending them and producing symptoms of severe intracranial pressure—if the growth slightly alters its position, the ventricular outflow is again established and the acute symptoms subside. In some such cases of internal hydrocephalus, due to pressure from intracranial growths, the cerebrospinal fluid may even find an exit through the cribriform plate at the roof of the nose, and produce a rhinorrhoea affording a spontaneous outflow for the dammed-up fluid, with a corresponding improvement in the symptoms. If a nasal discharge of this sort ceases, the symptoms of intracranial pressure return at once.

Spontaneous cure of intracranial tumours is so rare as to be beyond the bounds of practical prognosis. It occurs now and then, however, in certain aneurysms, which become filled with blood clot and then undergo obliteration. In certain parasitic cysts (e.g., cysticercus and echinococci), the parasite may die and the cyst undergo absorption or calcification. Probably the least uncommon variety of spontaneous regression of an intracranial tumour is in the case of solitary fibrosarcoma, which may undergo partial absorption and calcification. Lastly, under the influence of antisyphilitic remedies, syphilitic gummata may undergo absorption and cure, provided that the syphiloma



is still in the stage of cellular proliferation, and without degenerative or sclerotic changes; in the latter case, a gumma will resist even the most energetic medicinal treatment.

Intercurrent complications, rather than direct intracranial pressure by the tumour itself, may be the cause of death. Thus, respiratory complications are not uncommon, especially in the form of inhalation-pneumonia; or a patient with a tuberculoma may have fulminating meningitis superadded; or he may die from miliary tuberculosis.

*Purves Stewart.*

**CEREBRAL TUMOUR, SURGICAL.** (*See also CEREBRAL TUMOUR, MEDICAL.*) Two recent publications have thrown a great light upon the end results of operation for this condition; these are the report by Tooth of the figures for the National Hospital, Queen Square, and von Eiselsberg's account of the Vienna cases.

**Prognosis apart from Operation.** In the main, of course, the outlook is very gloomy, and the great majority of cases, after intolerable headache, blindness, mental impairment, various forms of paralysis, epilepsy, etc., die in the course of six months to five years. But to this generalization there are important exceptions. The duration may be, and often is, much longer than that described. Many cases are on record in which symptoms of tumour lasted for ten or more years. Tooth, for instance, has found amongst the patients with cerebral tumour discharged from the National Hospital in Queen Square, London, fifty-one who were not operated on, but have survived, on an average, about seven years. About seventy others did not reply, and many are probably dead. In estimating the prognosis, therefore, the length of time that has elapsed since symptoms were first noticed, up to the date of examination, is very important.

The location also is important. Tumours below the tentorium are always liable to cause sudden death by blocking the foramen magnum. Many cerebellar 'tumours' in children are tuberculous, and may lead to fatal tuberculous meningitis at any time. On the other hand, in adults, tumours of the cerebello-pontine angle and of the cerebellum may be innocent; and Tooth reports eighteen cases living, on an average, six years after the onset of symptoms.

With reference to the possibility of cure, it is of course feasible to remove a gumma by early and efficient treatment with mercury and iodides; but there is a tendency to relapse, perhaps in some other part of the nervous system, and the scar may lead to paralysis, loss of sensation, or epilepsy.

Apart from these cases, there are a fair number of instances known in which symptoms, apparently diagnostic of cerebral tumour, have ceased to advance, or even more or less completely disappeared. Some of these were probably cases of serous meningitis (Osler), and a similar confusion may arise in connection with growths of the spinal cord.

The prognosis in individual cases must be founded principally upon

the rate of progress of the symptoms up to the time of examination, and the diagnosis as to the exact nature and location of the growth. Signs of urgency, calling for operation if life is to be saved or made tolerable, are rapidly increasing blindness or optic neuritis, respiratory or cardiac distress, drowsiness or dullness, and intractable severe headache.

**Prognosis when treated by Operation.** It is only a minority of the cases that are suitable for any attempt at radical removal. Bruns could only attack 30 out of 100 cases seen by him, and only three or four of these were permanently cured. At the National Hospital for the Paralyzed and Epileptic, out of 497 patients with cerebral tumour, only 111 were treated by removal of the tumour (about a fifth). As both these series would probably include cases sent up speedily for operation, the proportion amenable to surgical removal in ordinary practice may be even less.

**Operation Mortality.** Three operations have to be considered—decompression, exploration, and removal of the tumour.

**Decompression.**—The mortality of this procedure is not negligibly small. In von Eiselsberg's series, 6 out of 28 died within a month; at Queen Square, 29 out of 80 were fatal in the same length of time. If the patient survives, the results are usually very satisfactory in cases where there is a real rise of intracranial pressure, both in relieving headache and in saving the sight. Cerebral hernia may give trouble afterwards if the dura is opened. The eventual fatality from the continued growth of the tumour cannot, of course, be averted, though it may be postponed.

**Exploration.**—The mortality of exploration at Queen Square was also heavy, 25 out of 74 dying within a month; in von Eiselsberg's series, 16 died out of 35. The death-rate, then, is about 40 per cent.

**Removal of the Growth.**—In the Queen Square series, 31 out of 111 died within a month; and in Vienna, 25 out of 100; so that the mortality is about 25 per cent. The danger is least with tumours of the cortex, and greatest with those of the cerebello-pontine angle; in the latter case, more than half die. The causes of death are shock, cardiac or respiratory failure—which may come on a week or two after the operation—septic meningitis, and occasionally pneumonia. Most of the extirpations (all in von Eiselsberg's series) were done in two stages. Of 168 cases at Vienna, 17 died as a result of the first stage.

**End-results.**—Turning next to the end-results of operation, it will be observed that about a third of the cases at Queen Square, treated by extirpation of the growth, were alive and well some months or years afterwards; but by no means all these were free from danger of recurrence. In von Eiselsberg's series, of 168 cases operated on, only 16 are described as cured, and 23 as improved, giving a total of only about a quarter of the whole. Kuttner's series is unduly favourable, in that cases of hydrocephalus and serous meningitis are included.

## RESULTS OF OPERATION FOR CEREBRAL TUMORS.

I. *Fuchs's Series*—National Hospital for Paralyzed and Epileptic.

Frontal	96	50	73	31	9	13	17	5	22	7
Central	65	54	83	30	1	9	14	1	10	2
Temporal	47	30	61	7	1	1	14	1	9	5
Occipital	14	7	50	2	0	0	3	0	2	0
Cerebello-cerebri	13	6	16	1	1	0	2	1	3	1
Pituitary	14	1	28	4	1	0	0	0	0	0
Cerebellum	74	33	41	11	1	1	11	5	8	2
Extracerebellum	44	36	82	21	13	7	1	1	11	7
Pons	41	4	10				1	1	3	0
Various	49	18		1	1		7	7	10	5
Not located	40	3	7				1	0	2	0
Total	497	265	53	111	31	37	71	25	80	29

II. *Fuchs's Series*—*Lucina* (1901-1913)

Cerebrum	Excision of growth	41	9	10		1	9	6	3	3
	Ligature of angioma	2					0	1	0	1
	Incision of cyst	3		1		1	1	0	0	0
	Diagnosis of first stage	6								
Pituitary Body	Tumour not found	23	9		9		0	2	2	1
		16	1				0	12	0	0
Cerebellum	Excision of growth	5	1	3			0	0	1	0
	Incision of cyst	3					3	0	0	0
	Menigitis serosa	3			2		0	0	1	0
	Diagnosis of first stage	9								
	Tumour not found	12	7		3		0	2	0	0
	Large*	11	10				1	0	0	0
Sigmoid	Small*	4	1				2	0	0	1
	Diagnosis of first stage	2								

\* Size of tumour at operation.

III. *Kuttner's Series* (1907-1912).

Total operations, 72; mortality, 30.5 per cent; tumour removed successfully in 22 cases. Of the 22 patients, 9 were alive three to six months after operation; 5, one to two years after; 4, two to three years after; 2, three to four years after; and 2, four to five years after.

*Functional Results.* Of 22 cases, 19 are completely cured and back at work, but only 1 of these were true tumours; the others were cases of hydrocephalus, sinus meningitis, etc., with symptoms resembling tumour. Sight was restored to normal in 7.5 per cent.

It must be remembered, however, that considerable temporary relief is often afforded to cases that recur and die later. Innocent tumours, of course, show far better end-results than the commoner sarcoma and gliomata, which almost always recur. It is seldom that removal will be successful if the symptoms have progressed rapidly before operation. Tooth, on the authority of the Queen's Hospital, advises that the surgeon should not attempt to remove red or purple diffuse growths, probably glioma or sarcoma; nor yellow gelatinous or cystic degenerating gliomata which become friable if interfered with. Nor should he attack subcortical swellings, with the exception that cysts may be tapped. If the patient survives the operation, the best results are obtained in cases of tumours of the cerebello-pontine angle, which are usually innocent. Allen Starr finds 100 per cent in the literature of 69 cases 'cured' (up to three months) out of 162 operated on; 1 was well after twelve years. Glioma of the cortex is exceedingly likely to return; only one of the London cases was apparently cured.

Unfortunately, after the removal of tumours of the cortex, patients may be left with hemiplegia, aphasia, or mental impairment, if the Rolandic area or speech centres were involved.

Summing up, we find that only about a fifth of the cases diagnosed as cerebral tumour are suitable for removal; that a fourth of these probably die of the operation; that another fourth will be greatly improved, or cured; whilst the remaining half will not be improved, or will die of recurrence. Thus, of 100 cases, 20 are extirpated, 50 die of the operation, 5 are improved or cured.

Nevertheless, the headache and loss of sight are so distressing, that Von Eiselsberg quotes Horsley with approval in the dictum that "it is unhuman not to operate on a patient with cerebral tumour"; and to cause a decompression, at least, is possible.

REFERENCES. Tooth, *Rep. of XIth Internat. Med. Congr.*, Sect. vii., p. 2. *Practitioner*, 1914, April, 187; Von Eiselsberg and Ranzi, *Archiv. f. Chir.*, 1913, Sept., 309; Kuttner, *Rev. de Chir.*, 1913, 646.

A. Rendle Short.

**CERVICAL RIB.**—In many cases cervical rib gives rise to no trouble at all, this must be so, because though the condition is usually bilateral, the symptoms are almost invariably unilateral. There are three groups of sufferers: those with pressure on nerve-roots, causing

numbness, pain, anaesthesia, or wasting; those with narrowing of the artery leading to pallor or blueness, and feeble circulation, or even gangrene; and those with a pulsating tumour of the neck. There is said to be a tendency to phthisis, and an aneurysm of the subclavian has been induced. There is no tendency to spontaneous cure, but some improvement may follow rest.

**Effects of Removal.** There does not appear to be any mortality, so far, in the recorded cases. In 1 out of 21 operations collected by Eisendrath the plica was accidentally opened, and Thorburn had the same accident in 2 out of 20 cases; but no serious harm resulted. Personally, I use a posterior incision, which is easy, and I think safer.

**End-results.** These are fairly satisfactory, but not invariably so. The writer has seen one patient who was operated on three times by various surgeons; eventually she improved. Of the 21 cases in Eisendrath's series, 2 were no better. Sargent had 1 failure in 29 cases. In Thorburn's 20 patients, pain was relieved in four-fifths, and paralysis in half, of those suffering from it.

Streissler sums up the results as follows: 77 per cent are cured; 13 per cent improved; 10 per cent not improved. Sometimes it is several months before the benefit is felt.

REVIEWED.—Thorburn and others, *Proc. Roy. Soc. Med.*, 1913, vi, *Chir. Sect.*, 113; Eisendrath, *Amer. Med.*, 1904, viii, 322; Streissler, *Ergebn. d. Chir. u. Orthop.*, 1913, vi, 280.

A. Rendle Short.

**CHARCOT'S JOINTS.** There is, of course, no prospect of cure in these cases, but with care the joints may settle down and remain *in statu quo* for years. The writer has seen some excellent results following excision in suitable cases, but this is not lightly to be undertaken, as there is a real danger of suppuration or of non-union.

A. Rendle Short.

#### CHEST, GUNSHOT WOUNDS OF. (See GUNSHOT WOUNDS.)

**CHICKEN-POX.** This is a disease which is but occasionally fatal, and one in which complications but seldom occur. During the eleven months, Feb. 7, 1902, to Jan. 6, 1903, 25,000 cases of chicken-pox were notified in London. There were therefore probably about 27,280 cases during the year 1902. During that year 32 deaths from chicken-pox were registered. Probably in not all of the cases was death strictly due to that disease. But even if it were, the fatality was only 0.11 per cent. Of some hundreds of cases which have come under my observation, I have met with three in which death took place. In one case, a child of ten months, there were laryngeal symptoms, presumably due to vesicles in the larynx, which necessitated tracheotomy; the wound became septic, and fatal bronchopneumonia supervened. The second case was one of varicella bulbosa in a child aged one year. The third was a case of so-called varicella gangrenosa, also in a child aged one year. Varicella haemorrhagica is invariably, and varicella bulbosa occasionally, fatal. But both of

these varieties of the disease, especially the former, are very rare. *Aureoelle gangrenosa*, which is a complication rather than a form of the disease, is more common, and is occasionally fatal, usually through some lung complication. The prognosis depends on the number of pock which become gangrenous, and the age and physical condition of the patient. Should the larynx be invaded by the eruption a very rare event—tracheotomy may be necessary, and this is an operation which is always attended by some risk, as in the case mentioned above.

F. B. Goodall

**CHOLECYSTITIS.** Cholecystitis may be diagnosed under the following circumstances:

**Acute Suppurative Cholecystitis.** This may occur in connection with gall-stones (*calc. infra*), as a sequel of typhoid fever, or apart from any known cause.

In the post-typhoid cases, there are reports in the literature of 24 operations with 8 recoveries. Idiopathic cases are rare, and simulate appendicitis. The prognosis depends entirely on early diagnosis and operation; granted this, the majority recover; otherwise nearly all die.

**Cholecystitis without Gall-stones but causing Similar Symptoms.**

This is by no means rare, and many of the patients are operated on and drained under the mistaken supposition that stones will be found. According to Stanton, of 38 such cases 16 were cured, 10 much better, 24 either better, and 19 no better. These results are not nearly as good as in ordinary gall-stone cases.

**Empyema of the Gall-bladder.** This is usually due to impaction of a stone in the cystic duct, followed by infection. If an operation is performed early, the great majority do well after cholecystectomy.

**Cholecystitis with Gall-stones.** (See article on GALL-STONES.) Septic infection greatly increases the risk of the operation for gall-stones; at the Bristol Royal Infirmary 2 out of 9 such cases died, and in the Mayo's series 10 out of 61. The end-results are also less satisfactory.

REFERENCES—Stanton, *Jour. Amer. Med. Assoc.*, 1911, lvi, 441; Mayo, *Ibid.*, 1906, xlv, 209; Rendle Short, *Bristol Med. Chir. Jour.*, 1913, March, 34.

A. Rendle Short.

**CHOLELITHIASIS.** (See GALL-STONES.)

**CHLOROSIS.** In the average case of chlorosis, complete recovery can confidently be expected in from six weeks to four months.

The greatest obstacle in the way of absolute cure is failure of the patient to persist with the necessary treatment. Symptoms disappear, and the patient's sense of well-being is so greatly increased that he fails to realize that complete health has not been regained. It must be too strongly insisted upon that the measure of recovery is not the patient's subjective sensations, or an appearance of health,

but an examination of the blood. Any deficiency in the number of corporcles or percentage of hemoglobin is to be regarded as a clamant indication for vigorous persistence in treatment.

The reason for this is the great tendency of the disease to relapse. The relays occur after complete recovery, but the conditions which arise as the result of incomplete cure make relapse almost certain. The patient has little or no discomfort. Her sense of well-being contrasts strongly with her previous breathlessness, palpitation, and headaches. She may now feel fit for exercise, work, or recreation formerly denied her. This is misleading, although her blood is not yet a satisfactory medium for maintaining the respiration of the tissues. The deficiency can only be met by increased cardiac and respiratory action; the heart is strained, and in a very short time symptoms become as marked as ever. There is now, however, this important difference: They are not nearly so readily curable.

Another result of failure to attain complete recovery is that the patient becomes accustomed to a condition of health which is short of the normal standard. She becomes easily fatigued, listless, irritable, even sulky, and often finds little sympathy in her family circle. The more striking symptoms are not so much in evidence, and the result may be that the unfortunate patient's disability is attributed to an ingenuous disposition of mind rather than to a deficiency of hemoglobin in her blood. This type of semi-invalidism is a common result of "home" treatment. The occurrence of slight symptoms or marked pallor leads to the purchase of a box of Bland's pills or of some proprietary preparation of iron. As soon as the symptoms have subsided or the box has been emptied, the treatment, such as it is, stops, and the patient resumes her condition of semi-invalidism. With increasing years this state of affairs may be outgrown, but those cases of chlorosis in women of thirty and even forty years of age which are exceedingly difficult to get well, are mainly recruited from this class.

It may be noted that in chronic chlorosis, nutrition is deficient at a time of life when mind and body should be most active. Girls doing mental work are handicapped, so that they fail to profit to the full by education, and among workers, chances of promotion may be lost during the period of life when they are most likely to present themselves. Over and above all this, such cases fall easy victims to intercurrent disease.

#### Factors affecting Prognosis.

19. If the onset occurs at an early age, the illness is more likely to be severe and prolonged than if the first attack takes place at a later age. It may be noted that chlorosis practically never occurs for the first time after the age of twenty three or twenty four, so that when the condition is met with at a later age, it may safely be assumed that it is a relapse or recurrence of a previous attack, and that it will be more difficult to effect a complete cure.

*Hereditary.* A family history of chlorosis is not necessarily an indication of any special prognostic significance, but if hereditary or family

Exposure appears to be a causal factor of greater moment than stress of environment, then prognosis is so much the worse.

*Emotional Conditions.*—As in other illnesses, the more definitely a remediable cause can be ascertained, the greater is the likelihood of cure. The difficulty is that a removal of the cause may not be practicable or possible. An unhappy love affair is proverbially difficult for any outsider to influence, and the most tactful physician is the one least likely to make the attempt to do so. Homesickness is another potent cause of persistence of a chlorotic condition, and its removal, when possible, may entail too great a sacrifice to be entertained when the damage to health is very persistent or severe. Emotional conditions of many kinds may be antagonistic to the success of treatment, and in many instances, such as the recollection of a severe fright, cure may be very difficult to overcome.

*Occupation.*—A sedentary or otherwise unsuitable occupation may be the cause of persistence of anaemia, or of relapse after cure. It is often a difficult problem for the physician to advise in regard to an occupation which may be congenial and inimical to health at the same time. Each case has to be judged on its merits. The factors which will have to be balanced are the actual damage to health, the response to treatment, the probability of diminution of the chlorotic tendency as the patient grows older, and the amount of worry, either sentimental or financial, which a change of occupation may entail.

*Climate.*—A change of neighbourhood may determine the onset of an attack of chlorosis. Curiously enough this effect sometimes follows a change from town or country to the seaside. Such cases readily respond to treatment and speedily become acclimatized.

*Marriage.*—Chlorosis very rarely persists after marriage, but occasionally does so. Such cases are generally severe. In some instances there is a complete restoration of the blood to normal during pregnancy, and a relapse after the puerperium.

In dealing with chlorosis, the anaemia which is often associated with *maternal pregnancy* should be kept in mind. This anaemia may be the chlorosis, but is often secondary.

**Effect of Treatment.**—Chlorosis is not one of the diseases in which complications arise through the claims of alternative lines of treatment. There may be difficulties in the way, but the main indication is quite simple. That indication is the adequate administration of iron. The difficulties which may arise are the persistence of faulty conditions of life, or a disinclination or disability of the patient to take a satisfactory dietary—carbohydrates, largely in the form of cereals, being preferred to meat.

In the severer cases, a speedy restoration in health cannot be expected unless the patient is confined to bed. It is our practice to confine every case with less than 60 per cent of haemoglobin to stay in bed until the percentage is well above that figure, and if we are asked how long the patient will be kept there, we may say three weeks.



That period may be extended or shortened as the result of blood examination, but it is by far average. Even the milder cases need more regularly in bed than when they are going about. Anoblation may be seriously delayed by the patient's inability to retain iron. Such cases are not common, especially if rest in bed be insisted on.

By postural and constipation, when they are not with, may have to be treated before any iron therapy can be persisted in and the time of cure is of course postponed. Very rarely, even when dyspeptic symptoms have been relieved, iron is not well borne, and we may be obliged to fall back for one of the less irritating forms, such as the so-called preparations of iron, or one of the organic combinations. Neither will be found nearly so effective as the perbromide, carbonate, or reduced iron. Many of the organic preparations are useless; preparations of ferrous iron are notably valueless, and considering the minute traces of iron which they contain, this is not surprising. The great drawback to all organic compounds is their small proportion of iron and their expense.

Not iron is claimed as a rule by the addition of strychnine and other drugs to the prescription, unless there is some special indication for them. A little arsenic may be of use, when the count of red corpuscles is very low. When a case is complicated by considerable atony or dilatation of the heart, appropriate treatment is of course called for, and the question of prognosis then enters a somewhat wider sphere. We may remark, however, that cardiac atony or dilatation due to chlorosis is in nearly every case a readily curable condition.

The idea that chlorosis depends on constipation is now exploded. Certain it is that chlorosis is not cured by purgatives, although they may play a useful part in its treatment.

The view of Hablanc and Lorrain Smith, that chlorosis is due to an increase of blood plasma, has led to a trial of therapeutic measures intended to deplete the body fluids. Purgatives, diuretics, diaphoretics, and hot baths have been tried, but without good result, and the physician has been glad to fall back on treatment by iron. Attempts to influence chlorosis by bleeding, with the view of thereby stimulating the bone marrow, have been made, but the results have not been satisfactory.

It may be stated that when such measures are tried alone they fail, and when they are tried along with the administration of iron, the ensuing benefit is attributable to the iron.

When iron is reasonably well tolerated and fails to cure anaemia, we may be assured that in 99 per cent of cases the anaemia is not chlorosis, and a revision of diagnosis is called for. Rheumatism, syphilis, and tubercles are among the most likely causes of confusion.

**Complications.** Any anxiety that is ever occasioned by a case of chlorosis is much more likely to be due to the occurrence of a complication than to the disease itself. A connection between chlorosis and *gastric ulcer* is well recognized, but their exact relationship cannot be said to be well defined. A history of chlorosis in gastric ulcer is

usually accompanied by the symptoms of a strabismic deviation in cases of chlorosis under actual observation.

The occurrence of one or more of the symptoms of *exophthalmia* during the course of chlorosis is probably too frequent to be a significant one. Out of a series of 257 cases of chlorosis quoted by von Noorden (1) 100 showed more than one of the symptoms of Graves's disease.

The complication of outstanding importance in connection with chlorosis is *venous thrombosis*. It occurred in 6 out of 431 cases recorded by von Leden, and in 5 out of 230 of von Noorden's histories. Venous thrombosis may occur in the femoral veins or in the arms, but undoubtedly one of the commonest sites is in the cerebral sinuses. The occurrence of the latter is an experience not readily forgotten by the medical attendant. It is one of the catastrophes of medicine, and there is the danger that the symptoms may at first be attributed to meningitis. Nearly all post-mortem records of cases of chlorosis give venous thrombosis as the cause of death.

**Intercurrent Affections.** An important aspect of chlorosis is that it increases liability to all forms of infectious disease, and diminishes the patient's powers of resistance to them.

G. L. Gulliard  
V. Goodall

**CHOLERA.** The death-rate of cholera varies considerably in different seasons of the year and in various periods of an epidemic. In the Calcutta Medical College Hospital during the eleven years from 1895-1905 it was 59 per cent in 1243 cases, and varied between 6·7 in the first quarter and 49·7 per cent in the third quarter of the year. At the beginning of an epidemic, the mortality is considerably higher than at the end; a fact which should never be forgotten in evaluating the effect of any given treatment. In South-Eastern Europe the death-rate may be as low as 30 per cent when an epidemic has lost its original intensity.

The above figures represent the mortality before the introduction of treatment by hypertonic salines intravenously and permanganates orally. Since when the mortality in 1903 cases in the Calcutta Medical College Hospital has been only 25 per cent. The mortality among Europeans in Calcutta used to be over 80 per cent, but has now been reduced to from 20 to 25 per cent. In an epidemic in the Bombay Presidency the mortality has been recorded as having been reduced from 60 to 20 per cent by the distribution of permanganate pills. The new treatment therefore allows of the mortality being reduced to about one-third of the former rate.

The mortality in individual cases is mainly influenced by the following factors, the figures being derived from 564 cases, nearly all cholerae treated by the writer by his new system in Calcutta. The most important factor is the age of the patient, the death rate being comparatively high below the age of 5 years; lowest, namely 49·4 per cent, between 5 and 10; after which it rises rapidly with each decade, having been 36·5 per cent between 41 and 50, and 47·8 per cent in

Indian patients over 50 years of age, among whom under the former treatment it was no less than 73.7 per cent, fatal uraemia being especially frequent in the later decades. In Europeans, and in Chinese (Duncan Whyte), the death-rate does not rise so rapidly with the age. On the admission of a patient the blood-pressure and specific gravity of the blood afford the best indications of the severity of the case. Those with no pulse at the wrist and specific gravities of 1006 and over (1056 being the normal), indicating very great loss of fluid from the body, are always grave, although under the present treatment 70 per cent of them recover. Other serious signs are rapid respirations, such as forty or more per minute, cyanosis, great restlessness, and a rectal temperature down to below 97°. Rapid and repeated recurrence of collapse after hypertonic injections, collapse without the specific gravity of the blood being increased (indicating previous anuria), vomiting of large quantities of watery fluid, and a blood-pressure persistently below 80 to 90 mm., are all grave signs in the acute stages.

In the *reaction stage*, which older writers regarded as at least as deadly as the collapse stage, the chief dangers are severe febrile reaction and continued suppression of urine. In the pre-transfusion days, patients in the Calcutta European Hospital whose temperatures rose during the reaction with returning pulse to from 103° to 106° all died of toxæmia. After hypertonic saline hyperpyrexia may occur, especially in hot damp weather, and if the temperature is not reduced before the patient becomes unconscious, death always results, although it is usually preventable by timely measures to reduce the fever. Much more frequent and serious is continued suppression of urine, ending in fatal uraemia, occurring either in very severe cases with repeated collapse, or in comparatively mild ones not coming under skilled treatment until two or more days after the onset of the disease and already suffering from anuria for a day or more on admission. If suppression of urine has lasted for two or more days the prognosis is exceedingly grave, especially if the specific gravity of the blood is not increased, showing little loss of fluid. With the hypertonic saline treatment the death-rate from uraemia was 44 per cent among 592 cases; but recently the addition of 2 per cent bicarbonate of soda to the saline transfusions has reduced it to about one-third of that rate in Calcutta, while Sellards had previously obtained a great reduction of uraemic deaths by the same measure in the Philippines.

**Complications.** Pneumonia is a serious late complication, with a very high case mortality; but in Calcutta it is only responsible for 2 per cent of the mortality in cholera, although more frequent in colder climates. Sudden heart failure in apparently convalescent patients, due to too early and sudden sitting up in bed, accounted for  $\frac{1}{2}$  per cent of the deaths. Septic complications are predisposed to by the low state of cholera patients, especially if acidosis is present, but the alkaline treatment has lessened its incidence. Cholecystitis

with clinical symptoms occurs in about 2 per cent, but is very rarely fatal. Suppurative parotitis is seen in 4 per cent of cases, but is usually amenable to early incision, though it may produce death if neglected, and in very exhausted patients. The prognosis is much worse in opium eaters and in opium smokers (Duncan Whyte), especially with regard to uræmia.

*Leonard Rogers*

**CHOREA.** The prognosis is mainly concerned with childhood, although the occurrence of chorea in adolescence and in adult life is thoroughly recognized.

It is interesting to notice in an out-patient department the manifestations that rheumatic children show when they are first brought to a hospital, and the result gives a rough practical idea of the relative frequency of the important ones.

Thus in 500 cases, 248 suffered from arthritis and arthritic pains, 350 from morbus cordis, 245 from chorea, 137 from sore throat, and 29 showed nodules.

It should be added that all cases of chorea were looked upon as chorea, an error probably on the safe side.

Chorea is much more frequent in the female; of 284 consecutive cases, 202 were females and 82 were males.

This manifestation is very seldom directly fatal in childhood. Of the many hundreds that the writer has seen, only 2 have died from the severity of the movements, though some others have been desperately ill. This experience is confirmed by the recent statistics of Abt, who in 226 cases of chorea saw only 1 case fatal from the violent movements. So far, then, as the first problem in prognosis—the outlook for the particular attack—we may with confidence feel that it is good—a warning, let it be added, not to over-drug these patients.

The duration of an attack is most uncertain. We may collect statistics and arrive at some such average time as six to eight weeks, but to apply any average to a particular case is as likely as not to result in failure. Abt found that the time in hospital of average cases varied from six to eight weeks.

The liability to relapse is great, and there is a group of cases which seems to develop annually a fresh attack over a period of years. Of great interest is the fact that these attacks seem to come on almost spontaneously. With regard to this entire question of recurrence in rheumatism, it is remarkable how persistently an obvious event is assumed as an explanation for the occurrence; yet who of us, with patients suffering from tuberculosis, would expect to find a clear-cut explanation for every lighting-up of that infection? Why should not the rheumatic infection be dominant in the system, as undoubtedly the tubercle bacillus does, and light up again under circumstances of climate and season which we cannot definitely ascertain?

The prognosis of chorea is intimately bound up with that of heart disease, for 217 consecutive cases showed obvious signs of organic heart disease in 122. Two points will, however, be emphasized here:

Firstly, that recurrent chorea should always put us on guard for the development of mitral stenosis; secondly, that chorea, if severe, is a very grave event when there is also severe endocarditis.

When severe chorea develops at the height of a pericarditis — fatal issue is frequent. In 20 fatal cases of acute cardiac rheumatism in which chorea was a prominent symptom, 11 died in their first attack, and in every case there was pericarditis. Conversely, when, during a severe chorea, acute endocarditis develops, the prognosis is always grave.

There are some cases of chorea in which perfect recovery is extremely slow, and it is doubtful whether, for some years, the child can be really said to be quite natural in its movements. Such cases may have exacerbations once or twice each year, and they may be called examples of chronic chorea. Eventually they appear to get well, although the improvement is so gradual that it is difficult to define when the recovery occurs.

The mental condition in some of these cases is considerably altered, and the writer has known several of them looked upon as mentally deficient. Children with chorea are often exceedingly unstable and emotional long after the movements have ceased, and if in addition there has been practically no education, there is no doubt that the standard of intelligence in the most chronic cases is much lowered, and very possibly permanently damaged. As a rule, in ordinary cases, the intelligence is good, although the mental balance is always weak in the children who are the victims of severe chorea; and in rare cases, with an unsatisfactory mental history in the family, there may be for many months a condition of mind which is so close to aberration as to give rise to considerable anxiety.

We must remember that there are rare cases of tuberculous meningitis in which movements indistinguishable from rheumatic chorea occur; the prognosis in such is, of course, hopeless.

Mental delusions and hallucinations that occur in some cases pass away, as does also dumbness.

In adult life, the predominance of chorea in the female still holds good, and the disease is more severe and certainly more fatal, although such an event is decidedly rare. The Guy's records quoted by Herbert French showed 3 deaths in 29 consecutive cases, a much higher proportion than occurs in childhood. The mental changes in the adult are likely to be more prominent than in the child, and may result in an actual dementia lasting for a considerable time, and some of these patients are indeed very close to the border of insanity.

It must be remembered that chorea may sometimes begin at a very early age. The writer has had three cases in which the condition developed under three years of age. In all the very young cases he has seen there has also been cardiac disease, a point of great prognostic importance.

The duration of an attack depends to some extent upon the mode of onset. The most acute cases in childhood often recover the most quickly — the more chronic ones may linger on for months.

The writer believes that a point of considerable importance in the prognosis of chorea, upon which more information is needed, is the influence of present educational methods. He looks upon chorea as slight meningo-encephalitis, and, if this is correct, it is evident that a school routine, necessarily based upon the assumption of healthy children, may cause an injurious strain in cases of incipient chorea. The problem is a difficult one: but it is clear that many rheumatic children of the poor attend school in a state of ill-health and mental irritability—children who among the well-to-do would be at once kept at home or sent to a quiet country house, and be freed from all mental excitation.

Do any drugs alter the prognosis? That careful and rational treatment improves the outlook is undoubted, but there seems no one drug that has yet been discovered which produces a certain curative action. On the other hand, the prognosis may be made much less favorable by reckless treatment. Severe arsenical neuritis is a terrible addition to the burden of the illness; subacute poisoning, or death from overdosage with chloral, are tragic events, but not unknown happenings. Chloroform may produce alarming symptoms in childhood if given incautiously, but the intoxication is a passing one, and to this extent has little effect upon the prognosis.

So far as the writer can ascertain, a good deal will depend, in the question of prognosis, upon the adaptation of the line of treatment to the individual and to the phase of the illness. Exceedingly severe physical and emotional storms, if treated with arsenic, will not derive benefit, but are assisted by nerve sedatives. A combination of the dihalates and bromides seems helpful in early rheumatic cases. Arsenic aids recovery when the temperature is normal, but the nervous system is obstinately unstable. Rest and absolute quiet—indispensable in the early stages—are often, towards the end of a long case, much inferior to cheerful, sensible company, and orderly exercises.

Recently L. and W. H. Mayer have stated that they have obtained remarkable results with the intravenous injection of ten minims of 1 per cent phenol solution, repeated daily for three days. There is not at present sufficient evidence upon this method to enable one to make any alteration in the general prognosis. *E. J. Poynton.*

**CHORION-EPITHELIOMA.**—No type of malignant disease is found to present more marked variation in respect of its malignancy. On the one hand, death has followed growth and the performance of a radical operation within the month; while on the other hand, in some cases where operation has been delayed for more than a year after the first symptoms indicative of malignancy have occurred, yet the patient has been saved. Even when metastases have been left behind at the time of operation, recovery has taken place in a few cases. Cases are recorded in which spontaneous cure has occurred where the diagnosis has rested upon the presence of vaginal nodules and masses growing in the urethral veins, which have been subjected to microscopic examination.

There is some evidence which suggests that cases following vesicular mole are less virulent than other forms. As the presence of hydatid mole has in many instances acted as a danger signal, it is likely that an ensuing chorion-epithelioma will be attacked at an earlier stage than a growth following upon normal pregnancy or abortion. Further, the extreme difficulty of deciding when a hydatid mole has taken on a malignant character will often lead to radical operation earlier than absolutely necessary. All investigators are agreed as to the impossibility of deciding in border-line cases, and clinical observation and symptoms must be considered in forming an opinion.

Teicher<sup>8</sup> gives the following results in cases collected by him in the literature: Of 99 cases operated on, 11.1 per cent died within a few days. Of 63 cases operated on, 13, or 20.6 per cent, were in good health and free from recurrence two years later. Two years may safely be taken as indicating a complete cure in these cases.

Sepsis, or general dissemination, is the final stage in the disease; but cases which were known to have had abdominal metastases and later<sup>9</sup> to have had hæmoptysis, suggesting the presence of deposits in the lungs, have yet in rare instances been recorded as recovering.

**Chorion-epithelioma of the Fallopian Tube.** The cases which appear to have originated in the Fallopian tube are, as might be expected, more serious than in the case of the uterus. In the first place the difficulty, almost the impossibility, of diagnosis, and in the next place the early dissemination which occurs, both militate against a favourable outlook.

Bazy<sup>7</sup> has collected 12 cases, with the following results: 2, not operated on, died; of the other 10, who were operated on, 5 died soon after operation, 1 lived from two to four months, 1 was cured. In one case the growth was only the size of an early fetal gestation, for which indeed it was mistaken at the time of operation; nevertheless the patient died in a few weeks with extensive metastases. In contrast to this is a case recorded by Phillips,<sup>3</sup> who removed a chorion-epithelioma of the left tube, and later operated for metastases, removing the uterus and right appendage, but leaving behind a mass at the root of the mesentery which he took to be metastases in glands; yet the patient recovered and was well two and a half years later.

REFERENCES. <sup>1</sup> *Albutt's System of Gynaecology*, 1909, 407; - *Ann. de Gyn. et d'Obst.*, 1913, April; - *Jour. Obst. and Gyn.*, 1911, n. 299.

*Bryden's Gynaecology*,

#### CIRRHOSIS. (See LIVER.)

**CLIFT PALATE.** In spite of the publication of several very important series of cases, well followed through and treated by various methods, we are still without reliable information on some necessary points. It would be very valuable, for instance, to have data for judging the mortality amongst cleft-palate babies in the early years of life, before the age at which it has been customary to operate. Sir Arbuthnot Lane claims that many lives are saved by closing the

palate during the first few weeks after birth, because so many of these children would otherwise die, but this opinion is unsupported by figures and is open to grave doubt.

Further, we do not know whether children, whose palates have been closed by a flap-operation, will eventually be able to speak well. At the exhibition of cases treated by various methods at the Royal Society of Medicine in 1911, very few of those shown by the advocates of this procedure were old enough to talk, and their mouths showed a good deal of scarring in many cases, so that it was open to question if the very essential mobility of the soft palate would be obtained.

On other points, however, we are now in possession of very excellent data. Four methods of treatment come up for discussion: (1) *Langenbeck's*, or the ordinary operation; (2) *Lane's* turn-over flap method; (3) *Brophy's* operation; and (4) the *Oblurator* method.

1. **Langenbeck's Operation.** Provided that care is exercised in the choice of time of operation, so that the child is in good health when it is performed, the immediate danger to life in patients two years of age or older, is extremely small. Berry reports 154 cases without a death.

The prospect of *closure of the gap* is good. Berry says that he has never seen a cleft which could not be closed by operation, provided that the parts had not been spoiled by a previous failure. In his list of 138 first operations, there were 109 in which complete union took place, or the hole left was only big enough to admit a probe and would probably close spontaneously. In 25 cases success was partial or a bed remained; some of these were cured by a second operation. In 4 cases there was complete failure; some of these also were remedied subsequently. It must be admitted that not many surgeons could produce so high a percentage of successes.

Second operations gave 13 successes and 3 partial successes.

The end-results as regards *speech* depend on many factors: the age at operation, the length and mobility of the soft palate, the intelligence of the child, and the care in after-training. In Berry's tables, the speech was investigated at least a year later in 97 cases; it is described as good in 36, good, but certain letters still gave trouble, in 21, and poor or poor in 40; in many of these last there was very definite improvement, others were mentally defective, and the great majority had no proper training.

#### LANGENBECK'S OPERATION (BERRY).

Operation	Cases	Union				Speech		
		Complete	Partial	Failure	Good	Good, but certain letters still gave trouble	Poor or poor	
First Operations	138	0	109	25	4	36	21	10
Second Operations	16	0	13	3	0	3	3	7



The end results of second operations were not so good; out of 43 followed 3 spoke well, 3 had trouble with certain letters, and 7 were only moderately improved.

2. **Lane's Flap Operation.** At the meeting of the Royal Society of Medicine in 1911, the principal exponents of this method were Sir Arbuthnot Lane, Hilton Fagge, and one of the former's house surgeons.

Of Lane's operations, 369 were reported, with a mortality of about 6 per cent. Of these, 144 were first operations on children under twelve months, the majority being but a few weeks old. By this very early interference, such as the argument, shock is avoided, ill-development of the mouth and nasopharynx prevented, and children are saved who would otherwise die of malnutrition. Of these 144 cases, 18 (12.5 per cent) died in hospital. What eventually happened to the survivors is not, as a rule, known.

Fagge reported 57 cases, of which 38 were under one year old. Of these, 3 died in hospital, and an attempt to follow up the others showed that 11 had died since. It is, therefore, by no means certain that the operation is life-saving; probably the reverse is the truth.

Gowder has operated on 30 cases, all but 3 by Lane's method. He failed to obtain complete closure at the primary operation in 7 cases.

The end results as regards speech are not known in a sufficient number of cases to justify deductions. In 15 cases investigated by Gowder, speech was good in 4, fair in 4, and poor in 7. Three of the 4 classed as good were still very young, and the final condition remains to be seen.

#### FLAP OPERATIONS.

Lane, all cases	369	22 (5.9 per cent)	
" first operations under one year old	144	18 (12.5 per cent)	
Fagge, all cases	57		
" first operations under one year old	38	3 (7.8 per cent)	11 (37 per cent)

3. **Brophy's Operation.** The essential point in this operation is to force the maxilla together by stout wires before the child is three months old. By this means it is usually possible to close a wide gap, the best results being obtained within a few weeks of birth. Brophy claims to have treated 300 cases with a mortality of only 3 per cent, but 5 out of 11 English cases died, and necrosis ensued in another. This operation can only be used when there is a complete cleft of the hard palate.

Which uses a somewhat similar method. He lost 2 out of 10 cases.

4. **The Obturator.** It is easy to close the cleft in the hard palate by this means, but it is difficult or impossible to provide a movable

is not palatable, controllable by muscles, and therefore speech is not greatly improved. The obturator is more useful in adults than in young children, who would require frequent changes, and might also get it impacted in the oesophagus.

REFERENCES.—Berry and Legg, *Hard Lip and Cleft Palate*, 1912. *Proc. Roy. Soc. Med.* 1911, iv, pt. 3, surgical section, 169; Toyder, *Brit. Jour. Surg.* 1913, II, 1, 259.

V. *Buckle Short.*

#### CLUB FOOT. (See TALIPES.)

#### COLITIS.—

**Simple.** The prognosis is, as a rule, good, provided the condition is taken in hand early. When very exceptionally acute, death may occur from exhaustion, toxæmia, or collapse.

**Membranous.** This disease is, as a rule, chronic; however, the majority of patients eventually recover, though some do not appear to be benefited by treatment. The outlook is better in men than in women. The complaint is not in itself fatal. The age of the patient has little influence on the course of the illness, nor has the presence of intestinal sand, which is not uncommon.

**Ulcerative.** The outlook is exceedingly serious if the disease is in any way severe, many of the patients dying within the course of the first few months after presenting themselves for treatment. Grave symptoms are high fever, marked distention due to flatus, severe hæmorrhage, copious diarrhœa, exhaustion, and, more rarely, peritonitis. Death may take place in three or four days from the first onset of symptoms, and frequently occurs within the first two months. It must, however, be remembered that many of these patients give a history of previous attacks of diarrhœa, and if the onset of the illness is measured from the first of these, the duration is often many years. On the other hand, life may be prolonged with continuous but acute symptoms for upwards of two years, and in a small proportion of cases permanent cure apparently results from treatment, even when the disease has been very acute and severe. The vast majority of cases run their course either to death or recovery without complications. Though perforative peritonitis may occur, it is much less common than might be supposed when the extensive area of ulcerated surface is taken into account. Hepatic abscess is very rare indeed. Pulmonary embolism sometimes kills. In cases which recover, there is little liability to obstruction of the bowels from cicatrization.

The mortality is higher than in tropical dysentery; thus, death occurred in 40 out of 55 cases treated at Guy's Hospital; 28 out of 42 at St. Bartholomew's; 9 out of 19 at St. George's; 8 out of 19 at St. Mary's; 40 out of 80 at St. Thomas's.

The mode of death in the St. Thomas's Hospital series was as follows:—Of 8 children, all died from exhaustion following diarrhœa; of 32 adults, 9 died from exhaustion following diarrhœa; 1 from hæmorrhage; 8 from hæmorrhage and diarrhœa; 1 from hepatic abscess; 6 from peritonitis after perforation; 2 from peritonitis

without perforation; 5 from peritonitis following closure of an artificial anus.

At the present time there is not sufficient evidence upon which to base a prognosis from the predominant organism present in the evacuations, or from agglutination tests. The sex of the patient does not influence the outlook.

It is questionable whether the use of vaccines materially modifies the prognosis. Improvement and sometimes cure have followed their use at times; on the other hand, they have frequently no effect in arresting the course of the disease or preventing a fatal termination.

**Tropical Bacillary Dysentery** (See also DYSENTERY).—This disease varies very greatly indeed in its virulence. Mild cases are rapidly cured and the prognosis is extremely good. The severity of the earliest symptoms forms an important guide. The mortality of epidemics of average severity, such as those which occur in Japan, is about 30 per cent. Convalescence is very liable to be slow, and a return of the symptoms is not uncommon. A great deal depends on the time at which the illness first comes under treatment, for if taken in hand early the prognosis is good, while if neglected in the earlier stages it is very liable to become chronic, with a poor outlook. A very guarded prognosis must be given if the temperature remains elevated. The presence of a leucocytosis is uncommon, but even if it occurs in any given case, it does not necessarily involve a bad prognosis. The choleraic form of acute bacillary dysentery is usually fatal, but the prognosis appears to be decidedly improved since the introduction of the use of the intravenous hypertonic solution of Leonard Rogers (i.e., sodium chloride 120 gr., potassium chloride 6 gr., calcium chloride 4 gr., to a pint of water), combined with rectal injection of calcium permanganate (5 gr. to the pint).

The chronic form generally gets well or ends fatally in the course of a few months, but may last for several years with relapses. A retracted abdomen, gross anæmia, emaciation, exhaustion, œdema of the extremities, offensive stools, are all bad signs. In rare cases the patient may succumb to hæmorrhage. Perforation, peritonitis, and hepatic abscess are very unusual. Leonard Rogers says that in 125 post-mortem examinations on dysenteric cases in Calcutta, no case of portal pyæmia or serious hepatic complication was found in any of the bacillary cases, which numbered 56 per cent of the whole. He also points out that the mortality from bacillary dysentery among the Mecca pilgrims, which in 1909 was 61.1 per cent, was reduced by serum treatment in 1910 to 10.8 per cent.

The more frequent use of a Shiga, Flexner, or polyvalent anti-dysenteric serum promises to improve the outlook still further. Unfortunately the same cannot as yet be claimed for vaccine treatment.

Leonard Rogers gives the following figures of the case mortality in India from 1906 to 1910: British army, 2.93 per cent; Indian army, 0.51 per cent; Indian gaoles, 5.29 per cent.

**Sprue.** The prognosis is very unsatisfactory unless the patient is under treatment at the earliest possible moment. If the disease is of long standing, no recognized remedy has any very great influence on the course of the illness. Typical or severe mouth eruptions indicate, as a rule, an advanced state of the disease.

In addition to the diarrhoea, the following are all bad signs, namely, diminution in the size of the liver, and emaciation. Many of the more acute cases succumb within eight to twelve months of the beginning of the trouble, but if they survive this period they tend to pass into a very chronic condition, with a disease which lasts well to ten years or even longer. The prognosis appears to be improved by residence in a temperate climate. Temporary improvements are often followed by relapses, even if the patient has made an apparent cure in a temperate climate.

**Amoebic Dysentery.** Children suffer from the disease less severely than adults, and natives of a place where amoebic dysentery is endemic are more easily treated satisfactorily than others.

In acute dysentery, periods of apparent improvement, which are of a delusive character, sometimes occur, during which the stools become less frequent and offensive, and tenesmus is much less marked. These periods of calm may be followed by severe relapse of symptoms. Marked prostration should arouse a very guarded prognosis. In acute fulminating cases, peritonitis from perforation, gangrene of the gut, and colic abscess, or exhaustion, may kill the patient even within a week or ten days from the onset. Severe hemorrhage may occur, but this is a very rare cause of death. The patient must not be regarded as out of danger because there is no fever, for many cases prove fatal without elevation of temperature. Palpable thickening of the bowel, most frequently felt over the caecum and sigmoid and often associated with great tenderness, may be present in severe cases. If more widespread thickening of the bowel can be felt, the case is generally one of the acute fulminating class, and the prognosis grave in the extreme. The mortality rates vary from 20 per cent to 50 per cent; but much depends on the stage at which the disease comes under treatment, and the particular type in any given case. Chronic amoebic dysentery may last for a year, and even then be liable to repeated relapses.

The figures just quoted refer to the prognosis before the introduction of emetine. The outlook appears to have been wonderfully improved since Leonard Rogers introduced the method of the hypodermic administration of the soluble salts of emetine. Solutions of these salts may also be injected with very great success into amoebic abscess cavities in liver or spleen. When no more amoebae can be discovered in the stools, or not found at all owing to the closed nature of the lesion, the progress of the *leucocytosis* is most important, both from the point of view of prognosis and of continuance of the treatment. Absence of leucocytosis in acute amoebic dysentery is of bad omen, indicating extremely feeble resistance.

In the case of a cured abscess, the leucocytosis should have disappeared in about a fortnight. With an uncomplicated intestinal lesion, it should appear much sooner. A case with over 20,000 leucocytes per c.mm. should be regarded with considerable gravity.

Liver abscess may arise without dysenteric symptoms being evident. If, however, these are prominent, the prognosis is much worse, because there is then much more probability of the liver suppuration being multiple. Many of these cases are practically hopeless. If the abscess is single, even if of great size, it rarely destroys sufficient tissue to make recovery impossible. Secondary septic infection is very liable to follow an open operation, and this very frequently kills the patient if the abscess is large.

Lactine, if used early enough, appears to prevent to a very great extent the hepatic complications, and to have a marked curative effect if they are already present.

*J. R. Charles*

**COLON, CARCINOMA OF.** Compared with the average rate of growth of cancer elsewhere, carcinoma of the large intestine is not a particularly rapid or malignant type of the disease. It is certainly more favourable than cancer of the rectum. As Paul has pointed out, and contrary to the generally-received opinion, the hypertrophic form, in which a large tumour can be felt, is less rapidly fatal than the stenosing form, which causes chronic or acute intestinal obstruction. The duration of life, from the first onset of symptoms to the end, is usually from six months to two years, apart from treatment. In the great majority of cases the eventual fatality is due to an attack of acute obstruction; less often, to cachexia; and rarely, to perforative peritonitis.

Marked anaemia and loss of flesh, or symptoms of obstruction, show that the end is not far off.

**Results of Surgical Treatment.** The mortality of operation depends very greatly on the state of the patient when the surgeon sees the case; also, to some extent, on the method of intervention. If signs of acute obstruction are already present, the outlook is very grave, and all that can be done at the moment is a short-circuiting or colostomy; but in a minority of cases the patient may recover sufficiently to allow of a subsequent radical operation. Cases with cachexia are already beyond hope of cure, though it may be possible to give some relief.

It will be perfectly evident, from the figures supplied, that a two-stage operation is decidedly the safer, probably giving a mortality of about 15 per cent. This refers to cases in which there is no acute obstruction present. By a two-stage operation is meant, either Paul's method, in which the growth is resected and a drainage tube tied into each end of the bowel at the first operation, the spur being removed and the fistula closed subsequently; or a preliminary colostomy, followed by resection and end-to-end union.

The best results after the one-stage operation are from the Mayo

1906, where 8 died out of 61 operated on, or 13 per cent. But in Finkelstein's series, including the patients of the Mayos and several other surgeons, the mortality in 209 cases is 29 per cent.

Apart from acute obstruction cases, the mortality is given by various authors as follows:

## MORTALITY OF OPERATION FOR CARCINOMA OF COLON.

Author	Stages	Cases	Mortality
Finkelstein	Two stage	142	16
Paul	"	14	0
Aschultz	"	30	20
Moynihan	"	32	15
*Finkelstein	One stage	209	29
Aschultz	"	20	55
*Moynihan	"	68	32.3
Mayos	"	61	13
Harlinum	Stages not specified	143	33.5
St. Thomas's Hospital	"	58	39.5
Voecker	"	58	46.5
Card	"	17	35.2
Lassalle	"	28	10.0

Aschultz's reports refer to cases in von Mikulicz's clinic up to 1907; Voecker's to Czerny's clinic; Moynihan's tables were published in 1906; Finkelstein's relate to the years 1907 to 1912. Very probably several of the series taken from the literature include the same groups. Paul's cases are all from his private practice. The Lassalle series, published by Voelchond, relate to the years 1880-1910. In 49 cases the operation was in one stage.

**End-results of Operation.** These are not unfavourable, provided, of course, that there were no secondary deposits at the time of interception, and that the glands were removed. Various observers report as follows:

## END-RESULTS OF OPERATIONS FOR CARCINOMA OF COLON.

Author	Cases	Survived	Duration
Mayo	16	9	Over three years
Aschultz	27	14	" "
Moynihan	49*	9	" "
Paul	13†	5	One to three years
		2	Over three years
Lassalle	24	6	One to three years
		8	Over three years
		8	Under three years

\* See also p. 106, for details of the cases in this series.

We may conclude, therefore, that about half the patients are cured, death from recurrence is often late. In four of Paul's cases it took place from two and a half to seven years after the operation.

**Palliative Operations** include colostomy above the growth to relieve obstruction, and a short-circuiting operation.

Colostomy, in the presence of an acute obstruction, is, of course, a desperate performance, and frequent; the patient does not rally. Of 14 cases in Paul's private practice in which this operation was performed for malignant disease, acute obstruction was present in 21, and 9 of these died soon afterwards. There were no fatalities in the absence of acute symptoms.

The survival afterwards is often surprisingly long, should the patient recover from the immediate effects of the operation. Of Paul's 64 cases, 9 died shortly after the operation, 28 within a year, 17 one to three or more years later, 40 were alive (all for more than a year and one to ten years, except one). Some of these presumably had a resection performed later. It is not quite clear how many of these long-survival cases had a subsequent resection; it cannot be more than the total resections for cancer were only 11 in number.

It is not safe to suppose that these patients were necessarily left in a state of misery. Persons with a colostomy have frequently been able to get about their duties; a lady has even acted as hostess through a London season, without serious inconvenience, wearing a colostomy belt.

We have no adequate figures to show the risks or successes of short-circuiting operations in cases of cancer of the colon.

To sum up, then, the mortality of the one-stage operation is 30 to 40 per cent; of the two-stage operation about 10 per cent; and about half the patients who survive will be cured.

REFERENCES.—Paul, *Brit. Med. Jour.*, 1912, ii, 172; Moynihan, *Abdominal Operations*, 1906; Makins, 'Cancer of Colon,' *Burke's System of Operative Surgery*; Finkelstein, *Archiv. f. Klin. Chir.*, 1913, July, 936; Mayo, *Ann. Surg.*, 1909, July, 201; Auchincloss, *Surg. Gyn. and Obst.*, 1914, ii, 248 (Summary).

A. Rendle Short.

**CONCUSSION.** (See HEAD INJURIES.)

**CONGENITAL DISLOCATION OF HIP.**— See HIP.)

**CONGENITAL MALFORMATIONS OF THE HEART.** (See HEART.  
CONGENITAL MALFORMATIONS OF.)

**CONGENITAL STENOSIS OF THE PYLORUS.** (See PYLORUS, CON-  
GENITAL STENOSIS OF.)

**CONTUSION OF ABDOMEN.** (See ABDOMINAL INJURIES.)

**CONVULSIONS, INFANTILE.** (See INFANTILE CONVULSIONS.)

**COXA VARA.** Apart from treatment, the condition usually gets steadily worse, the shortening becoming more noticeable as growth proceeds. Rarely, the rickety form may improve; Hoffa had a case

reach the angle of the femur increased from 105 to 120 on one side and 110 to 125 on the other in three years.

If a good extension check the process, but do not rectify the deformity already present. The best results are obtained by subcondylar osteotomy, or better still by Whitman's method, that is removal of a wedge with its apex at the lesser trochanter. Section of the neck of the femur is risky; one death from sepsis and two cases of necrosis of the severed head are recorded.

REYNOLDS: *Tibia, Deformitas in India. Diseases of Bones and Joints. 1. Bungle Sheet.*

**CYSTITIS.** (See PYELOCYSTITIS; BLENNORRHOEA; TUBERCULOSIS OF CYSTIS, PANCREATIC. (See PANCREATIC CYSTIS.)

**DECIDUOMA MALIGNUM.** (See CHORIOCARCINOMA.)

**DELIRIUM.** (See TYPHOIDAL FEVERS.)

**DEMENCE.** (See MENTAL DISEASES.)

**DENGUE.** (See TYPHOIDAL FEVERS.)

**DIABETIS INSIPIDUS.** This name is applied to cases in which very large quantities of urine are passed without any signs pointing to disease of the kidneys. Little is known of the nature of the malady, though attempts have been made to differentiate certain types. (*See also, polyuria, phosphaturia, acaturia.*)

**Hydruria or Polyuria.** This common form of the disease occurs chiefly in children, and more often in those of the poor. The condition may arise suddenly or gradually. No certain prognosis can be given until the course of the case has been carefully observed. Some cases continue for many years without giving rise to inconvenience, but the frequent micturition; others terminate fatally within a few months. A sudden onset is more favourable than an insidious one, as the condition may subside as suddenly as it appeared; cases of this kind associated with injuries to the head have the most hopeful outlook; those which follow some shock are also likely to recover.

Chronic cases, with insidious onset, and accompanied by wasting, loss of appetite, dryness of the skin, and increasing weakness, are likely to end fatally within five or six months; those, however, which are, for the most part, asymptomatic may last long, sometimes exhibiting acute exacerbations and comparative remissions. Children of tuberculous parents usually do badly; those presenting signs of a syphilitic taint may recover on appropriate treatment. In a certain proportion of cases, diabetes mellitus supervenes and proves fatal, while tuberculosis of the lungs may be the cause of death, as in the latter malady.

Several different methods of treatment have been proposed, in comparatively recent years, which cause the general outlook in these



cases to be better than formerly. One of these is the withdrawal of salt from the dietary, on the ground that the malady consists in an inability of the kidneys to excrete this substance except in extremely dilute solution, an enormous flow of water being thus necessitated. A connection has also been traced between diabetes insipidus and disturbance of the pituitary body, and the use of preparations of pituitary substance has seemed to modify the disease. It is stated that cases marked by infantilism, with headache and contracted visual fields, may be treated with an extract of the anterior lobe of the pituitary body; cases with obesity, drowsiness, and, in females, amenorrhœa, with extract of the posterior lobe. The skull may be skiagraphed to endeavour to find evidence of alteration of the sella turcica. This method of treatment is, however, in its infancy, and nothing certain is known of its results.

**Azoturia.** Examination of the urine may show the continued passage of increased quantities of urea, the condition being usually accompanied by languor and aching in the loins, and sometimes by increased appetite as well as thirst. These cases generally do well if treated early by rest, change of scene, and hydrotherapy (Carlsbad, Homburg). If neglected, the condition may pass into one of saccharine diabetes, or emaciation may supervene, and gradual or sudden death.

**Phosphaturia.** In some instances, which clinically resemble the above, the amount of phosphates contained in the urine is increased even more markedly than the urea. The patients are irritable, and suffer from digestive disturbances. The treatment is similar to that just described, and, if taken early, these patients do well.

REFERENCES.—Bradford, in Albutt and Rolleston's *System of Medicine*, vol. iii, p. 212; Jewell, *Med. Rec.*, 1914, 212. W. Cecil Bosanquet.

**DIABETES MELLITUS.** The true nature of diabetes, and its relationship to other forms of glycosuria, are still unknown, so that for practical purposes they must all be considered together. No useful distinction can be drawn between persistent glycosuria and mild diabetes mellitus, and from time to time apparently mild cases pass into the grave affection. With a view to prognosis, it may be most convenient to sketch the course of a few typical cases of varying severity, and then to endeavour to indicate points which may be used to assign individual patients to one or other group.

**Typical Varieties.**

1. *Alimentary Glycosuria.* A young or middle-aged man, feeling out of sorts after a copious meal accompanied by many 'sweets,' is examined by a doctor, and the urine is found to contain sugar. On the following day, this has disappeared. A similar experience subsequently, or a test administration of glucose, proves him to be the subject of alimentary glycosuria. With a little care in avoiding dietary indiscretions, he remains free from any disturbance of health.

In addition to this form of alimentary glycosuria, there are a number

cases of transient glycosuria which hardly amount to disease, and constitute no danger to life or health in themselves. Thus, closely related to the alimentary form, but by some classed as a renal glycosuria, the condition often seen in pregnant women, whose urine may from time to time contain small quantities of sugar (apart from their well-known lactosuria) which disappears after delivery (*see below*). Fenton and Woods state that similar glycosuria is common in infants.

A form of glycosuria apparently associated with disorder of the liver, but possibly rather to be assigned to coincident pancreatic disturbance, occurs in alcoholic subjects. Quite large amounts of sugar may be present in the urine for a considerable period of time; but on cutting off the supplies of intoxicants, complete recovery may be obtained. A somewhat similar recovery may occur in syphilitic subjects as a result of suitable treatment (mercury, iodide, salvarsan). It is wise, therefore, to withhold a definite opinion in regard to such cases until a suitable regimen has been adopted, and continued for two months.

2. *Chronic Glycosuria (Chronic Diabetes)*. A middle-aged man of sedentary habits, engrossed in business anxieties, stout of build, and with other tendencies, is found to suffer from glycosuria. On strict diet the sugar disappears, but the patient cannot tolerate strict dieting. On a diet containing a moderate amount of starchy materials he continues to pass 2 to 5 per cent of sugar, but suffers no apparent inconvenience, living to a fair age, and ultimately dying of cerebral hemorrhage or arteriosclerotic heart failure.

3. *Diabetes of Moderate Severity*. A middle-aged man notices that he is losing flesh and strength, while his urine is increased in quantity and he is unusually thirsty. On being questioned, he admits that he has not been well for the past year, and that the symptoms have gradually developed. The urine is found to contain a moderate amount of sugar. On a strict diet this gradually falls in amount and finally disappears, and it is ascertained that a small amount of carbohydrate can be allowed without the return of glycosuria. On a restricted diet he remains well for some months, but the glycosuria returns and a still more limited diet is necessitated. Later still, no restriction of carbohydrates is found to be efficient, and the urine always contains a considerable quantity of sugar. The patient perhaps complains from itching of the skin, or from boils and pustules. Finally ketone and diacetic acid appear in the urine, perhaps accompanied by albumin and casts, and the patient dies comatose after an illness of two or eight years.

4. *Early Diabetes*. A boy, aged ten to fourteen years, suffers from constant hunger, polyuria, and increasing weakness, all of which symptoms recur within the period of a week or ten days. When seen by the doctor, he is weak and drowsy, with a flushed face, and a red tongue coated on the dorsum with thick fur. His breath smells of acetone, and this substance, together with diacetic acid and glucose, are present in the urine. On a diet containing a limited amount of carbohydrate,

aided by doses of liquor morphine and administration of sodium bicarbonate, in drachm doses, by the rectum, he improves: The drowsiness passes off, the acetone bodies disappear from the urine, and the sugar diminishes in amount, but does not disappear. On careful diet the boy remains comparatively well for six months, when the former symptoms return, to yield once more to treatment. A second period of comparative health is followed by a second relapse: treatment is ineffective, an-hunger is noticed, and increasing drowsiness, deepening into coma and death. The whole illness has extended to a little over eighteen months from the first onset of symptoms.

Coming to the cases which are usually classified as diabetes mellitus, no general rules as to probable duration can be laid down. Feilchenfeld found that, of 151 cases, 30 per cent lived over ten years after recognition of the malady. The shortest case which I have found recorded is that of a girl, aged seventeen, who developed acute diabetes after typhoid fever and died in eleven days (Laache). Chronic cases may last over thirty years. It will be convenient to consider *seriatim* the various factors which influence the prognosis.

#### Factors Influencing the Prognosis.

*Age.* As a general statement, it may be said that the younger the patient the worse is the outlook. In infants and young children the course of the disease is very rapid, seldom more than twelve to eighteen months. It is doubtful if recovery ever takes place in established cases, but Mason Knox, who collected 16 cases occurring within the first year of life, states that he found records of 2 recoveries. In rather older children, a similar brief course is common. In young adults the outlook is scarcely better, a fatal termination almost invariably ensuing within two or three years. In those over twenty-five the course is likely to be less rapid, and the patient may live seven or eight years if carefully looked after. In subjects over forty the course of the affection is usually much more prolonged, a duration of ten to fifteen years being common. Acute cases are, however, to be encountered at almost all ages.

*Sex.* The outlook does not appear to be strikingly different in the two sexes; but cases occurring in women about the climacteric are said to be specially amenable to treatment. It seems likely that they are often instances of glycosuria due to disturbance of internal secretions coincident with ovarian atrophy.

*Obesity.* Diabetes or glycosuria occurring in fat persons usually runs a slow course, often without much apparent disturbance of health, though various complications may be present from time to time. Hence the French have classified the disease into two forms, *diabète gras* and *diabète maigre*, the latter being the dangerous form. The stout diabetics often exhibit gouty symptoms, and perhaps more often die from arteriosclerosis or uraemia than from coma—the typical diabetic ending. They are also liable to cerebral hemorrhage.

*Social Position.* There is no doubt that persons who are well off and thus able to carry out a strict régime of diet and mode of life, are

more favourably placed than the poor, who cannot afford luxuries in the form of starch-free foods, rest, climatotherapy, and so forth. Acute rapidly fatal cases are rare among the upper classes. Cases in middle-aged persons of business habits, associated with some degree of worry and anxiety, often do well when these causes are eliminated by rest or retirement.

*Family History.* In a considerable number of cases, other members of the patients' families have suffered from diabetes. Some ideas as to the probable severity or chronicity of the case may be gleaned from what has happened to the others; but no great reliance can be placed on such evidence, as some cases in a family may be grave and others comparatively mild.

*Onset.* An acute onset with severe symptoms is of bad omen, whereas a gradual increase, with periods of improvement or quiescence, points to a likelihood of a long course, but such a rule is far from absolute. Some instances which follow an acute infective disease yield readily to treatment, while mild cases may develop into severe ones; thus, however, according to von Noorden, is rare, at all events if patients submit to strict regimen. Cases associated with head injuries may completely recover: they should probably be called glycosuria rather than diabetes.

*Symptoms.* Great thirst and increased appetite point to severe diabetes, but the absence of these symptoms does not necessarily imply that the affection is of mild type; indeed, loss of appetite may be a bad sign if it has previously been large or moderate. Wasting is rapid in grave cases, and it is useful to weigh the patients regularly every week, as much information as to progress or retrogression may be thus obtained; a patient who is gaining weight is usually doing well. Constipation is usual, and may be difficult to treat, but does not necessarily affect the outlook. On the other hand, diarrhoea is a bad sign, and if intractable, is often found to be a forerunner of coma. Severe epigastric pain is another warning signal which should not be neglected. Drowsiness may precede actual loss of consciousness by some days, and should always excite alarm. The smell of acetone in the breath may be the first warning of the grave intoxication which is accompanied by the presence of acetone bodies in the urine, but regular examination of the urine will always show the presence of traces of these substances in this secretion before it is noticeable elsewhere. It may be worth noting that acetoneuria may be found apart from diabetes mellitus (cyclical vomiting of children, etc.), but it is always of serious import.

*The Urine.* The continued passage of very large quantities of urine is usually a sign of grave disease, and diminution in the amount passed is often an early sign of improvement. Very large amounts of sugar are also bad, but it cannot be said that the severity of the case is directly proportional to the saccharin output; this varies with the diet taken and with other factors. Thus, the sugar may be much diminished, or actually disappear, just before the onset of coma; so

that such an occurrence in the presence of grave symptoms is an alarming sign. In chronic severe cases the percentage of sugar and its total amount are usually small. In the presence of intercurrent infective disease (see *below*), the sugar may diminish or disappear from the urine. The most important consideration in connection with the urinary sugar is the effect of restricted diet in reducing the quantity excreted. The usual procedure, in respect to cases seen for the first time, is to estimate the quantity of sugar passed for two or three days on a normal diet, and then gradually to reduce the amount of carbohydrate food, substituting such materials as cassia bread, gluten, saccharin, etc., for the ordinary bread, potatoes, sugar, etc., taken. When all starchy food has thus been withdrawn, the quantity of sugar in the urine is again estimated on three successive days. If no sugar is found, then small amounts of bread or potato are added to the diet until sugar once more appears. In this way the carbohydrate tolerance of the individual is estimated. If some 120 grams of carbohydrate can be taken in twenty-four hours without the appearance of sugar in the urine, the case is a mild one, and the patient is likely to live for many years. If, on the other hand, no carbohydrate can be taken without glycosuria, the disease is likely to be serious, and if no restriction of diet causes disappearance of the sugar, the state of affairs is manifestly grave. (It need hardly be noted that, in all cases here dealt with, the sugar in question is glucose.) Pentosuria is apparently a family or hereditary abnormality of metabolism, and is of no importance from a health point of view. Repetition of similar tests of tolerance during the progress of a case will indicate improvement or deterioration, according as the quantity of carbohydrate daily assimilated is greater or less than at first. In most cases the degree of tolerance tends to fall as time goes on.

The urine should be tested from time to time for the presence of acetone and diacetic acid. The ferric-chloride test for the latter is simple, and usually sufficient for practical purposes, as the two bodies are generally present together. If they are found, the aspect of the case immediately assumes a graver character, as it evidently belongs to the class of severe diabetes and is likely to terminate sooner or later in coma. It must not, however, be assumed that this is imminent, for acetone bodies may appear and disappear for considerable periods without fatal issue. A definite increase in the excretion of acetone and diacetic acid is a cause for anxiety, especially if the patient tends to be drowsy, or the quantity of sugar diminishes concurrently.

The appearance of any considerable amount of albumin in the urine is of bad omen, though small quantities may be found from time to time in chronic gouty cases without any serious effects resulting. If large numbers of casts are also found, the condition is serious, as this phenomenon often shortly precedes the fatal issue. Estimation of the ammonia-content of the urine is also of value in prognosis, any large increase in the normal quantity being associated with acetonuria, and being an indication of approaching coma.

The *skin* in diabetes is usually dry; the occurrence of a tendency to sweat has been said to be a good sign, but it would be unwise to lay any stress on such a point. Pruritus seems to be more common in chronic cases, especially in gouty subjects. Boils may be troublesome but are not often of serious import. On the other hand, a large carbuncle is sometimes a grave complication, and may give rise to fatal septic intoxication and coma.

Pigmentation of the skin in association with glycosuria is sometimes classed as a separate disease, *hämochromatosis*, or *hæmialoides*. The features are rather those of cirrhosis of the liver, a condition usually found in these subjects after death, which is generally due to intercurrent disease rather than to cause. The glycosuria may sometimes disappear while the other symptoms continue. The duration of the condition, after the phenomena have become well marked, may be from two to three years, but some patients may succumb within a few months.

*Nervous System.* Loss of knee-jerks is commonly noticed in diabetes, and seems to be of no special importance as an indication of the severity of the disease. Neuralgia is a frequent trouble, especially in elderly subjects, but does not influence the general prognosis. It usually yields to rest in bed and regulation of the diet. Most of the sensory disturbances in diabetes are associated rather with vascular degeneration than with true peripheral neuritis, which is a rare complication.

*Coma.* Until recent years, the prognosis of diabetic coma was almost hopelessly, patients invariably dying within a comparatively small number of hours after the condition originated. Even now, the outlook is so far desperate that a fatal termination to the disease is almost certain to ensue before many months after such an occurrence; but in many instances the immediate fatality may be averted by treatment, at all events in the commencing stages of the condition. Recovery is certainly possible from a state of deep drowsiness and practical unconsciousness with the typical symptoms of air-hunger, under the administration of large doses of bicarbonate of soda, either in the form of enemata or by intravenous infusion. The administration of glucose itself by the rectum has also been employed in this condition, and is supposed to result from carbohydrate starvation.

*Gangrene.* Dry gangrene in diabetes is due to arterial disease, and consequent deficiency of the blood supply to the affected part. It is best treated expectantly, the limb being kept dry and, as far as possible, aseptic. The outlook is fairly good under these conditions. If the gangrene is moist, pointing to bacterial infection, amputation is necessary, and the outlook is bad.

*Cataract.* The appearance of cataract in an infant or young child is a sign of grave disease and of a rapidly fatal issue. In any acute operation is inadvisable. In chronic cases, in which the glycosuria is controlled by dieting, operation is often quite successful, but there is always a danger of local hæmorrhage supervening.

*Intercurrent Disease.* Acute infective disease occurring in the course of diabetes is always a source of anxiety, as it may induce fatal coma. This is not, however, at all a necessary sequence, as diabetics may pass through severe illnesses and make satisfactory recoveries; but the prognosis must always be guarded until complete convalescence. The effect produced on the glycosuria is variable. In some instances the sugar disappears from the urine during fever; or diminishes markedly; in other cases it is unaffected, or may even increase. A fatal diabetes may date from an attack of acute disease, such as enteric fever, though it is difficult to make sure that slight symptoms may not have existed previously, and been overlooked until the urine was tested regularly in the course of the infective disease. Pneumonia in diabetics is almost invariably fatal, gangrene of the lung being a frequent termination. Erysipelas and other troubles due to pyogenic organisms are also dangerous, owing to the diminished resistance shown by the tissues in these patients. Tuberculosis of the lungs is a common cause of death, constituting the most frequent termination after coma diabeticum. It is doubtful if recovery from this infection ever occurs in true diabetes, but its course may be prolonged for two, or even three, years. The sugar often tends to disappear from the urine as the pulmonary disease progresses. In grave cases, a fatal issue may occur in two or three months after signs are noticed in the chest. The prognosis in individual cases will depend on the rapidity of emaciation and on the progress of signs of destruction of the substance of the lungs. There may be fever of the usual hectic type, but in this, as in other infective disorders, cases are met with in which grave infections run their course with little or no elevation of temperature.

*Pregnancy.* The relationship of pregnancy to diabetes is not well understood. According to Franck, transitory glycosuria occurs in 10 per cent. of all gravid women, and more persistent glycosuria in 10 to 12 per cent. Whitridge Williams believes that if the symptom occurs late in pregnancy, and the sugar is not more than 2 per cent, while there are no symptoms of ill-health, the condition is transitory and unimportant; if it occurs early, or in larger amount, no prognosis should be given till delivery has taken place and the progress of affairs been observed. Diabetic patients may make good recoveries from the troubles of labour, or may die in coma. If the amount of sugar in the urine is large, and uncontrolled by diet, artificial labour should be induced. I have known a case in which glycosuria occurred in one pregnancy, with increased thirst and polyuria, to pass off after delivery, and return again with the next pregnancy, the case then becoming one of confirmed diabetes. A cautious prognosis is certainly necessary in all these cases.

*Surgical Operations.* Diabetics may make good recoveries from severe surgical procedures; on the other hand, coma may ensue and prove fatal. This risk makes it wise to avoid all unnecessary operations of a trivial or cosmetic nature; but dangerous conditions, such as

pendentitis or cancer, which in themselves threaten life should be treated without delay. A general anæsthetic, especially chloroform, is to be avoided if possible, local or spinal anæsthesia being preferred. Strict asepsis is of the greatest importance: the mortality of aseptic operations, in Karewski's experience, amounted to 11.7 per cent, that of septic operations to 26 per cent: 11.8 of the former and 21.7 of the latter being due to coma. Shock is also to be avoided by all possible means, and it is wise to reduce the glycosuria by diet, and to administer doses of bicarbonate of soda, before operation. Aetionmia is a contraindication to surgical interference.

**Mode of Death.** The greater number of diabetics die ultimately from coma, this condition occurring in probably 90 per cent of the acute cases. In chronic diabetes this termination is less common, but can never be excluded. The next most common cause of death is necrosis of the lungs, which is also more frequent in young subjects with severe disease. Other causes of death are septic infection, as from carbuncle or erysipelas, cerebral hemorrhage, meningitis as a sequel to meningitis, gradual cardiac failure of arteriosclerotic type, and a peculiar form of sudden, or almost sudden, cardiac failure, possibly due to involvement of the myocardium. In some cases in which the symptoms of coma are present, the patient, nevertheless, retains mental consciousness until the end.

REFERENCES.—Luton and Woods, *Arch. of Pediat.*, 1911, xxvii, 907; Knudsen, *Zeitschr. f. Versicherungsmed.*, 1912, v, 33; Franck, *Arch. f. klin. Pathol.*, 1913, lxxii, 387; Laache, *Med. Klin.*, 1910, vi, 503; Lapet, *Presse Med.*, 1910, xviii, 89; Karewski, *Deut. med. Woch.*, 1914, No. 1; W. H. W. Williams, *Amer. Jour. Med. Sci.*, 1909, cxxxvii, 1; Williamson, *Pittsbor.*, 1911, lxxxvi, 821.

W. Cecil Bosanquet

**DIARRHŒEA, INFANTILE.** A simple non-inflammatory diarrhœa is very much less serious than an inflammatory diarrhœa due to *enterocolitis*. In this latter condition, high fever, constant vomiting, marked tenderness, loss of elasticity of the skin, drowsiness, collapse, grave nervous symptoms associated with convulsions, are to be regarded as of the greatest gravity.

Pulmonary catarrh with collapse of alveoli and bronchopneumonia not infrequently arise during the illness, rendering the outlook still more serious. If the temperature in the rectum reaches 105 the prognosis is very bad, or if it runs up with a sudden leap from the normal to any great height. Exposure to chill during the height of the attack is very likely to produce an exacerbation of all the symptoms.

**Summer Diarrhœa (Cholera Infantum).** In this complaint the prognosis is based on points similar to those mentioned above (enterocolitis). The younger the patient (*æbris parvus*), the worse the prognosis.

In the more chronic diarrhœas of children, the incidence of œdema of the extremities is a sign of grave import, and so also is the onset of flush in the mouth.

J. R. Charles.



**DILATATION OF THE STOMACH.** — (See STOMACH—MEDICAL ADDITIONS OF.)

**DIPHTHERIA.** The most important factors which govern the prognosis of this disease are: (1) *The age of the patient*; (2) *The site of the disease*; (3) *The severity of the attack*; (4) *The occurrence of certain complications*; (5) *The treatment*.

1. **Age of Patient.** The following table, based on 56,507 cases of diphtheria treated in the hospitals of the Metropolitan Asylums Board during the years 1900 to 1909, shows the importance of age as a factor in the case-mortality:

FATALITY ACCORDING TO AGE.

0-1	34.0	0-5	15.7	25-30	1.3
1-2	22.7	5-10	8.3	30-35	1.3
2-3	16.4	10-15	3.4	35-40	1.0
3-4	13.4	15-20	1.8	40 and over	5.0
4-5	11.2	20-25	0.9	All ages	10.3

From this table it appears that the disease is much more fatal in children than in adults, and that, up to twenty-five years of age, the younger the patient the greater is the risk to life. The large majority of these patients were treated with antitoxin. *See* appears to have no influence on the fatality.

2. **Site of the Disease.** The most common sites are the *fauces*, *nasal passages*, and *larynx*. The false membrane may be found on all these parts simultaneously, or may be limited to one of them. The more intimately adherent the false membrane is to the mucous surface, the more surely will absorption of toxin take place and toxæmia and its sequels occur. Now the false membrane is almost invariably attached very loosely to the nasal passages and to the larynx and trachea. Hence toxæmia is seldom pronounced and is often absent in nasal and laryngeal diphtheria if the fauces are unaffected, and it is the faucial form of the disease which affords the most striking examples of toxæmia. Diphtheria of the air-passages is, however, the most fatal of the three varieties under discussion, because of the mechanical obstruction to respiration to which it gives rise by occlusion of the larynx, trachea, or bronchi.

In adults, invasion of the air-passages may be overlooked until involvement of the small bronchi gives rise to dyspnoea, and it is then too late to save the patient by operation. Aphonia, therefore, even without dyspnoea, is a grave sign in an adult. Fortunately the air-passages are seldom attacked in adults.

Simple nasal diphtheria is seldom fatal. The most serious cases

in those in which the nose, throat, and windpipe are simultaneously involved.

An estimate of the influence on prognosis of the involvement of the larynx may be derived from the statistics of the Asylums Board already quoted. During the ten years 1900 to 1909, the fatality of cases in which the larynx was not affected was 8.8 per cent; whereas in those in which it was affected (with or without involvement of the fauces) the fatality was 18.9 per cent.

Of other forms of diphtheria, the *ulcer* and *cutaneous* are the most serious, because they are prone to be accompanied by grave toxæmia. In *ocular* diphtheria there is considerable risk of loss or impairment of sight from damage to the eyeball.

3. **Severity of the Attack.** Most of the laryngeal cases must be regarded as severe, because of the high fatality amongst them. About half of them come to tracheotomy or intubation, 57.3 per cent at the Lister Hospital, Homerton, during the ten years 1905 to 1914 (586 out of a total of 1022 cases in which the larynx was involved).

In other forms of the disease, severity depends upon the degree of toxæmia; this, in its turn, depends upon the extent and persistence of the false membrane. Albuminuria may be taken as a rough index of toxæmia; the more lasting the albumin and the larger its amount, the more profound the toxæmia and the greater the chance of the occurrence of some untoward event. Early nephritis (blood and casts in the urine) is a most serious condition; fortunately, it is rare. The following symptoms of toxæmia are extremely grave: repeated vomiting; scantiness of urine; hemorrhages into the skin and subcutaneous tissue, and also from mucous membranes (unless from the nose only, in nasal diphtheria); an infrequent, feeble, and irregular pulse; an ashen hue of the lips and extreme pallor. In most cases in which one or more of these symptoms are present the patient is evidently ill, even to the unpractised eye; but occasionally, when there is progressive suppression of urine, with little or no vomiting, he may seem to be doing well, and even to be getting better. Other unfavourable symptoms are a blotchy erythematous rash, usually most pronounced on the extremities; enlargement of the liver; and convulsions.

4. **Complications.** *Paralysis* is the most frequent, as well as the most important; it occurred in about 16 per cent of the 56,507 cases mentioned above. It usually supervenes after the false membrane has disappeared, and when the patient may appear to have recovered from the attack of diphtheria, commonly during the third or fourth week, and with diminishing frequency up to the seventh. Hence it is important to know what forms of diphtheria it may follow. The lesions which give rise to paralysis are caused by the toxin; so that the more toxic the case, the higher the risk of palsy. In respect of the gravity of the paralysis itself, a fatal issue is the more to be feared the earlier this complication arises and the more rapidly the various groups of muscles are involved. The outlook is grave if any of the

ordinary muscles of respiration are affected, especially the diaphragm. Frequent vomiting is a serious symptom. Paralysis is met with much more often in children than adults. Its termination is either by complete recovery or by death; patients are never left permanently paralyzed. About 43 per cent of the cases are fatal.

*Heart failure* may occur, not only in connection with paralysis, but even in cases in which that complication has not supervened. Like palsy, it is to be anticipated most in the toxic form of the disease. Acute cardiac dilatation, especially when accompanied by pericardial pain, is nearly always fatal. Heart failure is prone to occur in patients who have been allowed to get up and about too soon after the false membrane has disappeared.

*Lobar pneumonia* is the only other serious complication. It is found only in 1 or 2 per cent of the cases, and chiefly in those which have undergone tracheotomy.

5. *Treatment. Antitoxin.* In cases not treated with antitoxic serum the prognosis is less favourable, *et ceteris paribus*, than in those so treated. Amongst the antitoxin-treated cases, those do best which are brought under treatment earliest. Of severe cases which receive the serum late, those have the best chance of recovery in which large doses (20,000 to 30,000 units) are given. The earlier the serum treatment is commenced, the less chance is there of the larynx becoming invaded, and of paralysis supervening. If paralysis does occur in a patient who has been treated with serum early, it is almost always very slight. Convalescence is hastened in those who receive serum treatment at the beginning of the illness.

The following figures, from the 1911 annual report of the Metropolitan Asylums Board, show the case-mortality per cent according to the day of disease upon which the serum treatment was commenced.

TABLE III.—MORTALITY ACCORDING TO DAY OF COMMENCEMENT OF SERUM TREATMENT.

Day of commencement of treatment	No. of cases	No. of deaths	Case-mortality per cent
1st day	149	4	2.6
2nd "	911	31	3.4
3rd "	981	88	8.9
4th "	707	89	12.5
5th " and over	1116	170	15.4
Total	3864	362	9.3

*Operation (Tracheotomy and Intubation).* In respect of recovery after tracheotomy, the prospect has very much improved since the introduction of the serum treatment. Whereas about 30 per cent

to recover, about 70 per cent are now cured. In some hospitals intubation is practised, usually to be partial exclusion of tracheotomy. It is impossible to compare satisfactorily the results of intubation with those of tracheotomy, because of the lack of parallel cases, which can be fairly set against each other. During the years 1905 to 1911, 586 cases of laryngeal diphtheria were submitted to operation at the Eastern Hospital, and of these 156 died, a mortality of 26.6 per cent. These cases can be arranged as follows.

RESULTS AFTER OPERATION.

Intubation only	295	28	9.4
Intubation followed by tracheotomy	159	74	46.5
Tracheotomy only	132	54	40.9
<b>Total</b>	<b>586</b>	<b>156</b>	<b>26.6</b>

It will be seen that 35 per cent of the intubated cases came to a fatal issue. The fatality of all the cases operated upon, viz., 26.6 per cent, compares favourably with the fatality, about 30 per cent, of the tracheotomy cases at these hospitals in which intubation was not practised.

The patient who is intubated recovers much more quickly than the patient who is submitted to tracheotomy.

The most favourable ages for tracheotomy and intubation are 5 to 9 years. The prognosis in adults is very grave.

If a patient is intolerant of the intubation tube, and coughs it out frequently, tracheotomy should be performed; irritability of the membrane is prone to be followed by ulceration. But if a membrane is coughed out with the tube, even though the latter is frequently renewed, resort should still be had to re-intubation until the membrane has disappeared. The longer the intubation tube is worn, the more favourable condition of the larynx to be set up. It has been my practice not to leave the intubation tube in the larynx for longer than 10 days, and I have seldom met with ulceration of that organ on the tube.

E. W. Goodall

DISLOCATIONS. (See JOINTS, INJURIES OF.)

**DISSEMINATED SCLEROSIS.** The causation of this disease is not known as yet. The characteristic patches of sclerotic overgrowth of glia are secondary to an antecedent degeneration of the myelin sheaths. Why the medullary sheaths themselves should

become degenerate at present unknown. There is much to be said in favour of a toxic origin for the malady, but until the toxins are fully identified, our treatment must remain frankly symptomatic.

Early diagnosis is of great importance. If we can recognize the disease in its earliest stage, we save the patient from misdirected treatment. Thus, for example, some cases of disseminated sclerosis are mistaken for cerebro-spinal syphilis, and are subjected to long and futile courses of anti-syphilitic medication. Others are mistaken for tabes or other varieties of ataxia. Others, again, mistaken for cerebellar or cerebral tumour, have even been submitted to exploratory operation. Most frequently of all, the remittent course of unstimulated chorea causes it to be mistaken for hysteria, and the patient is consequently stimulated by encouraging suggestions to try and throw off her malady by her effort of will, and to undertake exercises of a tiring kind which probably hasten the progress of the disorder.

The duration of the disease is uncertain. At the outset it should be remembered that by itself it is rarely fatal. The commonest course is a chronic one, lasting for years, with occasional periods of remission or arrest, during which marked improvement takes place, followed, after variable intervals, by further relapses. The remissions may amount to apparent cure. The longest remission with which I am acquainted occurred in the case of a woman who, at the age of twenty-four, had her first symptoms of the disease, consisting in complete paraplegia, with loss of sphincter control, and with central scotoma due to retinobulbar neuritis. She recovered from this in six months. Three years later, she had another attack of visual trouble, with weakness of the right leg, lasting several months. She married at the age of twenty-nine and had four healthy children. For many years she led an active life, apparently in ordinary health. At the age of fifty-three, i. e., twenty-seven years after her second attack, she again became weak in the right leg, and within three years developed the classical signs of disseminated sclerosis, including motor weakness, intention tremors, and the characteristic changes in the reflexes. At the age of sixty-eight, i. e., forty-five years after the first onset of the disease, she is still alive, although the limbs are severely paralyzed and ataxic. Nevertheless she gets up to dinner daily, and is still able to go out driving.

The next most common variety of the disease is that in which the symptoms, after slowly or rapidly attaining a degree of moderate severity, remain more or less stationary. The patient, although suffering from motor weakness and perhaps confined to bed, remains well nourished, and the general health is fairly well sustained, it may be for many years, until at last a final exacerbation of the disease occurs.

A third variety is met with, where the patient has a series of attacks or exacerbations, consisting in transient blindness, diplopia, monoplegic or hemiplegic attacks, etc., clearing up in part, but leaving him in the intervals more and more paralyzed, each fresh exacerbation

regarding the general level of strength, until the patient becomes bed-ridden with contractures, sphincter trouble, etc. In such cases special attention is required to prevent cystitis and bedsores, either of which complications may lead to a terminal toxæmia. Intercurrent pulmonary complications, tuberculous or pneumonic, may also prove fatal. Bulbar paralysis, from the presence of a sclerotic area in the somites, is a less common cause of death.

To sum up then, the prognosis in disseminated sclerosis, as regards recovery, is unfavourable, but, as regards duration, long remissions may occur, especially if physical or mental strains are avoided. In the latter case, when the patient lies become bedridden, the duration of life depends on assiduous nursing, prevention of bedsores and bladder infection, and avoidance of pulmonary and other complications.

The patient with disseminated sclerosis is not infrequently somewhat emotional, with a tendency to smile and laugh on slight provocation. In the more complicated cases there is rarely, if ever, any true intellectual disability. This fact is sometimes of importance with regard to legal and moral capacity.

*PAUL S. SWEET*

#### DRUG HABITS. (See also MENTAL DISEASES.)

**Opium.** Children are much more susceptible to the influence of opium than adults, but among the latter there is a great personal factor as far as susceptibility is concerned. In acute poisoning, a white or ashy face covered with clammy sweat is of extremely grave, but not necessarily fatal, significance. It should be remembered that in the comatose condition, false appearances of improvement may occur which are very deceptive, the patient again relapsing into fatal coma. Since death generally supervenes as the result of cessation of respiration, an improvement in the depth of this, and in the colour of the skin, should be carefully looked for. Dilatation of the pupils during deep coma, following on their contraction, is of the gravest import.

**Morphia.** In morphinism, much depends on the length of time the patient has been under the influence of the drug, and the dose taken. As much as 75 gr. has been tolerated by chronic morphinists in the course of twenty-four hours. It is probably more difficult to break the habit in patients who take the drug hypodermic than in those who take it in any other way. As in opium-eating, there is a very marked personal element in the amount which can be tolerated. Young people can stand larger doses over more prolonged periods without gross cachexia appearing than can the more elderly. The latter are more liable to feel the effects of the withdrawal of the drug to a greater degree. Chronic morphinomaniacs do not live to 60 years, and are very liable to be carried off by an attack of some acutely mild acute disease; or if they escape this, they pass into a condition of extreme asthenia and emaciation, and die from sheer physical debility.

In the treatment, the great danger is that of inducing a fatal

collapse by too sudden withdrawal of the drug, while there are frequently periods after cure has been apparently obtained, during which the patient suffers from intense craving for morphine. The craving is less severe and not so constantly repeated as in the case of alcoholism or cocaineism. These periods of craving may, however, recur for six to ten months to two years after the cure.

**Heroin.** This is not a harmless drug, for a habit may be induced which, in severe cases, presents as much difficulty in escaping from as does the escape from the opium habit. Moreover, the patients may remain physical wrecks, with undermined constitutions and of no resisting power, even when they have been cured of their habit.

**Cocaine.** The prognosis of chronic cocaineism is worse than in the case of morphinism, because the patients have no desire whatever, in the great majority of cases, to be delivered from their habits, and have a very great tendency to relapse immediately. They are liberated from restraint. There is a greater destruction of the higher mental faculties than in the case of morphinism, and if possible, the patients are even more inveterate habits. This renders treatment more difficult and prognosis worse. With the onset of marked emaciation, sunk-in eyes, tremors, hallucinations, and delusions of persecution, the prognosis is well-nigh hopeless. It produces destruction of its victim more quickly than opium or alcohol. Delusional insanity may develop very rapidly in chronic cocaineism, and the delusions may remain for weeks after the drug has been entirely withdrawn. There is a strong personal predisposition to the effects of the drug.

**Chloral.** Full tolerance is not obtained even though the habit of taking this substance may have lasted for a long time. The great importance of this is that the usual dose, or even a smaller dose than usual, may be followed by a fatal result. The same remark adds good with reference to chloroform.

**Sulphonal.** The repeated ingestion of sulphonal may lead to very serious symptoms, because the drug has a cumulative action, being excreted slowly from the body. A dangerous sign is the onset of hematuria, evidenced by the appearance of red, pink, brown, or almost black urine. This danger is more marked in women than in men. When given continuously, sulphonal may produce sudden coma and death, but more often there are other warning symptoms such as <sup>1</sup> the rations, mental confusion, exhaustion, nausea, tympanites, abdominal pain, cyanosis, coldness of the extremities. This may be followed by death from exhaustion in some cases.

If any of these symptoms arise, the use of the drug must be stopped immediately; but all danger is not then passed. Serious symptoms have arisen for the first time as long as nine days after the cessation of the administration of the drug.

**Trional and Tetronal** may produce the same grouping of symptoms, including hematuria, if given over a prolonged period. A large single dose is not likely to produce them, as much as 120 gr. of trional having been taken without the onset of hematuria.

*J. R. Charles*

**DUODENAL ULCER** (See also STOMACH, SURGICAL AFFECTIONS)

Remembering that in many cases an ulcer of the duodenum is so latent as far as any manifestation is concerned, it is impossible to say how many get well unrecognized. Of those diagnosed, perforation is reported to occur in about 10 per cent, while more or less severe hemorrhage arises in from 30 to 40 per cent. In different series the mortality rate from hemorrhage has varied from 13 up to 36 per cent. The possibility of complications, which include abscess (e.g., subpyloric), subsequent stenosis of the duodenum, stenosis of the common bile duct, and secondary malignant disease, must be borne in mind in every prognosis. Relapses in duodenal ulcer occur with about the same frequency as in gastric ulcer.

*J. R. Charles*

**DYSENTERY.** There is no disease, or rather group of diseases, in which the death-rate differs so widely, chiefly in relation to the nature of the infection and the stage in which the patient comes under treatment. Thus, among many thousand cases coming early under observation in India, the mortality in a series of years varied from 0.54 per cent in the Indian Army and 2.93 per cent in British troops to 5.20 in those on ships. On the other hand, in a large Calcutta hospital where only chronic and often moribund cases are admitted, in the course of 20 years the death-rate was no less than 40 per cent, the cases being equally divided between the bacillary and the amoebic forms. The importance of differentiation between the different forms of dysentery has not only recently been at all generally recognized, accurate figures regarding the mortality of amoebic and bacillary dysentery are very scanty.

**Mortality of Bacillary Dysentery.** When this form is epidemic, as in Japan, the mortality is high, such as 30 per cent, but can be much reduced by the use of antidysenteric serum. In some collected cases, as among the Mecca pilgrims at the El Tor station in Egypt, the death-rate was no less than 64.4 per cent (Ruffer and Williams), but was reduced by a polyvalent serum to only 40.8 per cent. Among similar cases in native patients in a Calcutta hospital the mortality was between 30 and 40 per cent, serum treatment being not used on account of the cost. Bahr in Trip had a mortality of 12 per cent under the saline treatment, but only 4.8 with the use of serum. Extensive data regarding the prognosis, in cases proved generally to be bacillary dysentery and treated in an early stage, appear to be wanting, but apart from epidemics it would probably be under 10 per cent. The war should provide data on this point.

**How to Follow the Case Mortality of Bacillary Dysentery.** Cases occurring in epidemics or several in a house at one time are usually the most serious form is one accompanied by cholera-like symptoms. The most serious form is one accompanied by cholera-like symptoms, but hypertonic salines, as now used in cholera, will save many such cases. High and prolonged fever is an indication of toxæmia requiring serum treatment. Local peritonitis is a rare but serious sign in bacillary dysentery. Perforation, pylophlebitis,



and severe hemorrhage from the bowel are also rare but deadly complications. In cases coming at a late stage, the previous duration of the illness is the most important factor in the prognosis. If the disease has continued for over a month with little abatement, a chronic state with extensive intractable ulceration—especially of the lower half or two-thirds of the large bowel—will be present, which is most difficult to deal with. In this stage bad signs are great emaciation, anuria, hiccough, and exhaustion, with the continued passage of numerous stools. Bacillary dysentery often attacks patients suffering from other exhausting diseases, such as kala-azar, when the prognosis is particularly hopeless. A chronic form of arthritis may follow the disease, and was especially frequent during the South African War.

**Mortality in Amoebic Dysentery.** At the Calcutta Medical College Hospital this disease accounted for one-twelfth of the total mortality and one-fifth of that due to tropical diseases. At El Tor, Ruller and Willmore had a case mortality of 91 per cent. in chronic amoebic dysenteries among the pilgrims before the introduction of emetine. In Calcutta at the same period, the writer had a mortality of 43.3 per cent. in cases treated with large doses of opocanatha by the mouth, but during the last three years, under emetine injections, the mortality has been only 12.5 per cent., nearly all in cases admitted with hopeless gangrene of the bowel or complicated with kala-azar. Vedder agrees with Rogers that all but nearly moribund patients can now be cured with emetine. In the Panama Canal zone, where the cases presumably come under early observation, Deeks reported 65 cases with only one death under treatment with large doses of bismuth subnitrate, but subsequently stated that emetine had a more definite specific effect. The stage of the disease greatly affects the death-rate, as patients are not infrequently admitted to hospital with a gangrenous condition of the greatly thickened lower bowel wall and local peritonitis, often without actual perforation, from which recovery is not possible, the patients dying within a very few days of admission. Apart from this grave condition, and from hepatic complications, the prognosis of the disease, as far as recovery from the particular attack is concerned, is now very favourable under emetine, although a certain proportion of the cases subsequently relapse and require renewed treatment.

*Factors Influencing the Treatment in Individual Cases.*—The dangerous conditions are great thickening of the bowel wall, enabling it to be felt as tender sausage-shaped masses through the anterior abdominal wall, and indicating gangrene and local peritonitis; the passage of black eddy-like sloughs of the mucous membrane; local peritonitis, only occasionally due to actual perforation, sometimes with post-ecolic abscess usually on the right side of the abdomen, or general peritonitis.

Unfavourable symptoms are cold, clammy skin, hiccough, and a very high degree of leucocytosis such as 10,000 and over (up to 50,000 may not rarely be recovered from). The number of the stools is of comparatively little significance, as actual constipation may result from

of the bowel, when the case may not even be recognized as such during life. Very severe hemorrhage may also be dangerous but usually is readily controlled by emetine.

*Complications.*—In addition to gangrene of the bowel or peritonitis (with or without actual perforation), by far the most common and serious complication is acute hepatitis going on to liver abscess. In the stinging amoebic dysentery, numerous small abscesses may be met, producing a hopeless condition. More frequently, a single large abscess forms insidiously—especially in chronic or latent amoebic dysentery of the large bowel—the prognosis of which is separately considered (see AMOEBIC LIVER ABSCESS). Amoebic abscess may also form in the spleen or brain, both being serious, especially the latter. Arthritis has also been recently described as following amoebic dysentery and yielding to emetine.

*Louise B. Reed*

### DYSMENORRHEA.

1. *Spasmodic.*—This variety is the commonest, and in many ways the most troublesome. Great difficulty is experienced in giving an opinion as to the evolution of a case of spasmodic dysmenorrhœa.

There are three points upon which the attention should be focussed: (a) The severity of the symptoms; (b) The physical development of the case; (c) The neurotic element.

*The Severity of Symptoms.*—This must be gauged not only by subjective impressions, but also by an attempt to fix by other means the standards of expression of pain peculiar to the patient.

In cases where the pain is severe, localized exactly in the hypogastrium, and lasts for a day or two with definite paroxysms, it is usually a waste of time to employ medicines; on the other hand, where the symptoms do not appear intense, and the other features are good, it may be taken that in the majority of cases simple medical measures, attention to physical hygiene, and sufficient rest, will be successful.

1. *Physical Development and Tone.*—In the first place, dysmenorrhœa in the small infantile, or in the bicornuate, uterus is almost intractable to medical or lesser surgical measures (such as dilatation, which brings at best only temporary relief). In the majority of cases an extirpation is eventually required.

Next, in cases with a conical cervix or with antelexion, the results of medical treatment are small, while dilatation or incision of the cervix is permanently successful in at least 50 per cent of the cases, and in many more for a period of from one to five years. The failures in many cases explained by faulty operation, in which the internal os is not dilated. Older gynecologists are agreed that the use of the glass stem enhances the chance of cure in cases of antelexion. In those cases in which there is no physical defect, attention should be paid to the general tone of the body; many patients in weak, nervous, physically exhausted and anæmic, only require judicious correction of errors, and medical measures, in order to recover completely.

c. *The Neurotic Element.* The greatest difficulty will be found in estimating the proportion due to an underlying neurosis, and that due to the effect of continued dysmenorrhœa. The patients are usually thin, often the subjects of chronic arthritis or of bad circulation.

There is no doubt that the continued pain endured for years leads eventually to a loss of resistance, and a morbid fear of the forthcoming period, which is often found in alcohol, or in morphia injections. Under these circumstances it is rare for medical treatment alone to be successful, and cervical operations give as a rule but a temporary benefit.

Reviewing, then, the prognosis of spasmodic dysmenorrhœa in general, it is seen that the greatest circumspection is required in forming an opinion. Beyond the special points detailed above, other factors are the age of the patient and the presence of sterility. Sterility is an indication for dilatation, and the results are perhaps best expressed in the following figures given by Brickner: Of 38 patients suffering from dysmenorrhœa and sterility, only 27 per cent were cured of both the sterility and the dysmenorrhœa.

The following figures also give some indication of the outlook in dysmenorrhœa generally. Findley quotes Kelly as follows: Of 95 cases of dilatation, 48, or 49 per cent, were permanently relieved; 14, or 14.7 per cent, received great benefit; and 7, or 7.4 per cent, were completely relieved for from one to twelve years, when, however, the pain returned.

Brickner<sup>1</sup> used Dudley's operation instead of dilatation in 73 cases—42 for dysmenorrhœa alone, and 38 for dysmenorrhœa with sterility—and obtained the following results: Of the 42 patients with dysmenorrhœa, 14.3 per cent were relieved; 33.3 were not relieved; and 21 per cent were worse; of the 38 patients with both dysmenorrhœa and sterility, 27 per cent were cured of both.

2. *Membranous.* This much rarer condition is decidedly more grave in outlook; it has not been successfully treated by drugs, and it nearly always recurs after dilatation and curettage. It is important to try to discover the presence of any pelvic disease; thus, in a few cases operation has revealed a tuberculous condition of the appendages, associated with tuberculous endometritis, and hysterectomy has brought permanent relief.

3. *Congestive.* This covers a wide field, and is after all but a symptom in the course of pelvic inflammatory disease or uterine displacement, so that it rarely requires consideration from the point of view of the dysmenorrhœa. Nothing, however, is more striking than the alleviation of the symptoms which results from the correct treatment of the underlying pathological lesion.

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EAR DISEASE, INTRACRANIAL COMPLICATIONS OF. (See INTRACRANIAL COMPLICATIONS OF EAR DISEASE.)

## ECLAMPSIA.

## MATERNAL PROGNOSIS.

In considering the prognosis as regards the mother in eclampsia, it is necessary to pay special attention to particular symptoms, and only at a comparatively late stage of the disease that it is possible to form an opinion.

The general mortality in a large series of cases will be found to be around 25 per cent, but in a small series it may be reduced to 10 per cent, or even less. This does not so much indicate a marked superiority of one form of treatment over another as it points to the fact that the cases in one series have been mild and in another severe. While the majority of obstetricians are convinced that emptying the uterus as soon as convenient after the first convulsion is most important, there remain a number of physicians, especially among the younger members of the profession, who are in no way convinced that the results therefrom are an improvement upon the purely expectant methods of treatment of former years. Binion<sup>1</sup> believes that the sooner the uterus is emptied after the onset of fits the better the results, and he states that by adopting such a principle he is enabled to reduce the mortality from 25 or 30 per cent, representing the results of expectant treatment, to 2 or 3 per cent.

**The Maternal Prognosis from the Clinical Aspect.** The prognosis varies directly with the *period of onset* of the fits. The figures recorded by Galatin<sup>2</sup> from the records of the Guy's Charity are most instructive in this respect:—In cases beginning before the onset of labour, the mortality was 50 per cent; in those beginning during labour, it was 25 per cent; after delivery, 8 per cent.

*The number of fits and the interval between each fit* are undoubtedly of great importance. Rapidly recurring fits, in which the interval becomes shorter and shorter, will, as a rule, soon end in coma. Recovery has been recorded in a patient in whom 200 convulsions were reported. Some idea of the importance of the number of fits may be gained from the result of Cesarean section in this respect. Peterson<sup>3</sup> records that in cases thus operated upon after 4 to 5 fits, the mortality was 15 per cent, while in those operated upon after 6 fits had occurred, it was 50 per cent. That is to say, after the fifth fit the mortality is doubled. It would appear that the administration of chloroform or chloral has in many instances been of service in reducing the number of fits.

*The function of the urinary system* is of the greatest importance in these cases. Grave significance attaches to a marked diminution in the total quantity of urine excreted in the twenty-four hours, especially when the small quantity becomes solid with albumin. Conversely, an increase in the daily quantity of urine is to be regarded as pointing to a favourable termination.

Evidence of *jaundice* following the eclamptic convulsions must be taken to indicate considerable lesions in the liver. In these cases there is frequently a persistently raised temperature, a degree or more above normal, and a prolonged stage of coma. In the worst

cases there is some haematoma, and small subcutaneous haemorrhages are seen.

*Drop coma accompanied by considerable elevation of the temperature* will probably indicate cerebral lesions.

Lastly, a point which is often overlooked, but which is of importance from the point of view of prognosis, is the fact that eclampsia renders the patient liable to haemorrhage during parturition and to septic infection during the puerperium, so that it must not be concluded that all danger is past because the fits have ceased.

#### **The Maternal Prognosis from the point of view of Treatment.**

There is little doubt that impudicious treatment may be attended with disastrous results.

First, with regard to expectant methods, it would appear inadvisable to persist in them if labour is not progressing and the fits continue. They are, of course, the only resource in post-partum cases, except where a marked drop in the urinary excretion renders it advisable to try decapsulation of the kidneys, an operation in which the mortality is at least 50 per cent.

In the vast majority of cases the problem resolves itself into deciding which is the best method of emptying the uterus under the circumstances. It is generally admitted at the present day that the best results will be obtained by that method in which the uterus is most rapidly emptied while at the same time the patient receives the least shock. It is assumed that emptying the uterus prevents further auto-intoxication from placental bodies; on this assumption it is *a priori* probable that the best results would follow Caesarean section in all cases occurring before dilatation of the cervix. Unfortunately, Caesarean section is regarded by most obstetricians as being too serious a procedure except in special circumstances, and it must be admitted that the result hitherto have not been strikingly superior to those given by non-conservative methods: though it is undoubtedly true that the figures of Caesarean section represent a large proportion of very severe cases.

Three methods of emptying the uterus require consideration: (1) Rapid dilatation of the cervix, with forceps delivery; (2) Vaginal Caesarean section; (3) Abdominal Caesarean section.

1. *Rapid dilatation of the cervix* is indicated in cases about term, in which the cervix is readily dilatable. The results of this method of treatment have been published by Bossi<sup>1</sup> (who uses a special dilator), the maternal mortality being 14 out of 138 cases, or 10.15 per cent. These results are certainly good. Bossi's dilator has not become popular, however, owing to the risk of extensive laceration of the cervix: so that dilatation with the hand is considered to be the safer method.

2. *Vaginal Caesarean section* has given results which have not been uniformly good, owing to the fact that even after the lower segment has been incised it still remains to extract the child. Again, unless the cervix is already 'taken up,' the difficulty of the operation may be considerable.

Routh<sup>1</sup> has collected 15 cases performed by British operators with 4 deaths, a mortality of 26.6 per cent. Beckmann,<sup>2</sup> however, concerning this method has a mortality of 18 per cent.

*Abdominal Caesarean section* has been more extensively performed. It gives the best results in cases in which the cervix is rigid and it is usually advisable to empty the uterus at once. The figures of results vary considerably. Thus, Routh<sup>1</sup> collected 105 cases by British operators and found that there had been 50 deaths, a mortality of 47.6 per cent; Peterson<sup>3</sup> collected 283 cases from all over Europe and America operated upon between 1908 and 1913, and found a mortality of 25.79 per cent; still better results are shown in 91 cases operated upon by thirteen different surgeons, a mortality, namely, of 18.63 per cent.

FETAL PROGNOSIS.

The later the onset of eclampsia and the less the number of fits it occurs, the better the outlook becomes for the foetus.

As regards treatment, there is no doubt that provided the child is viable, abdominal Caesarean section offers a very much better prospect than any other method. Thus, in Peterson's<sup>3</sup> statistics of 248 cases, when only the viable children were taken into account, the fetal mortality was 9 per cent.

Fichtenstein, in the Leipzig Klinik, grouping all methods of treatment, had a fetal mortality of 37.3 per cent in 94 cases; or counting only viable children, 21.3 per cent. Bossi<sup>4</sup> gives the total mortality in 118 cases as 20.97 per cent.

REFERENCES: <sup>1</sup>Bunn, "Die Behandlung der Eklampsie," *Deut. med. Woch.*, 1907, xxxiii, 1945-1947; <sup>2</sup>Galdini and Blacker, *Midwifery*, 487; <sup>3</sup>Peterson, *Amer. Jour. Obst.*, 1914, April; <sup>4</sup>Bossi, 16th Intern. Cong. Med. Sci. (Obst. et Gyn.), Buda-Pest, 1909; <sup>5</sup>Routh, *Jour. Obst. and Gyn.*, 1911, vii; <sup>6</sup>Beckmann, *Monats. f. Geb. u. Gyn.*, 1913, lIII, 2.

*Bryden's Glandwing*

**ECTOPIC PREGNANCY.** The prognosis depends upon: (1) *The method of treatment adopted*; (2) *The stage of advancement of the pregnancy*; and (3) *The condition of the patient when she comes under treatment.*

1. **The Method of Treatment.** It is now established beyond doubt that the best results are attained by immediate operation in all cases in which the gestation has not advanced beyond the sixth month. Dr. late Hamilton Bell, investigating cases from St. Thomas's Hospital, observed that many hamatococles due to ectopic gestation were completely absorbed if left alone; this is generally admitted, but the adoption of such a course is fraught with dangers which far outweigh the risks of surgical interference. The immediate dangers are: (a) That a further and possibly fatal hamorrhage may occur; (b) That the hamatococle may suppurate; (c) That the gestation may be alive and secondarily implanted in the pelvis, when the surgeon will later be faced by the problem of dealing with an ectopic pregnancy advanced to the later months. Further, there are the disabilities that certainly

arise from the palliative treatment of ruptured ectopic pregnancies, in that adhesions of great variety and density are almost certainly formed.

Some idea of the relative value of the two methods of treatment may be gathered from the following table, which is compiled from figures given by Endley<sup>1</sup>:

TREATMENT OF ECTOPIC PREGNANCY.

		MORTALITY.	
		Number	Percentage
Schäfer	Expectant	241	68.8
Schäfer	Operative	82	2.1
Echling	Do.	130	2.3
Kreng	Do.	63	0

2. **The Stage of Pregnancy.** The surgical difficulties increase with the advancement of the gestation. Thus, the operation is relatively simple when undertaken in the first three months. From thence onwards it becomes a more formidable procedure, because the increased size of the placenta and of the blood-vessels passing up to it, of necessity gives rise to profuse hemorrhage during its removal. So much is this the case in the later months of gestation that all authorities are agreed that in a pregnancy advanced beyond the sixth month it is wiser, whenever possible, to postpone any interference until after 'term': at this epoch, with the advent of spurious labour and the death of the fetus, the subsidence of the placental circulation renders the removal of the fetus and the separation of the placenta a comparatively innocuous proceeding, attended by inconsiderable loss of blood.

It may, however, happen that the surgeon is forced to intervene during the later months of pregnancy, either by reason of rupture of the sac, or separation of the placenta, causing internal hemorrhage. The risk under these circumstances is always considerable, and may be further aggravated by the site of the placental implantation. Thus, in intraligamentous pregnancy, practically the whole of the clava is placental, and its removal is accompanied by very great bleeding; if, on the other hand, the surgeon contented himself with removing the fetus only, and trusts to the placenta to separate by necrotic disintegration, the possibility of septic infection further complicating the process is considerable. When, however, the gestation sac is intraperitoneal, the removal of the placenta is often more easily accomplished, and especially so when it is chiefly vascularized by ommental vessels through the medium of adhesions.

Finally, it is to be remembered that it is generally impossible to find peritoneum with which to cover the site of implantation, and that the adherence of intestine or the formation of peritoneal bands is not

operation—in the former case an intestinal obstruction may occur and has been recorded as the cause of death in several cases.

3. **The Condition of the Patient when she comes under Treatment.**

Opinion is mainly divided upon the question of immediate interference or waiting until the shock of hemorrhage has passed off. The preponderance of weight now inclines to the view that immediate operation as soon as the condition is diagnosed is attended by the better results. Efficient treatment of the shock and collapse from hemorrhage will perhaps again start bleeding, while the presence of the extravasated blood in the peritoneal cavity is to be regarded as a constant source of irritation. Further, the operation is itself so quickly performed in most cases, that the additional shock may be regarded.

REFERENCE.—Mudley, *Diseases of Women*, 1914, 472

*By John A. Downing.*

**ECZEMA AND ECZEMATOUS ERUPTIONS.** It is impossible to lay down brief rules for prognosis in eczema, for under that name several conditions of widely diverse origin are included. The points which influence the prognosis, and the varieties, are as follows.

1. **Eczema due to External Irritants.** Many conditions known as eczema are the result of the irritation of substances used in professions and trades. The possible irritants are so numerous that it would be out of place to enumerate them here. Certain soaps, soda, prolonged immersion in water, chemicals used in manufactures (e.g., trinitrotoluene and other high explosives) or remedially applied, may all cause this type of eruption. Exposure to strong sunlight is sufficient to cause a dermatitis in some subjects. Certain plants act similarly. As a rule, on the removal of the patient from the source of irritation, this form of dermatitis yields rapidly to simple soothing applications. Recurrence is almost certain if the exposure to the contact is repeated, and in many instances the skin becomes more and more easily affected as the attacks recur. In other instances a degree of immunity may be acquired.

2. **Parasitic 'Eczema.'** Under the name 'eczema' are included certain forms of eruption produced by ringworm fungi. These occur especially in the groin, axilla, and on the extremities. They yield to antiparasitic remedies, and are discussed with the ringworms. The most rebellious cases are those in which the eruption occurs between the toes and on the adjacent part of the sole. It is to be remembered that relapses are often due to neglect of disinfection of clothing.

3. **'Seborrhœic Eczema.'** This variety is associated with dandruff of the scalp and a greasy condition of the skin, and chiefly affects the middle line of the trunk, the face, and the flexures. It usually clears up rapidly under treatment by sulphur, resorein, and salicylic acid, provided the condition of the scalp can be controlled.

4. **Eczema of Infants.** This commonly involves the face. It usually begins in nurslings, and is often very intractable. An essential feature in successful treatment is the avoidance of scratching, which



causes secondary pyococcal infection. In most cases the dietary requires attention. The course is tedious, but the prognosis is good on the whole; relapses, however, are common, especially during the period of dentition. In a small proportion of cases seen in hospital practice the affection is persistent, or may for years merely show temporary remissions.

**5. Eczema dependent on Antecedent Conditions of the Skin.**

The xerodermitous and ichthyotic skin is very prone to eczema, which tends to recur every cold season. The eczema can usually be prevented by treating the congenital condition by regular bathing, and by theunction of glycerin and water, or some oily preparation daily; this should be made part of the daily toilette.

Varicose veins are a common cause of eczema, and the prognosis depends upon the possibility of the patient keeping the parts at rest. If this can be enforced the eczema soon yields to treatment. If the varices can be removed by operation, or if the limb can be properly supported by appropriate bandages, the eczema may be prevented, but relapses are exceedingly common.

The scaly skin is also prone to eczema, and very troublesome cases are met with in elderly subjects. The prognosis in these cases is usually unsatisfactory.

**6. Eczema of Doubtful Origin.**

In many cases we are at a loss to determine the cause of eczema. We may get evidence of gout, rheumatism, diabetes, renal disease; or there may be some antecedent general illness; or, again, we may be entirely unable to account for the condition. Here we have also to treat any general affection present, and the prognosis will depend in the main upon our success in determining and dealing with the underlying cause. Local applications may frequently clear up an attack, and by dietetic measures, hydrotherapy, etc., we may relieve the affection of the skin; but relapses are common unless the primary condition can be removed.

*J. H. Sequeira.*

**EMPHYEMA.** We have a fair amount of reliable material, gathered from a wide area, from which to judge of the prognosis of emphyema, and the results of treatment show a remarkable constancy.

**Prognosis apart from Operation.**—Apart from treatment by evacuation of the pus, death usually results from cachexia, after a long illness. A sudden fatality is not uncommon. Spontaneous relief, though unusual, is not impossible. The patient usually goes on for many weeks with fever, wasting, and signs in the chest; at length the pus bursts, either through the chest-wall—commonly just outside the apex-beat of the heart,—or it may be coughed up. This involves some risk of sudden death; but if the immediate danger is survived, patients sometimes get well. Pneumothorax may result. Bursting through the chest-wall seldom results in cure; a very persistent sinus generally remains. In both methods of natural cure, the lung is likely to have been long pressed upon, and so fail to expand properly, causing cirrhosis with cavities and chronic invalidism.

**Prognosis after Drainage Operations.** In older children and adults, the mortality after drainage operations seems in hospital records to be very constant at about 4 in 5, as the following table shows.

MORTALITY AFTER DRAINAGE OPERATIONS.

Lloyd	200	20
Lord	252	22
Schede	389	12.3
Lehrerz	120	25.8
Amstutz Children's Hospital	178	21.9
St. Bartholomew's Hospital	499	22.2

In the great majority of cases the operation involves removal of a rib, or ribs. Simple puncture, or insertion of a tube without rib resection, is very likely to be followed by re-accumulation of pus.

The mortality is influenced by (1) *The age of the patient*; (2) *The bacteriology of the infection*; and (3) *Whether the empyema is unilateral or bilateral*.

1. *Age.* In infants under two, there are many deaths. Nathan reports 115 cases, mostly treated by a drainage operation, with a death rate of 33 per cent. Zyller considers that simple puncture, if indicated when necessary, gives better results. His figures are: of 104 cases treated by puncture, 7 died; of 7 babies treated by drainage operation, 6 died.

2. *Bacteriology.*—With reference to bacteriology, the tuberculous, or an apparently sterile pus due to tuberculosis, makes the best prognosis; mixed infections are unfavourable; the pneumococcal is favourable; and, according to Lord, streptococcal infection is very dangerous.

PROGNOSIS ACCORDING TO BACTERIOLOGY.

Author	Cases	Survived	Died	Percentage
Schede	Knister	31	9	16
	Schede	45	10	35
	Lord	9	1*	8
Tuberculous	Lord	27		5
	Lord	35		4
Pneumococcus	Lord	17		1

3. *Double Empyema* is a grave condition, but in pneumococcal cases probably about half recover.

The two most favourable varieties of empyema are the kind that arise without obvious cause in non-tuberculous subjects, and the post-pneumonic form. According to Leidy of 288 post-pneumonic cases 16 per cent died, the period of illness averaging eighty-three days; of 101 idiopathic cases 8 per cent died, the illness lasting on an average sixty-six days.

Grave complications are those associated with pneumonia, tuberculous abscess, phthisis, or disease of the lung.

The operation itself is not altogether devoid of danger. Chloroform death is not very infrequent, and there are about a dozen cases on record in which convulsions followed close upon the evacuation of the pus.

**Eventual Results.** Much depends upon early diagnosis and operation. If the lung has been compressed for weeks it will probably fail to expand, and a period of 3000 will result, especially in tuberculous patients.

A serious, however, as by no means a death variant. Godlee writes of two of his operation cases who, wearing a tube, lived in moderately good health for many years, up to twenty in one instance. E. H. Barker's operation has a considerable mortality, perhaps about 40 per cent, but the varies much with the number of ribs that have to be resected and the condition of the patient's general health.

Leidy followed 14 cases of primary (idiopathic) empyema for a number of years; 9 were well ten years after, 2 died of lung trouble, and 2 of intercurrent disease. Of 26 post-pneumonic cases investigated five years later, 15 were well, 1 had phthisis, 2 had had leucoplaxia, and there was a persistent sinus, and 7 were dead (1 of lung abscesses and 3 of intercurrent diseases).

Richardson, Leidy, and others. *Ob. & M. McClellan's System of Medicine*. Waverly, *Dr. Zerkow's Case*, 1913, Scot., 419. Gao and Herder. *British System of Medicine*, 1909, ed. v, 76. *Zylich, Medical J. K. Reich*, 1912, 31.

L. Rosdoff, Stettin

#### ENDOCARDITIS. (See RHEUMATIC PHLEBITIS, MYO-, and ENDOCARDITIS.)

**ENDOCARDITIS, ULCERATIVE.** It may seem almost a waste of time to discuss the prognosis of so hopeless a disease; but recent work has shown that the outlook is not quite uniformly desperate.

The expectation of life, dating from the onset of symptoms, varies from a few days to two or even three years in the cases that end fatally, while complete recovery appears to occur in a small percentage. It is difficult to say exactly what that percentage is, probably less than five per cent achieve a real cure. It may even be objected that this is an unduly optimistic figure, but allowance is made in it for the fact that a more general practice of making cultures from the patient's blood is leading to the recognition of a number of comparatively benign cases—cases which might easily be mis-labelled chronic valvular disease, were it not for the application of laboratory methods. Death

may be due to a variety of causes, the most important being cardiac disease, embolism of brain, lung, or heart, uraemia, and general toxæmia.

The cases in which recovery may ensue belong almost exclusively to this category. The discrimination between this and other types is based on clinical and bacteriological grounds. The symptoms that suggest this group of cases are such as suggest that the blood infection and its results are of a comparatively low virulence: fever is moderate, and there may be afebrile intervals; the patient wastes and loses colour, but often so gradually that it is difficult to persuade him (or a prudent way of living); there is usually a history of rheumatic infection, with well marked signs of valvular disease—pandul, tender, swollen joints, plaques are common, especially on the fingers—and the sputum often contains evidences of active nephritis. When blood cultures are made, the streptococcus which is described in Germany as *S. viridans*, and classified by the St. Bartholomew's Hospital workers as the common streptococcus of the alimentary tract, is recovered. Sometimes the mitral-valve bacillus is recovered from cases of a similar kind (p. 17). The picture is that of chronic valvular disease, with evidences of a comparatively mild bacteræmia.

At the other end of the scale are ranged those cases in which there is infection with a wide daily swing, and often with rigors; the evidences of general poisoning, delirium and coma, dominate the clinical picture, and the signs of heart disease are inordinately so much so that they may be overlooked altogether. From cases of this kind *Staphylococcus aureus*, *Streptococcus pyogenes*, *Streptococcus pneumoniae*, and *gonococcus*. The course is rapid, and usually fatal. Between the two extremes, every grade of intensity may be encountered.

Generalizations are permissible, it may be said that the discovery of the *Staphylococcus aureus* or of the *Streptococcus pyogenes* is a sure warning of a fatal issue after a short illness; that infection with the *Streptococcus pneumoniae* or *gonococcus* is practically always fatal within a period of three months; but that in those cases that are associated with *Streptococcus viridans*, *B. influenzae*, or *Staphylococcus albus*, the possibility of recovery may be entertained.

From the clinical standpoint, a serviceable general rule is that the more the case is like chronic valvular disease, the less hopeless is the outlook; but that where the case is one of septicæmia, with little or no sign of cardiac disease, there is no hope of recovery. An equally unfavourable prognosis is to be given in those cases, seldom diagnosed but often fatal, where the cardiac infection is predisposed to, by, and terminates, some chronic rheumatic malady such as consumption, cancer, Bright's disease, or diabetes. The hopelessness of such conditions as these is too obvious to call for further comment. On the other hand, at least one case of recovery is on record in which the infective process had apparently attacked a congenitally malformed heart.

Even in the comparatively benign cases, the course is usually run in six months; and the chance of complete recovery is still so

lamentably slender that it is not fair to hold it out as anything but a forlorn hope.

Sudden death sometimes brings this disease to a close. Of Horder's 150 cases, 19 ended in this way. Embolism or hæmorrhage into the brain, or embolism of the cardiac wall, may be responsible. Tearing of a diseased cusp, indicated by sudden change in the murmurs, with aggravation of the signs of cardiac embarrassment, may accelerate death greatly.

**Influence of Treatment on Prognosis.** Of this there is unfortunately little to be said. A very few cases are on record in which the application of specific remedies (autogenous vaccines and sera) has appeared to save life, so that it is perhaps fair to claim that cases in which treatment can be carried out along these lines stand a less negligible chance of cure than those in which it is not feasible.

*Carey F. Coombs.*

#### ENTERIC FEVER. (See TYPHOID FEVER.)

**ENTERITIS, TUBERCULOUS.** Owing to the formation of adhesions, general septic peritonitis is less likely to occur in tuberculous than in other forms of ulceration of the small intestine, though this disaster is by no means unknown. Moreover, a general peritonitis may occur by organisms, e.g., *B. coli*, escaping into the general peritoneal cavity through a very much thinned intestinal wall, without actual perforation. More commonly, fistulous communications are established into other parts of the intestine, or into localized abscesses. Strictures may arise from fibrotic healing of the ulcers, but it is rare for these to give rise to subsequent intestinal obstruction. Fatal hæmorrhage may occur. The ultimate prognosis depends, in the vast majority of cases, on the presence of tuberculosis elsewhere in the body. This is generally in the lungs, peritoneum, or mesenteric glands.

*J. R. Charles.*

**EPIDIDYMITIS, TUBERCULOUS.** It is difficult and unsatisfactory, in one respect, to discuss the prognosis of an affection which is probably, in the great majority of the cases, only the most evident manifestation of an extensive involvement of the genito-urinary organs. It is obvious that the eventual outlook must usually depend more upon the state of the bladder, prostate, and kidneys, than upon the treatment of the testis. Tuberculosis of the urinary organs is discussed elsewhere. (See KIDNEY, TUBERCULOUS; and BLADDER, TUBERCULOUS.)

We shall here include tuberculous orchitis with epididymitis.

It has been much debated whether the epididymitis is the primary manifestation of tuberculosis in the genito-urinary organs; but favour of late has rather been accorded to the opinion that, in most patients, the kidney, though it may show no signs itself, passes out living tubercle bacilli which invade the prostate, leading to a secondary infection of the vas, and then of the epididymis and testis. It is true that the

finger, examining from the rectum, is frequently unable to feel anything in the prostate, but at autopsy this gland is always diseased; it has lately been declared, contrary to the general teaching, that infection of the epididymis begins in the globus minor (that is, nearer the prostate), not in the globus major. All this, of course, has an important bearing on prognosis.

We have very little evidence as to the fate of a tuberculous testis left to itself. No doubt the majority of such cases perforate the skin and lead to chronic suppuration; extension of the disease will also probably take place. A few non-operated cases go on without much change, or even with some improvement, under treatment with tuberculin; but there is little prospect of a cure, and great risk of emaciation.

**Results of Operative Removal**—We have to discuss the end-results of three methods of treatment by operation: removal of the epididymis, unilateral castration, and bilateral castration.

The *immediate mortality* after operation is very small indeed. Some patients, however, fall victims to acute general tuberculosis within a few months. The proportion is given as 5.5 per cent by Barney. Much depends on the surgeon's judgement in accepting or rejecting the worst type of cases.

#### END-RESULTS OF REMOVAL OF TUBERCULOUS TESTIS OR EPIDIDYMIS.

Author	Cases Followed	Cured	Fate of Cases				Total Deaths
			Less than 1 year	1 year to 2 years	Over 2 years	Alive	
		per cent	per cent	per cent	per cent	per cent	per cent
Barney*	71	62	-	-	-	32	5.5
Von Bruns	-	16	-	-	26	-	-
Simon	92	57.6	-	-	-	6.6	35.5
Horwitz	30	60	3	-	7	7	23.3
Bristol Royal Infirmary	16	62	6	12	12	-	12

\* For all cases followed for over one year.

For determining the end-results, we have several valuable publications to guide us; but the subject is complicated, and some of the statistics are scanty in detail or compiled too soon after operation. Thus, Barney published in 1912 some American hospital figures; but two-thirds of his 71 cases were followed less than a year, so that his rate of cure, 62 per cent, is high, and the after-fatalities, 5.5 per cent, are much too few. In many points, however, his results are interesting and valuable, as we shall see.

Von Bruns and Simon publish statistics of patients traced from three years upwards. The first finds 46 per cent cured by unilateral castration, and 56 per cent by bilateral castration. Simon finds 57.6 per cent cured and 35.8 per cent dying out of 92 cases. Horwitz reports a small series, mostly followed for more than a year, 60 per

cer, were cured and 23.3 per cent died. At the Bristol Royal Infirmary, of 16 cases all followed over eighteen months, 10 were cured, 1 developed phthisis, 2 suffered from cystitis (present before operation), 2 developed tuberculosis of the other side, and 2 (including one of these last) died of pulmonary tuberculosis.

We may conclude, therefore, that when followed for several years afterwards, perhaps rather more than half the cases are cured, and about 20 per cent die of tuberculosis elsewhere. The remainder continue to suffer from various tuberculous affections, such as cystitis, prostatic abscess, phthisis, etc., which were no doubt already present at the time of operation. In Barney's series, nearly half the patients had some evidence of tuberculosis elsewhere than in the testis when first seen: in 63 per cent the prostate or vesiculae were affected.

There is some evidence that these coincident manifestations of tubercle may improve after removal of the testis or epididymis. Thus, of the 63 per cent of cases with palpable nodules in the prostate or vesiculae before operation, Barney found that 48 per cent disappeared, leaving 15 per cent *in statu quo*.

*Recurrence in the other testis* was observed in 2 out of 16 Bristol cases, in 29 per cent of von Bruns' series, and in 7 per cent of Horwitz's. It may be quite late: in one of the Bristol cases it occurred six years after the first operation.

*Sexual power*, according to Barney, was retained in 60 per cent of the unilateral cases; but azoospermia was present in 11 out of 13. There are, however, plenty of instances recorded, 1 in the Bristol series, in which healthy children are born afterwards. The wife and child do not appear to be infected. Even bilateral castration has no demoralizing effect: if performed before puberty, it arrests the development of the secondary sexual characters.

*The fatal cases* die of general tuberculosis, phthisis, or uraemia from tuberculous kidneys.

**Results as regards Treatment.** With reference to the effects of treatment, we have to consider unilateral castration, bilateral castration, epididymectomy, and tuberculin.

On paper, the results of *epididymectomy* are better than those of *unilateral castration*. Horwitz gives 4 out of 11 dying after the former, and 6 out of 19 after the latter. Barney also claims greater success. This merely means, of course, that less extensive cases give better results than those in which the testis is already infected, but it affords justification for the practice of leaving the testis if it appears to be uninvolved.

*Double castration* may be necessary, but it by no means makes a hopeless prognosis: indeed, both von Bruns and Simon claim better results in these cases than in those in which only a unilateral castration was performed.

*Tuberculin* appears to be of very decided value in the treatment of this and other tuberculous affections of the genito-urinary tract; but its claims rest rather on individual reports than upon statistics.

For castration: Rather more than half the patients get quite well; about 20 per cent die of tuberculosis elsewhere. Bilateral cases are no worse than unilateral in the eventual results. For early cases, cryptorchidectomy is as satisfactory as castration. The operation often leads to improvement of the prostatic nodules, if present. The prognosis in individual cases depends far more upon the tuberculosis of the bladder and other organs than upon the condition of the external genitals.

REFERENCES. Barney, *Boston Med. and Surg. Jour.*, 1912, clxxi, 409; Hertz, *Jour. Amer. Med. Soc.*, 1902, xxxviii, 1607; von Bruns, *Centr. f. Chir.*, 1901, Report of Congress, 119; Simon, *ibid.*, 125. A. Rendle Short.

### EPILEPSY.

The Prospects of Spontaneous Cure, i.e., cure without medicinal treatment, are so small as to be almost negligible, and therefore the occurrence even of a single epileptic fit calls for an assiduous and prolonged course of treatment. One epileptic fit favours the occurrence of another, since the fit increases the instability of the cerebral cortex. In female patients, puberty and the menopause, so far from exercising a beneficial influence on the fits, as has been popularly supposed, have quite a contrary effect. Both of these physiological crises are associated with profound disturbance of metabolic equilibrium, during which any irritability of the cerebral cortex is more likely to be increased than diminished, and, in fact, puberty is a specially common time for epileptic fits to commence. Sometimes infantile epilepsy ceases spontaneously at the age of four to five years, but this cannot be held out as a probability in any individual case. As a rule, the later in life the disease appears, the greater are the chances of spontaneous arrest. Marriage of an epileptic has no material influence on the disease, either beneficial or otherwise. Pregnancy sometimes arrests the fits temporarily, but they generally return after the pregnancy is over.

The Danger to Life in idiopathic epilepsy is not great, despite the alarming appearances presented by the epileptic patient during the actual fit. Status epilepticus (where one fit follows another in rapid succession without the patient recovering consciousness between the individual fits of the series) is relatively rare, but it may be fatal from exhaustion and heart failure. The chief practical risk to life is that the epileptic patient may die accidentally, during a fit—most commonly by drowning through falling into water, an inch or two being enough to prove fatal, since the fit prevents the patient from making any effort to save himself. Other epileptics may die from apnoea, by rolling over on the face in bed during an attack. Others, again, may inhale food into the air-passages, if the fit occurs during a meal, or vomited material may be inhaled, with the same result. These, however, are secondary 'accidents'; so also are the frequent injuries to the head and face sustained during falling, and the occasional burns which result from falling on to a fire. All of these 'accidents'



can be obviated only by close watching of the patient and never, under any circumstances, leaving him unobserved.

**Prospects of Cure or Arrest by Treatment.** Epilepsy is one of the diseases in which medicinal treatment often succeeds in profoundly modifying the disease, either by diminishing or abolishing the attacks, or by altering the type of the paroxysm during the time that treatment is persevered with. The prognosis in any individual case depends largely upon the personal reaction of the patient to the remedies prescribed, and the assiduity with which these remedies are administered. Even where the fits do not entirely cease, treatment may sometimes enable a patient to live an active and useful life in place of an existence which is distressing to the patient himself and to those on whom he is dependent. From a series of cases observed by Gowers, the following main conclusions were drawn in regard to factors affecting the outlook:

*Ic.* The younger the patient at the age of onset, the less is the prospect of cure. Cases beginning between the ages of ten and twenty have relatively the worst prognosis; those beginning before the age of ten are somewhat more favourable. The most favourable are those which commence after the age of twenty (with the exception already referred to, viz., that cases beginning in women at the menopause have an unfavourable prognosis).

*Sex.* The prognosis is slightly better in males than in females, possibly owing to the intercurrent factors of menstruation and of the menopause in the female sex.

*Previous Duration of the Disease.* The shorter the duration, the brighter are the prospects of its yielding to treatment. Cases which have lasted for less than a year are the best of all; if the disease has existed for five years or less, the chances are only fair; if the fits have been occurring for more than five years, complete arrest is almost unattainable, and we usually have to be content with a mere diminution in their frequency.

*Intervals between Attacks.* Severe attacks, when occurring daily, are unlikely to be arrested. Attacks occurring at intervals longer than a month have the most hopeful prospect. Attacks occurring regularly once a month, in relation to a menstrual period—whether before, during, or after each period—are relatively more difficult to arrest than those where the attacks occur at somewhat shorter, but irregular, intervals.

*The Waking or Sleeping State,* during which the fits habitually occur, is of importance. If the attacks occur only in the waking state and not during sleep, or only during sleep but not when awake, the prospects are three times as bright as when they occur both asleep and awake. The prognosis is rather better in pure nocturnal than in pure diurnal epilepsy.

*The Major or Minor Character of the Fits* has to be borne in mind. Major fits are much more easily influenced by treatment than minor fits. It is not uncommon for the minor fits to persist, in spite of treat-

after the major fits have been completely arrested. The minor attacks may even become more frequent. Nevertheless, it is of great importance to persevere with treatment, since, if it be suspended, the major fits are almost certain to reappear.

*Hereditary Disposition* to epilepsy, contrary to expectation, does not appear to render the epileptic patient less amenable to treatment. I have been strongly impressed with the frequency with which hereditary cases responded successfully to treatment.

*Mental Change*, whether dullness or irritability, is an unfavourable prognostic. We must bear in mind that some cases of apparent mental dullness in epilepsy may be due to excessive bromide medication.

*The Occurrence of an Aura* appears to render the prognosis slightly more favourable; possibly because, in such cases, the patient may sometimes be trained by an effort of will to fight, during the time of the aura, against his threatened fit. The precise variety of aura seems to have but slight significance in this respect.

*The Apparent Exciting Cause of the first Fit* is occasionally of importance with regard to prognosis. Thus, I remember one case in a young medical student, in whom a first and only epileptic fit occurred during the excitement of an election free-fight. The patient avoided exciting meetings thereafter, and never had another fit. I have also seen a number of cases, chiefly in adolescents, in which some unusual article of diet (e.g., salmon, ice-cream, sausage, etc.) had been consumed at the meal immediately preceding each attack, and at no other time; in others, each fit was preceded by a definite attack of constipation. Such classes of patients chiefly consisted of cases in which the fits occurred at long intervals of months, and even of several years. Attention to the diet and careful regulation of the bowels are of importance in every epileptic patient. Frequently, however, no constant exciting cause can be traced, and its presence or absence does not appear very materially to influence the prospect of cure.

The ultimate prognosis depends upon the patience and assiduity with which the patient and his friends can be induced to carry out the treatment. Treatment, dietetic, hygienic, and medicinal, must be persevered with for a long time after the fits have ceased. Two years without a fit is commonly agreed to be the shortest period that should elapse before treatment is relaxed. Even then, the bromide should not be withdrawn suddenly, but gradually, grain by grain, so as not to expose the brain to sudden stress.

Percy Stewart.

**EPITHELIOMA OF LIP.**—(See LIP, CANCER OF.)

**EPITHELIOMA OF TONGUE.**—(See TONGUE, CANCER OF.)

**EPULIS.**—(See JAWS, TUMOURS OF.)

**ERYSIPELAS.** A simple attack of cutaneous erysipelas, in a healthy person, is almost free from danger. The inflammation usually subsides about a week. Recurrence is not uncommon in those cases which appear to be independent of a wound.

Extensive cases, or those occurring in infants, the aged, sufferers from Bright's disease or diabetes, or alcoholics, are of much graver import. High fever and delirium, and the development of pyæmic abscesses, point to a probable fatal issue.

The mortality in 875 cases at St. Bartholomew's Hospital, a good many years ago now, was 3.5 per cent, being rather heavier in males than females. When there was definite cellulitis as well as erysipelas, the mortality was much higher: 41 per cent in 889 cases.

*A. Ruddle Short.*

### ERYTHREMIA. (See POLYCYTHEMIA.)

**EXOPHTHALMIC GOITRE.**—In this disease it will be necessary to investigate the results of various forms of medical treatment; of surgical treatment; the dangers to which the patients are liable; and finally, the factors that make for a good or a bad prognosis.

#### RESULTS OF MEDICAL AND SURGICAL TREATMENT.

TREATMENT	CASES TREATED								
	No.	Survived	Deaths	Survived	Deaths	Survived	Deaths	Survived	
Medical	1. Hale White (hospital)	161	11	48	54	0	25	5	16
	2. " " (private)	55	0	54	64	0	17	6	13
	3. Rogers (antithyroid serum)	480	0	240	30	20	0	34	16
	4. Jackson & Eastman (qm. HBr)	56	0	56	76	0	13	11	0
	5. Williamson & Mackenzie	56	0	56	18	20	30	8	24
	6. Stoncy (x-rays)	48	0	41	34	54	10	0	2*
	7. Porter (hot injection)	22	0	20		84		16	1**
Surgical	A. Partial thyroidectomy.								
	1. Kocher (progressive Graves's)	539	3	360 <sup>+</sup>	45	0	41	8	6
	2. Kottner	64	17	37	34	36	17	14	0
	3. Guy's & St. Thomas's Hospitals	23	33	13	8	0	64	31	0
	4. Berry	28	11						
	5. Walton	50	1	46	54		37	8	0
	6. Deval (Chicago Hosp.)	200	5.5	65	38	10		18.4	?
	B. Ligation of arteries.								
	Mayo	225	2	115	2	48	0	31 <sup>+</sup>	9
	C. Sympathectomy.								
Bousson	27	11	15	13	10	20	7	20	

**Medical Treatment.**—The tables that have been published, giving end-results, require examination before they can be generally accepted.

Some authors are over-enthusiastic on behalf of a special mode of treatment; others are meagre in details. Perhaps Hale White's<sup>2</sup> statistics command most confidence, full particulars being given for each case, based almost entirely on a communication from the patient herself or her medical attendant. The treatment was very diverse, including digitalis, belladonna, arsenic, thymus, Moebius' serum, and other drugs; most of the private cases were ordered prolonged rest in bed, which Hale White considers of the first importance. It must be borne in mind that the mildest cases would not be adequately represented in these figures, as such would not be so likely to become hospital in-patients or to seek the consultant.

It will be observed that about 44 per cent of Hale White's hospital cases died in the institution; that of those followed through, more than half recovered more or less completely, a quarter improved, and 17 remained *in statu quo*, and about 13 per cent have since died. The private cases did decidedly better, about 64 per cent recovering, while only 13 per cent died subsequently. Most of these patients have been followed up for several years. With reference to those who have died since, the mortality appears to be about double that of healthy females of the same age.

Rogers<sup>1</sup> presents figures, without full details, illustrating the results obtained by the use of his antithyroid serum. No doubt rest and regimen must bear a share in the credit. The treatment does not appear to improve upon the success obtained by other methods. About 20 per cent are quite cured, and one-half altogether experience great improvement. The percentage of those not improved is high.

Jackson and Eastman<sup>3</sup> publish statistics of treatment by neutral gamma hydrobromide, in addition to rest and general supervision, and the percentage of cases cured or greatly benefited is high; the details, however, are meagre.

Data collected from the practice of Williamson and Mackenzie<sup>4</sup> are presented by the last named, a variety of methods of treatment having been followed. The results are not so good as Hale White's, only 18 per cent being cured and 20 per cent greatly improved, whereas the latter reports about 60 per cent recovered more or less completely.

There is no convincing evidence favouring any special drug treatment, and it would appear that of cases sufficiently ill to require hospital treatment or a specialist's opinion, about half get well or almost well, 20 per cent improve, about 10 per cent do not improve, and the mortality rate is about twice the normal.

The end-results of r-ray treatment<sup>5</sup> compare favourably with other methods, but the figures are rather small, and only about half of the cases described as 'cured' or 'almost cured' had been followed for a year or longer; it cannot therefore be regarded as proved that the rays are a great advance on other treatment. In some reports they have not given particularly good results.

Another comparatively new method is to inject each lobe with about 3 drachms of boiling water, under local anaesthesia of the skin.

According to Porter,<sup>8</sup> this will cure mild cases and anchorate severe ones. He uses it as a preliminary to operation when the patient is too bad to undergo a thyroidectomy. Several injections are given at weekly intervals. Of 22 cases, 16 were more or less completely relieved, and only 3 did not improve. The others were lost sight of; one died of cancer.

**Surgical Treatment.** This has made far more headway on the Continent and in America than in England, where until recently it has been reserved for the worst, not to say totally insuitable, type of cases, and is thus put to a severe test.

Three operations are in current use: complete or partial excision of the sympathetic ganglia of the neck, or section of the connecting nerves; ligation of the superior thyroid arteries; and removal of one half of the thyroid gland.

Data concerning cases of sympathetomy, followed up afterwards, and dealing only with instances of undoubted Graves's disease, are not easy to find. Bosson<sup>7</sup> has published a record of 15 answering to this description, of whom 2 were cured and 6 greatly improved, but it is not clear that the benefit followed very closely on the operation. Out of 27 operated on, 3 died soon afterwards. The rationale of the treatment is open to doubt, and it is said that blindness may follow.

Although the Mayos proceed to remove half the thyroid at a second operation if the first is not successful, they publish figures<sup>8</sup> giving the end-results of cases in which the treatment adopted has been *ligature of the superior thyroid arteries*. The details are scanty. The operation mortality was only 2 per cent. A few cases were cured; about half were greatly improved, but about a third were either not improved or had to submit to the second operation of hemithyroidectomy.

In the majority of Kocher's cases *half the gland is removed*.<sup>9</sup> He divides his patients into two groups; in the first there are symptoms of hyperthyroidism which are neither permanent nor progressive, associated with a parenchymatous or adenomatous goitre. Except that two patients died of pneumonia (out of 130), the results of operation were uniformly good. In the second group of 539 cases there were progressive symptoms of Graves's disease; here the mortality was 3 per cent. He lays great stress on the use of a local anæsthetic. Although the majority of the patients had been suffering long and severely, nearly half were completely cured even when watched for many years, but they often required more than one operation, the first removal having proved too limited. The cases classed as 'better' were able to earn their living; these amounted to 41 per cent.

Kuttner's<sup>10</sup> figures are about equally favourable, although he admits a much higher mortality (11 out of 64).

In two London hospitals, Guy's and St. Thomas's, quoted by Hale White and Mackenzie, the results are dreadfully bad, but it is probable that they represent a much severer type of case which the Continental and American surgeons would have refused to touch.

One-third of the patients died, and although the majority of those who survived were improved, several were not benefited, and only one was absolutely cured.

Berry,<sup>11</sup> however, has published a far more successful series of cases. He operated on 28 patients, including one who died on the table before the first incision was made. Two others died within a few days; 25 recovered well, and of these all were benefited, some to a most remarkable degree, but others relapsed. Every one of these patients had marked Graves's disease, with exophthalmos.

More recently published figures show a steady improvement, due partly to better selection and partly to better technique. Walton's<sup>12</sup> series of cases operated on by himself shows a death-rate of only 2 in 40, this favourable result being obtained by exercising great care in choosing the type of patient and time of operation, and by 'stealing' the gland after the manner of Crile. Of 16 patients followed up, 25 per cent 'cured'—that is, free from symptoms, though in some the pulse was 100—and 17 were better; only 4 were little, if at all, relieved. He followed most of these for periods of one to four years. He points out that there is often great immediate improvement, then a partial relapse a few weeks later, then more or less permanent improvement after three or four months.

David<sup>13</sup> reports a series of 200 patients operated on by various surgeons at the Chicago Presbyterian Hospital, between 1905 and 1911, of whom 11 died. Of 65 cases followed up in 1915-16, 38 per cent seemed to be cured, 40 per cent much better, and 18·4 per cent (if any) better. He points out that the exophthalmos is difficult to influence.

*The immediate dangers of operation* are considerable. The patients take a general anæsthetic very badly, and a good many have died on the table; on the other hand, the pitiable nervousness makes the duration of operation under local anæsthesia great, and Kocher admits that a considerable number are very much upset, with rapid pulse, fever, and other alarming symptoms. Again, patients with exophthalmic goitre have frequently an enlarged thymus, which may precipitate sudden death. Interference with the gland may lead to a profuse outpouring of thyroid secretion into the veins, with symptoms of acute hyperthyroidism, including very rapid irregular pulse, fever, tremor, and increased exophthalmos: this may end in death within a day or two. Crile's anoci-association methods, and the administration of large quantities of saline per rectum, help to avert these dangers. Occasionally tetany has followed, from injury or removal of the parathyroid glands.

**Comparison of Results of Medical and Surgical Treatment.** We may conclude, briefly, that under medical treatment, of 100 patients, 15 will die of the disease, 10 go on for years without much change, and 75 get more or less well. After operation, the early and late mortality together is also about 15 per cent, and the proportion of cases cured, better, and no better, is about the same. One benefit,

however is not brought out by figures; the medical treatment is long and tedious, whilst the operation, if successful, leads to a much quicker cure. To obtain best results from surgery, cases must be taken at the favourable time. As the Mayo and Berry have pointed out, the toxæmia advances to a certain degree, attains a maximum usually towards the end of the first year, and then subsides, and the proper time for interference is either early or late, but not at the height of the toxæmia. It is dangerous to operate on patients with a markedly dilated and irregular heart, great muscular prostration, great excitability, persistent albuminuria or glycosuria, or lymphocytosis with leucopenia. Great emaciation, however, is not a contra-indication *per se*.

When there is doubt as to the patient's ability to stand an operation, it will be wise to content oneself with ligation of the superior thyroid arteries or the injection of iodine water, proceeding to hemithyroidectomy at a later date if necessary.

With these precautions, the present-day operative mortality is from 5 to 10 per cent, and the Mayo have now had a consecutive series of 278 cases without a death.

**Sequelæ.** Like other chronic invalids, patients are liable to various chest complaints, and also to profuse or uncontrollable *diarrhœa*. In many of Hale White's hospital cases, vomiting or diarrhœa was responsible for the fatal issue; in his private practice, where the patient is more likely to be put to bed and to be suitably fed from the first, this complication was much less in evidence.

*Nervous Symptoms*, such as delirium or coma, are not uncommon at the termination, and usually point to a rapid dissolution. Mania or melancholia may also occur.

*Cardiac debilitation* is fairly frequent, and acute attacks may lead to sudden death. A mitral murmur may appear.

Rarely, the exophthalmos so increases that *ulceration of the cornea*, or even blindness, may result, or the eye may be dislocated forwards on to the face.

Glycosuria is not uncommon, and several of Hale White's cases died of diabetes. In other patients, intervals of hypothyroidism (myxœdema) alternate with periods of hyperthyroidism.

Relapse may occur even after many months or years of apparently perfect health. In one case known to the writer a relapse was induced after more than twelve years of entire freedom from symptoms; the first attack was brought on by a head injury and the second by iodine poisoning. In the great majority of instances, however, relapse does not occur if once complete freedom from symptoms is obtained for any length of time. Patients stand confinements very well, even if the disease is still present in mild degree. Many so-called relapses are really exacerbations of symptoms which had only partially subsided.

**Prognosis in Individual Cases.** In Hale White's tables, the cases are grouped according to the severity of the symptoms and the

essential result. We combine the hospital and the private patients

	Males	Females	Total
Cases that have done well	36	16	52
Cases moderately well, or better	16	4	20
Cases that did not do well	4	1	5
Total	56	21	77

Many of Koehler's successful cases were very ill; in one of these the eye ball had prolapsed and had to be replaced, yet the patient got quite well, with no exophthalmos. Seventy of the ordinary symptoms, then, does not make a bad prognosis. Cases that come on acutely usually get well rapidly, even if they become very ill for time.

There are certain danger signals. *Diarrhoea* and *vomiting* that do not yield soon to rest in bed and suitable feeding are of grave import. *Delirium* or *coma* usually heralds a rapidly fatal termination. The most significant sign is probably the *wasting*; prognosis improves or deteriorates with the patient's weight.

Cases supervening on a chronic goitre are usually mild in type, but long-lasting.

It is almost impossible to foretell how long a patient will be ill. Six to eighteen months is a very ordinary time, but many cases drag on for years. When the weight is steadily falling, the outlook is less favourable; when it is steadily rising, the patient is usually within a few months of the end of her troubles.

A few cases are on record, especially in children, in which the symptoms came on rapidly in a day or two, and as suddenly disappeared after a few weeks or less. As a rule, children do better than adults, and women better than men.

It is quite common for some degree of permanent indurative swelling of the thyroid and slight prominence of the eyes, due to fatty accumulation in the orbits, to persist even after recovery.

REFERENCES.—<sup>1</sup>Hale White, *Guy's Hosp. Rep.*, vol. lxx, 1911, 1; <sup>2</sup>Rogers, *Lancet*, 1909, Dec., 1023; <sup>3</sup>Jackson and Eastman, *Boston Med. and Surg. Jour.*, vol. 163, 1910, 419; <sup>4</sup>Mackenzie, *Albott's System of Medicine*, ed. iv, part 1, 377; <sup>5</sup>Stoney, *Brit. Med. Jour.*, 1912, ii, 476; <sup>6</sup>Porter, *Jour. Amer. Med. Assoc.*, 1914, lxi, 88; <sup>7</sup>Boisson, *Etude critique des interventions sur le goitre sympathique cervical dans la maladie de Basedow*, Paris, H. Jouve, 1898; <sup>8</sup>Coyle, *Ann. Surg.*, 1909, vol. i, 1018; <sup>9</sup>Koehler, *Lancet*, 1912, i, 576; <sup>10</sup>Koehler, *Rev. de Chir.*, 1911, 1031; <sup>11</sup>Berry, *Lancet*, 1913, i, 583, 663; <sup>12</sup>Walton, *Pract.*, 1917, Oct., 309; <sup>13</sup>David, *Ann. Surg.*, 1916, O-1., 400.

A. Rendle Short.

EXTRA-UTERINE GESTATION.—(See ECOTIC PREGNANCY.)



**FACIAL PALSY.** (See NERVE LESIONS.)

**FEMUR GUNSHOT FRACTURE OF.** (See GUNSHOT WOUNDS.)

**FIBROIDS.** (See UTERUS, FIBROIDS OF.)

**FILARIASIS.** Filariae may be commonly present in the human body without producing any symptoms. The chief danger is secondary septic infection, which may cause death after prolonged fever. Filarial abscess, lymphangitis, chyluria, and elephantiasis are rarely fatal of themselves apart from septic and other complications.

*Leonard Rogers*

#### **FRACTURES.**

**Simple Fractures.** The world war, in its profound effects on civilization, very naturally brings a heavy pressure on the resources and scientific efficiency of the medical profession, and hardly any department of medicine or surgery has received greater demands on its abilities than the department of surgery which deals with fractures. Compound fractures in all grades of severity are continuously under treatment, and no doubt, when the war is over, much information will be available and much useful knowledge acquired. As compound fractures are rarely suitable for the operative method, the older form of splint treatment is largely and effectively used. The Thomas splint and its various modifications are achieving a well-deserved popularity in war surgery.

The recent report of the American Surgical Association, 1915, deals with 1747 cases—1358 non-operative and 387 operative. Of the latter, 258 cases of simple fracture and 129 cases of compound fracture were operated on. These numbers are disappointingly few. They are set out in table form for comparison with the British Medical Association Report, 1912 (see below).

Before entering on a detailed consideration of the end-results of various fractures, it may be well to emphasize the fact that surgeons and practitioners for some years have had a growing consciousness that the available methods of treatment have not always yielded results which can be described as satisfactory. It is platitudinous, but nevertheless true, to say that the utility of a bone after a solution of its continuity depends in a measure on the nature and extent of the traumatism. If this is severe, then a complete reconstitution with a good functional result cannot always be expected.

It is quite obvious that there has been, and is, a constant effort to obtain good results on the non-operative side, operative methods apart for the moment, as witness the wonderful inventions which lumber up the splint rooms of hospitals, rusty worm-eaten evidences of the difficulty and disappointment which attend treatment. Nearly thirty years ago, M. Lucas-Championniere<sup>1</sup> began to issue his protest against rigid and prolonged splint or plaster fixation; he remained until his death the grand protagonist of the school of treatment by mobilization and massage. Few now apply this method in its entirety,

to recognize its great importance as an accessory to any mode of treatment.

The extension methods of Bardenheuer are becoming more known in this country, and those who have mastered the application of the apparatus speak highly of the results. The fracture bed in use at the Essex Hospital, Monmouth, is particularly useful for this form of treatment.

The nail-extension method of Steinhilber would appear to take a middle ground between non-operative and operative practice, but its employment does not seem to be sufficiently general at present to enable an opinion to be formed. Finocchietto's extension strap is an adaptation of the principle, and has strong advocates.

Ewald issues a word of caution in respect of the Steinhilber method; he says that the results from the point of view of the fracture are satisfactory if not brilliant. He had used the nail in 29 cases of fracture of the lower limb; in 18 cases the perforations healed in two to four weeks, but in 9 cases he has had an infection which lasted from five to twelve months, and in one case it was necessary to open an abscess at the end of two years. Ewald also warns us against using too large a nail in the calcaneum, and observes that the nail must be exactly in the middle of the bone—there is risk of fracture.

A new school has evolved which contends that accurate anatomical reconstruction, and consequential good functional results, can best be secured by operative treatment. This school, most ably led by Abduhot Lancé, Dr. Lambotte, and others, energetically rejects for many fractures the non-operative and the older operative methods, and bases its case on the application of a plate, screw, encircling wire, or an intramedullary splint, or bone inlay to the fracture, accurately secured by free incision.

These differing systems of treatment show that all is not well, and a guarded prognosis must be guarded.

The new light on the subject afforded by radiography, and the changes under the Workmen's Compensation Acts, reveal the good or bad results of the various methods. The report of the late Mr. Chilton on "On the After-effects of Injuries," in which he states that "it is a great difficulty in remembering a case of Pott's or Dupuytren's disease which had sufficiently recovered to resume police work, came as a shock to the profession.

The universal desire for an inquiry into the ultimate results obtained in the treatment of simple fractures was voiced at the meeting of the Fracture Section of the British Medical Association in London, 1910. In accordance to a resolution there passed, the Council of the Association appointed a Committee, whose report appeared in the *British Medical Journal*, November, 1912. In this report we have contrasted non-operative and operative methods, and it must form the basis of any opinion on the prognosis of fractures for some time to come. The number of cases on which the report is founded is 2940; this does not include the cases investigated abroad, which are set out separately.

Amongst the important conclusions of the Committee, one finding stands out prominently, taking operative and non-operative cases together, namely that if a good functional result is to follow, a good anatomical position must be attained. We find good functional use accruing in 90.7 per cent of cases when this latter is achieved. When the anatomical results are moderate or bad, we find only 29.7 per cent of good functional results. When the anatomical results are bad, we note 53.3 per cent of bad functional results. This shows the importance of endeavouring to obtain a good anatomical reconstitution.

A consideration of the age-group tables in the report affords further useful information. In the non-operative cases under 15 years of age, there was a good functional result in 90.8 per cent, as compared with 15.1 per cent in cases over 15.

In the operative cases belonging to the class in which operation was decided on at once and performed as soon as practicable, we find that under 15 years there was a good functional result in 93.6 per cent. In those over 15 years, operation gave a good functional result in 66.3 per cent. This shows the distinct superiority of operative as compared with non-operative methods. The operative cases are few relatively to the non-operative; hence it is not advisable to dogmatize on the greater excellence of operative results. Still, it may be assumed that as the older operative methods on the long bones, such as wiring, etc., become discarded, and more operative cases become available for comparison, even better results may be looked for in the future.

Dujarier<sup>1</sup> reports that in 32 cases of operative intervention for fractures of the leg, recent or old, he has not had a check; all his patients are consolidated and walking. The operations were carried out between 1901 and 1912.

Fredet<sup>2</sup> records his experience of operation in 20 cases, follow-up the technique of Landotte; he expresses himself as fully satisfied with the results.

Darrach<sup>3</sup> reports that of 2100 fractures treated at the Roosevelt Hospital, 5 per cent required operation. His results of operation on recent fractures were: ideal 71 per cent, fair 21 per cent, bad 8 per cent. In old fractures, operation gave: ideal 30 per cent, fair 47 per cent, bad 23 per cent.

The method of inserting a bone-graft, generally from the tibia, in ununited fractures is coming into favour, due very largely to the peculiarly attractive advocacy of the late J. B. Murphy. Albee<sup>4</sup> reports 15 successful cases.

In Table VI of the British Committee's report, given below, three fractures are considered, and the percentages of good functional results (apart from consideration of the anatomical result) are given. It will be seen that there is a diminishing number of good results in each group as age increases. In the words of the report, "there is a progressive depreciation of the functional result of non-operative treatment as age advances; the older the patient the worse the result."

PERCENTAGES OF GOOD FUNCTIONAL RESULTS FOR EACH AGE GROUP.  
(B.M.A. REPORT, Table VI.)  
(Three Fractures.)

DIXON AND PHILLIPS, SHAFTS		RADDIS AND LUNA, SHAFTS		PORTER'S	
Age	Per cent	Age	Per cent	Age	Per cent
0-10	93	0-10	72	0-10	100
11-15	95	11-15	52	11-15	100
16-20	81	16-20	50	16-20	50
21-25	77	21-25	50	21-25	54
26-45	65	26-45	28	26-45	54
46-60	57	46-60	28	46-60	38
61	50			61	30

Table V of the A.S.A. report deals with the percentages of good functional results for the age groups, and is in full agreement with Table VI of the B.M.A. report. The comment is as follows: "In patients under 15 years of age, good functional results depend less upon good anatomical results than in older patients, and the bad functional results are almost negligible, 3 per cent. The older the patient the greater is the proportion of bad results, and the more certainly do such bad results follow failure to secure anatomical union of the fragments. The proportion of good functional results secured from moderate and bad anatomical results grows progressively less the older the patient." This gives a clear indication of the importance of endeavouring to secure good anatomical results.

In the tables which follow, when cases are spoken of as having a good anatomical and a good functional result, it means that the result is perfect, or nearly so. The result we should all aim at is a good anatomical and a good functional restoration of a limb. The percentage of these achieved by non-operative and operative treatment will be readily found in the tables, and those who require this high standard in their work will turn to the figures headed "Good Anatomical and Good Functional Results."

In respect of fractures in the neighbourhood of joints, the A.S.A. reporter comments that it is much more important to secure a good anatomical result in fractures involving joints than in fractures of the shafts of long bones; in shaft fractures a bad result follows in about half the cases, whereas in joint fractures a bad anatomical result creates a bad functional result in three-fourths of the cases.

In further reference to the prognosis of fractures in the neighbourhood of joints, the recent important thesis of M. Srauve\* contains the following cogent conclusions:

The prognosis of intra- and juxta-articular fractures is most grave. Those involving the ankle, wrist, and elbow have as a result more or less functional weakness. The cause of this being imperfect re-aptation of the fragments, and (2) resulting exuberant or vicious callus, which distorts the normal plane of the articular surface. The insufficiency of ordinary treatment is thereby demonstrated. In the hands of specialists the ordinary measures may sometimes be sufficient, but

no matter in whose hands, the results are often bad. Surgical treatment should be undertaken more often than is usually done. The reason this latter is not generally accepted is because the surgery of bones is far from having arrived at perfection, especially that which concerns articular and juxta-articular fractures. This method is capable of being perfected, and will be in the future. The usual methods have said their last word, and remain to day as they have for long been—insufficient.

Whether or not these weighty words will be modified, the future experience of surgeons and practitioners alone will decide. For the present the older or non-operative methods remain "safe and serviceable." Truly the results are not of the best; accurate reconstitution, at any rate in adults, cannot always be attained and maintained. Patients will be satisfied with fair functional results, and practitioners will hesitate to recommend a cutting operation. That the operative method offers the nearest approach to scientific accuracy in reconstruction there can be no doubt; at present it is in the hands of experts, but with a more general diffusion of knowledge the treatment will be more widely applied.

A criticism put forward by some opponents of the operative method, but which is not yet proved, is that there is greater delay in the process of consolidation than under non-operative methods. Even if this turned out in the event to be correct, it can hardly be a serious objection, as it would seem to be more important that a workman should return to work with a straight, well-reconstituted limb, even after a somewhat longer convalescence, than that he should return earlier with an irregular and consequentially weak limb, with the greater probability of a breakdown.

On examining the report of the British Fractures Committee more closely, it will be seen that the non-operative treatment of fractures of the shafts of the long bones in children under 15 years (excepting fractures of both bones of the forearm) shows a high percentage of good results; so it appears that operation is not a necessity in children. The Committee point out that, as previously indicated, the operative cases submitted for examination were few in comparison with the non-operative cases, and that it is undesirable on this ground to arrive at a verdict as between operative and non-operative methods. But if we take the operative cases as they are set out, we find that in cases treated by immediate operation, the deleterious influence of age upon functional results is less marked. In most of the age groups, operative treatment gives a greater number of good results than non-operative.

Another very definite finding of the Committee is that operative treatment should not be regarded as a method to be employed in consequence of the failure of non-operative methods, as the results of secondary operations (that is to say, operations on (1) cases in which there has been failure to obtain and maintain accurate apposition by means of external mechanical appliances, or (2) cases of non-union, or deficient or faulty union) compare very unfavourably with those in which operation was carried out as soon as practicable.

With regard to the important question of *mortality*, in fifteen hospitals 1916 fractures of the long bones were treated non-operatively, with a death-rate of 1 per cent. The majority of the deaths were due to sepsis, or associated injuries. The number of cases treated by operation was 1040, with a death-rate of 0.77 per cent.

The causes which in the non-operative cases led to a fatal result, were 1 death in 5 of the operative cases. The death-rate directly due to operation is then 0.33 per cent. Dr. Lambotte's death-rate in 567 operations is 1.5 per cent; amongst these he includes operations for fracture-dislocation of the iliac bone, multiple fracture of the leg, comminuted fracture of the femur, and a case of irreducible subtrochanteric fracture of the femur in an infant six days old. Another case had appendicitis and evacuation of pus per anum. Most of the deaths are associated with the injuries, accidental or avoidable.

The American Committee recommend that as a general principle fractures should be treated by a skilled surgeon, and that the *x-ray* examination is of great importance and should be efficiently made. Further that general anaesthesia should be employed to effect the reduction; that neither the operative nor non-operative method is to be recommended exclusively; each has its indications and should be employed when required; non-operative methods are especially effective under fifteen years of age. This last is one of the very definite conclusions which emerged during the British Committee's inquiry. Again it and when operative methods are decided on, they should be employed early. This also is in agreement with the British Committee's report. The American Committee recommend some rigid form of cast applied directly to the bone, or a bone inlay, as the best method of fixation in operative cases. There can be no doubt as to the soundness of this principle. Absolute mechanical fixation is essential. This has been abundantly proved by experience, and by the experimental evidence laboriously adduced by Hey Groves.<sup>9</sup> The bone inlay cannot always be relied on to maintain this fully; it certainly gives good results in suitable cases. The two Committees agree that the operative treatment should be undertaken only by surgeons of special experience and training, under the best possible aseptic conditions, and with an adequate equipment ready to meet every emergency.

In commenting on the statistics obtained, the American Committee draw attention to the fact that in the operative cases anatomical union was secured in less than 72 per cent of cases. The figures show that if good anatomical results are not obtained, but only moderate, better function follows non-operative than operative treatment. Probably those cases in which by operative means good anatomical results were not secured were difficult ones, or possibly non-union cases. At all events very few of the operative cases belong to the class in which operation is decided upon at once and is performed as early as is practicable. The American Committee observe that unless good anatomical results are obtained by operation, the slight improvement in the position of the fragments, short of perfection, does not

compensate for the additional injury to the soft parts entailed by the operation. The conclusion is that unless the surgeon is reasonably certain of securing accurate anatomical results by operation, he will do better to leave the fracture unredressed.

The Committee remark that infection is the important question in the operative method: over 5 per cent of the whole operative series became infected during the operation. While good operative results were obtained by good surgeons, the infected cases are not the sole property of bad surgeons. This is in harmony with the British Committee's finding.

Both Committees' reports are examined herein in some detail.

#### Femur.—

#### RESULTS OF NON-OPERATIVE AND IMMEDIATE OPERATIVE TREATMENT OF FRACTURES OF FEMUR. (B.M.A. REPORT.)

Site of Fracture	Treatment	Cases	Good anatomical result	Loss of motion or good functional result
Neck	Non-operative	91	100.0	100.0
	Operative	1	100	9.8
Separated epiphyses of head	Non-operative	9	44.4	22.2
	Operative	1	100	0
Upper third of shaft	Non-operative, all ages	96	54.1	4.2
	Ditto, under 15	47	87	8
	Operative (all under 15)	3	100	—
Middle third of shaft	Non-operative, all ages	436	67.8	13.2
	Ditto, under 15	328	87	7.8
	Operative, all ages	27	92.5	—
Lower third of shaft	Non-operative, all ages	104	58.6	15.3
	Ditto, under 15	50	86	8
	Operative, under 20	2	50	—
Lower extremity, involving knee	Non-operative, all ages	12	41.6	8.3
	Ditto, under 15	2	100	—
	Operative	1	100 (anatomical result only)	—

#### A.S.A. REPORT, Table XII.

Site of Fracture	Treatment	Cases	Good anatomical result	Loss of motion or good functional result
Neck	Non-operative	63	100.0	100.0
	Operative	6	33.3	None
Proximal	Non-operative	8	37.5	12.5
	Operative	4	25.0	None
Shaft	Non-operative	264	39.3	28.0
	Operative	100	56.0	10.0
Distal	Non-operative	4	25.0	50.0
	Operative	4	25.0	None

AVERAGE DURATION OF INCAPACITY (B.M.A. REPORT.)

Age Group	Site of Fracture	Number of Cases	Average Duration of Incapacity
Under fifteen years	Upper epiphysis and neck	26.5 weeks	No record
	Shaft	16.5 ..	16.2 weeks
	Lower extremity	18.2 ..	No record
Over fifteen years	Upper epiphysis and neck	53.2 ..	No record
	Shaft	33.6 ..	52 weeks
	Lower epiphysis	18.7 ..	26 ..
Independent* incapacity 15 years	Upper epiphysis and neck	30 per cent	No record
	Shaft	11.7 ..	None
	Lower extremity	2.5 ..	None
	Lower epiphysis	2.5 ..	None

A.S.A. REPORT, Table XVI (All Cases).

Site of Fracture	Average Duration of Incapacity
Neck	24.5 weeks
Shaft	24.3 ..

If we consider the figures of other authorities, we find Scudder<sup>10</sup> reporting on 16 cases of fracture of the neck of the femur treated by fixation and immobilization. The cases were examined two and a half to twenty-four and a half years after the accident, at ages between 50, two and over sixty. Of the 16, 11 had impairment of function; that is, 12.5 per cent, gave good functional results. In Walker's<sup>11</sup> report of 112 cases, 48 died within a week of admission to hospital, and 32 were not traced; of the remaining 32, only 10 had completely recovered, that is, about 16 per cent of good functional results survived. Ashurst and Newell<sup>12</sup> give the end-results of 21 cases of fracture of the neck of the femur treated conservatively; 5, or 23.8 per cent, had a perfect functional result.

From this we conclude that 26 per cent of good functional results is the best we can expect from non-operative treatment in adults.

Scudder's<sup>10</sup> statistics of 35 cases of fracture of the shaft of the femur treated non-operatively by Buck's extension, outside T splint, or long plaster apparatus and later plaster, show that of 16 cases between seven and forty-eight years, 5 had a perfect result; in 5 cases between forty-nine and seventy years, the average age was fifty-eight years, none had a functionally perfect result. Of 14 cases where the average age was seven and a half years, all had functionally perfect results; four mention slight occasional stiffness, and these have a little stiffness of the knee.



This gives a good functional result in about 24 per cent over eighteen years.

Lambotte's report shows 43 cases of immediate operation for fractures of the femur: 40 had a good anatomical and a good functional result, 2 a good anatomical and moderate or bad functional result. That is to say, a good functional result is achieved in 76.9 per cent of cases operated on.

Walker's record 24 cases of operation for fractured femur; operation was only performed after the best efforts of conservative treatment had failed. The Lane technique was carried out, with Simon extension and plaster case. No mortality or serious complication followed; in one case the plate was removed for slight superficial suppuration. Improvement has resulted in every instance.

Patetta. The prognosis in stellate and longitudinal or subaponeurotic fractures is usually good under early massage and movement treatment. Transverse fractures with separation or the interposition of aponeurotic tags between the fragments have a more serious outlook as regards restoration to full function.

Helfreich<sup>1</sup> (1899) quotes Balu's report on 41 old cases averaging four years after the injury. In 42 some weakness remained amounting to 5.5 per cent of working power; this is 4.5 per cent good results.

Bull's<sup>2</sup> report (1890) is a vast improvement: 16 cases are recorded; he states that 14 of these, or 87.5 per cent, had 'excellent' results. They were all treated by plaster-of-Paris splints, with appropriate confinement of the fragments.

Lucas-Championniere, who applied his method of massage and mobilization to most fractures, held that the treatment is only of exceptional application in fractures of the patella: as a general rule, suture was his method of choice, for the reason that it brings about a definite anatomical restoration.

Power's<sup>3</sup> (1898) collection of 744 cases operated on, exhibits a mortality of 1.4 per cent. The late results showed 91 per cent of satisfactory results, 3 per cent had marked stiffness and disability, 4 per cent had total ankylosis.

Stimson<sup>4</sup> (1910) records 200 operative cases in two series. First series (10 cases): 2 became infected, with resulting stiffness. Second series: all recovered without accident, with good use of joint; these show 99 per cent good results.

Lockwood<sup>5</sup> (1911) reports 391 operations on 38 patients, ages twenty-two to sixty-three. The wires had to be taken out in 2 cases, -kigrams were available in 42, and of these, 41, or 97.6 per cent, had good bony union and good limbs. He is strongly in favour of operation, as it gives better results in a shorter time.

Delatour<sup>6</sup> (1911) gives an account of 99 operations: of these, 6 patients have useful joints, but with limited motion; 40 have flexion to at least a right angle, and perfectly useful joints. The remainder were not traced: all had good motion to at least forty-five degrees when they left hospital, and a satisfactory result was expected.

Sandler (1915) quotes a report by Quinby on 30 cases of these, 21 were treated by suture and 6 expectantly. Serviceable results were obtained in 81.5 per cent of the operative cases and 66.5 per cent of the expectant. He notes that certain troubles follow either form of treatment, and that the operative treatment is to be preferred in selected cases.

There can be no doubt that in transverse fractures with separation, separation apart from the definite though small risk of sepsis, will give the only chance of bony union, and so contribute materially to a good functional result. Under operative treatment the period of incapacity will be from two to three months; under conservative treatment from six to twelve months.

Constitutional disease or age may decisively influence the selection of conservative methods.

*Refracture.* Corner's paper puts this matter very clearly. After stating that the patella is the most frequently re-fractured bone in the body, he points out that this occurs most often between the ages of thirty and forty. After operation, 69 per cent of re-fractures occur in the first year; after non-operative treatment, 86 per cent of re-fractures occur after the first year. The percentage of re-fractures is approximately the same after operative as after non-operative treatment.

**Tibia and Fibula.**

**RESULTS OF NON-OPERATIVE AND IMMEDIATE OPERATIVE TREATMENT OF FRACTURES. (B.M.A. REPORT.)**

		Cases	%	%
Soleus tibia	( Non-operative, all ages	424	71.4	10.7
	Ditto, under 15	223	9.5	2
	Operative	17	76.1	17.6
Both bones	( Ditto, under 15	7	100	
	Non-operative, all ages	152	70.5	3.9
	Operative	2	100	
Fibula	( Non-operative, all ages	548	44.4	25.6
	Ditto, under 15	116	91	
	Operative, all ages	22	63.6	1.5
Both bones	( Ditto, under 15	2	100	
	Non-operative, all ages	246	37.5	10.1
	Ditto, under 15	8	87.5	12.5
	Operative, all ages	4	50	

Leclotte's figures for immediate operative cases of fractured tibia are 75 cases, with 4 good anatomical and good functional results, and moderate or bad anatomical and good functional results; that is, 100 per cent of good functional results after operation.

Leclotte's statistics of 18 cases of fracture of both bones show

good functional results by operation in 95 per cent. Of 35 cases operated on for failure to maintain apposition, non-union, or defective or faulty union, 8 had a good anatomical and 24 had a good functional result—that is, a percentage of 69 good functional results.

A.S.A. REPORT, *Table XIII*

Type of Fracture	Treatment	No. of Cases	Percentage of Good Functional Results	
			Operative	Non-operative
Shatts (also shaft of tibia above, 24 cases)	Non-operative	73	46.5	16.4
	Operative	19	68.4	—
Ankle: all forms	Non-operative	44	76.8	4.5
	Operative	0	—	—

AVERAGE DURATION OF INCAPACITY. (B.M.A. REPORT,)\*

Age Group	Fracture Type	Average Duration of Incapacity (Weeks)	
		Operative	Non-operative
Under fifteen years	Shatts	12.8 weeks	9 weeks
	Lower epiphysis, Pott's fracture	22 ..	No record
Over fifteen years	Shatts	26.7 ..	31.2 weeks
	Lower epiphysis, Pott's fracture	23.7 ..	14.5 ..
Permanent incapacity over 15 years	Shatts	8.4 per cent	9 per cent
	Lower epiphysis and Pott's fracture	6 ..	25 per cent bad results

A.S.A. REPORT, *Table XVI* (ALL CASES).

Average Duration of Incapacity	
Shatts	17 weeks
Ankle	17 ..

In Bardenheuer's account of 140 cases of ankle fractures generally, 77.2 per cent recovered before ninety-one days; 20 had passed the fifth year; half of these had fracture of both bones; 19 of the 20 had become fit for work.

Bardenheuer points out that this good result in older people should be taken as proof of the excellence of his extension bandage.

Hazard<sup>21</sup> traced 64 non-operative cases of Pott's fracture one year after injury. "Thirty-eight cases were under thirty-five years, and all had perfect functional results. Of 12 between thirty-five and fifty years, "function was perfect in all the cases, extension was normal, but there was distinct limitation of flexion in all." Of 14 between fifty-five and sixty-four years, "function was perfect in 4 only, 5 had practically a stiff joint. Flexion and extension were limited in all."

Chaput,<sup>22</sup> in a careful study of 30 cases of malleolar fractures treated non-operatively, notes only 7 good results (23·3 per cent), 4 fairly good, 9 moderate, and 10 bad.

Of 6 cases where operation was undertaken after the failure of external mechanical methods, for non-union, or faulty or defective union, 1 had a good anatomical and 1 a good functional result, 3 had a bad anatomical, and 3 a bad functional result.

Roberts and Kelly<sup>23</sup> quote Haemel's statistics on fractures of the tibia and fibula at the ankle. There were 40 cases: 70 per cent recovered, 30 per cent became disabled; the average loss of earning capacity was about 50 per cent.

**Astragalus.** The table constructed by G. Gayet<sup>24</sup> gives the results of the operative treatment of fractures of the astragalus. If there is no displacement, or if displacement and the fragments are easily reduced and maintain their position, massage and early movements will in all probability give a good result.

If there is much displacement of fragments, partial or complete removal of the bone will be required.

Of 22 cases up to the age of sixty-four years in which complete removal of the bone was performed, 21 (95·9 per cent) gave a good result in the sense that the patient was able to return to his occupation; the bad result was in a case operated on eight months after the fracture. Of 10 cases of partial removal, 1 only (10 per cent) gave an excellent result, 1 a satisfactory result, and 1 returned to work but was quickly fatigued.

Cabot and Binney<sup>25</sup> give figures in respect of 8 cases. There was a good result in 25 per cent and a bad result in 75 per cent, and they conclude that the results are distinctly worse than in fracture of the calcaneum. The average period of disability was about a year and a half. In making a prognosis from an *x*-ray photograph in cases of fracture of the astragalus, it is well to remember that the posterior surface of this bone has a small tubercle, the *os trigonum*, which occasionally has a separate existence and so simulates a fracture.

**Calcaneum.** Three forms of this fracture are recognized: (1) *Of the posterior portion with the tendo Achillis*; (2) *Commminution of the body*; (3) *Of the sustentaculum tali*.

In the first form there is not usually much separation of the fragments; but if there is, then operation and fixation by a screw will give the best results. In the second form, accurate anatomical reposition is not generally feasible; operation may be required to remove fragments; in any case the results are very unsatisfactory. In the

third form, there generally results a certain amount of eversion and sinking of the inner border of the foot.

In all the forms there frequently follows pain in the foot and difficulty in walking; consolidation of the fracture itself is much delayed, and no weight should be borne on the foot for at least two months.

Ellis records 42 cases of fracture of the calcaneum; in 4 only was the result good (8.6 per cent).

Cabot and Bunney's statistics of 26 cases show good results in 50 per cent, fair in 38 per cent, and bad in 12 per cent. These good results seem to be quite above the average, and appear to be accounted for by the fact that 7 were heel-fragment cases, and that 5 of these had good, and 4 a fair result. The average duration of disability was about six months. This period appears short, probably on account of the number of heel-fragment cases in the series.

Cotton reports on 33 cases. Only 5 had anything approaching a good result. He believes that he is obtaining better results by moulding the fragments and producing impaction by hammering.

**Cuboid.** Fracture of this bone is rare, and there is not generally great displacement of fragments, though the fracture is usually a comminuted one. A good result may be expected.

**Tarsal Scaphoid.** Isolated fracture of this bone is not very rare, and a considerable number of cases have been reported. It is difficult to maintain the fragments if much displaced, or even to reduce them; but if this can be effected, then a good result will probably follow. In cases where the fragments cannot be reduced, removal by operation is indicated.

Macanstrand and Wood report 2 cases of between five and six months' standing of complete removal of the scaphoid for fracture, with a good functional result in both.

Abadie and Range report 28 cases; of the 15 in which the result is mentioned, 4 were operated on, and 3 of these had a good result; 11 were treated non-operatively, and 3 had a good, 4 a moderate, and 4 a bad result. The tubercle of the scaphoid is occasionally fractured by muscular action, such as dancing, and a valgus condition may ensue. In forming an opinion from a radiograph, it is well not to overlook the occasional presence of a scaphoid bone in the tibialis posterior tendon; it might be taken for a fracture of the scaphoid tubercle.

**Cuneiform Bones.** Fractures of these bones occur in association with a crush of the foot, and the prognosis depends largely on the damage to other parts. If a readjustment can be made and the soft parts recover, then a fair result may be expected.

**Metatarsals.** Fractures of these bones may cause considerable disability in the use of the foot if a fair alignment of the bones cannot be achieved. If there is much displacement of the fragments, anatomical restoration and fixation by operation will give good results. Fractures united with marked upward or downward displacement frequently cause very definite disability.

*5th Metatarsal (Jones's fracture).*—An indirect fracture which occurs by inversion, bending on the outer side of the foot; the line of fracture is near the base. There is neither crepitus nor deformity. The diagnosis depends on the radiographs, and the prognosis is good.

*Phalanges.*—These fractures are frequently compound, and the prognosis depends largely on whether the wound infection is localized, or becomes extensive, involving joints and tendon sheaths. In the former the result will be good, and in the latter great disability will ensue.

*Humerus.*—It will be observed from the table appended that the results of fractured tuberosity are not good, and it seems reasonable to expect better in cases in which the fragment is separate if it is fixed in position by means of a screw.

RESULTS OF NON-OPERATIVE AND IMMEDIATE OPERATIVE TREATMENT OF FRACTURES. (B.M.A. REPORT.)

Fracture	Treatment	No. of cases	Percentage	
			Good	Bad
Ankle	Non-operative	5	80	—
	Operative	2	100	—
Distal radius	Non-operative, under 20	5	80	20
	Operative, under 20	2	100	—
Distal ulna	Non-operative	3	33	—
	Non-operative, all ages	37	40	17.5
Scaphoid	Ditto, under 20	10	100	—
	Operative, all ages	6	60	—
	Ditto, under 20	2	100	—
Scaphoid	Non-operative, all ages	68	61.5	21.9
	Ditto, under 15	18	61	22
	Operative, all ages	6	83.3	—
Scaphoid	Non-operative, all ages	17	41.1	11.1
	Ditto, under 15	8	7.5	12.5
	Operative, under 15	1	100	—
Distal radius	Non-operative	50	44	22
	Operative	14	57.1	7.1
Distal ulna	Non-operative, all ages	17	41.1	23.5
	Ditto, under 15	11	72.7	—
Distal radius	Non-operative, under 25	7	42.8	42.8

A.S.A. REPORT, Table X.

Fracture	Treatment	No. of cases	Percentage	
			Good	Bad
Ankle	Non-operative	15	60.0	20.0
	Operative	15	40.0	6.6
Distal radius	Non-operative	19	47.3	36.8
	Operative	8	12.5	None
Distal ulna	Non-operative	56	76.7	40.0
	Operative	13	53.8	None

Seven cases of fracture of the surgical neck, 2 being under ten years were treated by operation after failure of non-operative methods, owing to faulty or defective union. In all, the results were good; that is, 100 per cent good functional results. The operative results seem to be specially good for cases of this class.

In 13 cases of fracture of the shaft in which operation was undertaken on account of failure of non-operative methods, owing to faulty or defective union, 61.5 per cent had good functional results.

In 6 cases of supracondylar fracture, 2 being under ten years, in which operation was undertaken for failure of non-operative methods, owing to faulty or defective union, 33.3 per cent had good functional results.

Six cases of separated lower epiphysis were operated on for the same reason; 4, or 66.6 per cent, had a good functional result.

In a case of fracture of the internal condyle in which operation was undertaken for failure of non-operative methods, the functional result was only moderate.

*Musculospiral Paralysis* occurs in from 1 to 8 per cent of cases of fractures of the humerus, being associated most frequently with fracture in the middle third of the shaft. The prognosis is fairly good after suture, or release, or both. Scudder's<sup>9</sup> table of 44 cases treated by operation shows 8 cases of recovery of function—72.2 per cent; the shortest interval in the successful cases between the accident and the operation being three weeks, and the longest three years. The statement of Bruns, that 50 per cent of all cases require operation, seems to be worth noting.

Hitzel's<sup>1</sup> statistics refer to 44 non-operative cases of fracture of the surgical neck of the humerus. Two were in children, 1 treated by non-operative and the other by operative methods; both had perfect results. 4—the remaining 439 cases, hyperabduction to the amount of 5 per cent was lost in all except 2; external rotation to the amount of 5 to 40 per cent less than normal was present in all cases.

The treatment adopted was: Arm flexed and held in a sling, cushion in axilla, extension of from 5 to 10 lb. applied and allowed to hang for a hour. When fracture is reduced, shoulder plaster splints back and front down to wrist; a fix control, splints on for three to five weeks, massage and movements at end of ten days, galvanic and faradic currents to deltoid.

Scudder,<sup>9</sup> on the indications for and results of excision of the shoulder joint for fracture and dislocation, observes that this is not a complete excision, but merely partial—that is, removal of the head of the humerus. He states that he is much impressed by the disability which follows this operation. The operative mortality is nil, but 59 per cent of the patients had only fair results. This is striking when contrasted with a number of unredressed dislocations and fractures with surprisingly good function.

*Lower End of Humerus.* There were 106 cases, all under ten years; 54 cases of fracture of the external condyle in children treated by

hyperflexion for two weeks, then massage; in 1, a fragment had to be removed; all had perfect return of function; 54 cases of supracondylar fracture in children reduced under anaesthesia, arm flexed at right angle beyond two cases had musculospiral paralysis and were operated on. Function becoming complete in twenty weeks in one case, in the rest so satisfactory, in thirty-six weeks.

Of these cases, 50 had no perceptible deformity; function of the elbow joint was perfect in all cases. In 34 adult cases, 12 involved the external condyle; 11 were uncomplicated; all treated by as much hyperflexion as possible; no deformity resulted; function excellent, but not perfect. Six cases of fracture of the internal condyle were treated by reduction under ether and flexion; function excellent in 4, perfect in one.

*Fractures of the Elbow.* Andre Treves<sup>11</sup> gives a careful account of the late results of 162 cases in children, as follows:

Fracture	Union	Deformity	Function
Supracondylar	18	51	10
Internal condyle	17	21	4
Simple internal condyle fracture	1	16	17
Lower epiphysis	3	2	0
			Perfect function 88 per cent
			Excellent function 80 per cent
			Perfect function 94 per cent
			Satisfactory 59 per cent
			Perfect function 100 per cent

Ten supracondylar cases had operations for defective union, and 6 for nerve injuries.

Six internal condyle cases had operations for defective union, and 3 for nerve injuries.

Thirteen fractures of the internal condyle with luxation had good results—77 per cent.

These figures again show that good functional results are obtained in children by non-operative methods. Treves says that the treatment, save in supracondylar by flexion, where extension is required, and the supracondylar with lateral displacement, where extension is desirable, should be by immobilization in flexion, the duration of immobilization being from eight to fifteen days, and not beyond three weeks. Early massage and movements are harmful, because they produce excessive callus in children, and besides, they are very painful.

Nerve lesions complicating fractures of lower end of the humerus are not often present; they rarely require operation. Roberts and Kelly<sup>12</sup> give statistics as follows: Ashurst, 1 case of median-nerve injury in 56 cases; Coenen, 3 musculospiral injuries in 31 supracondylar fractures; Destot, Vignard, and Barlatier, 1 case of musculospiral and 1 case of median injury in 72 fractures above the elbow; Broca and Mouchet, 9 cases of nerve injury in 78 elbow fractures. Muller



considers that nerve complications develop in 20 per cent. of all supracondylar fractures.

Roberts and Kelly give a table from Ashhurst recording the end-results of fractures of the lower end of the humerus:

Ashhurst	56	17	81
Coates	31	28	25
Collins	31	27	18.5
De la C. Villard and Bercot		19	28.2
Hellmuth	21	11	21.3

The table gives an average of about 40 per cent. 'perfect results.'

It is advisable to inform parents and patients that an inconspicuous or mobile joint does not necessarily mean that there will eventually be good functional incapacity.

#### AVERAGE DURATION OF ISCAPACITY. (B.M.A. REPORT.)

Under fifteen years	Anatomical neck and upper epiphysis	8 weeks	No record
	Surgical neck and shaft	10.5 "	26 weeks
	Lower epiphysis and supracondyle	13.5 "	8.7 "
Over fifteen years	Anatomical neck and upper epiphysis	5.2 "	8 "
	Surgical neck and shaft	27.6 "	32.8 "
	Lower epiphysis and supracondyle	15.1 "	7.8 "
Permanent incapacity over fifteen years	Anatomical neck and upper epiphysis	20 per cent.	None
	Surgical neck and shaft	10 "	8.5 bad results
	Lower epiphysis and supracondyle	17 "	9 "

#### A.S.A. Report, Table A11 (ALL CASES).

Shoulder	10.9 weeks
Shaft	12.0 "
Elbow	8.2 "

Radius and Ulna.

CASES OF NON-OPERATIVE AND IMMEDIATE OPERATIVE TREATMENT OF FRACTURES OF RADIUS AND ULNA. (B.M.A. Report.)

		No. of cases	Good	Not good
Radius - upper epiphysis	Non-operative, under 15	2	50	
	Non-operative, all ages	45	73.1	12.7
Radius - shaft	Non-operative, under 15	19	73.6	10.5
	Operative, all ages	7	77.1	14.2
Radius - lower epiphysis	Non-operative, all ages	4	75	25
	Non-operative, all ages	15	66.6	13.3
	Non-operative, under 15	11	63.6	9
	Operative, under 10	1	100	
Radius - olecranon	Non-operative, all ages	47	27.6	29.7
	Non-operative, under 15	4	100	
	Operative	1	100	
Ulna - olecranon	Non-operative, all ages	20	45	30
	Operative, all ages	19	73.6	5.2
	Non-operative, all ages	18	77.7	11.1
Ulna - shaft	Non-operative, under 15	10	80	10
	Operative	1	result	not good
Ulna - lower epiphysis	Non-operative	3	100	
	Non-operative, all ages	2	38	17.1
Ulna - end of shaft	Non-operative, under 15	76	63	
	Operative, all ages	54	75	
	Non-operative, under 15	3	100	

A.S.A. Report, Table XI.

		No. of cases	Good	Not good
Shaft	Non-operative	53	60.3	30.18
	Operative	24	70.8	None
Wrist	Non-operative	12	50.0	25.0
	Operative	3	66.6	None

Hertz records 15 cases of fracture of the head of the radius with complete displacement: flexion and extension eventually were complete but in 11 cases pronation and supination were only half the normal. Of 4 cases with displacement of fragments, in 2 the head had been removed in its entirety; in the remaining 2 a broken fragment was removed. The functional result was best in the cases in which the head was completely removed, and not good in the 2 cases of partial removal.

In 10 cases of fracture of the neck of the radius of the transverse type, half an inch below the head, 2 (20 per cent) had a good and 8 a moderate functional result.

If the head of the radius is removed, leaving the orbicular ligament undamaged, fair good functional results may be expected with some assurance.

Arrest of growth of the radius is to be found as an end result of separation of, or injury to, the lower radial epiphysis.

Poland records 17 out of a total of over 700 of these cases. He also notes 56 cases of arrest of growth after these injuries, the radial cases being the most numerous. Recently, 3 cases have come under my own observation: the diminished length of the radius, and the moulded length of the ulna, gave the hand its characteristic deformity. In only 1 of these 3 was the functional result good.

Table VII of the B.M.A. Report gives a summary of all fractures over fifteen years, and notes the average duration of incapacity:

Non-operative	27.6 weeks	9 per cent
Operative	27.3 ..	7.8 ..

#### AVERAGE DURATION OF INCAPACITY. (B.M.A. REPORT.)

Under 14 years	Radius and ulna	17.4 weeks	6 weeks
14-17	Colles's fracture	3.7 ..	No record
Over 17 years	Radius and ulna	20.6 ..	19.4 weeks
"    "	Colles's fracture	17.4 ..	
Permanent incapacity	Radius and ulna (including lower epiphysis)	6 per cent	8 per cent
"    "	Colles's fracture	11.7 ..	

#### B.M.A. REPORT, Table VII (ALL CASES).

Stalls	10.3 weeks
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**Carpal Scaphoid.** Hitzroth records 14 cases, 7 without displacement of fragments, treated by a moulded interior splint, fingers free, hand in slight radial deflection and extension, early massage, full

ment in sixth week. The result was that hyperextension was held in all, flexion in 4 with pain on movement. In 3 cases with displacement of proximal fragment, the latter was removed by dorsal approach and treated as the foregoing; result, extension two-thirds normal, flexion seven-eighths normal, deflection less than normal.

There were 4 cases with similar displacement associated with dislocation of the scaphoid; the fragment and the scaphoid were removed in 3; result was fair. In the fourth case the fragment of the scaphoid was removed, and an ineffectual attempt to reduce the scaphoid was made; the result at the end of nine weeks was a stiff wrist. The prognosis is not wholly good, though Cotton<sup>10</sup> says that in 3 of his cases removal of fragments was done in uncomplicated fractures, and results were practically perfect.

Lockette<sup>11</sup> thinks that in view of the unsatisfactory results ordinarily obtained, the fragments could be readily held together by a fine wire with a better result.

Compbell records 3 cases of fracture of the carpal scaphoid with displacement of the median nerve, which eventually made a good recovery towards the nerve injury. In examining a radiograph for this fracture it is necessary to remember that in about 4 per cent of persons the scaphoid is normally divided into two parts in the course of development; this might be mistaken for a fracture.

**Semilunar.** A number of cases of fracture of this bone have been recorded by Liebmayer,<sup>12</sup> Finsterer,<sup>13</sup> and others. It is a compression fracture. The prognosis is not good as regards function; the bone requires removal on account of pain and diminished movements of the hand.

**Os Magnum.** Fractures of this bone are relatively rare. Harrigan<sup>14</sup> collected 6 authoritative cases, including one of his own; in 2 cases the diagnosis confirmed by *x* rays. The results do not seem very satisfactory. In none of the cases is it stated that a good result was obtained.

**Trapezium, Trapezoid, Uniform, Pisiform.** Fractures of these bones have been reported. They are important, for they are likely to be followed by ankylosis, so that the best results may be expected by early active pressure, early passive movements, and massage.

**Metacarpals. Fracture of the First Metacarpal.** This may occur at the distal end of the shaft or at the base. If good alignment can be secured and maintained, a good result may be expected.

**Fracture at the Base (Bennett's Fracture).** An oblique fracture occurs at the base. Good anatomical reposition is not always achieved, but very fair functional results may follow.

Lockette<sup>11</sup> had a good result by fixing the fragment into position with a fine screw.

**Separation of the Basal Epiphysis** of the first metacarpal occasionally occurs. In the two cases recorded by Coles<sup>15</sup> a good result followed.

**Fractures of the Shafts** of the other metacarpals are apt to give little trouble if a good alignment cannot be achieved; if this is

obtained and maintained, the results are good. In difficult cases, oblique fractures and such like, Lambotte recommends a small form of fixateur, or a small plate, or cerclage, as giving good results.

*Fractures of the Hand* (knuckle fracture; pugilists' fracture).—According to Cotton,<sup>1</sup> some deformity always remains, flexion may be impaired, function generally is good. He quotes a case in which there were sixteen of these fractures in both right and left hands without serious loss of function occurring, except in one knuckle.

*Phalanges*.—These fractures usually unite well, and unless the crush, which is generally the cause, is severe, a good result follows moderate readjustment of the fragments.

*Sesamoid Bones of the Thumb*.—This fracture has been described by Preiser,<sup>2</sup> no bony union followed, but the functional result was good. Penn G. Skellern<sup>3</sup> collects 4 cases of these fractures, including the case of Preiser; 3 of them were due to direct violence, 1 was possibly due to indirect violence. He says that immobilization in a neutral position by a silicate of sodium dressing fulfils all indications.

*Scapula*.—*Fractures of the Body* are often multiple. Union takes place frequently with overlapping or exuberant callus, but generally speaking good functional results ensue. Cotton states that in his 10 cases the results were practically perfect.

*Acromion*.—This fracture is rare. Union may be fibrous or bony; in either case the functional results are nearly always good.

*Spine*.—The ridge may be broken, or the mass of bone, including the acromion, may be separated; some deformity, but no permanent disability, results.

*Glenoid*.—Fracture is rare, except as an accompaniment of dislocation of the head of the humerus. It is possible that chipping off of the edges may predispose to recurrence of the dislocation.

*Coracoid*.—The line of fracture is usually well behind the tip, but this may be split longitudinally. Union is seldom bony, but there is no displacement unless the coraco-clavicular ligaments are torn. Rarely is there any great functional disability.

*Accl.*—The line of fracture is through the suprascapular notch to the axillary border. Bony union with some displacement is the rule. In the majority of cases good functional results ensue.

*Sternum*.—Fractures of this bone are usually associated with damage to the intrathoracic or abdominal organs, and the prognosis may depend on the extent of injury there. Gurlt collected 98 cases, and of these 54 were simple cases; 46 recovered, 8 died; whilst of 44 cases complicated by severe injuries, only 4 recovered.

*Fracture of the Ensisiform Cartilage* may occur. It is sometimes followed by troublesome vomiting, which, in one of the 4 cases tabulated by Gurlt, persisted for two years and then ceased spontaneously. In three of the cases, vomiting ceased when the depressed cartilage was drawn forward.

*Clavicle*.—These fractures usually unite well; non-union is rare. The bond is firm at the end of four weeks. Displacement, deformity,

shortening are the rule. The amount of shortening may be as much as two inches. These conditions, however, do not follow in all cases in which the line of fracture is transverse, and where displacement is absent at the beginning.

Despite deformity and shortening, the functional usefulness of the extremity is much interfered with.

The rare complications of this fracture, which render the prognosis doubtful, are injuries to the subclavian artery and vein, brachial plexus, or lung, and pressure by exuberant callus. If operation is needed for great deformity and failure of the usual treatment to maintain a correct position, or for other reasons, a screw driven in internally, or cerclage (Lambotte's), or a fine Lane plate away from the bone, will give good results.

**Ribs.** Simple fractures without complications do very well. If excessive callus forms and persists, it may cause pressure on intercostal nerves, and persistent pain may follow. In old or feeble persons the immediate outlook is more serious, pneumonia being the dangerous sequela.

**Costal Cartilages.** Fractures occur most frequently near the costal junction, the seventh and eighth being most often involved. The prognosis is good. Union takes place by means of osseous or cartilagenous tissue.

**Pelvis.** Fractures of the pelvis are not common, and the prognosis varies largely on the associated damage to pelvic viscera.

Shock is a cause of death in many cases. If the patient recovers, there is frequently deformity, which, if it obstructs the pelvic outlet, may be a serious matter during parturition. On the other hand, in the lesser injuries, the results may be quite good.

Wood<sup>1</sup> records a total of 54 cases, with a mortality of 50 per cent. In 14 laparotomies were done—four for ruptured bladder or rectum—

and 4 died. Four external urethrotomies were required; two died.

**Os Pubis.** Fractures of this bone are frequently followed by much discomfort, sometimes by severe pain. Excision gives very excellent results.

England<sup>2</sup> gives figures on the prognosis in respect of the various parts of the pelvis:

**Os Iliac.** Nine cases. In 1 laparotomy was necessary, in 1 radical excision of the fracture. Of the 9 cases, 8 are definitely recorded as cured, i. e., 88.8 per cent.

**Os Pubis and Ischium.** Ten cases. In 6 there were urinary symptoms of varying degrees of severity. Most of them were complicated by other injuries. Death occurred in 1 case, 3 cases required operation, and 6, i. e., 60 per cent, were definitely cured.

**Os Pubis.** Two cases. No complications occurred. One was definitely cured, i. e., 50 per cent.

**Os Pubis and Ischium.** Five cases. There were urinary symptoms in 3, operation was performed in 2, there were 2 definite cures, and 1 definite cure, i. e., 20 per cent.

**Superior Maxilla.** In uncomplicated cases union takes place in about four weeks. Severe neuralgia may follow as a consequence of the superior maxillary nerve becoming involved in callus. Deformity is not common.

**Malar Bone.** The prognosis is usually good. There is generally little callus formation. Reposition should be attempted early.

**Nasal Bones.** The prognosis must be very guarded as to eventual deformity. The primary external disfigurement does not tend to become accentuated, but the internal obstruction, if any, does.

**Mandible.** Simple fractures, in which the mucous membrane is not torn, unite in about six weeks; the prognosis is usually good. Even severe compound fractures terminate with remarkably good results. Non-union is very rare; statistics show that this occurs in only 2 per cent of all pseudoarthroses noted. Fractures of the condyloid process may be followed by ankylosis of the temporomaxillary joint.

**Hyoid Bone.** Fractures of this bone are extremely rare, owing to its elasticity and protected position. In Gurli's collection of 27 cases, 21 were fractures of the bone alone. In simple uncomplicated fractures the prognosis is good. The serious complications are oedema of the larynx, necrosis, abscess, and hemorrhage.

**Larynx and Trachea.** The prognosis is very grave. Of 75 cases reported before 1879, the mortality was 78.6 per cent. Of 70 cases reported since that date, the mortality was 37 per cent. The dangerous complications are oedema of the larynx, intralaryngeal and intratracheal hemorrhage, mediastinal emphysema, septicæmia, and aspiration pneumonia.

#### ESTIMATION OF DEPRECIATION OF CAPACITY FOR WORK.

BROUARD'S Table I.

	70-80	70-80	50-70	70-90
Right Upper Limb				
Loss of whole limb	70-80	70-80	50-70	70-90
Loss of part below elbow	70-80	70-80	50-60	70-90
Loss of hand	60-75	65-75	45-55	70-90
Loss of thumb	25-35	25-35	15-25	40-55
Loss of index finger	10-15	10-25	10-15	25-35
Loss of middle finger	10-15	10-15	5-10	15-25
Loss of ring finger	5-10	5-10	5-10	15-20
Loss of little finger	5-10	5-10	5-10	15-20
Complete ankylosis of shoulder	40-55	40-50	25-35	40-65
Incomplete ankylosis of shoulder according to degree	10-40	30-40	10-25	30-40
Complete ankylosis of elbow	30-40	30-35	10-25	35-45
Incomplete ankylosis of elbow according to degree	10-30	10-30	0-10	20-35
Complete ankylosis of wrist	20-35	20-30	5-15	30-45

BROUARDÉL'S Table II.

Description of Fracture	Upper Limb		Lower Limb		Wounds (in cm.)
	Upper	Lower	Upper	Lower	
Upper Limb					
Fracture of whole limb	60 70	60 70	40 50	70 80	
Fracture part below elbow	60 70	60 70	40 50	70 80	
Fracture of hand	55 65	55 65	30 40	70 80	
Fracture of thumb	15 25	15 25	10 25	25 40	
Fracture of index finger	5 15	5 15	5 15	15 25	
Fracture of middle finger	5 10	5 10	5 10	15 20	
Fracture of ring finger	5 10	5 10	0 5	10 15	
Fracture of little finger	0 10	0 5	0 5	5 10	
Complete ankylosis of shoulder	40 50	30 45	10 25	35 55	
Incomplete ankylosis of shoulder					
according to degree	10 40	10 30	0 10	10 35	
Complete ankylosis of elbow	25 35	25 35	5 15	25 40	
Incomplete ankylosis of elbow					
according to degree	5 25	5 25	0 5	10 25	
Complete ankylosis of wrist	15 20	15 20	5 10	20 30	
Incomplete ankylosis of wrist					
according to degree	5 15	5 15	0 5	5 20	

BROUARDÉL'S Table III.

Description of Fracture	Upper Limb		Lower Limb		Wounds (in cm.)
	Upper	Lower	Upper	Lower	
Lower Limb					
Fracture of whole limb	50 75	50 75	70 90	50 75	
Fracture of limb below knee	50 70	50 70	60 80	50 70	
Fracture of foot	40 60	40 60	60 80	50 60	
Fracture of all the toes	25 35	20 30	40 60	25 35	
Fracture of great toe	15 20	10 20	20 40	15 20	
Complete shortening of the lower limb (above 5 cm.)	25 35	20 30	45 60	25 35	
Incomplete shortening of the lower limb (below 5 cm.)	up to 25	up to 20	up to 45	up to 25	
Complete ankylosis of hip	30 45	30 45	60 80	30 35	
Incomplete ankylosis of hip					
according to degree	10 30	10 30	40 60	10 30	
Complete ankylosis of knee	20 30	20 30	40 50	20 30	
Incomplete ankylosis of knee					
according to degree	10 20	10 20	30 40	10 20	
Complete ankylosis of ankle	10 25	10 25	40 60	10 25	
Incomplete ankylosis of ankle					
according to degree	0 10	0 10	30 40	0 10	



On the Continent, in cases in which there is complete and permanent disablement, compensation is allowed equal to two thirds of the wages earned. In the United Kingdom, half the average weekly wage is paid so long as there is incapacity for work. The worker will receive his full compensation, so long as he is unable to do any work.

The preceding tables are after Brouardel,<sup>10</sup> 100 being reckoned as the full estimation of depreciation. This figure is applied to such cases as complete loss of vision or loss of the use of two limbs. The tables will give a general idea of the depreciation in working capacity in the various permanent injuries, four types of workers being selected. The short notes which follow are intended to give a general idea as to the working capacity after injury of men who follow arduous occupations. The figures are taken from Brouardel, Rohmer,<sup>11</sup> Olive et Le Meignen,<sup>12</sup> and others.

**Fractures at The Upper End of the Femur** which result in non-union or excessive callus formation with interference with the movements of the joint, and ankylosis, may seriously depreciate a workman's earning capacity. He may be compelled to use a stick, or even a crutch, and he will in all probability be obliged to seek other employment if his usual work required the full use of his hip joint, as would be the case if the work involved climbing ladders, etc. Wasting of muscles is a frequent accompaniment of partial ankylosis, and adds to the incapacity. Complete ankylosis of the hip may be estimated at as much as 80 or even 90 per cent; at an angle, 58 per cent; atrophy of muscle, 33 per cent. If fixed in the flexed position, walking and standing will be interfered with; and if the fixation is in the extended position, there may be a difficulty in sitting. It will probably take at least eight months before the patient is fit to begin work in an ordinary simple case of fracture of the neck; this is presuming that the patient is not beyond middle age, and that there are no complications, such as arthritis, phlebitis, pseudarthrosis, etc.

**Fractures of the Shaft of the Femur** may be followed by non-union and almost complete incapacity for work. Union with shortening and deformity is more common. In measuring the shortening it is well not to forget that there is sometimes a difference in the length of normal lower limbs. Some authorities state that this is as much as 4 cm., and the increase is generally in favour of the left limb, so that a shortening to this extent may be considered of no importance. Olive and Le Meignen are of opinion that shortening below 3 cm. should not be compensated unless it is associated with other lesions. Brouardel reckons great shortening to be that above 5 cm., and values it up to 60 per cent. In the lesser degrees of shortening, a great amount of accommodation occurs, and this can be easily assisted by adding to the thickness of the sole of the boot. In the greater degrees, correction is difficult and the incapacity for work is considerable, save in those workers who can sit at their occupation. The foregoing remarks on shortening apply equally to fractures of the tibia and fibula.

Angular deformity and excessive callus formation may prevent the contraction of muscles. Pain will follow the involvement of nerves in callus, and it is frequently a cause of incapacity in cases of union with flapping or bowing of the limb; standing for a length of time is sometimes impossible. If good alignment of the fragments is achieved, recovery will take place in four to six months; in many cases it will be as much as twelve.

**Fractures involving the Knee-joint** are sometimes followed by ankylosis or weakness in the joint. If the ankylosis is in a good position, the incapacity is about 40 per cent; in the bad position, according to degree, up to 50 per cent; relaxed knee-joint, 75 per cent. The insecurity here is most noticed in going up or down ladders or stairs. Marked wasting of the muscles of the thigh usually follows injuries to the knee-joint. In simple cases it generally takes from six to twelve months for full working capacity to be regained.

**Fractures of the Patella.**—If bony union is achieved, the return to function is the usual course. If the union is fibrous and there is much separation of fragments, a useful, though not perfect, limb results. If there is much separation of fragments, a weak and flailing limb will result, with consequent incapacity, which may be as much as 50 per cent.

**Fractures of the Shafts of Tibia and Fibula**, united with deformity, with painful callus, are often associated with thrombosis, swelling of the limb, and trophic troubles. If non-union occurs, the incapacity is about 50 per cent. If the fracture is in the upper end, involving the knee-joint, the resulting condition may approximate to that found in fractures of the knee involving the knee-joint (q.v.).

*If the Fibula is fractured* near the upper end, the peroneal nerve may be involved either in the fracture or in the resulting callus, and a lesion of talipes equinovarus ensue, with incapacity for work. (Boatman, see Fracture of Fibula.) In favourable cases a patient is usually fit to return to work in three or four months.

**Fractures of the Lower End of the Tibia and Fibula involving the Foot** are grave injuries, and very frequently result in serious incapacity. Deformity, a varying degree of ankylosis, and pain are almost frequent sequelae. If the foot is fixed at a right angle—the favourable position—the incapacity may be from 15 to 20 per cent, according to the nature of the work. If fixed at an acute angle, or in extended position, the incapacity may be as much as 60 per cent. The older the patient, the less is the chance of his being able to return to full work.

The union of the late Mr. Clinton Dent, mentioned earlier, having reference to that picked body the Metropolitan Police, shows how serious these injuries are in persons whose occupation requires standing or walking.

**Fractures involving the tarsus and Metatarsus** may sometimes result in permanent incapacity, occasionally equal to loss of the foot, on

account of pain, swelling, and difficulty in walking or standing for a long time. Flat foot may ensue, and is estimated at from 30 to 50 per cent. Sometimes the strain on the sound foot occasioned by the weight of the body being thrown on it in an effort to save the injured foot, causes a condition of flat foot in a previously healthy foot.

In metatarsal fractures, if there is much displacement of the fragments either in an upward or downward direction, the pressure of the workman's hard boot may cause definite incapacity: metatarsalgia may ensue.

*Fractures of the Toes* rarely cause incapacity unless they become compound and septic. The loss of the great toe is estimated at from 40 to 20 per cent. The loss of a single phalanx does not cause any incapacity unless the scars are tender. The loss of several toes or all the toes may be estimated at from 20 to 30 per cent as a maximum.

In many tarsal fractures it will be six to eight months before the patient is fit to undertake heavy work, or in metatarsal fractures three to six months.

**Fractures about the Upper End of the Humerus** may be followed by more or less ankylosis and a consequent limitation of movement, atrophy of muscles, injury to the circumflex nerve, or chronic arthritis. Ankylosis may be estimated according to degree at from 50 to 60 per cent; atrophy of muscles 28 to 58 per cent; chronic arthritis 45 to 66 per cent. Arthritis may greatly delay recovery. Benign cases are well usually in two to four months, but severe ones may last as much as twelve months or more.

*Fractures of the Shaft of the Humerus* may be followed by non-union (which is relatively frequent), faulty position, pain, and involvement of the musculospiral nerve in callus. Any of these may cause almost complete incapacity. In uncomplicated cases recovery is usually complete in three to four months. Non-union occurs with greater frequency after fracture of the shaft of the humerus than after that of any other bone, 376 in 1274 cases of non-union in all bones. According to Bruns, only 56 per cent of recoveries follow resection; in 187 cases of pseudo-ankylosis of the humerus so treated, 98 recovered, 3 were improved, 73 were unimproved, 5 died.

*Fractures at the Lower End of the Humerus and Elbow-joint* may be followed by complete or incomplete ankylosis, or loss of movements of pronation and supination. Ankylosis in extension may be estimated at from 40 to 50 per cent; in medium flexion, 33 to 40 per cent; in acute flexion, 20 to 25 per cent. Loss of pronation and supination may be a serious disability, especially in skilled workers, mechanics, etc. Simple uncomplicated cases frequently recover full working capacity in three months.

**Fractures of the Radius and Ulna** are sometimes followed by disability due to non-union or faulty union. In non-union the forearm is practically useless, and in faulty union there is frequently loss of pronation and supination.

*Fractures at the Lower End of the Radius and Ulna involving the*

**Dislocations** are sometimes followed by more or less ankylosis. Complete ankylosis of the wrist is estimated at from 25 to 33 per cent. Partial ankylosis may not interfere with working capacity except in specially skilled trades. In favourable cases, probably about three weeks may be reckoned as the period of recovery.

**Fractures of the Carpus** may cause ankylosis similar to that which follows fractures in the wrist-joint. Simple cases recover in from one to two months; the shorter period will apply to those cases in which operations can be begun early.

**Fractures of the Metacarpus** are not usually followed by any very marked incapacity unless the bones are united with great displacement.

**Fractures of the Phalanges** do not generally cause much disability.

If the thumb is ankylosed in a straight or flexed position, there will be interference with the full power of the hand, and amputation may be necessary to restore function. Loss of the thumb is the most important.

Loss of the thumb is a forecept as well as a grasping instrument. If loss of a thumb be reckoned at from 50 to 75 per cent, loss of the thumb will be valued at about one-third of this. Ankylosis of thumb-joints, 25 to 33 per cent; loss of a single phalanx of the thumb is a serious matter.

Loss of index finger, 16 to 25 per cent. Ankylosis of index joints, 8 to 25 per cent; loss of one or more phalanges of the index will equal one-third to two-thirds of the total loss of the index. The estimation of

loss of the middle finger is about 8 to 16 per cent, and the loss of the ring finger is a little less. The loss of the little finger is valued at under the last two mentioned.

**Fractures of the Scapula.**—If union is in a faulty position, so as to interfere with the movements of the shoulder or render these painful,

the estimation of the incapacity is estimated at from 10 to 20 per cent.

Muscle lesions about the shoulder are followed by an amount of wasting and oedema which frequently takes quite a long time to recover.

**Fractures of the Sternum.**—In simple uncomplicated fractures the working capacity is usually good, though pain is sometimes persistent, but not wholly incapacitating. If the costiform cartilage is driven into the chest, an operation may be required to raise it. Remy<sup>47</sup> suggests

10 to 20 per cent valuation for a sinking in of the sternum without deep lacerations.

**Fractures of the Clavicle** usually result in some deformity; but if uncomplicated by injury to adjacent parts, there is in most cases an

adequate recovery. Non-union is rare, but if it occurs an operation may be necessary. Excessive callus formation may cause pressure

on the plexus, pain, and incapacity for work. The estimation for incomplete recovery is from 16 to 50 per cent. In an ordinary case,

about two months will elapse before full work can be undertaken. In severe cases it may be much longer.

**Fractures of the Ribs.**—Uncomplicated fractures usually heal well, and there is generally very little incapacity for work afterwards.

Sometimes faulty union and excessive callus formation may leave a permanent neuralgia as a result. If incapacity occurs on raising the arm,



MICROCOPY RESOLUTION TEST CHART



28

25

32

22

4

2.0

1.8

APPLIED IMAGE



or is due to pain, it may be reckoned at from 20 to 50 per cent, or even more. Austrian statistics, in a record of 1415 cases of fractured ribs, show 806 complete recoveries in periods up to seven months.

**Fractures of the Pelvis.**—Fractures of the pelvis are frequently complicated with fatal internal injuries. If recovery takes place, pain may be persistent, or it may be checked by movements, and as a consequence walking may be difficult. Simple fractures of the ilium may unite with deformity causing very little incapacity.

**Fractures of the Sacrum** may result in great incapacity, particularly if nerves are involved.

#### COMPOUND FRACTURES.

An interesting table in the U.S.A. Report is the one numbered XXXII, giving comparative results of operative and non-operative cases of compound fractures. As statistics on these fractures are not readily found, the schedule set out is significant, though the number of cases is disappointingly meagre.

Site of Fracture	Cases	OPERATED		NON-OPERATED	
		Good anatomical results	Good functional results	Good anatomical results	Good functional results
Humerus (shaft)	6	83	100	4	100
Radius (shaft)	2	100	100	1	100
Ulna (shaft)	1	100	100	2	100
Radius and ulna	6	83	100	4	50
Femur	38	73	76	20	70
Tibia (shaft)	22	59	68	34	64
Fibula (shaft)	4	50	100	6	46
Tibia and fibula	50	60	60	82	68
Totals	129			153	

Observe that the percentage of good functional results is higher in the patients operated on, except in compound fracture of both bones of the leg; in the non-operative cases there is a higher percentage of good anatomical results. This is contrary to the established canon that good anatomical results are followed by a high percentage of good functional results; but it must not be taken that operative treatment is the best treatment in compound fractures. It is generally known that the occasional fixation of a compound fracture by means of a plate and screws has been followed by very good results. Yet it is certain that a universal adoption of this method would be followed by a high percentage of bad results.

The average duration of incapacity was noted in 51 cases:

Site of Fracture	Duration
Femur	13 months
Leg	6 "
Upper extremity	4 "

There was no marked difference between operative and non-operative cases.

In an interesting article on fractures of bones in gold mining by F. W. Freeman,<sup>18</sup> there is a useful note on fractures from an economic standpoint. The mining company pay their workers an average wage of \$3.25 per day. If a workman is injured, for every dollar the man loses in wages the company spend a like amount to get him well.

When he is injured, his pay stops, but he draws \$1.00 per day from the Aid Fund, without any expense to himself for surgical services or hospital. For example, a man loses 100 days, equal to \$325.00; he draws \$100.00 from the Aid Fund, a loss to him of \$225.00; while it costs the company \$325.00, besides the loss of efficiency in breaking in a new man.

In a total of 311 cases of simple and compound fracture, we find the following losses to the employees and to the company:

Fracture	No. of Cases	No. of Days	Loss to Employee	Benefit from Aid Fund	Net Loss to Employee	Cost to Company
			\$	\$	\$	\$
Skull	25	976	3172	976	2196	3172
Head	1	9	29.25	9	20.25	29.25
Vertebra	1	7	22.75	7	15.75	22.75
Cervical	4	182	591.50	182	409.50	591.50
Scapula	1	23	74.75	23	51.75	74.75
Humerus	25	825	2681.25	825	1856.25	2681.25
Radius	1	117	270.25	117	153.25	270.25
Ulna	4	89	289.25	89	200.25	289.25
Radius and ulna	5	248	906	248	658	906
3rd Carpals	7	140	453	140	313	453
Distal radius	39	721	2343.25	721	1622.25	2343.25
Proximal radius	6	183	594.75	183	411.75	594.75
Ulna	10	2137	6945.25	2137	4808.25	6945.25
Scapula	1	35	113.75	35	78.75	113.75
Humerus and tibia	39	4773	15512.25	4773	10739.25	15512.25
Femur	19	1322	4296.50	1322	2974.45	4296.50
Tibia	18	800	2600	800	1800	2600
Fibula	4	360	1170	360	810	1170
Metatarsus	31	992	3224	992	2232	3224
Toes	70	980	3185	980	2205	3185
Totals	311	14,919	46,365.75	14,919	31,446.75	46,365.75

Pringle<sup>19</sup> reports on 230 cases of open fracture of the long bones. In 159 patients an attempt was made to save the limb. The general treatment was as follows: The limb was thoroughly cleaned, the wound in the skin and subcutaneous tissue excised, the soft parts re-opened up, and all pockets made accessible; muscle, fascia, and periosteum ingrained with dirt were cut away; the bones, if necessary, were turned out of the wound and dirt removed; large fragments were cleaned and preserved; fixation by means of wires,



screws, or plates was employed in some cases, and the wound was always closed if possible. Of the 112 cases treated by fixation, 9 died from various complications, such as pneumonia, chronic Bright's disease, cardiac failure, etc., and secondary amputation was required in 7; of the 96 patients whose limbs were saved, all recovered with good union. There were 47 patients treated by cleaning (no fixation); 4 died of cardiac failure, shock, etc., and secondary amputation was required in 7, the same number as in the fixation class. The length of time required for treatment in hospital in those whose limbs were saved was, on the average, 62.7 days, the longest period being 200 days. Pringle is a thorough believer in efficient cleaning and fixation in suitable cases. Whilst the fixation method may be admissible in certain circumstances in open fractures occurring in civil life, it has caused disaster in gunshot fractures.

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#### FRIEDREICH'S ATAXIA. (See ATAXIAS.)

#### FRONTAL SINUSITIS. (See NASAL ACCESSORY SINUSITIS.)

**GALL-STONES.** We shall inquire (A) *Into the prospect of severe trouble arising from the presence of gall-stones*, and (B) *Concerning the risks and benefits of the various forms of operation.*

1. **The Prognosis of Gall-stones apart from Operation.** As is known, gall-stones are very frequently found at the autopsy in cases where their presence was never suspected during life. They are found to be present in 4 per cent of all adult males and 20 per cent of all adult females, and are undoubtedly commoner in the obese. Only in about one-fifth of the cases are typical attacks of gall-stone colic recognized.

As Moynihan has forcibly pointed out, this does not mean that the remaining four-fifths never have any symptoms. A large proportion of them have uneasy sensations of fullness, which may amount to recurring attacks of pain, not in the right hypochondrium but in the epigastrium. It is not at all uncommon for a very exact mimicry of gastric ulcer to be the result, and it may even be supposed from the similarity of the symptoms that the ulcer has perforated. In a number of these cases hyperchlorhydria is found, and some of them do actually develop a gastric ulcer in consequence.

*Gall-stone colic* with or without jaundice, and *gastric symptoms*, are therefore quite common evidences of the presence of calculi in the gall-bladder. There are a number of less frequent ill-effects. In about 20 per cent of the cases which are sufficiently severe to come to hospital for operation, a *stone becomes impacted* in the common duct, and in a further 10 per cent in the cystic duct (Kehr, Mayos, and Bristol figures). Stone in the common duct causes persistent jaundice and pain, and sometimes febrile attacks; stone in the cystic duct gives rise to dilatation of the gall-bladder, either simple (mucocele) or infected (empyema of the gall-bladder).

Another trouble resulting from gall-stones may be a *fistulous opening* into the peritoneal cavity, some viscera, or on the skin surface. In Courvoisier's statistics collected from the literature, there were 184 cases of cutaneous fistula (usually at the umbilicus), 119 of perforation into the peritoneal cavity, 83 into the duodenum, 39 into the colon, 4 into the lung, and a very few each into the stomach, kidney, and liver. In 4 cases (one of whom was Ignatius Loyola) the inferior vena cava was opened by a gall-stone fistula.

*Acute cholecystitis* is a quite common consequence of stones in the gall-bladder, and occasionally leads to perforation and peritonitis. Suppurative abscess or abscess of the liver may also result.

*Intestinal obstruction* due to gall-stones is rare, but many hundreds of cases are on record. Of 280 in the literature, 156 died (Martin). In the literature statistics are seldom very valuable. Occasionally, obstructions around the bile-passages may lead to intestinal obstruction. *Cancer* of the bile-ducts or gall-bladder is a well-recognized consequence of the long-continued irritation of calculi. We have some statistics giving us an idea of the frequency of this result. Cancer was found in 18 out of 109 cases at the London Hospital, and 45 out of 133 cases at Guy's. The greater frequency is due to the older date of the statistics; nowadays many more cases are operated on early. Combining these figures, we obtain a frequency of 8 per cent; the

ancient statistics of Riedel were as high as 28 per cent. It will be seen, however, that the danger of cancer is by no means negligible if even 8 per cent of patients with symptoms sufficiently severe to be operated upon already show it. Watton records 3, and Mayo Robson and Lawford Knaggs 4 each, cases in which cancer has supervened *after* operation, but this is evidently extremely rare. In the end-result statistics of Kehr, Davis, Arnsperger, McWilliams, Stanton, and the Bristol figures, comprising nearly a thousand in all, this sequel is not once mentioned.

We conclude, therefore, that in the majority of cases the presence of gall-stones leads to some discomfort, which in about one-fifth of the cases is very severe, though it may be only temporary; that of those in whom cholelithiasis is definitely diagnosed, about one-third eventually suffer from impaction of a gall-stone, or develop a fistula or acute cholecystitis demanding prompt interference; that another 8 per cent go on to cancer of the bile-passages, and that a small proportion, perhaps 1 per cent, lose their lives from intestinal obstruction, perforative peritonitis, pancreatitis, or subphrenic abscess.

It is scarcely realized by the profession that the prognosis of gall-stones, apart from treatment, is as grave as these facts prove. It will probably be admitted by nearly everyone that the prospects of permanent relief of symptoms by medical treatment—olive oil, salines, mineral waters and spa treatment, dieting, etc.—are very slight, and any patient who has had one attack of hepatic colic will most probably get others. Fortunately these are often at long intervals, so that life may be tolerable notwithstanding.

**B. Prognosis of Operation for Gall-stones.** We shall consider, first, the operation mortality and its causes, and then the prospects of permanent cure.

*Table I.* THE OPERATION MORTALITY FOR GALL-STONES.

Author	Cases		Deaths		Mortality		Percentage	
	No.	per cent.	No.	per cent.	No.	per cent.	No.	per cent.
D'Arey Power	73	23.3	53	11.3			20	5.5
Kehr	1600	16.5	691	2.9	389	3.3	520	44.6
Mayo	1500	1.4	1164	2.5	105	2.9	102	2.4
Bristol Royal Infirmary	84	13	31	9.6	27	11	12	42
Arnsperger	230	6.9						
Munn	200	0						

**1. Operation Mortality.** As a glance at *Table I* will show, it is impossible to give a figure for the death-rate of the operation for gall-stones which will not be utterly misleading if applied to particular cases without discrimination. All depends upon the exact nature of the individual's condition.

In absolutely straightforward, uncomplicated cases, the mortality is very low. D'Arcy Power records 27 such without a death; Kehr's statistics of 2194 operations of this type with a mortality of 1 per cent. On the other hand, in the presence of 'serious complications,' including cancer, peritonitis, infection with fever or pus, an ulcer, etc., most of the statistics range about 50 per cent.

In *Table I* we are able to give in some detail four series of recent cases. D'Arcy Power quotes 73 cases under his observation in St. Bartholomew's Hospital from 1900 to 1912. The total mortality is high (23.3 per cent), because in England it is principally the severe, complicated cases that are sent to a hospital. He does not distinguish between stones in the gall-bladder and in the ducts. The Bristol Royal Infirmary figures, representing the practice of nine surgeons during the years 1900-1911, are very similar, but present a smaller proportion of serious complications, so that the total death-rate is much less. It will be observed that even in the absence of such serious complications, about 1 in 10 die.

Kehr, of Hallerstadt, who performs an enormous number of operations for gall-stones, can quote 1600 cases, his total death-rate being 10.6 per cent higher than that in the Bristol series, but in uncomplicated cases his results are much better, the mortality being 2.9 per cent when the stones are in the gall-bladder and 3.3 per cent if in the ducts. His statistics run over twenty years.

Dr. Mayo also record a long series, and they appear to deal with a simpler type of case than the English or German material, so that total death-rate is only 4.4 per cent. Their figures in uncomplicated cases are a little better than Kehr's, and much better than the English. There is little doubt that when it becomes the rule to operate in the surgeon early instead of late, the death-rate will fall considerably. In the Bristol figures, for instance, it was very remarkable to observe how the formation of adhesions affected the prognosis. Of 100 cases with extensive adhesions, 30 per cent died.

In all the figures, the common-duct cases show a mortality rather lower than those with stones in the gall-bladder only. Cholecystectomy is more severe than cholecystotomy; thus:—

	Mayo	Kehr
Cholecystotomy	845 cases; 2.1% died	307 cases; 2.2% died
Cholecystectomy	319 cases; 3.1% died	384 cases; 3.3% died

Additional risk is due, not so much to the added severity of the condition, as to the fact that the necessity for removal shows a more complicated type of case, at any rate in the hands of the above-named surgeons. Of 12 cases of stone impacted in the cystic duct in the Bristol series, none died.

The causes of death are illustrated by the Bristol statistics: shock, 3 cases; peritonitis, 3; gastric ulcer, 2; fatty heart (twenty-one days after), 1; pneumonia, 1; cut portal vein, 1; intestinal obstruction, 1. Cancer also accounts for some fatal results. A few jaundiced patients die of persistent hemorrhage. Some writers describe a post-operative cessation of the hepatic functions, characterized by absence of bile, fever, vomiting, and death. Both Kehr and D'Arcy Power remark that the death rate is much higher in males than females, being approximately double.

2. *The Prospects of Cure.* We have available several series of end-results of cases followed for periods varying from one to ten years after operation, and representing English, German, and American practice. Kehr and Davis also give figures, but the first are not followed long enough and the second are too vaguely expressed. In the table, all forms of operation for gall-stones are classed together.

Table II. PROSPECTS OF RELIEF AFTER OPERATION FOR GALL-STONES.

Author	No. of cases	Cured		Unrelieved	
		No.	Per cent	No.	Per cent
Amnsperger	147	64.6	43.7	6.9	8.8
McWilliams	68	66.2	40	23	9
Stanton	245	7.9	15	6	3
D'Arcy Power	20	7.0	20	10	0
Bristol Royal Infirmary	59	52.5	32.2	15.2	5

Amnsperger records the cases operated on at Heidelberg in the years 1907-1909, it being customary to remove the gall-bladder. Both he and Davis specially warn against stitching the gall-bladder to the abdominal wall. It will be seen that about two-thirds of the patients were cured and only 6.9 per cent were unrelieved. McWilliams's figures are rather older (published in 1906), and there is a high proportion of cases not benefited, or requiring a second operation. Stanton gives the end-results from Ochsner's clinic, where the results are much better, perhaps on account of earlier operation. D'Arcy Power's cases are few in number, and many of them were operated on late in the disease. The Bristol figures are from the same series as was quoted under the heading of mortality, and show only about half cured, but another third improved; perhaps the difference between this and the other reports is principally in the use of the word 'cured,' which in the Bristol table is taken to mean absolute freedom from symptoms.

Taking all together, we may conclude that about 85 per cent are cured or relieved by operation, and the remainder, about 15 per cent, are not improved. What are the causes of lack of success? Principally three: (a) Recurrence of the stones; (b) Adhesions; and

Incisional hernia. Second operations have often been performed, but we are informed as to the relative frequency of these. Thus:—

Amsperger	gall-stones, 41 cases;	adhesions, 43 cases,
McWilliams	8 ..	1 ..
Short	8 ..	10 ..
Bristol Royal Infirmary	1 ..	3 ..

Adhesions, therefore, are rather commoner. It is very difficult to say whether the gall-stones are new formations, or stones overlooked (perhaps increased in size since the first operation; probably the latter is more usual. Adhesions may produce symptoms exactly like gall-stone. Second operations in this class are not often successful. It is noteworthy that there is sometimes an attack of severe pain a few days soon after the operation, which therefore appears to have been relieved by permanent cure. This is noted by Munro, and was seen in three Bristol cases. It is probably due to catarrh of the ducts. Removal of the gall-bladder is not a certain preventive of re-formation of calculi: Amsperger relates three cases in which they recurred soon after the operation. Incisional hernia is quite a common sequel, the frequency varying from 3 to 10 per cent. It often gives but little trouble. There is not much difference in the end-results whether the stones are removed from the gall-bladder, the cystic duct, or the common bile-duct. In Short's series, the common-duct cases gave the most failures, whereas in the Bristol series there were very few of these who did not get relief. The principal factor in determining the end-result is the amount and extent of adhesions found. In the Bristol cases with extensive adhesions, 6 out of 19 died and 36 per cent were unrelieved, whereas in the absence of adhesions only 10 per cent failed to obtain benefit. Short reports that of 107 uncomplicated cases of stones in the gall-bladder, only 5·4 per cent were unsatisfactory.

We conclude, therefore, that in simple, early cases the mortality of the operation is about 3 per cent, and that 90 to 95 per cent will be greatly benefited; that in the type of case usually operated on in England (months or years of recurrent gall-stone colic, 10 per cent die and 85 per cent of the survivors are relieved; and that in cases with serious complications such as infection, perforation, cancer, etc., 50 per cent die, and relief is likely to be incomplete in most of the patients. It is evident, therefore, that to obtain the best results in the operation for gall-stones, it ought to be undertaken decidedly more liberally than is now the custom. For this reason, the figures of a few of our American surgeons are better than those of average English practice.

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A. Rendle Short.

**GANGRENE.** The prognosis of this disease depends, of course, upon the cause of the gangrene. That due to anaerobic wound infections is dealt with elsewhere (see GAS GANGRENE). Gangrene due to Raynaud's disease is likely to lead to loss of the finger-tips, but there is no danger to life. When due to frost-bite, to embolism of a main artery, or to injury, it will, of course, necessitate amputation; but there is no great danger of the gangrene spreading, or of life being imperilled, unless, owing to delay, septic infection from the dead area takes place.

We shall particularly consider here the outlook in cases of senile and diabetic gangrene: (1) *In relation to the limb*; (2) *In relation to the life of the patient*; and (3) *In relation to the treatment*.

**1. Prognosis as to the Limb.** It is often difficult to be sure exactly how much of a limb is irremediably affected. Sometimes the skin turns black, but the deeper structures are living. When, however, the duskeness appears to be deep-seated, and the region, usually the foot, is painful or no longer sensitive to pressure, it is beyond recovery. If a line of demarcation forms, it is no use to expect, in senile or diabetic cases, that this will be the limit of the advance of the gangrene; though in traumatic or embolic gangrene, or in cases of frost-bite, where the artery is blocked at a particular point, the disease does not usually spread above a line of demarcation. In senile cases, one only too often sees, after a while, a spreading duskeness even above the line, and the process gradually advances up the leg if it is allowed to do so. The writer recollects seeing in a workhouse an old pauper who developed gangrene of the toe, which extended, in the course of years, up the leg to the middle third of the thigh; but for seven years he persistently refused amputation, and still retained possession of his dry, black, stinking leg! Such a case is unusual; most patients would have died of septic intoxication long before.

In many cases it is possible to foretell how much of a limb is in danger by feeling how far down the arteries can be found pulsating, and by taking a skizzgram to see how far up the vessels the calcareous changes extend.

**2. Prognosis as to Life.** This is usually grave in an untreated case, and depends upon the rapidity of advance of the gangrene, the age and condition of the patient, and the degree of septic absorption. Much sugar in the urine makes the outlook more ominous, and if there is a good deal of fever, and the dead area is moist, nothing but early amputation is likely to save the patient's life.

**3. Prognosis as influenced by Treatment.** It is quite useless, in a senile or diabetic case, to amputate at the site of any line of demarcation that may have formed. Nor has the operation of making an anastomosis between the femoral artery and vein met with success save in a very few exceptional cases. The treatment remaining, therefore, is to amputate through the lower third of the thigh or, in early cases with pervious arteries, at the site of election. The amputation conducted under such circumstances is by no means a

of the risk. Of 39 cases so treated at two London hospitals, the Chelsea and St. Thomas's, from 1907 to 1911, 16 died shortly afterwards—a mortality of 41 per cent. *A. Rendle Short*

**GAS GANGRENE.**—Gas gangrene is a clinical term used to denote a spreading infection commencing in damaged muscle, and due to one or more varieties of gas-forming anaerobes, of which the most important is the *B. perfringens* or *B. colchii*. At the beginning of the war the disease was little known, and terrible in its consequences, but multiplied experience has come greater knowledge and vastly improved methods of treatment, rendering the prognosis much less grave. The prognosis depends upon many factors, of which the most important are indicated in the headings of the paragraphs below.

**Prevalence.**—Anaerobes are abundant in the highly-fertilized soil of Flanders and Northern France. They are carried by projectiles into a wound by the trench mud that clings to the clothing and skin of the soldier. Local contamination of the clothing and skin of the buttocks and thighs is another source of infection of a wound with anaerobes.

**Characters of the Wound.**—The severity of the infection varies with the character of the wound. Gas gangrene is primarily a disease of muscle. Hence projectiles such as ragged fragments of shell or shrapnel, by causing extensively lacerated wounds of muscle, are more often followed by gas gangrene than are the wounds caused by steel balls or undistorted rifle bullets.

Concomitant injury to a large artery, such as the popliteal, renders the prognosis graver.

Open fractures are associated with considerable tearing of muscle and with the formation of large hematoma, and are therefore favorable sites for the disease.

**Types of Disease.**—Gas gangrene may start acutely, and run a rapidly-spreading course; or it may begin subacutely, remaining for some time more or less localized. In the fulminating cases it may occur in from twenty-four to thirty-six hours.

The subacute case is the type for which local surgical measures may be employed, while amputation is nearly always required to save life in the acute type.

**Stage of the Disease.**—The prognosis becomes rapidly graver with the length of time the disease has been established before the patient is brought for treatment. An amputation, however, will frequently save life although performed through crepitant tissues, provided the upper limits of the infected muscles or group of muscles be properly dealt with (see under 'Results of Treatment.')

A profound toxæmia, manifested by extreme pallor, vomiting, and pupils very small, and occasionally wholly imperceptible radial reflexes, are signs of grave import. Amputation is here the only hope, and is fortunately sometimes successful, even in profoundly toxic cases.



Metastatic abscesses containing gas and purulent offensive fluid are seen at times at the sites of saline infusions, morphin injections, and occasionally in contused areas not actually wounded by shell fragments. At this septicæmic stage, treatment is of little avail.

**Site.** The disease is most commonly met with in the lower extremity, the source from which the infection is derived being the soil and fecal contamination. The danger to life is less if the upper limb is affected than when the lower limb is the seat of the disease.

Where the muscles of the buttock are attacked by the acute spreading type of the infection, the prognosis is generally grave. The same applies to a slightly less extent to the muscles arising from the scapula.

Gas gangrene of the abdominal wall, especially the muscles of the posterior abdominal wall and loins, is too frequently the cause of death in cases of gunshot wound of the abdomen, even where multiple injuries to the intestines have been dealt with successfully by operation. Anaerobic infection of the liver around retained shell fragments and clothing is very fatal.

Anaerobic infection of a hemothorax is a grave condition, necessitating prompt resection of a rib or ribs to save life. Many cases die even after irrigation and efficient drainage of the pleural cavity.

**Shock and Other Factors.** Multiplicity of wounds renders the prognosis much worse. When the patient is suffering from shock or collapse the infection tends to run a more rapid course. Any condition therefore that tends to aggravate existing shock or collapse will make the outlook less favourable. Such conditions are: (1) The position and character of the wound or wounds; (2) Unrelieved pain, e.g., from a badly splinted fracture; (3) A long and fatiguing journey in a jolting and dilance; (4) Exposure to cold and inclement weather; and (5) Anæmia from excessive bleeding.

Wounds of a large artery, resulting in the cutting off of the blood-supply of the wounded muscles below, are frequently followed by a massive gangrene involving the whole limb below the vascular lesion. The popliteal and posterior tibial arteries more commonly, and the brachial artery less commonly, are the best instances of this.

**Results of Treatment.** Briefly the essentials of treatment are: the making of adequate incisions, thoroughly exposing the limits and recesses of the wounds in the muscle; the removal of foreign bodies, including clothing; the excision of infected muscle and muscle likely to become infected; the provision of good drainage; and the adoption of certain methods of post-operative dressing.

The success of local excision of muscle in the early stages depends on a knowledge of two main principles: first, that spread of the disease takes place in the length of the muscle infected, whereas spread across between neighbouring groups of muscles, or even contiguous unwounded muscles of the same group, is rare; secondly, that all infected muscle must be removed as thoroughly as possible. In the early stages, infected muscle is a dirty brick-red in colour, does not contract to

muscular stimuli, and often does not bleed on section. The colour of the gangrenous muscle is characteristic.

In the acute fulminating cases and those where there is massive necrosis below an arterial injury, amputation is the only resort. The amputation should be performed, when possible, above the origin or proximal limit of the muscle group affected. Where this is not possible, resort must be had to resection of the remains of the muscle in the stump. The maximum of drainage of the stump is necessary, however the amputation is near the wound, or where there is cause to think that, by force of circumstance, it may have been performed through infected tissues. For this reason the guillotine method is of almost value and, despite its detractors, has saved many lives. In many cases, however, it is quite possible to cut flaps, and even to suture them lightly over Carrel's tubes, B.L.P.P., or a salt pack, if it is possible no infected muscle is left behind in the stump.

It is important to emphasize the fact that gas in the subcutaneous tissues is no contra-indication for the performance of an amputation through such emphysematous tissue. If the source of the gas, i.e., the underlying muscles, is removed, the subcutaneous emphysema frequently disappears under the influence of multiple small incisions; often the skin passes through the creamy-brownish colour-changes described below. For instance, though a wound of the femoral sheath may become gangrenous and gas may spread well above Poupart's ligament, an amputation high up in the thigh, with incisions of the crepitant tissues above, will sometimes save a life.

The later colour-changes in muscle, described by Cuthbert Wallace, are of pathological rather than prognostic value. The colour-changes in the skin are, however, of somewhat more moment. The pallor and firmness of the initial stages are due to tension over the swelling part, and are early in their appearance. Where a limb becomes massively swollen, or over and round a fulminating focus, the skin becomes massively purple-green to black. Blebs of blood-stained fluid form, and expose a raw purplish area. Dead-white patches are intermingled with the purple. When this condition is seen, amputation is indicated. A brownish-cream-coloured spreading pigmentation of the skin and subcutaneous tissues occurs in the subacute stages of the disease. It is not of grave import, but should be treated by multiple incisions.

Of the methods of dressing the wounds after operation, Carrel's method holds the first place. Eusol, Dakin's fluid, brilliant-green, and Bayne have all been used as instillations. The writer is much impressed with the excellent results obtained from the two last. B.L.P.P. is an excellent application. The salt-pack is still extensively used by many. Where much muscle has been resected, efficient drainage should always be provided.

The subjoined tables have been compiled from a consecutive series of 61 cases that passed through the operating theatre of a casualty

clearing station. The mortality is probably low, in that it represents only the mortality after operation. Certain cases admitted are too ill for operation, and thus are not shown in these lists.

The term 'recovered' is used to denote patients sufficiently recovered to travel to the base. Here again, therefore, the end-mortality may be slightly higher than stated. By the term 'conservative operation' is meant an operation where the wound was opened up,

Table I. -MORTALITY OF THE TWO MAIN TYPES OF THE DISEASE.

	CONSERVATIVE OPERATION		AMPUTATION		Total
	Recovered	Died	Recovered	Died	
Head and neck		1	1		2
Scapular region			1		1
Chest wall			1		1
Abdominal wall			1		1
Back			1		1
Upper arm	4		7		11
Forearm	5		2		7
Buttock		1	3		4
Thigh	12	11	22		45
Leg	17	6	23	2	48
Foot	1		8		9
		Mortality 48.72 per cent		Mortality 2.86 per cent	131

Table II. RESULTS OF METHODS OF OPERATION IN RELATION TO SITE.

	CONSERVATIVE OPERATION		AMPUTATION		RECONSTRUCTIVE OPERATION	
	Recovered	Died	Recovered	Died	Recovered	Died
Head and neck	1	1				
Scapular region	2					
Chest wall	1					
Abdominal wall	1					
Back	1					
Upper arm	5		4		2	
Forearm	2		5			
Hand			1			
Buttock	3	1				
Thigh	26	1	6	8	1	3
Leg	22	1	12	4	6	3
Foot	6	1	3			

Table III.—RESULTS OF METHODS OF OPERATION IN RELATION TO TYPE.

	CONSERVATIVE OPERATION		AMPUTATION		DISSECTING AND OPERATION	
	Recovered	Died	Recovered	Died	Recovered	Died
Localized spreading	7	2	25	11	9	6
Not localized	63	1	6	1	—	—

...ted muscle and other obviously devitalized tissue excised, and drainage provided for. Cases under the heading 'Requiring Second Operation' were those in which an original 'conservative operation' was performed, which was followed in from one to three days by an amputation or multiple incisions on account of further spread of the disease.

C. H. S. Webb.

GASTRIC ULCER.—(See STOMACH, DISEASES OF.)

GASTRITIS.—(See STOMACH, MEDICAL AFFECTIONS OF.)

GENERAL PARALYSIS OF THE INSANE.—(See MENTAL DISEASES.)

GENU VALGUM.—In young children with rickety deformities, this condition may improve in the course of years, with splints and a more ample dietary; but in older children and young adults the deviation of the knees is likely to be permanent, and may increase up to the point which growth ceases. The success of treatment depends much on the technical skill of the individual surgeon, but it is usually possible to obtain an excellent result at a small risk by the Maccewen operation, consisting in taking a wedge out of the tibia.

A. Rendle Short.

GENU VARUM.—(See RICKETS.)

GLANDERS.

**Acute Glanders.** This is an extremely fatal disease; the mortality is over 90 per cent. Death occurs in from one to three weeks. Only when the lesion is localized and no internal organ is affected can a favourable termination be hoped for. The appearance of a pustular eruption is highly ominous.

**Chronic Glanders.**—Half of these cases are fatal. In this form, so long as the disease is localized and the internal organs are not attacked, recovery may result. But the course of the disease is always uncertain, and the patient is always subject to the risk of the occurrence of an acute attack.

E. W. Gouldall.

GLYCOSURIA.—(See DIABETES MELLITUS.)

**GOITRE.**—Swellings of the thyroid gland may be due to a variety of causes, of which the following are the most important: (1) *Parenchymatous goitre*; (2) *Adenomatous and cystic goitre*; (3) *Papillary goitre*; (4) *Malignant goitre*; (5) *Exophthalmic goitre*.

1. **Parenchymatous Goitre** usually attacks older children or young adults, advances to a certain extent, and then becomes stationary for the rest of the patient's life. Not uncommonly, however, it may resume growth and produce marked pressure symptoms, even in adults. Sometimes a goitre appears rapidly and increases at a great rate, causing considerable dyspnoea.

2. **Adenomatous and Cystic Goitre** do not usually show the same tendency to arrest, but very gradually increase in size. Hemorrhage into a cyst may bring on urgent dyspnoea.

The prognosis as regards life in these three conditions is almost always favourable. Suffocation from pressure on the trachea only in quite rare cases comes on so rapidly as to be dangerous. Apart from operation, of course, some patients would pass gradually into a very grave condition from lateral compression of the air-passages. A few simple goitres in elderly persons assume indignant characters.

Spontaneous cure is not to be hoped for, except in quite recent cases in young adults or children. Iodides or thyroid extract will aid in bringing this about, but if the swelling has persisted many months they usually fail. If they are going to do any good, the benefit will be evident within a month. It is often desirable to change the supply of drinking water or boil the water.

In rare cases of goitre the internal secretion of the thyroid becomes deficient, and myxœdemata ensues. More commonly it is excessive, with mild symptoms of Graves's disease.

The children of goitrous mothers suffering from deficient thyroid secretion are apt to be goitrous. Congenital swelling of the thyroid is almost invariably associated with goitre in the mother, and the child may be a cretin. In the great majority of cases of goitre in women there is no thyroid insufficiency, and the children are therefore normal.

The prognosis after treatment by operation is very favourable. Only a small proportion of cases of goitre need be operated on, marked deformity or dyspnoea being the principal indications, and "there is never too much dyspnoea" for the operation to be done (Berry).

*The operation mortality* is very low. At the Bristol Royal Infirmary during the past three and a half years, 59 operations have been done without a death. Kocher's mortality is 3 in 1000. Of 267 innocent cases, Berry lost 3, 2 dying of heart failure and 1 of pleurisy following a wound of the larynx. A general anæsthetic, usually open ether, was used. None of his cases developed tetany or myxœdemata, which in the early days, when all or nearly all the thyroid gland was removed, were both fairly frequent. Tetany is not entirely banished, however, as a number of modern operators have been less fortunate than Mr. Berry, and can report a case or two. It appears to be due to removal

of the principal functioning parathyroid gland lying behind the thyroid. It is not usually very serious, even if it does occur. There is a risk, small but not negligible, of death from hæmorrhage: I have seen one case.

The *end-results*, provided an adequate removal is made, are most satisfactory. In Mr. Berry's tables, 222 out of 274 are perfectly cured as far as the goitre is concerned (traced from one to five years, or a few less than one year). In two cases the growth, though absent, is extending, and in one stridor persists. The others are either lost sight of, or some swelling remains.

4. **Papilliferous Goitre** is by no means so favourable in prognosis, but there is a considerable tendency to spontaneous cure. Five patients came under Mr. Berry's care: 1 is lost sight of, and 2 were cured, but in 2 others the growth continued increasing and they returned for operation after operation for several months.

5. **Malignant Goitre** is uncommon, and the prognosis is very grave indeed, both as regards the immediate and the ultimate results. It attacks the larynx and its nerves early, and causes secondary glands in the neck. Of 7 cases in Mr. Berry's statistics, 3 died after the operation, 1 is lost sight of, and the other 3 died of recurrence twelve, fifteen, and sixteen months later.

6. **Exophthalmic Goitre.**—This is discussed elsewhere (*see* EXOPHTHALMIC GOITRE).

REFERENCES.—Berry, *Proc. Roy. Soc. Med. (Surg. Sect.)*, 1908, i, pt. 3, 21.

A. Reville Short.

**GONORRHOEA.** The principal object in the treatment of gonorrhœa is to prevent the spread of the infection to the posterior urethra, since there is no prospect of serious complications if the disease is confined to the anterior part of the urethral mucous membrane. Formerly it was recommended that local treatment should be postponed until the subsidence of the acute stage—a most pernicious doctrine, as the gonococcus was thereby enabled to make its progress unchecked to the posterior part of the urethra.

If the patient is seen in the incipient stage of the disease, attempts should be made to abort it, and to destroy the gonococcus before it has had time to spread far down the urethra. This is best effected in the following manner: The anterior urethra is first coagulated by a solution of cocaine and adrenalin, and a urethroscopic tube subsequently introduced to its full extent; down this tube a pledget of cotton-wool saturated with a solution of nitrate of silver, 10 gr. to 1 oz., should be introduced on a holder, and the whole of the anterior urethra thoroughly swabbed out. The reaction may be severe, but it usually subsides in a short time, leaving a watery discharge which clears up in three or four days. But it is seldom that the disease can thus be checked in its early stages, and when once the prostatic urethra has been invaded by the gonococcus, the patient is liable to complications, and a guarded prognosis must be given.

When the whole urethra is infected, treatment by irrigation or injections must be adopted; the modifications of nitrate of silver, such as protargol, argyrol, argaldin, or ichtlargin, have a destructive effect on the gonococcus, and should be employed as long as that organism is present in the discharge; astringent injections, such as sulphate, permanganate, or sulphocarbide of zinc, may be used alternately with the silver salts; at the same time a rigid abstinence from alcoholic liquors should be enforced, and no violent exercise should be taken. A long continuance of the discharge, or frequent infections, may give rise to peri-urethral thickening, which contracting forms a stricture, the dilatation of which will often be followed by a cessation of the discharge.

If the posterior urethra is attacked, the complications to which the patient is liable are more numerous and more serious, and will necessitate a guarded prognosis as regards ultimate cure.

Epididymitis is a most serious complication, since by it the function of the testicle may be destroyed, and cases of double epididymitis must be looked upon with gravity, since this condition is responsible for a large number of cases of sterility. With a view to preventing this possible contingency, the most careful treatment is required until all traces of the thickening of the epididymis have subsided; this is effected by means of pressure and heat, best applied by means of a Jullien's bandage. No positive opinion as to the patient's matrimonial prospects should be given until an examination of the semen has been made and the presence of active spermatozoa ascertained. Prostatitis, either acute or chronic, is a further complication of the disease; the prognosis of acute prostatitis is good, and the condition usually subsides in a week or ten days, though it may form an abscess which will require to be opened.

Chronic prostatitis is a common complication of a posterior gonorrhoea, is a most difficult condition to treat satisfactorily, and is responsible for a large number of cases of sexual hypochondriasis. Massage of the prostate gland per rectum, and subsequent instillations into the prostatic urethra of 20 min. of solution of nitrate of silver, 5 to 20 gr. to 4 oz., by means of a Guyon's syringe, is the treatment from which the most satisfactory results may be expected.

Seminal vesiculitis is a not infrequent concomitant of chronic prostatitis, and may yield to similar treatment, though massage of the seminal vesicles is a more difficult procedure than is that of the prostate. In this condition, catheterization of the common ejaculatory ducts through the urethroscopic tube has been recommended and carried out with success, but this is a process of considerable difficulty, and one requiring much technical skill.

Gonorrhoeal cystitis is another complication of posterior gonorrhoea, and is commonly located at the neck of the bladder, although the whole of the vesical mucous membrane may be affected. Treatment by rest in bed, by the administration of balsamics, urotropine, and bismutol internally, and later by irrigations of the bladder with weak

ceptic solutions, will usually ensure the disappearance of this symptom, but occasionally the infection spreads upwards to the pelvis or the kidney, a region in which local applications are not available except by means of the ureteric catheter.

Gonorrhoeal ophthalmia in the new-born or in the adult is a most serious complication, but is one which usually yields to treatment by local applications of nitrate of silver solution or its modifications, such as protargol, followed by astringent lotions and the application of a mercuric lotion. The prophylactic treatment of the sound eye is a necessary accompaniment of the treatment. Ophthalmia neonatorum is a disease which should be averted by prophylactic measures, but a condition which, when recognized early, should yield to applications of solutions of nitrate of silver or of its compounds.

In addition to the complications of gonorrhoea due to a direct infection with the gonococcus, there may be a systemic infection from the organism or from its toxins, giving rise to gonorrhoeal arthritis, pyelitis, irido-choroiditis, endocarditis, pericarditis, pleurisy, peritonitis, and meningitis, really forms of gonorrhoeal septicaemia.

It is in the systemic manifestations of gonorrhoea rather than in the local ones that vaccine therapy is chiefly indicated, though it has been found to be beneficial in all stages of the disease. Either stock or autogenous vaccines may be used, but in either case their introduction is liable to be followed by both local and general reactions, the local ones interesting themselves in redness and swelling at the site of injection, and the constitutional ones in rise of temperature and in an increase of pain in the region affected by the gonorrhoeal invasion. In our experience, rectal injections of antistreptococcal serum yield most satisfactory results in cases of gonorrhoeal arthritis or other forms of septicaemia, 10 c.c. of the serum being introduced per rectum daily for a fortnight or three weeks. Intramuscular injections of the soluble salts of mercury, especially of hydrarg. succinimide gr.  $\frac{1}{4}$ , twice weekly, have also been productive of most satisfactory results. The prognosis in gonorrhoeal arthritis must be a very guarded one, as, in a certain proportion of cases, the affected joints are permanently injured, and some limitation of movement will be the result. In addition to the vaccine treatment, local measures such as Bier's passive congestion may be tried, and in the case of the knee-joint, early aspiration may be practised, followed by counter-irritation and passive movement.

Excision of the seminal vesicles has been attended with success in cases of gonorrhoeal arthritis on the assumption that in the vesiculae situated the focus of systemic infection, and in justification of this somewhat severe operation it is undoubtedly the case that seminal prostaticitis is a frequent accompaniment of gonorrhoeal arthritis.

*J. Ernest Lane.*

**GONORRHOEA IN THE FEMALE.** Before considering the results of infection in particular sites it will be well to make a few observations on gonorrhoea irrespective of the localization. Speaking generally, the ill effects are less obvious than in the case of the male,



but are even more disastrous and serious, especially when—as happens in at least 50 per cent of all cases—the infection reaches the cervix and is an ascending one. Considerable lesions in the urinary tract are decidedly exceptional. The lower genital tract is little liable to severe gonococcal lesions and when attacked readily recovers. In the first week or two after infection, no definite opinion concerning ultimate prognosis can be made in individual cases; under palliative treatment the mischief has become localized at the end of a fortnight, and the prognosis varies with the lesion then present and its site.

**Gonorrhoea and Sterility.** It is estimated that 70 per cent of all sterile marriages are the result of gonorrhoea, either in the husband, the wife, or both. Of women who have had gonorrhoea, it is found that 30 per cent are sterile. 'One-child' sterility is pretty generally regarded as resulting from the extension of gonorrhoeal infection during the puerperium.

Giles found that in the cases he operated upon for pelvic inflammation or tubal disease who were under forty years of age and married, 25 per cent subsequently became pregnant. Of these, 19 women had 25 children, and 5 other women had miscarriages.

Norris records that in 68 cases treated surgically, but none of which was sterilized, 17 of those under forty years of age became pregnant, and 4 others had miscarriages.

The chance of infecting the child when gonorrhoeal women bear children is to be regarded as serious. It is variously estimated that 10 to 30 per cent of all blindness in the world results from this cause.

**Prognosis as affected by Treatment.** Chief interest in the treatment of gonorrhoea centres round the different methods adopted—whether reliance is to be placed upon vaccines, or whether the older methods of local applications and douches are to be almost the only hope of the physician.

Concerning the value of vaccines, the widest variation in opinion is found, both as to their use in general and in localized lesions. The weight of opinion tends to the views that chronic lesions react better than acute; that success is more likely to follow their administration in general infections than in localized lesions; that the vulvovaginitis of children is benefited; and that many cases of chronic arthritis react to vaccines.

Pelvic disease of the tubes or peritonium does not react to vaccine treatment.

#### **Prognosis in Particular Sites.**

**Vulvovaginitis.** The infection in children is usually acute, and would appear to react better to vaccines than to simple palliative measures.

The following table is taken from Norris and gives the result of vaccine treatment; the second series in each instance was reported after an interval of five years:—

## RESULTS OF PALLIATIVE AND OF VACCINE TREATMENT OF VULVOVAGINITIS IN CHILDREN.

Treatment	Cure	Not cured	Deaths	Remarks
Butler <sup>1</sup>	12	10	2	0
Butler <sup>2</sup>	25	0	25	0
Hamilton <sup>3</sup>	67	0	64	1
Hamilton <sup>4</sup>	84	76		5 (A 3 lost)

Hamilton<sup>6</sup> shows the comparative results obtained in gonorrhoeal vaginitis of the adult, according as douching or vaccine therapy was employed, and the duration of treatment.

## RESPECTIVE RESULTS OF IRRIGATION AND VACCINE TREATMENT OF VAGINITIS IN ADULTS (Hamilton).

Treatment	Cure	Not cured	Deaths	Remarks
Irrigation	260	158	53	49
Vaccines	84	76	5	3

Percentage of cures after irrigation, 62 per cent. of cases; after vaccine, 10 per cent. of those who were treated by the latter method.

The results in the above tables must be taken as much above the average, and unlikely to follow the administration of stock vaccines. *Condylomata*. The treatment of condylomata is in general uniformly good, although the larger masses require more extensive excision, often at repeated intervals.

*Bartholin's Gland*. Once infection of the gland has occurred, treatment has to be prolonged. Often an apparent cure results, within a month or two, in a recrudescence of inflammation and swelling, without discharge. In the more stubborn cases a Bartholinian cyst or abscess develops: the results of treatment by excision leave nothing to be desired.

*Urethritis and Cystitis*. Although by accurate examination it can be determined that at least 50 per cent of all cases of gonorrhoea show the diplococcus present in the urethra, it is in comparatively few instances that symptoms indicative of urethritis, and still more rarely of cystitis, result from gonorrhoeal infection. In all cases simple medical measures, such as local applications and irrigations, are successful. Stricture is exceedingly rare as a result. Herman<sup>7</sup> was able to collect only eight cases from medical literature, and it is doubtful if all of these were certainly gonorrhoeal. Balsamic remedies such as iodo-copaiba and copaiba are of no use in women. Alcohol and sexual abstinence are conducive to a recrudescence.

In rare instances the infection lodges in Skene's tubules, and there is formed a per urethral abscess, which can be readily and efficiently treated by surgical means. Gonorrhoeal proctitis has occurred after a cystitis, but is rare.

*Cervix.* The cervix is one of the most unfortunate sites in which to have the infection localized, owing to the depth of gland tissue and the coating of mucus; most remedial applications entirely fail of their object.

Figures as to the relative value of the different treatments are lacking. The application of caustic chemicals, or even of the actual cautery, when persisted in over a long time and with care appears to end more or less successfully in the majority of cases, but the treatment may be necessary for months and even years.

The number of cases of cervicitis in which vaccines have been employed are few, but in some cases in which local applications have failed, the result of a vaccine has been good.

Finally, in certain cases when the mucosa extroverts and a definite erosion results, it will be found that the best results follow surgical measures.

Whatever measures are adopted, there usually results a mild chronic cervicitis, perhaps owing to a superimposed pyogenic infection, with a degree of leucorrhoea which may be intermittent or vary in intensity from time to time.

*Uterus.* Endometritis is usually obscured by the associated pelvic inflammation. The condition ends in a few cases in a chronic metritis leading to fibrosis of the uterus.

*Salpingitis and Pelvic Inflammation.* In the acute, and especially in the subacute, stages, opinion is divided as to the value of rest and medical therapeutics; all are agreed that many cases which now come to operation might have been cured by purely medical means if the treatment had been continued some time longer. This is borne out by figures from Prochownick which we shall quote presently, and a rough comparison may be made with the results of operative treatment.

Krong (quoted by Stoehler) states that of 38 cases treated entirely by palliative measures, 32 were able to go about their work after a varying period of treatment by rest.

The most valuable figures are those of Prochownick<sup>9</sup>; he treated his cases with surgical measures when necessary, and sent many to a sanatorium for further treatment when thought advisable, and above all, the cases treated were all watched for at least five years. Of 120 cases treated, he records 160, or 38 per cent, of permanent cures; without any operation the permanent cures were 80, or 19 per cent. Of the 160 cures, 70 per cent were treated for over four weeks—some of them for six weeks—and later sent to a sanatorium. Of the 160 cures, 85, or 55 per cent, remained well after the one course of treatment; 27 remained well after a second course of treatment; 16, or 10 per cent, had pus collections which were evacuated; 10 required

operation for adhesions from three to five years after treatment (no cases or parts being removed).

Giles,<sup>1</sup> practising conservative surgery, had the following results: Cases treated, 132; cured, 120. These figures are perhaps optimistic. Many said to be cured suffer from adhesions, producing abdominal pain of greater or less severity. Even after operation, adhesions are formed. Where both appendages are diseased and extensive peritoneal inflammation exists, it is important that the uterus be either pushed forward or removed; there are numerous instances of surgical measures being regarded as a failure owing to retro-displacement with fixation of the uterus subsequently arising.

As regards vaccine treatment, Heymann and Moos<sup>10</sup> used vaccines in 44 cases of acute tubal infection. The results were very good in 27 per cent, fair in 41 per cent, and a failure in 20 per cent. All treatment was supplemented by local measures, so that it is not obvious how much is directly attributable to vaccines. In 9 cases of chronic tubal infection there were 7 distinct failures. They state that vaccines are also found useless in cervical and urethral infections.

*Peritonitis.*—In the pelvic peritonitis which follows acute gonorrhoeal infection, the results of surgical interference are so uniformly good in the early stages, that palliative measures are seldom continued when there is any fear of the peritonitis becoming general.

The result of operation in the general peritonitis that ensues upon rupture of a tube is more serious, as the following figures show. Baye,<sup>11</sup> 56 cases: 24 recovered, 32 died. Bonney,<sup>12</sup> 45 cases: 23 recovered, 22 died.

Further, the earlier the operation the better the prognosis. Of those operated on during the first twelve hours, 14 recovered, 4 died; after twenty-four hours, 1 recovered, none died; after forty-eight hours, 1 recovered, 4 died.

*Athritis.*—Norris<sup>2</sup> makes the following observations as to the prognosis in joint lesions.

In the acute form of the disease the occurrence of suppuration and the destruction in part of the joint is not infrequent; and in the chronic type partial ankylosis is rarer in the case of children. Serious lesions limited to intra-articular structures do best, but even in these relapses are frequent.

Norris,<sup>2</sup> quoting and summarizing the results obtained by a whole host of authors, gives the following figures respecting the results of vaccine treatment—211 cases: 84 cured, 102 improved, 25 not treated.

Heymann and Moos<sup>10</sup> think vaccines of great benefit; in 6 cases the results were: 2 very good, 3 good, 1 failure.

The opinion appears general that medical and local applications should be continued during the administration of vaccines in all cases.

*Puerperal Infection.*—Findley<sup>13</sup> states that 1 case in every 6 is due to gonorrhoea. The puerperal infection rarely causes death, but it is often complicated by the presence of streptococci. Often the

infection recurs in each puerperium and runs a similar course, lasting a few days, with high temperature and slight discharge; occasionally the fever is more prolonged. The more common end result is a one-child sterility or a pyosalpinx.

REFERENCES: *Jour. Obst. and Gyn.* 1919, March; *Norris, Gonorrhoea in Women* 1913; *Pract.* 1905, 589; *Jour. Amer. Med. Assoc.* 1910, h, 1301; *Lect. Dis.* 1908, v, 158; *Jour. Amer. Med. Assoc.* 1910, 1136; *Trans. Obst. Soc. London*, XXIX; *Manuals of Gyn. & Gyn.* 1903, XVII; *Ibid.* 1909, No. 20, 453; *Manuals of Gyn. & Gyn.* 1913, H. 11, 5; *Surg. Gyn. and Obst.* 1910, x, 466; *Ibid.* 1909, ix, 512; *Diseases of Women*, 1911.

Bryden Glenning.

### GOUT.

**Acute Gout.** The danger to life in an acute attack is practically negligible, unless acute inflammatory changes are set up in internal organs as a result of dull or injudicious treatment of the articular lesion. Violent cerebral, gastric, or cardiac symptoms may be set up in this way, and then the immediate outlook becomes grave indeed. The predominant symptoms indicating these changes are severe headache, violent delirium, acute epigastric pain associated with obstinate vomiting, and signs of acute pericarditis with a rapid, intermittent pulse and a tendency to syncope. The prognosis is worse if there is a strong hereditary history, and if the attack occurs early in life.

**Chronic Gout.** As a rule, in this condition the main danger lies in the gradual onset of complications, the most important of which are in the renal and cardiovascular systems. Of the former, the contracted gouty granular kidney has to be considered. The prognosis in this is probably much the same whether it is produced by the gouty diathesis or by any other etiological factor. It leads to death mainly along three lines, viz., firstly, by cardiovascular change; secondly, by the interference of superadded, often terminal, infections; and thirdly, by uræmic manifestations. From an analysis made by the writer from post mortem hospital records of 156 consecutive cases of patients who died with chronic interstitial nephritis, the following figures showing the causes of death were obtained: uræmia, 21; cerebral hemorrhage, 4; cardiac failure, 14; cardiac failure associated with much bronchitis, 7; the supervention of acute nephritis with œdema of the lungs, 2; supervention of acute nephritis with uræmia, 2; cerebral thrombosis, 4; aneurysm, 2; œdema of lungs, 2; subdural hemorrhage, 1.

Death occurred in a large number as the result of superadded terminal infections, thus: 28 died from lobar pneumonia, 3 from bronchopneumonia, 1 from pericarditis, 4 from phthisis, 4 from empyema, 2 from general urinary tuberculosis, 1 from the combination of pericarditis, pleurisy, peritonitis, and pneumonia, 1 from pericarditis with pleurisy, 1 from pleurisy alone, and 1 each from pneumonia and empyema, pneumonia and pericarditis, and pulmonary gangrene.

The following percentages are obtained from these figures, death from uræmia, 14.7 per cent; from indirect changes in other organs,

2 per cent, from secondary infections, 33.3 per cent; accidental, 1.2 per cent; carcinoma, poisons, 5.8 per cent.

The possibility of the incidence of a gouty venous thrombosis, with occurrence of pulmonary embolism leading to a fatal result, must always be borne in mind. In spite of all these dangers, the members of a gouty family are frequently long lived.

With reference to the prognostic value of changes in the fundus, a retinitis has the same serious significance as in other forms of gout; but a unilateral hemorrhagic retinitis, with extravasations of blood which may burst into the vitreous, sometimes occurs. These hemorrhages are most probably due to thrombosis of the retinal vein, and do not carry the same outlook as renal retinitis.

It is yet too early to say whether the prognosis of the vascular and renal lesions in gout will be materially modified by the use of radium emanations or thorium.

J. B. Charles,

**GENSHOT WOUNDS.** The time has not yet come when definite and sound conclusions can be arrived at as to the prognosis of wounds in war. A few isolated statistics can be collected, but they require more than ordinary discrimination before they can be accepted at their face value, for the following reasons:

1. Wounds vary very much in different wars. There is a desert type and a cultivated-soil type. The first was well illustrated by the surgery of the South African War, and by the recent Senussi campaign. The second includes the surgery of the battles on the French and Belgian front, and to a less extent in the Gallipoli campaign. In the former, wounds were usually due to bullets fired at a distance, and soil infection was the exception. In the latter, due to the conditions of trench warfare, shell and shrapnel wounds predominate, the range of bullets is often short, and soil infection of the clothes or other foreign material is the rule. Soil infection is due to streptococci in 80 per cent of the wounds, *B. perfringens* in at least 50 per cent, and *B. tetani* in 15 per cent. Virulent streptococcal infection, gas gangrene, tetanus, and prolonged severe suppuration are common for the rule.

2. The prognosis has altered very much for the better during the course of the war, partly by improvements in medical organization, and partly by advances in surgical treatment. The turning-point was somewhere about Christmas, 1916. It is not too much to say that the difference between war surgery in 1917 and 1915 is as great as that before and after the advent of Listerism in the '70's. The principal means by which the improvement has been effected are the injection of antitetanic serum in repeated doses, excision of the wound, sterilization by the Carrel-Dakin technique or pastes (Hey's antiseptic green + boric acid + paraffin, the flavine substitute, and the paraffin methods), secondary suture, improved splinting, and enterprising surgery. Of these no doubt the most important has been the thorough removal of devitalized muscle, so strongly

advocated by Colonel Gray. The salt pack and B.F.P., have also served a useful purpose, though now somewhat overshadowed. Blood transfusion seems destined to play an important part in reviving sufferers from shock and hemorrhage.

3. Prognosis is further complicated by the fact that there are three collecting places for statistics: (a) the front lines, field ambulances and casualty clearing stations; (b) the base hospitals overseas; and (c) the base hospitals in the British Isles, but one is not complete without the other. For complete information a series of patients must be followed through all three groups. Moreover, during the war there has been a steady shifting of the primary operating centre from behind forwards, the English hospitals, particularly since Christmas, 1916, getting less and less of the recent severe wounds and the casualty clearing stations doing more and more, with great benefit to the patients, as sepsis and gas gangrene are thereby minimized, and early loss of blood is reduced. More efficient splinting between the front line and the casualty clearing station has undoubtedly improved the patient's prospects, as exemplified in especially in cases of fractured femur.

4. A fourth complication is introduced by the nature of the individual wound, and concomitant circumstances. The injuries may be single or multiple, transport may be easy or infinitely difficult, the patient may come under observation early or be out for days. Hemorrhage varies much in similar-looking wounds. There is much difference between soldiers in their liability to shock, perhaps depending on temperament, and on previous fatigue, loss of sleep, starvation, and the psychological effects of victory or defeat.

For these reasons any conclusions must be regarded as extremely tentative. Nevertheless, a certain amount of valuable information is now available for collation.

According to a statement by Dr. Woods Hutchinson (October 1917), of wounded men who survive six hours, 90 per cent recover; of those who reach field hospitals, 95 per cent recover; of those who reach base hospitals, 98 per cent recover. Only about 5 per cent of the survivors are crippled or permanently disabled, as by amputations or other serious loss of function.

**Wounds of Soft Parts.** Bullet wounds are more favourable than those inflicted by shrapnel or fragments of high-explosive shell or bombs, and if fragments of clothing are carried in, grave suppuration or gas gangrene is probable. Large retained pieces of shell almost always give trouble. Tiny smooth pieces, and undistorted bullets, do not usually cause trouble unless for mechanical reasons. Wounds of the buttock, thigh, and calf are particularly apt to give rise to gas gangrene within from one to four days if the muscles are lacerated. Excising depends on early and ruthless opening up, with thorough excision of damaged muscle until it bleeds and contracts. This granted, with proper antiseptic treatment, the great majority can be sutured up on the fourth day or sooner, and even wounds 10 in. long and

down through the muscles ought to be healed in two to four weeks. The unsatisfactory cases are those in which excision is anatomically impossible (e.g., a long deep track through from the groin to the hilttock), those in which there are lig multiple tracks, those of patients suffering from severe shock or loss of blood who could not bear a proper excision.

It does not appear that the resulting deep scars in muscles give rise to any functional trouble afterwards, but if the favourable period for healing is missed by reason of suppuration, considerable crippling of divided muscles may result.

Proximal wounds are very seldom seen. Probably nearly all are fatal. **Wounds of Arteries.** Division of a main vessel in the leg (common femoral, popliteal, both tibials) nearly always leads to amputation. Wounds of the superficial femoral are not so disastrous. In a few cases suture or intubation (Fulcher's tubes) has been successful, in popliteal cases.

(On ANEURYSM and ARTERIAL HEMATOMA, see pp. 59, 306.)

**Nerve Injuries.**—The eventual prognosis of nerve injuries due to gunshot does not appear to be yet worked out.

In many cases with symptoms of a nerve lesion (paralysis, anæsthesia, wasting, electrical reaction of degeneration), the track of the missile has passed near it, but not through, and the signs are due to concussion or to hemorrhages in the sheath. Exploration of the length of the nerve reveals absolutely nothing, as I have more than once verified personally. These cases nearly all clear up in three months at the outside, mostly sooner, but a few persist longer. Often the muscular response to the Lewis Jones contract is better than would be the case if the nerve were divided, there may be no response at all for a time.

**Injuries of the Spinal Cord.** The great majority of these injuries are quite hopeless from the first, and nothing can be done. There is a large early mortality, within a few days; the survivors may live for months or even years, dying at last, usually of septic infection of the kidneys. There is often a little transient and delusive improvement in the paralysis or anæsthesia of the legs, one or two groups showing some recovery, but not enough to be useful. Fortunately there are a few cases that are capable of better things. If a missile is lying in the spinal canal, it is worth while to cut open and remove it. Very great relief of pain may be obtained. Occasionally the paralysis may clear up. This is especially likely to occur if there is evidence that the spinal cord is not completely severed, as shown by presence of reflexes, or an incomplete paralysis or anæsthesia. *Cauda-equina* cases also give some room for hope.

It occasionally happens that all the symptoms of a complete lesion are not present from the first, when the missile never touched the spinal cord. The paralysis is due either to concussion, or to small hemorrhages. These cases do not always clear up, unfortunately. If they are going to do so, the recovery will take place usually within a few



days, or within a month at the most. Marked wasting of the legs is a sign that no further improvement can be expected.

#### PENETRATING WOUNDS OF THE ABDOMEN.

The immediate dangers of wounds of the abdominal viscera are very great: the late dangers are less—much less, for instance, than in the case of the chest or knee joint. The principal risks are death from hemorrhage or shock during the first two days, and from the toxæmia of intestinal paralysis or of gas gangrene during the two days following. These constitute what is sometimes called late or secondary shock. General peritonitis seems to play a relatively small part: one does not often see the clinical picture so characteristic of perforated gastric ulcer, with a distended abdomen containing red sticky gut covered by lymph clot, with a copious exudate. Apart from operation, the great majority die, but a fair number, mostly shot through the solid viscera, recover. It is quite certain, however, that men may live whose intestines have been perforated. Col. Wallace quotes some instances. During the South African War it was the rule not to operate, and Makins reported 143 recoveries out of 207 patients. But there is no doubt that, owing to transport difficulties, a large proportion of the cases never reached the surgeon, and if they did, it was too late for operation to do any good. In the Russo-Japanese and Balkan Wars, also, expectant treatment gave the better results.

During the first year of the present War, both the British and the French military surgeons adopted the same line of treatment; but when it became realized that the majority of the patients died from hemorrhage, and that lives could be saved by early intervention, operation became the rule. According to Wallace, the death-rate was about 80 per cent in the pre-operation period (30 per cent out of 1098 died in field ambulances, 56 per cent out of 131 in six casualty clearing stations, and a certain number also at the base).

The general mortality amongst cases operated upon is about 50 per cent. Of 959 cases, some operated on and some not, treated at a group of casualty clearing stations during a battle in 1917, 67 per cent died; of 500 operated on, 45 per cent died.

#### RESULTS OF OPERATION FOR PENETRATING WOUNDS OF THE ABDOMEN.

	OPERATED ON	RECOVERED	PERCENTAGE
Lockwood, etc., an advanced casualty clearing station, 1915-16	356	171	48
Walters, etc., an advanced abdominal hospital, 1916	500	245	49
Wallace, group of casualty clearing stations, 1915-17	965	441	46
Group of casualty clearing stations, 1917 (during the progress of a battle)	500	227	45

The main factor influencing the result is the time of operation. Under twelve hours, 105 lived and 107 died; over twelve hours, 39 lived and 70 died (Wallace). After 36 hours it is probably better for the patient not to be operated on, unless for localized conditions.

A certain number of cases still recover without laparotomy, with a wound which is supposed to have traversed the viscera. These are mostly wounds of the upper abdomen involving solid organs. In a group of casualty clearing stations during 1917, of 152 patients not operated on, 71 got well enough to go down to the base.

We turn now from the general to the particular.

Bullet wounds appear to be just as serious as those due to shell or shrapnel. Wallace gives the following table:—

RELATIVE MORTALITY OF DIFFERENT PROJECTILES.

BULLET		SHELL		SHRAPNEL			
T	D	T	D	T	D		
10	63	16	68	10	21	30	31

Wounds of the upper abdomen are less dangerous than those of the lower, unless the chest and diaphragm are also injured. This is a very fatal combination. Long in-and-out transverse wounds of the middle abdomen are also very serious. If the bowel is herniated through a gap, recovery is very improbable.

The pulse-condition and pulse-rate are very important guides to prognosis. If the pulse-rate is under 85, three-quarters of the cases get well; above 100, the mortality mounts rapidly, and over 120 the death-rate is 80 per cent (Walters).

A flaccid abdomen in a man who is obviously shot through the viscera is said to be a certain sign of death.

The patient often arrives exhausted with his rough journey, and it is important to wait two hours to see what degree of recovery is obtained in response to remedies (warmth, salines, hot coffee, opium). These last may not always be suitable. If there is no marked improvement in two hours, the patient will probably take a day or two to revive, or more probably he will die.

The nature of the operation influences the prognosis. Speed, a well-timed, and a suitable anaesthetic, such as warm open ether, all help. Resections of gut are relatively unfavourable. Lavage is not desirable.

After operation, vomiting persisting after the first day or two is ominous. The patient seldom dies if the bowels can be got to open. If he lives three days, has ceased vomiting, the bowels are open, and there is no evidence of gas gangrene, he has at least a 90 per cent chance of complete recovery.

**Prognosis in Relation to Different Viscera Injured.** In practice

it is common for several viscera to be injured in the same patient; this of course reduces his chances, but we shall here consider only uncomplicated cases.

RESULTS OF OPERATION FOR UNCOMPLICATED PERFORATION OF BOWEL.

	LARGE INTESTINE			SMALL INTESTINE			LIVER		
	OPERATED	NOT OPERATED	DIED	OPERATED	NOT OPERATED	DIED	OPERATED	NOT OPERATED	DIED
Walters, etc.	9	6	66	122	58	47	58	23	39
Lockwood, etc.	4	3	75	57	33	53	38	20	53
Wallace	55	26	47	245	85	34	151	63	44
Fraser, etc.	23	10	43	96	37	38	85	37	43
Total	91	45	49	520	213	10	332	143	43

*Stomach.* As will be seen from the tables wounds of the stomach are slightly the most favourable, owing to the thickness of the wall and less tendency for a small hole to leak. About half the patients are saved. As Elliott and Henry have shown, there is some danger of late ulceration, hemorrhage, and perforation in the second and third weeks. They suggest that extractives (beef tea, oxo, bovril soups, etc.), which excite a flow of gastric juice, should be avoided in feeding.

*Small Intestine.* Forty per cent of the patients with one or more holes in the intestine, but no other visceral injury, have been saved. At special centres (Walters, Lockwood, and collaborators) half have recovered.

The outlook is grave if the abdomen is full of infected blood, and the results after resection are much less favourable than after suture, in all statistics. Thus:

Walters, etc.	-	64 cases sutured, 40 lived	62.5 per cent
"		58 " resected, 18 "	31 "
Wallace	-	130 " sutured, 59 "	45 "
"		115 " resected, 26 "	22 "

In each case resection, as compared with suture, halved the chances of recovery. No doubt the resected patients were more severely injured, on the whole.

There seems to be no difference in the figures for lateral and for end-to-end anastomosis. Wounds of the duodenum are very fatal; wounds of the jejunum and ileum much about the same.

*Large Intestine.* Approximately the same results are found here as in the small intestine. Missed or inadequately closed retroperitoneal wounds are responsible for most of the mortality, the patient

ing of sepsis, whereas small-gut cases die of shock, hæmorrhage, or toxæmia from intestinal palsy. The patient is often carried off abruptly by an acute septicæmia, with a pulse rapidly rising to 150, respirations to 40. The *B. perfringens* is responsible for some of these deaths.

Plugging in a Paul's tube, or proximal colostomy, is to be avoided if possible, as the following figures show:—

Walters, etc.	45 cases	sutured	21 lived	46.6 per cent
	13 ..	colostomy	2 ..	15 ..
Lockwood	102 ..	sutured	50 ..	49 ..
	49 ..	artificial anus	13 ..	26 ..
	14 ..	proximal colostomy	4 ..	28 ..

Once again this must be qualified by allowing that the colostomy wounds may have been more gravely injured to necessitate it.

*Rectum.* These are not very favourable. Suture, with a proximal colostomy, probably gives the best results in intraperitoneal cases. In extraperitoneal wounds it is usual to provide free local drainage, with a transverse or inguinal colostomy. About one-third recover.

*Bladder.* About 40 per cent recover. The majority die early of shock or hæmorrhage; a few succumb later, from sepsis.

#### RESULTS OF OPERATION FOR UNSCOMPLICATED WOUNDS OF PELVIC ORGANS.

	RECTUM			BLADDER		
	CASES	DIED	PERCENT	CASES	DIED	PERCENT
Walters, etc.	3	2	66.6	9	5	55.5
Lockwood, etc.				13	5	38.5
Wallace	8	3	37.5	25	11	44.0
Frasca, etc.	10	3	30.0	14	4	28.0
Total	21	8	38.0	61	25	41.0

The best results in intraperitoneal wounds are obtained by suture, with drainage of the peritoneal pouch between the bladder and rectum, with a catheter tied in the bladder. In extraperitoneal cases suture is usually impossible, and free drainage must be provided through the wound track. Opinion differs as to whether it is necessary to perform suprapubic cystostomy also.

Wounds of the solid viscera are much less dangerous than wounds of the bowel, the principal source of danger being hæmorrhage, with a smaller and later risk from sepsis. It will be found that about two-thirds got well with operation, although some of these were complicated cases, and many recovered without a wound. The liver resists infection badly, and large jagged bits of it, with clothing, are likely to cause serious trouble if left inside.

In a certain proportion of the cases—the exact frequency being in doubt, but certainly less than 20 per cent—further grave risks await the patient after surviving the immediate dangers and reaching a base hospital. These risks are abscess of the liver, subphrenic abscess, septic bilhary peritonitis, and severe secondary hæmorrhage into the peritoneal cavity, usually about the tenth day. These accidents are all most likely to occur if a large fragment of shell is retained in the liver. Another less serious trouble is a long-lasting bilhary fistula.

#### RESULTS OF OPERATIONS FOR WOUNDS OF THE SOLID VISCERA.

Walters, etc.*	27	13	18	11	6	51.5	10	6	60
Lockwood, etc.	29	20	69	4	3	75.0	13	9	69
Wallace	114	76	66	32	16	59.0	45	31	68
Fraser, etc.	33	19	57	14	9	61.0	29	17	58
Total	203	128	63	6	34	55.0	97	63	65

*Spleen.* Wounds of the spleen are somewhat more dangerous, but more than half recover after operation, and probably many more have got well without laparotomy. It is safer to stop the bleeding by suture and packing; splenectomy is much more serious, and should be reserved for big lacerations or wounds of the hilum.

In Colonel Wallace's 16 cases of suture, etc., 12 recovered; of 16 cases of splenectomy, 4 recovered. The eventual prognosis after loss of the spleen is quite good.

*Kidney.* Two-thirds recover after operation, and others get well without. In ordinary cases all that is necessary is to plug or suture the bleeding laceration. Nephrectomy at the front has a mortality of 50 per cent (Wallace); it should be reserved for urgent cases of uncontrollable hæmorrhage with a pulped kidney or lacerated ureter.

Secondary hæmorrhage is apt to occur on or after the tenth day, due to infection, the urine containing much blood and many streptococci. The clot may block the bladder, as in a case of my own. The treatment is nephrectomy. Makins reports 8 cases with 7 recoveries, at various base hospitals.

REFERENCES.—Walters, etc., *Lancet*, 1917, i, 207; Lockwood, etc., *Brit. Med. Jour.*, 1917, i, 317; White, *Lancet*, 1917, i, 561, 597, 637; Fraser, etc., *Brit. Med. Jour.*, 1917, i, 321; Makins, *Brit. Jour. Surg.* 1916, April, 615.

#### WOUNDS OF THE SKULL AND BRAIN.

The experience of recent wars has brought rather a surprise in that so many men shot through the brain have recovered. No doubt the

majority are instantaneously killed, but quite a large number are under medical care. The introduction of the 'tin hat' has not only saved many lives.

On arrival at the casualty clearing station or base hospital, the usual practice is to operate on all cases unless the patient seems to be moribund, either on account of considerable loss of brain substance, enormous area of depression, or multiple injuries. Exact statistics are not available, but if no operation is performed, many patients die of meningitis, cerebral abscess, or compression, and there will be some with a permanent paralysis that might have been avoided.

Experience shows that the best results are obtained by early operation, usually at the casualty clearing station, with excision of the wound, rubbing away of the bone edges injured, trimming of the bone, removal of the foreign body if within reach of the finger, and removal of depressed bony fragments, pasting of the wound, and closure, with glove-finger drainage. Leaving the wound open leads to infection and hernia. Scalp wounds excised, pasted, and sutured almost invariably heal by first intention. The patient's chances are seriously jeopardized if he is allowed to travel to the base in less than seven to ten days after operation.

With regard to the actual number saved, published figures are difficult to read and render comparable, on account of differences of the place, and type of operation.

#### MORBIDITY AFTER OPERATION FOR WOUNDS OF THE SKULL AND BRAIN.

	Operations	Deaths	Per cent
At casualty clearing station July, 1916-Sept., 1917	91	21	23.0
At base hospital, France, Sept., 1915	392	58	14.8
At base hospital, Egypt, 1915	104	19	18.2

At the casualty clearing station in France with which the writer was connected, there were a total of 91 operations on the lines as described, with 21 deaths, between July, 1916, and September, 1917. The Somme battle period is included, and at this time the slighter cases were sent down without operation. In the quieter period following, almost all patients with gunshot wounds of the skull or brain, if they were not moribund, were operated on. The death-rate is therefore higher than it would be at a base hospital, as few patients evacuated would be in danger of dying later.

At a base hospital group in France, reported on by Colonel Gray, in September, 1915, there were 392 operations on the lines as noted above, with a death-rate of 14.8 per cent. At that time most of the operations were done at the base, not at the casualty

clearing station. If 12 hopeless cases are excluded, the death-rate was 9 per cent.

At a hospital in Egypt during the Dardanelles campaign, Captain Whitaker gives figures of 101 patients operated on, with a mortality of 18.2 per cent. Of these, 88 had an intradural injury, whereof 19 died. Of the 64 with intradural injury who had not previously been operated on, only 9.3 per cent died. At this hospital, flaps were turned down and the wound was left open. Amongst the recoveries, there was incontinence of urine in one case, some hemiplegia or paraplegia in five cases, and lesions of the cranial nerves in two. The rest were completely restored.

Some information is also available with regard to the eventual prospects of these patients. Of course, if a considerable part of the motor cortex, visual area, or speech centre is destroyed, there will be a permanent impairment, and to some extent the nervous troubles discussed under HEAD INJURIES are also met with. In regard to 640 patients examined in England more than three months after being wounded, it is surprising how well they had got on. The late death-rate is small (16 in 1239 cases at eight London hospitals, i.e., 3.7 per cent). Many of these were hopeless from the first, and only 5 died after three months. Many cases evacuated to England with hemiplegia or diplegia improved up to complete recovery, especially when the injury was to the superior longitudinal sinus. Mental symptoms also usually improved. Six per cent suffered from fits, but in many of these they did not recur. Headache and emotional changes were common. In 69 patients a missile was still in the brain; of these, 4 died, one from an unconnected cause. There were fits in 4 cases. Thirty per cent were completely well in all respects; the rest showed various symptoms or were not yet healed. In only 10 per cent were serious disabilities, such as hemiplegia, present. Not many patients, however, were followed for more than a year, and some of those returned to duty have become unfit subsequently.

With reference to the prognosis in individual cases at the casualty clearing station or base hospital, large skull defects, loss of much brain substance, through-and-through brain wounds, and lodgement of large pieces of shell are all of very bad omen. Symptoms of meningitis (irregular fever, delirium, head-retraction, optic neuritis, late paralysis, turbid cerebrospinal fluid) are almost a death warrant. Cheyne Stokes breathing, or a very high temperature, usually points to imminent death. Prolonged coma, restlessness, and convulsions are not necessarily grave signs, but such patients will probably have marked nervous symptoms for months or years if they recover. On the other hand, patients who are conscious before operation nearly all do well.

Extradural injuries are much less serious than intradural, but in a certain number of cases the underlying brain is pushed and may suppurate. Colonel Gray therefore advises that the dura should be opened even if unwounded, when it is seen not to pulsate, provided

an operative field has been obtained, and especially if paralysis is present. The purpose is to hasten and perfect the cure by removing the injured brain tissue, which may act as a focus of irritation and form a permanent scar.

We may summarize as follows:—

1. The majority of cases of gunshot injuries of the skull and brain in the field, especially the through-and-through wounds of the brain.  
2. Of those patients reaching the base hospitals not moribund, 80 to 90 per cent may be saved by operation.

3. The more severe type of injury met with at a casualty clearing station can be dealt with successfully in three-quarters of the cases, and the earlier operation saves more lives, if the patient can be kept awake or two afterwards.

4. Only about 10 per cent of the patients who recover suffer from permanent paralysis or insanity, and 6 per cent have fits, often only one or two seizures. A good many show various neuroses such as headache and emotional changes.

5. A small retained missile does not appear to be very serious if the patient survives the first week. The late death-rate is very small, and very few suffer from fits. The majority recover well; a third are completely cured in three to twelve months.

6. Paralyses present just after the injury often clear up either early or late after operation, especially when due to injury of the superior individual sinns.

7. REFERENCES. Gray, *Brit. Med. Jour.*, 1916, i, 261; Whitaker, *Brit. Jour.*, 1916, April, 708; Sargent and Hodnes, *Jour. R.A.M.C.*, 1916, Sept.

#### PENETRATING WOUNDS OF THE CHEST.

As usual, a sharp distinction must be made between rifle or machine-bullet injuries, which are usually small and sterile, and those caused by shrapnel, fragments of high-explosive shells, or bombs, which are nearly always infected. Examination of the chest fluids in the first few days shows that approximately three-quarters of the infected cases are contaminated by streptococci, and half by aerobic bacilli.

The total mortality of all chest wounds in France, up to the middle of 1917, has been about 25 per cent, whereof 20 per cent die at the casualty clearing station, field ambulance, or regimental aid post, and 5 per cent at the base. At one very forward casualty clearing station in 1917, however, the mortality was 30 per cent. Depage's figures for the French army (1916) are about the same. He found that rifle bullets gave a death-rate of 11 per cent, and shell fragments 29 per cent.

Of 673 cases of pure chest wounds seen at base hospitals in France, I have found the following figures:

General mortality on lines of communication	-	5.8	per cent
Deaths in septic cases	-	40.0	"
Proportion of septic cases to all	-	14.0	"
Incidence of sepsis in cases with effusion	-	20.0	"



**Small In-and-out Wounds.** These almost always do well if the heart, great vessels, and diaphragm are unimpaired, and unless sepsis occurs. The great majority develop a hemothorax, large or small; a smaller number present either a pneumothorax, or no physical signs in the chest. Both these latter classes soon recover.

Of cases of hemothorax, as the above statistics show, the larger number fortunately remain sterile, and it may or may not be necessary to aspirate. Of 49 such cases followed up at least three months, about half (24) were fit for duty in three months, and nearly all the rest were fit in six months. One was not fit after three months; four were incapacitated by other lesions, and one died after an operation to remove a foreign body. These figures include a certain number of cases with retention of an aseptic foreign body. Apparently the recovery is nearly as perfect when the hemothorax is large as when it is small, but it takes longer. Less than half (9 out of 22) were fit in three months, whereas with a medium or small effusion 15 out of 27 were fit in that time.

According to Elliott's figures in 20 cases, a small sterile hemothorax does just as well if it is not aspirated; 14 were fit in three months, and 6 in six to eight months; 11 of these had an effusion estimated at twenty to forty ounces, well up into the axilla.

**Retained Foreign Bodies in the Lungs or Pleura.** Such missiles are likely to carry in septic infection, especially in the case of fragments of shrapnel or high explosive shell. Bullets or small fragments may, however, remain sterile, and in that case the prognosis does not appear to be much worse than with in-and-out wounds. Of 14 such cases followed up, 4 were fit for duty in three months, 7 in four to fifteen months, 2 were unfit in consequence of nerve lesions, and 1 was dead after an operation to remove the bullet.

In many cases retention of a foreign body is followed by infection, and a septic hemothorax or abscess of the lung develops. When the retained fragment is larger than a small hazel-nut the danger becomes very great, especially if the wound in the chest wall is open for the pleural cavity to communicate with the outside air. The ideal treatment is early operation under a local anesthetic, excision of the track, removal of the foreign body, cleansing of the pleural cavity, and closure without drainage. Apart from successful removal by operation, very few patients with a large piece of shell retained in the lung ever get down to the base alive. When the fragment is small enough for the patient to reach the base in safety, only 24 per cent (out of 83 patients) developed a septic hemothorax or empyema.

**Open Wounds.** These wounds are very dangerous. Apart from operation the great majority die at or before they reach the casualty clearing station. When a large foreign body is retained the risks are greater still, death resulting within a few days from hemorrhage, shock, mechanical displacement of the thoracic viscera, or violent sepsis, anaerobic or streptococcal.

Greatly improved results have lately been obtained by early operation, best under a local anæsthetic, designed to cleanse the track by suction, remove the foreign body, and clear out and close the pleural cavity. Captain Anderson succeeded in saving 44 out of 58 such cases, most of the fatalities suffering from multiple wounds; twelve patients required a secondary operation for drainage. More recently Captain Lockwood has operated on 39; only 9 died, and none needed reopening. To obtain access to the shell fragment it is usually necessary to resect a long piece of one or two ribs. I have used general anæsthesia in such cases with good success, but it is unnecessary as a routine. There is some risk of pneumonia in the affected lung. One of my patients died on the table from hemorrhage, a large shell fragment having been driven into a main branch of pulmonary artery.

Captain Roberts and Craig saved 10 out of 29 'open' cases, and several of the failures death was due to other injuries. During recent battle, 108 out of 255 chest cases operated on at casualty clearing stations died (42.3 per cent).

The subsequent history of patients operated on thus early appears satisfactory. I am privately informed that there were only 8 deaths at the base out of 183 chest cases operated on at the casualty clearing station. Secondary drainage was required in 32, of whom 1 died. Of 51 cases sent down with pleura closed, 2 died; of 35 sent down with pleura drained, 4 died.

**Infected Cases.** About 14 per cent of the whole number of chest cases seen at base hospitals show evidence of sepsis, or 20 per cent of those with effusion, and of these, 40 per cent die. Of the survivors, 60 per cent were followed up, and it was found that the results were—

Fit for duty in six months or less	-	48	cases
Fit for duty in over six months	-	11	..
Unfit	-	20	..
Not yet classified	-	15	..

About 60 per cent of those who survive, therefore, make a perfect recovery. The outlook is by no means so good if a foreign body is found. Only 30 per cent of these became fit for duty.

The unfit suffer from a persistent sinus or from chronic cough and deterioration.

We may briefly summarize as follows:

1. Of all chest wounds up to the present, at least one-quarter have healed.
2. Small in-and-out wounds without effusion almost all recover.
3. The majority develop hæmothorax. Four-fifths of these remain fit; half are fit for duty in three months, and nearly all the rest in six months. Except in large effusions, aspiration does not hasten matters.
4. A small non-infected foreign body, with hæmothorax, is not dangerous, and the patient recovers fitness, but not so quickly.

5. Cases of open chest wounds, and those with retained shell or shrapnel larger than a hazel nut, nearly all die unless there be early operation, which saves about half of them.

6. Of infected cases treated by rib resection and drainage, nearly half die. Of the survivors, two-thirds recover in about six months or only one-third if a foreign body is retained.

REFERENCE: Elliott, *Lancet*, 1917, ii, 371.

#### WOUNDS OF JOINTS.

It is very especially true in the case of the joints, that the prognosis depends on whether infection does or does not develop. If the wound maintains an aseptic course, recovery will take place usually with a fair degree of mobility of the joint, often complete mobility if the joint surfaces are approximately intact. If there is infection, a mobile joint is unlikely, and there is grave fear of prolonged suppuration, amputation, or even death.

**Knee-joint.** We shall consider the case of the knee-joint first, as the information here is much the most abundant.

In and-out rifle or machine-gun bullet wounds, with a small exit and entry, nearly always do well, and give a perfect or nearly perfect result, without any operation being necessary. Shell wounds, or rifle-bullet wounds with a large exit, almost all require early operation, or sepsis is pretty certain to supervene. Even if the case does well for some days or weeks, it is very disappointing to find that late suppuration ensues, as I have seen on several occasions at an English hospital.

The general prognosis during the period of the battle of the Somme, June to December, 1916, in cases of knee-joint injury requiring operation, was shown by the Rouen figures:—

Lesions with bone injury	438
"    without    "	407
Total	845
Total amputations =	164 = 19.4 per cent
Total deaths	72 = 8.5    "

There is no doubt that to-day (September, 1917) much better results can be obtained by the widespread application of a satisfactory technique, including excision of the wound, cleansing of the joint (the writer uses 1:1000 brilliant-green, and finds it very reliable), removal of foreign bodies, closure of the joint-cavity by suture, and the use of a reliable antiseptic such as that used in the Carrel-Dakin treatment, B.I.P.P., or, best of all, a flavine or brilliant green toric paste, followed by efficient fixation of the knee. If the joint-cavity can be closed, the great majority of the cases heal by first intention, even if the patella is split or there is some not extensive damage to the femur or tibia.

Of 322 such cases in the Rouen figures, only 82 required further

ation; that is to say, three-quarters did well. Today, the proportion in properly treated cases is undoubtedly still higher. Ogilvie, working in a French base hospital, obtained by this technique the following results:—

Cases operated on (his classes B, C, D)	47
Clear movable joints	27
Limited mobility	4
Stiff joints	14
Amputated	1
Died	1

The results are in reality better, because in some of these it was possible to close the capsule. This particularly applies to the satisfactory cases.

When the bones entering into the joint are extensively smashed primary excision may avert the necessity for amputation. In this case, of course, a stiff joint results.

*When the joint cavity cannot be closed*, the prospect of sepsis is greater. Of the Rouen figures, 38.4 per cent of the 336 cases in this group required a further operation. The others presumably did well, but will not be likely to get a perfectly movable joint.

*When infection occurs*, the outlook becomes much graver. The open wound that is likely to lead to infection can often be recognized on the hand. If the patient comes under treatment more than forty-eight hours after injury with an open leak of the joint, if the capsule cannot be closed, if there is much bony comminution, if a piece of splinter or cloth is retained, or if the vitality is reduced by grave laceration or multiple wounds, the risk is much increased. Much depends on efficient surgery at the casualty clearing station.

#### END-RESULTS OF SEPTIC ARTHRITIS OF KNEE.

	Cases	Deaths		Mortality	Cases
		Conservative	Amputation		
Excision	29	18	3	8	
Guthrie and Wolffenden (arthrotomy)	20	7	10	1	2
Guthrie (arthrotomy)	21	12	4	5	
Total	70	47	8	15	

Of the Rouen figures, when the cases that required no further interference after a conservative operation on the joint, and therefore presumably remained aseptic, are deducted from the total number, there is a residue of 397, and there were in the whole series 72 deaths and 164 amputations. Excepting a few multiple injuries, all of which probably came into this group, so it is clear that not more

than lost the infected knee, preserved life and limb, and perhaps not more than one third when we take into account the fact that during the Somme battle a large number of legs were amputated in hospitals in England for suppurative arthritis of the knee.

Individual surgeons have obtained much better results than these by the use of a special technique. Fullerton and Rankin excise the joint. Rankin obtained 48 recoveries with bony union out of 23 operations, with 3 amputations and 8 deaths. Campbell and Woffenden used lateral and posterior incisions for drainage, followed by Carrel's treatment, and saved 17 out of 20. This is the method I use, and I find it very satisfactory. It is important, in my opinion, to remove the posterior ends of both scapular cartilages. Pars, by other methods of drainage, saved 12 limbs out of 21. It will be seen that the lateral and posterior drainage method gives the best results. Of 17 cases, 7 obtained lam-bony ankylosis, and in 10 the joint preserved some mobility.

We may come, therefore, to the following conclusions:

1. Small in and out bullet wounds without much bone injury nearly all give a good result.
2. Shell wounds in which early cleansing and closure of the joint cavity is possible do well in at least 75 per cent of the cases. The joint usually recovers good movement, but may be more or less stiff.
3. When the joint cannot be closed, or in the presence of an extensive smash of the bones, retained foreign body, etc., the risk of sepsis is great.
4. If suppurative arthritis occurs, in practice the majority of the patients may lose limb or life, but with a proper technique of drainage, 75 per cent can be saved, with either bony ankylosis or a more or less movable joint in about equal proportions.
5. During the Somme battle period, the death-rate was 8.5 per cent, and the amputation rate 19.4 per cent. It is undoubtedly better now.

The other joints may be briefly dismissed, as published statistics do not appear to be available.

**Hip joint.** Wounds of the hip-joint are not common. If the patient survives the immediate risk of what is likely to be a severe injury, it is rather surprising how well the arthritis of an infected hip-joint responds to anterior and posterior drainage, and Carrel's treatment. During the Somme battle period the writer had six such cases under his care in England, and all recovered. The hip was stiff, and in several there was considerable shortening due to dislocation upwards.

**Ankle joint.** Wounds of the ankle-joint are difficult to preserve from sepsis. I have had a good result, with primary healing, from astragalectomy within a few hours of the injury in one case in which the bone was shattered. If suppuration occurs, the foot may be saved; but in my experience at an English base hospital it is too painful for walking on, and I believe it is better to perform Syme's amputation.

**Shoulder joint.** Here the conditions and prognosis much resemble those for the knee.

**Elbow joint.**—The elbow joint is difficult to close satisfactorily, and consequently many of the wounds suppurate. Early excision may not be very successful; many of the joints left after this procedure are either flail or ankylosed, especially if the olecranon is removed. Perhaps now that better means are available at casualty clearing stations of preventing sepsis (pastes, etc.) better results may be obtained. If infection occurs, the most efficient way to drain the joint is to saw through the olecranon, and restore it when all is well.

**Wrist joint.** This joint is also difficult to close, and infection is especially common, but it can usually be controlled by careful treatment of the antiseptic pastes. A stiff wrist is likely to result.

I am much indebted to Colonel H. M. W. Gray for help in the preparation of this article.

References: Gray, *Brit. Med. Jour.*, 1915, *v.* 41, *Burling. Dial.*, 1917, *v.* 27, *Collyer. Dial.*, 280, *Pulse. Dial.*, 282, *Rankin. Dial.*, 287, *Fulton. Dial.*, 296, *n. S. W.*, 27, Campbell and Whelden, *War. Med.*, 1917, *n.*, 185.

#### COMPOUND FRACTURE OF THE FEMUR

This may be taken as a type of bone injury due to shell or bullet wound, except that the prognosis, both immediate and long-term, is much less favourable for the femur than for other bones, because, as to the end results is not yet available, and we do not know what degree of functional recovery to expect.

The risks to life are early and late. The early risk is death on the battlefield, at or on the way to the casualty clearing station, or even in the base, from haemorrhage, shock, gas gangrene, or acute streptococcal septicæmia. The death-rate at the casualty clearing station is probably about 15 per cent; some of these cases present multiple wounds, those to the femur predominating. These figures agree with those given for 1000 cases by Sir Anthony Bowlby in April, 1916, and with the statistics for about the same number of cases after fighting in the early summer of 1917. Sir Anthony Bowlby estimates that 2 per cent die before reaching the clearing station. Many die on the battlefield.

Delayed at the base the late risks have to be faced. Major H. V. C. is working in Egypt and receiving from the Dardanelles, by a survey of 40 per cent; Major Martin, working at the base in France, has reported the late mortality as 15 out of 52 (10 died in France, England, that is, nearly 30 per cent).

According to some surgeons who were working at the front in the latter part of the war, the death rate at and in front of casualty clearing stations was much higher than that quoted above. Colonel Gray estimates that the total mortality, early and late, was as high as 40 per cent. Nowadays it is probably under 30 per cent, because

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cases are kept longer at casualty clearing stations, and the number of deaths at the base and in England is greatly reduced. The improvement is due to better methods of fixation and of wound treatment (excision, Carrel's method, pastes).

Of a group treated at casualty clearing stations in 1917, 174 out of 1000 were amputated (17.2 per cent). It is difficult to say how many more are amputated at the base or in England; during the Battle of the Somme the proportion amputated at the English base was by no means inconsiderable.

Information is also lacking as to the end-results. Hey Groves reported of the Dardanelles cases that 75 per cent of the legs saved showed good form and function. They were treated by trussion and extension. This figure is certainly higher than the general average; clean breaks due to gunshot injury may do very well; comminutions at the bottom of a big wound, even if life and limb are saved, are apt to show a persistent sinus, or great shortening.

One may estimate—but it is little better than a guess—that at the present time 24 to 25 per cent die, another 20 to 25 per cent need amputation, and of the rest, perhaps a third get a good functional limb without much shortening, or a sinus. The best results would be after a clean break due to a bullet. I have seen one such patient who lay seven weeks unattended, except by a wounded comrade, behind the German lines after a raid, and crawled to his own trench when the leg was sufficiently united to enable him to do so. He had  $1\frac{1}{2}$  in. shortening.

REFERENCES.—Rowley, *Brit. Jour. Surg.*, 1916, April, 626; Hey Groves, *Ibid.*, 592; Martin, *Ibid.*, 632.

V. L. de Stort.

### HEMATOCELE, PELVIC. (See ECTOPIC PREGNANCY.)

**HEMATOMA, ARTERIAL.** Recent rupture of an artery, subcutaneously or after a punctured wound, is a very serious injury which urgently demands surgical interference to prevent gangrene or fatal loss of blood. There has been some difference of opinion as to which operative procedure will lead to the best results. Thus Garbe has collected from the literature 78 cases of rupture of the axillary vessels in association with dislocation of the shoulder, 57 being due to efforts at reduction, especially by extension or the heel-axilla methods. One would have expected that incision and tying the vessel would have given better results than ligation of the subclavian, and it also allows of reduction of the dislocation; but in the records the incision method shows a mortality of 31 per cent and 44 gangrened, whilst ligation of the subclavian cured 80 per cent and only 20 per cent became gangrenous. The figures are, however, too few to prove the point, and go back into the pre-antiseptic era.

A larger and more reliable body of statistics, which we owe to the researches of Moond and Vanwerts, shows that the best results in every situation were obtained by restorative methods or by compress-

of the feeding artery, opening the hematoma, and ligature *in situ*. The results are shown in this table:

Operation	Cases	Wells	Allen	Quain	Chase
Ligature	41	60.5	11.6	7.5	12
Ligature and ligature <i>in situ</i>	17	81.5	10	6.5	1.2
Excision and resmear	1	100			
Excision of artery	39	87	5	5	5

As to reference to the individual vessels, the same writers relate 17 cases of injury to the **Carotid**, of which 6 died and 4 developed cerebral gangrene.

All cases of wound of the **Brachial** artery and vein all did well. Ligature of the **Femoral** artery has a bad reputation for causing gangrene, only 2 out of 56 showed this complication, and in 1 of these the vein was injured. In 9 cases the artery and vein were both tied without causing gangrene. Most of these, however, were superficial femoral cases.

The **Popliteal** was much more disastrous: 9 out of 11 were gangrenous at operation, and 4 more became so afterwards. In several of these the vein was also injured.

**Gunshot injuries** of large vessels are in a somewhat different category. The patient has frequently lost much blood, and there is a considerable risk that ligature of the artery will precipitate gangrene. If there is no external hemorrhage, the swelling is not increasing, and the nutrition of the foot or hand is good, there is considerable probability that the condition will settle down and either produce an aneurysm which will be more amenable to safe treatment at a later date, or even get quite well with a pervious artery. In a series of gunshot cases reported on by Colonel Makins from base hospitals in France, about a third of the cases of hematoma of large arteries were referred to England without operation, the condition improving, usually at least half the patients will settle down in this way. How many of them get quite well is uncertain. They need to be constantly watched for hemorrhage, extension of the swelling, malnutrition of the extremity, and suppuration. These would necessitate ligature or amputation. When the artery has to be tied for one of these reasons, the prognosis depends upon the vessel. No sufficiently full statistics are available. In Colonel Makins' series from base hospitals in France, 10 of the carotid cases 4 did well and 4 became hemiplegic. Two subclavian cases both died. Of 3 axillary cases 1 did well, another was only gangrenous but lived, and the third died. The brachial artery was tied 10 times, all the patients doing well except 1 in whom gangrene was already present. Of 4 cases of ligature of the common femoral, 2 did well, 1 died, and 1, though already gangrenous,



recovered. The superficial femoral and profunda showed 15 successes, 1 case gangrenous (before operation), and 4 deaths. Of 5 popliteal injuries, all got well; 1 was gangrenous, but lived. In no case was gangrene induced by the ligature, though the common femoral vein and artery were tied once, and the popliteal vessels twice.

REFERENCE: *Genl. Rec. d. Chir.*, 19<sup>e</sup>, 580; Mouton and Vanwert, *ibid.*, 1911, 63; Mikas, *Bull. Jour. Sci.*, 1916, iii, 35.

C. Rendle Short.

**HÆMOPHILIA.** It may be well to make it clear at the outset what we understand by this condition. It may be defined as a disease, usually congenital, characterized by a tendency to hæmorrhage, which may be spontaneous or in connection with wounds or injuries. The essential defect is diminished coagulability of the blood. The disease affects males in the great majority of instances, and the usual history is that the tendency is transmitted through the females, who are not themselves bleeders. Bullock and Fildes have gone so far as to deny the existence of *de novo* cases, or of definite symptoms appearing in the female. We are inclined to think they have arrived at this conclusion by the somewhat arbitrary course of disparaging, or disregarding, evidence to the contrary, and we may say at once that we have seen and treated patients whose history and symptoms have convinced us that cases without hæmophilic ancestry do occur, and that severe hæmophilia may affect females.

Prognosis may be considered: (1) From the point of view of the expectation of life or recovery of the patient; and (2) In view of the hereditary aspects of the disease, as regards the chances of a patient transmitting it to posterity.

**1. Prognosis as regards Patient.** This is always grave, especially in young subjects. As a rule, the condition does not show itself within the first twelve months of life. Some cases, however, are fatal shortly after birth from bleeding of the umbilical cord; the bleeding may be immediate or may not begin till the third day or later; it may be arrested, but is sometimes fatal within twenty-four hours.

The risk to life diminishes after early childhood. The child and his attendants learn to appreciate the danger of even slight knocks or scratches; and the essential defect seems to lessen. The seriousness of the outlook is illustrated by Granddier's statistics. Out of 152 boy hæmophiles, 81 died before the end of the seventh year.

The longer a patient lives the greater is his chance of outgrowing the tendency. In many of the surviving cases it has disappeared at the age of twenty or thirty; but other cases reach a ripe old age, and exhibit symptoms to the end.

Something can be done by treatment to diminish the tendency to bleeding. The administration of lime has been lauded, but Addison has thrown grave doubt on the scientific reasoning on which this treatment is based; he holds that even ionizable calcium is not absorbed. Definite improvement has followed the adminis-

of horse serum. The administration is best made intravenously, since the elastic recoil of the venous wall and skin form an excellent barrier to local bleeding. If patients can be got to submit to it, it is no doubt that an injection once a fortnight or once a month, continued for years, greatly diminishes the tendency to bleeding. None of our cases have suffered from anaphylaxis. The injection of 100 mg. peptone has not been tried often enough for conclusions as to its efficacy to be stated. It is indeed a matter of great difficulty to form an opinion regarding the efficacy of any line of general treatment, since the tendency to bleeding shows such extraordinary variations in the same patient at different times. After a serious or even dangerous hemorrhage, the coagulability of the blood may come to a degree approaching or reaching that of health, and this will may be ascribed to the last line of treatment employed. Residence in a warm climate seems to diminish the hemorrhagic tendency in some instances.

There is no doubt that prognosis in hemophilia has improved, owing to recent discoveries in connection with the coagulation of the blood. We have resorted in addition to our armamentarium of the means of stopping locally with accessible hemorrhages, means which were not previously available. Adhis has shown that the diminished coagulability of the blood is due to a great delay in the interaction between thromboplastin and lime, which forms thrombin. The thrombokinase which is supplied by the damaged tissues may be washed away in the blood escaping from the wound before it has had time to cause the thromboplastin and lime to unite to form the thrombin which determines the change from fibrinogen to fibrin. The existence of a layer of fibrin in the crevices of a wound may indeed play an important part in preventing the access of thrombokinase to a bleeding point in the centre of the wound. The indication in such a case, therefore, is to remove coagula from the wound which is still bleeding and apply to it an abundance of thrombokinase.

Thrombokinase can be obtained by making an extract of chopped ox-spleen or testis with 0.9 per cent saline solution to which a trace of sodium carbonate has been added.

Osseoff has stated that a powerful extract of thrombokinase can be obtained by washing sheep's fibrin in tap-water till it is haemoglobin-free and then kneading about 20 grms. of the wet fibrin in 300 c.c. of distilled water. So far as we are aware, this extract has not been used in practice. In case of emergency, blood freshly drawn from a patient's subject, and applied to the bleeding surface, will often arrest the hemorrhage.

Natural physiological styptics are more efficacious than those which depend on astringent or escharotic action, and moreover their use is untroubled by the danger of recurrence of the hemorrhage which sometimes takes place when an eschar separates.

Hemorrhages are not alone dangerous *qua* hemorrhage. Adherent hemorrhages to the posterior nares and among the teeth, and the presence of

decomposing blood in the stomach and bowel, may lead to great discomfort, and sometimes to marasmus and death.

Hæmorrhages and hæmo-serous effusions into joints are not dangerous to life, but may lead to permanent incapacity. They are often imperfectly absorbed, and frequently recur, with the result that adhesions, cross-joints and osteo-arthritis, with subsequent ankylosis of varying degrees, may be occasioned. Cases of fracture in hæmophilia have been recorded. A fracture of the femur takes place, but satisfactory union usually occurs.

Menstruation and parturition in non-hæmophilic females of bleeder stock are not associated with special danger. Even female bleeders seem frequently to escape serious consequences at these times, but in some cases menstruation is a recurring anxiety: in the case of one young lady under our observation, a fatal result from menorrhagia has been very narrowly escaped on three separate occasions. Between these serious episodes there have been intervals of months or years when menstruation has given comparatively little trouble, although the susceptibility to bruising and accidental bleedings has persisted.

The examination of the blood is of comparatively little service in estimating prognosis in hæmophilia. We have never found the great reduction of polymorphonuclear leucocytes which has been described by authors, and in particular by Wright; and if it be remembered that many persons in perfect health never have more than 6000 leucocytes per c.mm., even the majority of Wright's own figures are not particularly low. An estimation of the coagulability of the blood is sometimes of more service; but when bleeding is in evidence we may take it for granted that coagulation time is prolonged, and when bleeding is absent the coagulation time in a bleeder may be no longer than in a healthy person. An estimate of coagulation time might conceivably be usefully made before a hæmophilic entered upon some special undertaking, such as a journey; but data regarding the coagulation time before hæmorrhages are very scanty.

The onset of spontaneous hæmorrhage, or of increased liability to traumatic hæmorrhage, is sometimes preceded by prodromal symptoms. Headache, nervous irritability and lassitude, and sometimes even convulsions, may occur; but whether these are associated with an actual diminution of coagulability is a matter of inference rather than of observation. In other cases, a special feeling of well-being may precede a spontaneous hæmorrhage.

To sum up: The expectation of life in the case of a young bleeder is poor; it is probably diminished by 50 per cent. This state of affairs lessens with advancing age. The necessity for constant care, the occurrence of joint-effusions and their results, and the incidence of spontaneous hæmorrhages, reduce all but the slightest cases of hæmophilia to a condition of at least semi-invalidism. The danger of bleeding from accessible sites may be greatly diminished by the use of physiological styptics.

2. **Transmission of the Disease.**—The females of hæmophilic stock

code beyond the ordinary, and a study of the genealogy of hæmophilic families shows clearly that the great majority of the male offspring of the women, whether the latter are themselves bleeders or not, are likely to be hæmophiles. Women of hæmophilic stock should therefore be advised not to reproduce their species.

A male bleeder is obviously not a fit and proper person to assume the responsibilities of parentage; and apart from his personal disability, there is a definite, though comparatively slight, probability that he may propagate bleeders.

The question of marriage in non-hæmophilic males of a bleeder's race is more difficult. The man is under no personal disability, but there is rather more than a moderate risk that he may transmit the disease. We have published a genealogy in which a non-bleeder male of hæmophilic stock had two sons who died of hæmophilia. His non-hæmophilic daughter was twice married, and had hæmophilic offspring with her husbands. One of her sons, a non-bleeder, married a healthy woman, and had two sons who died of the disease.

*Quoted from Brit. Jour. Physiol.* 1913.

*G. L. Goodall,*

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**HÆMORRHOIDS.** A patient suffering from "an attack of piles" frequently asks whether he is likely to get better without operation. The answer depends on the condition found.

The thrombosis of an external pile, which is painful for a few days, usually gets quite well, and there may never be any further trouble. Bleeding piles can fairly often be relieved, rather than cured, by cathartics, purgatives, and local applications.

Strangulated prolapsed piles, in rare cases, cure themselves, after some illness, by gangrene.

A patient's life is very seldom in danger from hæmorrhoids, but embolism from a thrombosed pile has been recorded, and the possibility, if unchecked, might even threaten life.

The carbolic method, repeated once a week on two or three occasions, may give considerable relief in a majority of the cases, but I have seen it fail, and there may be painful swelling afterwards. It is far less reliable than operation, but worth a trial if the patient refuses an operation. The prospect of cure by injection of carbolic acid into the pile, or ionization, is always uncertain.

**Results of Operation.** There are three operations in common use, namely, the hægture, the clamp and cautery, and the Whithead operation.

**Mortality.** This is as low as that of any operation can be. Swinford and other surgeons have treated thousands of cases without a death. At St. Mark's Hospital, in forty years up to 1896, the mortality was 1 in 670; afterwards there were no deaths in many

years. **Post-operative Discomfort** varies with the method of operating. Pain is least in the clamp and cautery method, most after hægture. Stay in

hospital was, on an average, ten days after the clamp and cautery, twenty-one after ligature, and twenty-six after Whitehead's operation.

The two principal after-troubles are stenosis and recurrence.

*Stenosis* is unknown after the cautery operation; it occurs in slight degree, which is of no importance, after about a third of the ligature cases and half of the Whitehead cases. Stricture requiring treatment was met with in 8 out of 100 patients on whom Whitehead's operation had been performed.

*Recurrence* is extremely rare if an efficient operation is performed in the first place; the writer has never met with a case. The end-results of piles operations are almost invariably extremely satisfactory. In eighteen months, at St. Mark's Hospital for diseases of the rectum, only 2 recurrences were seen, one after two years and the other after eighteen.

The three operations ought not to be regarded as mutually antagonistic. The clamp and cautery is best for cases where there are only a few piles not involving the skin, because burns of the skin are painful. Whitehead's method is to be reserved for uncommon cases where the whole anal canal is a mass of piles.

REFERENCES. Anderson, *Brit. Med. Jour.*, 1913, ii, 1478; Swinton Edward, *Richard's System of Operative Surgery: Cases, Diseases of the Rectum and Anus*.

A. Ruddle Short.

**HEAD INJURIES.** The prognosis of a number of conditions will here be considered under one heading, because it is so difficult to distinguish between them in practice. The aphorism of Hippocrates still holds good: "There is no head injury so trivial that it should be despised, or so serious that it should be despaired of."

That the prognosis after a severe head injury is very uncertain is evidenced by the excellent hospital rule always to admit such cases, if possible, as a precautionary measure; it is quite impossible to tell what the outcome may be at the first examination. Every surgeon knows of patients lying deeply comatose, who appeared to be marked for death, who have recovered; and, on the other hand, how often has a resident imperilled his reputation by sending away a patient with apparently nothing the matter, who subsequently died. The three main causes of death after this latter mistake are the occurrence of intracranial hemorrhage, spreading oedema, or meningitis.

We shall consider: (1) *The mortality of various head injuries*; (2) *The material for giving a prognosis in particular cases*; and (3) *The possible sequelae*.

**1. Mortality of Head Injuries.** It is of no value to quote hospital statistics of mortality amongst head injuries in general, because practice differs so much as to what type of case is admitted and what sent away. A few well-defined groups, however, furnish valuable information. We have figures for the death-rate in cases of fractured base, fractured vertex, pistol-shot injury, and extradural hemorrhage.

Rawling's cases are taken from the records of St. Bartholomew's Hospital, Anderson's from the Cook County Hospital, and Bowen's those of Guy's Hospital.

## MORTALITY OF HEAD INJURIES.

		Cases	Survived	Mortality
Fractured base	Phelps	286	176	61
	Rawling	205	89	44
	Battle	163	54	32
	Anderson	58	33	57
	Phelps	116	41	34
Fractured vertex	Rawling	88	29	37
	Anderson	72	46	64
	Phelps	126	120	95
Pistol-shot wounds of brain	Bowen	36	14	38
	(with operation)	25	3	12
Treatment of extradural hæmorrhage or a serious brain injury	Bowen	36	30	83
	(with operation)	26	20	77

It will be observed that the figures for fractured base vary; in English practice the mortality is probably under 50 per cent. Fracture of vertex is less dangerous; about one-third die. Out of 137 cases of pistol-shot of the brain reported in a New York newspaper one year, 6 recovered after operation. Of 51 cases of extradural hæmorrhage treated by operation, 23 died, that is, less than half.

**2. Data for Prognosis.** As above remarked, prognosis is absolutely impossible at the first time of seeing, unless the patient is grossly moribund; and even if consciousness has not been lost, we dare not say that the injury is trivial. The great majority of such cases die within forty-eight hours, and after a week has elapsed, recovery is improbable; but even then there is a remote risk.

**3. Unconsciousness.** The degree, depth, or prolongation of primary unconsciousness, taken apart from other signs, is of very small value in forming a prognosis. If other signs are favourable, recovery will almost certainly occur, even if the patient is still unconscious at the end of the third or fourth day or later (Phelps). Nor will such cases necessarily have grave after-symptoms, if properly treated.

On the other hand, recurring unconsciousness, after a more or less long interval, is of very grave import, denoting intracranial hæmorrhage, and apart from successful operation, as in cases of middle cerebral rupture, the patient will almost certainly die in a few hours or days.

**4. Temperature** is a sign of great value (Phelps). If it is very depressed from the first, and shows no tendency to rise, the patient is likely to die outright of shock. Again, if at any time it rises rapidly, recovery is improbable. Recovery never occurred in Phelps's cases when 105° was reached, and very few survived whose temperature rose above 104°.

*Lapses* which is slow and full, or very quick and feeble, is generally rather ominous: the former usually indicates cerebral compression.

*Hemiplegia* is a grave sign, if it comes on from the first; it makes it probable that the cerebral cortex is lacerated.

*Depressed fracture* of the skull is a much less grave injury in young children than in adults.

*Escape of cerebrospinal fluid* from one ear, in Rawling's cases, did not make the prognosis of fractured base worse; escape from both ears had a mortality of 66 per cent.

*Septic complications* render the death of the patient certain if the meninges are involved or a subdural abscess forms, and therefore all cases with an open wound communicating with a fractured skull are in danger for a week or more.

Late deaths are due to sepsis in most instances, but it is extraordinary how long a person may live with a hemorrhage which eventually proves fatal. Two cases have come under the writer's notice in which the patients remained in a variable, but rather stupefied, condition for more than a month after an injury, to the occiput in the one, and to the spine in the other, each dying at last of intracranial hemorrhage, apparently dating from the time of the accident, and not repeated since. These cases have been called "late apoplexy."

*Concussion.* A few autopsies on men and animals have been recorded showing that it is possible for death to result from simple concussion, without any signs of injury post mortem.

3. **Eventual Results of Head Injuries.** Within a few days of the accident, the condition called *cerebral irritation* may come on, in seven cases, and last for a week or two. Such patients are likely to suffer from prolonged and severe functional defects.

*Nerve injuries* associated with a fractured bone may be immediate or remote; in either case they usually clear up. Those cases in which the paralysis does not appear for a few days, are always well in two or three months; in a few of the nerve injuries seen immediately after the accident, the lesion is permanent. The nerves most commonly involved are the second, seventh, and eighth.

A rare sequela of head injury is rupture of the internal carotid artery into the cavernous sinus, causing *pulsating exophthalmos*. Another rare injury is *traumatic cephaloplethoric*.

*Functional defects* of the brain are the most important sequelae of a head injury. It is well known that persistent headache or neuralgia, vertigo, loss of memory, mental enfeeblement, or traumatic epilepsy may follow such an injury, and may persecute the patient for the rest of his life. Sometimes he becomes very sensitive to the effects of a hot sun, or easily upset by a little alcohol.

Crisp English followed up a number of cases of head injury treated at St. George's Hospital, and obtained the following results, with which the statistics of Rawling closely agree.

	1900-1909	1910-1919	1920-1929
Of 100 cases of fractured skull	31	50	19
Of 100 cases of concussion, compression, laceration	48	42	10

In the fracture series, 52 out of 86 were earning their old wages, 26 were totally disabled, and the rest partially. In the second series, 64 out of 78 earned their old wages, 3 were totally disabled, and the rest partially. The old and the young suffered most.

These unfortunate end-results can be averted to a large extent by proper treatment at the time of the original injury. Patients, especially of the hospital class, are usually allowed to go back to work too soon. Every case of head injury ought to be kept quiet in bed on a liquid diet until the dazed look of the face has passed off, the blood-pressure has risen to normal, and the patient does not sweat, or become fatigued on attempting to get up. After a prolonged unconsciousness, lasting hours, the patient ought to lead a quiet life for many months. These conditions being observed, even severe head injuries seldom cause any permanent trouble. It is perhaps wise to decompress for symptoms of cerebral irritation lasting six or seven days.

*Traumatic Epilepsy.* In most cases, this is evidence of some definite lesion, such as a depressed fracture, scar in the meninges, old hemorrhage, or tear of the cortex, but sometimes nothing can be found. The results of operation are not very successful; if a definite cause can be removed the outlook is better. Much depends upon keeping the patient absolutely quiet for months after the operation. Rawling reports 20 cases of his own, of which 2 were cured, 11 markedly improved, and 7 not improved. Cushing gives figures as follows: 10 from attacks, 12: attacks less frequent, 30: no improvement, 17: total of status epilepticus, 2.

REFERENCES: Phelps, *Traumatic Injuries of the Brain*; Rowling, *The Fracture of the Skull and Brain*; Crisp English, *Lancet*, 1904; Anderson, *Surg., Gynec. and Obst.*, 1913, 522.

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#### HEART-BLOCK.—(See PEISE, IRREGULARITIES OF THE.)

**HEART, CHRONIC VALVULAR DISEASE OF.** The outlook in chronic valvular disease is notoriously obscure, and the new light which is breaking in hardly warrants didactic statements. Recent work teaches us that it is a misconception to regard a lesion of the valves as constituting a true morbid entity. The three great causes of valvular disease—rheumatic infection, syphilis, and atheroma—when they injure the valves, damage the even more important myocardium at the same time. In a few years from now we shall speak of acute rheumatism or cardiac syphilis as the disease and mitral obstruction and aortic insufficiency as symptoms, or at most phases, of those diseases. A book of this kind is, however, not the place for introducing a sweeping change of terminology, and the more usual plan of dividing valvular diseases along anatomical lines will be followed.



five—so, however, it soon proves impossible to exclude etiologic considerations.

**Mitral Regurgitation**, for instance, is notoriously a symptom which it is customary to treat of as if it were a disease. The available evidence teaches that generally, if not always, it is myocardial and not endocardial disease that makes the mitral valve incompetent. Stiffening of the mitral cusps causes obstruction, not incompetence; myocardial disease promotes stretching of the mitral ring to the point at which it becomes incompetent. The course of the mitral defect is therefore in the main that of the myocardial lesion that is responsible for it.

The diagnosis of mitral incompetence rests on the presence of a systolic bruit at the apex, providing the possibility of the latter having an aortic origin has been excluded. What does the discovery of this murmur portend? As we have already seen, mitral regurgitation is one result of myocardial atony; with one important exception, to be mentioned presently, this is its whole significance. Clearly, then, we have first to ask ourselves what is the morbid process that is injuring the muscular walls of the heart and making them atonic. In many cases it is, of course, some temporary anemia or toxæmia of the whole economy, such as chlorosis or pernicious — on a on the one hand, or diphtheria or typhoid fever on the other, that is attacking the myocardium among other organs. Here the prognostic import of mitral incompetency is small: since it furnishes some proof that the heart is attacked, it cannot be said to have no importance whatever; but the fact that there is a mitral systolic murmur adds nothing at all to the gravity of the prognosis. If in diseases of this general kind the patient's death is to be through his heart, it will not be because the mitral ring is so weakened that the valve leaks — it will be because the more important function of contractility is impaired, and experience teaches that atony of the mitral ring, as revealed by the mitral regurgitant murmur, is no index of interference with contractility.

When we come to those diseases in which the heart is picked out for attack by the morbid process (syphilis, alcoholism, arteriosclerosis, processes, too, which last till and tend towards death), a little more weight attaches to the presence of mitral incompetency. As in the group of conditions considered above, it is one more proof of the fact that the heart is really in peril. But a greater importance than this is often claimed for the mitral regurgitant murmur. It is said: There is a heart that from now onwards has to bear the disadvantages of a mitral valve that does not allow the left auricle and its tributary pulmonary veins to be drained. These drawbacks are alleged to be imperfect aeration of the blood passing through the lesser circuit, and extra work for the right heart. These ideas are worth considering; it, in a case of chronic myocardial disease belonging to any of the types named above, there be found a mitral regurgitant murmur, it does imply some liability to pulmonary stasis; and if the second sound at the pulmonary cartilage be accentuated, this liability is probably being

control. In fact, it is not too much to say that the best way of measuring the amount of stress imposed on the lesser circuit by mitral regurgitation is by observation of the degree of accentuation of the pulmonary second sound. Over against the evils attendant on the mitral leak in such a case, therefore, on the other hand, certain considerations do suggest that the supervention of mitral regurgitation may give actual relief where, as in many cases of chronic myocardial disease, the systolic power of the left ventricle seems to be giving out. Under such circumstances the fact that a little blood leaks back into the left ventricle is no doubt bad for the pulmonary system; but the harm done by this way is outweighed by the relief afforded to the wearing out of the left ventricle in that its systolic task is a little lightened. Therefore one should not be perturbed because a cardio-sclerotic with angina and stiffness develops a mitral systolic bruit; it is quite likely that relief from pain and other symptoms may follow. In all such cases as these the prognosis is really that of the disease itself; the mitral leak is not one, and by no means the most important, feature.

We said above that, with one reservation, mitral regurgitation is an expression of myocardial atony and no more. This one reservation must be made in regard to mitral disease due to rheumatism of the heart. Here the mitral apparatus is doubly afflicted: the myocardial disease, which always occur in every case of active carditis, and which does not when the acute phenomena have died down, favour stretching of the ring, while in practically every case each of the recurring phases of acute infection adds something to the inflammatory fibrosis of the mitral curtains—a fibrosis which, once established, never disappears. The active phases are more or less limited to the first twenty years of life; the lesions of the valves and pericardium that are established during these years remain, while the myocardial lesions recover to a considerable degree.

So far as the mitral regurgitant bruit is concerned, then, we have to point out to what extent it points to muscular damage that will pass away, and to what extent to valvular fibrosis that will tend to get worse. In the writer's view, the myocardial factor in rheumatic mitral incompetence is far more important than the endocardial; this view is chiefly based on post-mortem evidence. It is, however, probable that the more stiffened the mitral curtains, the louder and harsher the mitral murmur. It is further true that the presence and persistence of this murmur are evidence of the presence and persistence of chronic disease of the heart. Kemp's recent inquiry into the subsequent course of the cardiac complications of acute rheumatism shows that the mitral systolic bruit which is so prominent a characteristic of these attacks disappears during or after convalescence in about one-third of the cases. The writer's experience is roughly confirmatory of this, but it also shows that a bruit which has persisted for a year after it was first established is not likely to clear up. The great hindrances to the disappearance of this bruit are recurrent attacks of acute rheumatic carditis (in children, so often overlooked at the time) and

redeveloped years after obvious attacks have occurred. The latter point is responsible for the very definite contrast that exists between the behaviour of the convalescent rheumatic heart in children of the hospital class and in those who are more happily circumstanced. The former point is probably responsible for the fact that in adults whose attacks of rheumatism are more likely to be articular than in children, and who are less liable to relapse, a permanent systolic murmur is not such a common feature as it is in the rheumatic child. Even in cases where the apical systolic bruit has disappeared, it is well to remember that the patient is not yet out of the wood. Either with or without chronic relapse, it may reappear, or a presystolic murmur may develop. Prolonged absence of all signs of mitral regurgitation does not prove that the mitral curtains are normal—a process of inflammatory atresis may be going forward through a stage of latency to the point at which it causes signs of obstruction.

As for the actual harm which mitral regurgitation of rheumatic origin does to the rest of the heart, this is slight compared with the other lesions of the heart which are present in any case of rheumatic heart disease with signs of mitral reflux. It is true that in these cases the pulmonary second sound is nearly always unusually emphatic, but this must not be ascribed solely to the effect of mitral insufficiency in raising the tension in the vessel current; the fact that the *corpus arteriosus dexter* is uncovered is of equal importance, as it brings the diastolic snap of the pulmonary valves nearer to the observer. The importance of the signs of mitral leakage is indirect: their presence proves that the heart has been injured by the rheumatic infection, and their persistence proves that those injuries have not disappeared, and that there is still a likelihood of permanent cardiac disablement. The harsher the murmur, the greater the probability of this persistent type of disease; but even in those cases where a loud harsh systolic murmur at the apex persists into adult life, it is of more importance to note the size of the ventricles, and to estimate their functional efficiency than to bother oneself unduly about the intensity and line of spread of the apical bruit.

To sum up: Mitral regurgitation is a symptom of various disorders and diseases of the heart, and not a disease of itself. Its prognostic significance lies in the light which it throws on the course of the underlying condition.

**Mitral Stenosis**, on the other hand, is a distinct clinical and pathological entity. The cases that usually bear this label are, in reality, cases of rheumatic heart disease that have escaped the earlier dangers of the disease and its complications, and have survived into the residual or terminal stage. There are certain fundamental facts on a realization of which prognosis must rest.

1. Recovery is impossible. The fibrotic deformity of the curtains, the essential fact of the disease, cannot be caused to disappear by any means in our power. As they are, so they will remain to the end. Prognosis is therefore concerned solely with questions as to the patient's chances of survival.

The average age at death in a series of 57 cases of pure mitral stenosis examined post mortem at the Bristol General Hospital was 52. Probably this figure is low, in undue proportion of patients with fresh infection, as well as of those exposed to abnormal stress, is shared in a hospital series. In 6 cases there was evidence of fresh rheumatic inflammation of the heart in addition to the mitral stenosis; in this series the average age at death was 39, while in 8 cases in which the scarred mitral valves had become the seat of an infective endocarditis the average age at death was 31. The average age in another class would probably be lower if one were able to include cases in which fresh rheumatic infection has occurred but without producing any gross macro change. In such, microscopic and bacteriological studies of acute myocarditis. Post mortem data would show that (a) Mitral stenosis shortens life by twenty to thirty years. (b) The mechanical effects of the lesion are responsible for the end in a majority of cases. (c) Two complications, fresh infective endocarditis and infective endocarditis, occur in a small number bringing about a fatal termination earlier by a decade than they have been the case otherwise.

The average age of the onset of symptoms, in those cases where it is possible to enquire into this rather vague point, has been 32. From this it seems that the average expectation of life from the onset of symptoms is about 13 years. The actual date at which the lesion is first established cannot be ascertained in a vast majority of cases. The rheumatic process is so insidious in its beginning that these usually go undetected. It is, however, certain from a few cases that can be studied from the beginning, that the foundation of the valvular lesion are laid in nearly every instance before the age of 10.

There is, then, a preclinical stage during which the mitral orifice is becoming narrowed. How can this narrowing be foretold? In the early stage of rheumatic carditis the signs most distinctly indicative of narrowing of the mitral cusps are persistent harshness and loudness of the systolic apical murmur, if one be present; sharp accentuation of the first sound at the apex; doubling of the second sound at the apex; and that doubling be constant and definite; and the existence of a faint mid-diastolic bruit at the apex. If these phenomena last for months, uninfluenced by rest, one is justified in most instances in regarding the case as on the road to mitral stenosis.

Once established, the course of mitral stenosis is towards cardiac failure. As we have seen, this end may be forestalled by other happenings. The sclerosed, vascularized valve may become the home of bacteria, and the supervention of any blood infection, such as pneumonia or puerperal septicæmia, is more to be feared in the case of chronic mitral disease than in others. Actual evidences of infective endocarditis—swinging temperature, sweats, petechiæ, skin, hæmaturia, and so on—should never be forgotten in the diagnosis of cases of chronic mitral obstruction. The signs of this

complication are found, the outlook is well-nigh hopeless: death is probable within the year (*see* ENDOCARDITIS, FURTHERIVE). The supervention of a fresh attack of rheumatic carditis is not so immediately dangerous. In the presence of polyarthritides, or chorea, or subcutaneous nodes, one should look out for pericarditis, dilatation of the heart, or fever persisting after subsidence of the outward and visible evidences of active rheumatic infection. These indicate fresh carditis, inevitable results of which are temporary impairment of the myocardium and permanent addition to the mitral fibrosis. For these two reasons rheumatic reinfection of the patient with mitral stenosis must always be regarded with respect: every such attack tends to shorten the patient's life.

One other accident may intervene to accelerate the patient's gradual progress to the grave—that of cerebral embolism. This occurs in a small number of cases: Bradshaw found that 6 out of 77 cases of mitral stenosis ended so. Apart from the symptoms that point to embolism of other organs, no warning is given of this calamity. It rarely occurs except in persons with marked evidence of circulatory embarrasment, save when it is due to malignant endocarditis engrafted on the fibrotic lesion. The presence or absence of symptoms of active infection will serve to distinguish between the embolism that arises from this cause, and that which is due to detachment of clot from the mass in the left auricle. In the latter case, if the embolus is to be fatal it comes at once: in the former, the immediate shock of the embolism may pass away, and yet death may follow after a short interval from the later effects of the infection of the interior of the skull which is implied in an embolism of this type. In either case the majority of cases of cerebral embolism complicating mitral stenosis do not end abruptly. The non-infective embolus that fails to kill establishes a hemiplegia which is never completely recovered from.

In a large majority of all cases of mitral stenosis death is due to gradual cardiac failure. The forces responsible for this are two. The heart, and especially the left auricle, is asked to do more work by reason of the valvular obstruction: and gradually increasing venous stasis undermines the nutrition of the cardiac, and particularly the auricular, musculature. An unquenchable vicious circle is thus established. The results are pulmonary engorgement, auricular breakdown, and ultimate ventricular failure. The first of these threatens death by predisposing to bronchitis, suffocative oedema, and multiple infarction of the lungs: and for these reasons dullness at the bases, signs of bronchial and alveolar catarrh, and hæmoptysis are bad features of the case. Auricular failure can only kill in so far as it predisposes to the other fatal factors: that it lends itself to pulmonary hyperæmia is obvious, but it is not always realized how much the importance of auricular breakdown lies in its capacity for vexing the ventricles. The auricular contraction is not a vital function—the circulation can go on without it, for ventricular diastole will draw the auricles: but ventricular systole must go on, for if it stops, life stops

Now, auricular failure contributes to the ultimate downfall of the ventricular function in two ways. The overworked, inderted auricle goes into fibrillation: instead of handing down a regular series of stimuli to the ventricle at the rate of, say, 80 to the minute, it pours down stimuli into the ventricle in a disorderly and incessant stream, which escape into the latter chamber as fast as the auriculo-ventricular connections will transmit them. The result is that the ventricle is compelled to contract more often than is necessary, and in so disorderly a fashion that contractile substance cannot be built up on the ordinary rhythmic plan—a fact which cannot but indicate some waste of energy. Left auricular asystole also adds directly to the work of the right ventricle, and thus increases the probability of its failure. It also helps to overthrow the ventricular functions by increasing venous stasis, and so damaging the nutrition of the ventricular musculature.

There are thus three things to take note of if we are seeking to determine how near the patient is to auricular, and thence to ventricular, breakdown: (1) *Pitch of stasis*; (2) *Condition of auricles*; (3) *Condition of ventricles*.

1. *Pitch of Stasis* is to be measured by certain symptoms: dyspnea and cyanosis afford our best means of measuring it in the earlier stages; later we may be guided also by the total daily output of urine, the presence or absence of hepatic enlargement, the size of the necks in the neck, and the occurrence of oedema (though this is quite a late feature of mitral stenosis).

2. *The Condition of the Auricles* may be judged from data bearing upon (a) their size, (b) their functional integrity.

Increase in the size of the auricles is a bad feature of mitral stenosis as far as it goes, but it matters less than the more positive and direct evidences of impaired function. Dilatation of the right auricle is indicated by dullness filling in the cardio-hepatic angle; ascography is also of service, and it is even more so in the examination of the deep and inaccessible left auricle. The pressure signs that may arise from extreme dilatation of the left auricle (left recurrent laryngeal palsy, dysphagia, etc.) are all of serious prognostic import.

The signs of the previous class are less frequent and less ready to hand than the evidences of impaired auricular function. By far the most important of these is the totally irregular pulse, which is a constant feature of auricular fibrillation. The reasons why this upset of rhythm is bad for the heart's working have been stated above, but it must be remembered that the inception of this form of arrhythmia comes two things: the arrival of the auricle at an advanced stage of degeneration, and the addition of a new disability to the disadvantages under which the ventricles are working. In 26 cases under the writer's care the average age at which this form of arrhythmia was first detected was about forty, a little in excess, that is to say, of the average age at death in these cases. This proves that the totally irregular pulse—or rather, the fibrillation which underlies

it is a terminal phase in those cases of mitral stenosis that have escaped the more summary modes of termination. The patient may live on for years, if he is careful, after this has developed; in rare instances he may even be able to go to work and lead a fairly active life; but it will be on condition that he remains in the doctor's hands and submits to his advice for the rest of his days. Total arrhythmia nearly always marks the beginning of total invalidism. The expectation of life from its onset varies from a few months to ten years, or even longer in very fortunate cases, the average expectation being about five years. The factors making for long life in such circumstances are a good ventricle and a quiet life. For this reason older persons often do better than younger ones; in the latter the irregular pulse begins before the ventricle has had time to recover from the direct infective injuries of the first two decades, and moreover they are less willing to go so fully for the rest of their days than are those who have reached years of discretion.

The other evidences of auricular failure are as a rule masked by this very striking arrhythmia; nevertheless, they may be found if they are looked for, and they are not without importance, since they may foreshadow the onset of fibrillation. Decrease in intensity of a previously loud presystolic murmur, and lessening of the *a* wave as compared with the *c* wave in the jugular curve, both show that the auricular systole is becoming less effective. With the onset of total arrhythmia, both murmur and *a* wave disappear entirely. In cases of mitral stenosis of long standing, with much dyspnoea and cyanosis, the appearance of many auricular extrasystoles in the pulse curves is often a forwarning of imminent fibrillation.

3. *The Condition of the Ventricle.* Ventricular failure is likely to occur earlier in patients with dilatation of the ventricle, in those who have chronic bronchitis, in persons with high arterial tension (not an uncommon accompaniment of mitral stenosis), and in those who are prevented from giving themselves a due amount of rest.

The last phase is one of intense hyperaemia of the lungs, with or without intarction; to this stasis, failure of *vis a tergo*, as well as increased resistance in front, is contributory. Two symptoms that may appear at this late stage are worthy of separate mention in regard to prognosis—haemoptysis and vomiting. The former is never fatal of itself, and its significance differs in different cases. There is a constant slight weeping from the lung which does not betoken dangerous pulmonary congestion; it comes on early in the case, and may continue intermittently for weeks. There is, on the other hand, a more acute and intense type of haemoptysis which, if accompanied by respiratory embarrassment and even by pain in the chest, points to the occurrence of intarction. This is evidence of a more serious state of affairs, and death may follow soon. But people never bleed to death from the lungs in mitral stenosis, nor do they drown in their own blood as in tuberculous haemoptysis. Vomiting may be recalcitrant and intractable in this last stage of the disease; it may even kill the patient.

Of final cause of death in mitral stenosis, rare indeed but yet worth bearing in mind, is cerebral hæmorrhage. The reason lies in the association that sometimes exists between mitral stenosis and granular disease, and the consequent occasional association between mitral stenosis and high tension. It is a rare coincidence, yet so important that the possibility of its occurrence should not be overlooked.

The risks of sudden death in mitral stenosis are small. The cerebral aneurysms, embolism and hæmorrhage, are possible causes, and the writer is known at least one death in early mitral stenosis which occurred without warning. Possibly this was due to recurrent acute endocarditis, but there was no autopsy. At any rate, sudden death from cardiac causes is so rare in mitral stenosis that patients may be assured that the risks are almost non-existent.

As to the effect of treatment on the prognosis, the most conspicuous point to be derived is that which those enjoy who can and will consent to limit their activities. With regard to the amount of activity that may be safely allowed, there is of course no fixed rule; but the patient may, if he must, be allowed to undertake such work as does not cause him to become breathless. The writer has under observation at the present time five or six men with advanced mitral stenosis; one employed as a gardener, another intermittently as a plasterer, a third as a tanyard labourer, and so on. These men are better off than a little money than starving in idleness.

Women do a little better than men, and if their circumstances are comfortable and easy they do better than those who are compelled by want of help to do heavy housework and to undertake personal responsibility for large families. Pregnancy makes the symptoms worse for the time being, and introduces a small risk of reawakening of the systemic infection. French and Hicks found that in only 28 per cent of a large series of cases of mitral stenosis in married women was there a direct relation between pregnancy and heart failure; and in nearly all of these it took several pregnancies to bring on symptoms. It is in the extreme cases that the patient has to be prematurely delivered on account of the aggravating effect of pregnancy on the symptoms, such cases as require this extreme step, its consequences are often disappointingly small, the patient being but little relieved; but on the other hand, the patient suffers no ill consequences from the strain of labour, whether it be normal or induced, providing it be not unduly protracted; or perhaps it would be more correct to say that the effects of that strain are more than counterbalanced by the relief afforded by the emptying of the uterus and the removal of the impediment to breathing which the full uterus offers. In French and Hicks's series there was no single example of death during labour, and in only 10 per cent of those whose symptoms of heart failure began during pregnancy, did the woman die within three months of delivery; and the percentage of abortions was even smaller (5.5 per cent).

On these points regarding treatment in its effect on prognosis, there is but too little to be said. The future hope in mitral stenosis lies in



prevention and not in treatment. One observation is worth attention—the remarkable benefit experienced from the use of digitalis by patients with mitral stenosis and total arrhythmia. Armed with this drug, and after a period of complete rest, patients recover and retain their capacity for work in a most gratifying way. If this line of treatment—rest and digitalis—fails in a week to slow the pulse and alleviate the dyspnoea and other symptoms, in a case of mitral stenosis with total arrhythmia, the patient is in a hopeless case and cannot survive long. If, however, the treatment gives relief, it is probable that he will regain to some small extent his capacity for getting about and even for work; though, as we have already remarked, he will still have to regard himself as in need of continued medical care.

Patients who are urgently dyspnoeic, blue, and dropsical, are sometimes relieved to an astonishing extent by venesection, a procedure which seems to give cardiac tones a better chance of helping the patient, as well as affording direct relief. Leeching may have a similar effect. The value of opium in giving the patient rest may also be mentioned.

The outlook in mitral stenosis is discovered, therefore, by assessing its effects on the functions of the rest of the circulatory apparatus, especially the left auricle and the lesser circulation.

**Aortic Regurgitation** is the outcome of several morbid processes, which may act together but much more often operate singly. The prognosis varies widely according to the causation. This is chiefly because different causes affect the myocardium in varying degrees. Syphilis injures it profoundly and progressively; arteriosclerosis as progressively, but less profoundly and rapidly; rheumatism attacks the myocardium severely, but for the most part its effects are transient, though liable to repetition. The prognosis in any given case exhibiting the signs and symptoms of aortic regurgitation depends also on the degree to which the valves are injured, and the extent of the secondary effects of these injuries on the general efficiency of the circulatory apparatus.

In the syphilitic cases the expectation of life from the onset of symptoms is about five years, if we exclude cases in which syphilitic infection of the aorta has led to the formation of an aneurysm as well as to valvular disease. In cases of the latter type the prognosis is even worse.

In the rheumatic cases the prognosis is much better. This is not seen so well in mere averages of duration of life after onset of symptoms and the like, as in a consideration of a few typical cases. Out of a group of seven fatal cases seen by the writer in recent years, the youngest died at 43 in an acute attack of endocarditis, in which the aortic lesions had little or no effect in bringing about the fatal issue; while the oldest was a man of 45, whose ventricular contractility had been failing for years. Of the rest, two died at 49 and 29 respectively, in what seemed to be an acute phase of rheumatic endocarditis; two others at 35 and 37 of ventricular failure, and the fifth at 29 of malignant endocarditis engrafted on the old valvular lesion. Thus the various

Rheumatic disease of the aortic valves are exemplified: acute myocarditis by recurrence of the acute infective process, congestive ventricular failure, and ulcerative endocarditis. This third course is much less often encountered than the other two, so that those who are fortunate enough to escape at last from the years in which the rheumatic infection is active, and who are also able in later years to avoid ventricular overstrain, may look forward to a probability of long life. To quote examples, the writer has under his personal care a man of 44 whose rheumatic aortic lesion led to an almost complete breakdown seven years ago; warned by this, he exchanged a strenuous occupation for a lighter one, and is at present good for some years as far as one can judge. The writer also knows two members of the profession who live active and responsible lives in spite of rheumatic incompetence borne in each case for a number of years.

A third ill-defined group consists of those cases in which the aortic incompetence is one aspect of a cardio-sclerotic process of the simple or fibrous type. When the syphilitic factor has been rigorously excluded, this class is probably a small one, and no statistics are available. Experience shows, however, that the course is slower than in syphilitic cases, but more rapid than the rheumatic ones that have passed into the fourth and fifth decades.

Turning to the clinical features of each individual case, we must find out, first, how badly the valves leak, and secondly, how well the heart bears its abnormal burden. As to the extent of valvular injury, the most important physical signs are of less value than those which point to the effects of the leak on the peripheral circulation. The loudness of the regurgitant murmur and the extent of the area over which it is heard tells us nothing as to the degree to which the valve is rendered incompetent; except in this indirect way, that if the bruit be heard loudest just above the aortic cartilage there is most likely some dilatation of the aorta, and the prognosis is worse, since dilatation of the aorta belongs to the cases that are syphilitic in origin or severe in degree. The effect of the leak on the peripheral circulation is best measured by measuring the pulse-pressure—i.e., the difference between the systolic and the diastolic pressure. For the sake of accuracy it is well to compare this with the sphygmomanometer in every case; but even when this is not immediately feasible, a rough estimate of the circulatory disability may be arrived at by noting the amount of visible capillary pulsation, and especially the amount of visible capillary pulsation. The greater the swing between maximal (systolic) and minimal (diastolic) pressures of the peripheral vessels, the greater the amount of reflux and the worse the prognosis. A similar conclusion is to be drawn from the presence of any of those symptoms (headache, dizziness, nose-bleeds, visual disturbances, etc.) that indicate mistenderness in the supply of blood to the systemic organs; the more marked these are, the worse is the leak and the graver the prognosis.

Even more important than the state of the peripheral circulation, however, is the condition of the myocardium. How far is it able to

meet this very direct and very considerable task that is thrust upon it? Here a knowledge of the etiology is indispensable, and it is especially important to ascertain whether or not there is a syphilitic factor. A search for evidences of cerebrospinal syphilis, and an examination of the blood by the Wassermann method, should not be forgotten here. The discovery of the syphilitic factor makes the prognosis worse, because it implies an attack on the myocardium by a progressive and practically invincible process. If the case be one of rheumatic disease of the aortic valves, the most serious risk to which the myocardium is exposed is that of re-invasion by the rheumatic process: this danger becomes less with advancing years, and after the age of thirty it is remote. Of the cardiosclerotic cases nothing need be said, but that the same morbid process that has led to calcification of the aortic valves is sure to interfere more or less with the nutrition of the cardiac wall, and to do so, though slowly, yet progressively.

Not only etiology, but also symptomatology, come under review in finding out what chance the left ventricle has of coping with the extra burden thrown on it by the failure of the aortic valves. In this form of valvular disease the danger-signals to be anticipated are those phenomena that point to exhaustion of ventricular contractility. There are three factors at work, the combined efforts of which are sure to undermine the efficiency of the ventricular contractions in the long run: the myocardial lesions of the causal disease, which have just been discussed: the persistent overstress to which the ventricle is exposed by the valvular leak: and interference with the myocardial nutrition by the disturbance in the peripheral blood-supply, which tells on this as on every other systemic tissue. Failure of contractility is therefore probable in all cases except those in which the first of these factors, the etiological one, has done its worst in early life and become inoperative later—i.e., in the rheumatic cases. It is for this reason that cardiac pain, dyspnoea, and oedema—all of them evidences of failing contractile force—are of more significance than any physical signs in aortic disease of long standing. For the same reason the alternating pulse is a very grave sign in such cases. Among the physical signs, those which point to progressive increase in the size of the ventricle, and loss of strength in the first sound at the apex, are of most significance. Anything suggestive of gross myocardial change (coronary thrombosis or embolism, rupture of the heart, formation of a cardiac aneurysm) is of course of almost immediately fatal import. Rupture of a valve, on the other hand, though it adds at once to the patient's discomforts and disabilities, does not by any means always kill at once. The writer has recently seen two cases, in the one of which the man was alive and at work till about seven years after the rupture seems to have occurred, while in the other a year had elapsed and the patient was still working. The opening which a sclerosed valve offers to the various organisms capable of setting up an ulcerative endocarditis needs not to be enlarged upon: the supervention of septicæmic symptoms in a case of chronic disease of the aortic cusps will

only suggest the appropriate diagnosis and prognosis (*see* ENDOGENOUS VEGETATION). The possibility of other lethal lesions should not be overlooked, especially in the syphilitic cases (aneurysm, cerebral syphilis).

The liability to sudden death of persons carrying a leaking aortic valve is almost proverbial. Indeed, this risk has been rather over-emphasized. Yet when we consider the double attack to which the individual is exposed in this form of valvular disease—the direct injury to the myocardium that is inflicted by that which causes the valvular disease, and the less direct effects of overstrain resulting from the incompetence of the valve—it is not to be wondered at that this should be, among all others, that lesion which best and oftenest exemplifies the disastrous effects of exhausted ventricular contractility. In the syphilitic cases, if those which are terminated by rupture of an aneurysm be excluded, death comes suddenly in nearly 40 per cent; in the rheumatic cases, the writer had only two out of ten fatalities that could by any means be called sudden. Syphilis is more likely to cause sudden death than rheumatism, because of its more enduring and progressive interference with the nutrition of the myocardium. In many of the cases that end with unexpected abruptness, this atrophic might have been foreseen and possibly averted if more weight had been given to the symptoms of failing contractility that are present.

As for the effect of treatment, the results of antisyphilitic measures are of brief comment. No immediate and complete cures of aortic valvular disease can yet be placed to the credit of salvarsan; and as it is generally acknowledged that in the presence of cardiac disease the use of this medicament is not entirely free from risk, it is best to rely on mercury and iodide, the prolonged use of which (and especially the latter) does indubitably ameliorate symptoms, as much, no doubt, by its action on the myocardium as by any effect on the valvular lesion. In the rheumatic cases the establishment of a quiet way of life is amply justified by its results.

Complete cure is excessively unlikely, but it does occasionally come about. Signs disappear, and symptoms also. Possibly in such cases contraction of the aortic ring has played an important part in rendering the valve incompetent, and its recovery of tone has restored its functional integrity to the valve. It is so unlikely and so unforeseeable that it cannot be looked for with any confidence, but the fact that it may occur, if it be borne in mind, will serve to colour one's view of the disease.

Lastly, it should be recollected that, despite its dangerous nature, and the variety of ways in which it may end life, the possession of an incompetent aortic valve is not incompatible with a long life. The writer has already given instances of this, and there are other remarkable examples scattered through the literature; one, for instance, in which a man, known at 13 to have aortic valvular disease, was carried off with comparative comfort and freedom from symptoms at 66.

**Aortic Stenosis** presents three classes of cases to be considered. The first consists of those patients in whom the obstruction appears to develop slowly, the symptoms being first noticed at or about the age of 30, without obvious cause, apart from rheumatism in a few cases, and without accompanying signs of aortic regurgitation. This is a small group of cases, and the prognosis is nearly always bad: the patient rarely passes the age of 40. In a second group, the patient has already distinct evidences of aortic incompetence, when the signs of aortic obstruction become superadded. The result is a modification of the peripheral phenomena: the pulse loses its collapsing character, and so on. The effect on the prognosis in such cases is not as bad as one might assume at first sight, for the peripheral effects of the obstruction neutralize those of the regurgitation to some extent. Often the patient is actually more comfortable for the change. It is only in cases of severe valvular change that this sequence is encountered, so that the regurgitation is generally free and the symptoms are pronounced. The mitigation of the symptoms, which ensues upon the supervention of stenosis, affords the patient real relief, and delivers his ventricle from over-distention in diastole, thus diminishing the load which has to be lifted by each systole: so that, for the time at least, the heart's work is eased. Of course, the ultimate prognosis is not good, but it is not so bad as in the first group. In the third group are collected those cases of stenosis developing slowly in persons of 50 or over, thanks to a gradual calcification of the aortic cusps. Here the morbid process is a very slow one, and though the coronary arteries may be damaged at the same time, the myocardium yields but slowly, and the patient may attain to old age.

In individual cases of aortic stenosis there are two things to be assessed—the degree of obstruction and the condition of the left ventricular myocardium. The former is determined by observation of the type of pulse rather than by the physical signs, though the pronouncement of the thrill and murmur must also be given some weight. The more characteristically flattened the pulse-wave, the worse for the patient. As for the state of the ventricular muscle, this is revealed by an examination of the functions: pain, dyspnoea, alternating pulse, and other evidences of failing contractility are ominous signs.

*Treatment* has little effect, even in the syphilitic cases.

**Combined Aortic and Mitral Valvular Disease** is encountered in two sets of cases. In the first the rheumatic inflammation which injured the one set of valves did the same by the other: in the second, ventricular dilatation, consequent on aortic insufficiency and diastolic overfilling, has stretched the mitral ring and made the valve incompetent. In the first class of case, the signs of mitral stenosis are added to indefinite evidences of aortic regurgitation: or it may be that the aortic lesion is pronounced and the mitral signs are vague: while in a few there are pronounced evidences of both. In any such case the gravity of the outlook is greater than in the presence of a single lesion, partly because the mechanical disabilities of the one lesion are added

those of the other, and partly because the presence of severe and widespread endocardial lesions in post-rheumatic heart disease argues the presence of diffuse and severe myocardial damage. In the second group of cases the supervention of mitral incompetence in an aortic stenosis is evidence of severe embarrassment of the left ventricle, and therefore of bad omen.

**Acquired Lesions of the Tricuspid Valve.** The prognosis in these lesions is based on the fact that they never occur alone.

*Tricuspid Incompetence* is so common that some writers regard it as one of the normal functions of the tricuspid apparatus to open out under stress and relieve a distended right ventricle by permitting a certain amount of back-flow into the distensible liver and venous system. Whether this is going rather far or not, evidence does not at present allow us to decide; but there are certain facts available. First, such diseases as mitral stenosis, cardiosclerosis, and chronic bronchitis with emphysema, diseases which encourage hyperemia and stasis in the blood-channels that course through the lungs, lead at last to persistent over-stretching of the right auriculo-ventricular communication and render its valvular apparatus permanently incompetent. Second, the clinical evidences of this persistent incompetence are mainly those of venous stasis in the systemic circulation—big veins in the neck, enlargement of the liver, diminution in the output of urine, dropsy, and so on. Third, the more pronounced and persistent these symptoms, the worse the outlook; partly because the condition of venous stasis thus perpetuated undermines the nutrition and efficiency of various vital tissues, the myocardium itself among them, but also because the presence of extreme and permanent tricuspid failure proves the existence of a proportionately severe hindrance to the drainage of the lesser circuit into the left heart. The presence or absence of a tricuspid systolic murmur makes little or no difference to prognosis, at any rate as compared with the significance of the symptoms mentioned. In the first place, it is not easy to decide whether or no the heart is tricuspid at all; in the second, the valve may be grossly incompetent without any murmur being audible.

*Tricuspid stenosis*, if acquired, is always the outcome of rheumatic endocarditis, and as such is little more than an unusual feature in a common type of case. The tricuspid curtains are found thickened and stiffened in a small percentage of cases of mitral stenosis coming to autopsy, but only in a very few of these that the presence of such a coincidence of lesions can be diagnosed. When the diagnosis can be made, the patient's prospects are a good deal worse than in an uncomplicated case of mitral stenosis. According to Newton Pitt's figures, the duration of symptoms does not usually exceed five years, and about half the cases fail to survive the age of 30. The liver pulsation, sufficiently developed to yield a clear three-wave phlebogram, which has by some been regarded as a sign of tricuspid obstruction, is sometimes encountered apart from this condition; but even so, it is a valuable proof of advanced engorgement of the right auricle, and as such is a bad sign.

**Acquired Pulmonary Lesions.** These are so rare that they may be quickly dismissed.

*Pulmonary Stenosis* is of course rarely diagnosed as an acquired lesion; it runs a short course, the length of which may best be gauged by observation of the state of the right ventricle. As in the corresponding congenital malformation, the patient is specially liable to contract, and die of, phthisis.

*Pulmonary Regurgitation*, due to inflammation of the pulmonary semilunar cusps, is a very rare lesion; the diagnosis is a bold one, but if it has been made it carries with it a bad prognosis. More common is that insufficiency of the pulmonary valves which may develop in advanced mitral stenosis as a result of the great rise of pressure in the pulmonary artery. It is extremely hard in many supposed cases of this condition to be sure that we are not dealing with that very frequent result of rheumatic carditis, aortic and mitral valvular disease combined; but if this can be excluded and the diagnosis of secondary pulmonary insufficiency substantiated, it may be regarded as a bad sign in a case of mitral stenosis. It proves the existence of a high degree of circulatory obstruction; and it also threatens overloading of the right ventricle. As a matter of fact, its prognostic importance is not as great as might be expected, for it is only in cases of mitral stenosis that are obviously advanced, that one ventures on a diagnosis of secondary pulmonary regurgitation.

The general principles of prognosis may be briefly re-stated.

1. The valvular lesion is but a part of the picture; it is the observer's duty to discover as far as possible the state of the *whole* heart, and of all the organs.

2. The outlook depends ultimately on the balance struck between valvular disability and myocardial capacity. To what extent is the latter capable of rising to the occasion?

3. This question is best answered, speaking generally, by an intelligent exploration of the symptoms, and a search for evidences of myocardial exhaustion.

4. It is particularly important to see what effect a period of rest has in restoring myocardial efficiency before giving an unqualified prognosis in an apparently bad case.

Carey F. Coombs.

**HEART, CONGENITAL MALFORMATIONS OF.** In forecasting the future of a child or young adult who has been found to suffer from a developmental fault of the heart, the questions that have to be answered are, *How long is he likely to live?* and *Is there any chance of a useful career for him?* It would be possible to answer these questions with considerably more precision and confidence if it were possible in every case to discover the actual nature of the malformation. Unfortunately, such detailed accuracy is out of reach in very many cases, so that one's prognosis is founded on a varying admixture of knowledge of the defect present and the average duration of life in

cases, with observation of the symptoms as indices of the extent to which the efficient working of the heart is threatened by the disorders imposed upon it by the errors in development.

**Average Expectation of Life in Various Defects.** The following table and figures are collected from the writings of Peacock, Mondeveault, and others.

The lesion which is most readily, and therefore most often, diagnosed is pulmonary stenosis. Patients have been known to reach a good old age with this defect, even after an active life. The writer recalls several such—a railway porter who at 23 was just beginning to be lame, a cook who at 37 showed her first signs of broken compensation, and a lady of over 40 who leads a fairly active life. One case is recorded in which the patient reached the age of 52. These, however, are the exceptions. The average age at death in pulmonary stenosis is 5 and in pulmonary atresia 3.

The co-existence of other lesions is a matter of some weight. Of 100 cases in which an autopsy has been made, 56 per cent of those in which there was no associated defect of other parts of the heart ended fatally within the first two decades of life; of those in which pulmonary stenosis was coincident with a defective auricular but a perfect ventricular septum, the percentage was almost the same; of those in which there was an associated defect of the ventricular but none of the auricular septum, only 9 per cent survived the age of 20; and of those in whom there were faults in both septa, none passed that age.

Patency of the foramen ovale, without other defect, is a common but unimportant fault, but it is rarely diagnosed, so that we are thus deprived of the pleasure we might otherwise enjoy of giving a favourable prognosis in the great majority of these cases. Patients with this fault have lived a normal life without knowing that there was anything wrong with them. The same is probably true of limited defects of the septum ventriculorum; and since this is more readily detected affords some small scope for the exercise of optimism, if one can be said that no other defect of a more serious nature co-exists. Even when the septal faults are extreme and the heart is three-chambered, a good life may be reached.

But the other defects, congenital atresia of the tricuspid valve is apparently incompatible with survival beyond the first year of life. Of 1000 cases in which a transposition of the great arterial trunks was found post mortem had passed the age of five. Patentcy of the ductus arteriosus, if uncomplicated by other deformities is compatible with the attainment of middle life and fair activity. Coarctation of the aorta may remain latent throughout a normal life being discovered only at the autopsy. Of the cases verified post mortem, 14 per cent passed the age of 50. The gross defects of post-natal origin, those in which the heart lies exposed owing to a thoracic defect, are incompatible with more than a few days of extra-uterine life, though one case is described in which life was apparently maintained for a few days by the expedient of oiling the heart every three hours.



## INDEX OF PROGNOSIS

Transposition of the heart, on the other hand, makes no difference whatever to the subject's expectation of life, and the heart may even lie within the abdomen, as in Deschamps' famous soldier, without being seriously incommoded.

**Significance of Symptoms.** There are two chief ways in which a malformation of the heart may be responsible for the patient's death: cardiac failure and intercurrent infections. The patient's liability to the former is directly dependent on the extent to which the cardiac defect embarrasses his systolic efficiency; and in cases where the fault is on the right side of the heart, as it is in the great majority, this may roughly be measured by the degree of interference with the oxygenation of the blood. Thus, the more cyanosed the patient is, the worse the prognosis; and the same generalization holds good for other evidences of imperfect aeration, such as clubbing of the fingers, dyspnoea, stunted growth, and polyexanthema.

Of the intercurrent infections to which these unfortunate persons are prone, the most important are malignant endocarditis and certain pulmonary infections (tuberculosis and bronchopneumonia). The malformed heart seems to offer a ready home for streptococci and other organisms concerned in the production of ulcers of the endocardium; and though there is some evidence that acute inflammatory lesions of the developmentally crippled heart may recover, it must be acknowledged that this is a very remote possibility. Consequently, anyone with a congenital heart lesion who presents the symptoms and signs of acute blood infection, with or without evidences of embolism, is in a bad way. The vulnerability to tuberculosis is greater in those patients who have survived the first decade; when contracted it runs a rapid course. The risk of this and the other pulmonary infections is of course increased if the patient's circumstances do not admit of his living a protected and sheltered life.

Among the causes of death in cases of congenital heart disease, the possible importance of associated malformation in other organs must not be quite lost sight of. One of the writer's patients had pulmonary stenosis and Mongolian idiosy, but death was apparently due to the toxic effects of a congenital dilatation of the colon.

Sudden death is not a very common event in congenital heart disease, but cases of all kinds may end thus. It is impossible to lay down any rule for the foretelling of such an event; and with a malady which is already so crippling to the patient's usefulness, it is probably better to say nothing about it. In patients with a patency of the interventricular septum and drainage of both ventricles by one arterial trunk, sudden attacks of dyspnoea and cyanosis are apt to cause great alarm; here it is possible to assure relatives that avoidance of the provocative factor (which is usually easy to discern) will ward off further attacks.

To sum up, the prognosis in congenital cardiac defect is arrived at by making a diagnosis of the actual condition present as far as possible, and by filling in the gaps by assessment of the degree of cardiac embarrassment as revealed by the symptoms.

Carey F. Coombs.

**HEART, WOUNDS OF.**—Until Rehn, of Frankfurt, in 1897, published his classical and successful case of suture of a wound of the heart the injury was regarded as mortal, and treatment was in the hands of God. To-day there are scores of recoveries on record. In England, where the promiscuous use of the knife as a means of settling scores is not so common as on the Continent, the published cases are very few, and the writer is only aware of one success (Somerville). No doubt the immense majority of cases of wound of the heart are closed within a few minutes, if not instantly, and this is especially true of stab-wounds. Even when this procedure, however, death may be delayed. In the very desk on which this is being written there lies a pistol used by a suicide to shoot himself through the ventricle (reported at autopsy): as this did not have the desired effect, he afterwards turned the weapon upon his temple, and died of a pistol-shot through the brain.

The cause of death in stab-wounds is not cardiac shock. The heart of animals and man will withstand extraordinary ill-usage. The cause is due to the mechanical obstruction of the diastole by effusion of blood into the pericardial sac. A heart which has almost or quite stopped beating has been restored by aspiration of the blood in the chest, and this should be borne in mind: dealing with patients apparently dead.

Turning to the records of operation, there are in the literature up to 1912 about 230 cases treated by suture, whereof 140 died and 90 recovered, a death-rate of 58.5 per cent. Probably the true death-rate is a little higher, some failures being likely to pass unreported.

Success depends upon several factors.

1. It is essential, of course, that operation should be very prompt.
2. The mode of obtaining access is important. A flap with the incision external is less likely to cause fatal double pneumothorax than one with the incision internal. The stab-wound has usually opened one chamber already.

Wounds of the auricle appear to be less dangerous than wounds of the ventricle. In Peck's series, the results were as follows:

#### MORTALITY IN WOUNDS OF HEART.

Location	Cases	Died	Recovered	Per cent.
Auricles	11	4	35	
Left ventricle	74	45	61	
Right ventricle	69	48	70	

Death usually occurs on the table, or shortly afterwards; but some cases have developed aneurysm (nine on record) or leakage of the suture line; and suppuration has been responsible for some deaths, especially if the pericardial sac was drained.

REFERENCES: Peck, *Ann. Surg.* 1909, 1, 101; Pool, *Ibid.* 1912, iv, 485.

A. Rendle Short.

**HERNIA.** Common as this disease is, it is extraordinary how difficult it is to find reliable reports in the literature as to the end-results of different methods of treatment, in an adequate number of cases. This is particularly true with reference to femoral and umbilical hernia, where a prolonged search of the surgical records of many countries has been almost barren of result.

**The Spontaneous Cure of Hernia.** In young children, up to the age of four years, it is undoubtedly possible to cure some cases, probably only a minority, by the use of a truss. If this is to be efficient, the hernia must never be allowed to come down, or all the benefit previously obtained is lost. What usually happens, no doubt, is that the sac becomes very narrow, and it may well be that heavy straining in adult life would reopen it. On this point we lack evidence. But it is quite certain that occasionally the neck of the sac may be obliterated. This has been verified by subsequent operation in one or two cases. In older children or adults, cure of hernia by means other than an operation is so rare as to be practically negligible.

Femoral hernia in infants is seldom cured by a truss.

The great majority of cases of umbilical hernia in infants disappear after a year or so, if a pad and bandage is worn. We do not know if they ever come back again in middle life.

**The Danger of Strangulation.** It is very difficult to estimate the frequency with which a hernia becomes strangulated. Macready puts it at 1.6 per cent. The proportion of cases of strangulated to those of reducible inguinal hernia seen at a hospital is perhaps about 1 in 20; it is mere conjecture what proportion of the herniated members of the community who depend upon hospitals for surgery present themselves at those institutions for examination, but probably nowadays it is from a quarter to a half, which agrees pretty well with Macready's opinion. Femoral and umbilical hernias become, in proportion, much more frequently strangulated.

The risks of strangulation in persons who neglect treatment year after year, and neither have an operation nor wear a truss, must be much higher than 1.6 per cent, because this diminishing class furnishes the majority of the strangulation cases. It is a mere guess, but such a patient's prospects of calamity are probably 30 to 50 per cent in the long run, especially in the femoral and umbilical varieties.

**The Results of Operation.** We shall have to consider: (1) *The operation mortality*; (2) *The prospects of cure or relapse.*

1. *The Operation Mortality.* This is, of course, very low nowadays. A few years back it was by no means inconsiderable; in four London hospitals in 1890 it was as high as 6 per cent. To-day, however, it is only from 0.25 to 0.5 per cent in adults, and a little higher in infants (Bull and Coley). Bremner, of Vienna (1906), quotes 2000 cases with 5 deaths (0.25 per cent). Pott's enormous figures, running into thousands, for the years 1895 to 1903, show: inguinal hernia, 0.7 per cent died; femoral hernia, 0.5 per cent died; ventral hernia, 1.1 per cent died.

Fatalities are due to sepsis, pneumonia, anæsthetic calamities, and rarely extraneous occurrences. Thus, the writer lost a patient who developed typhoid fever; four or five instances are known in which the femoral vessels have been injured, and some of these have been fatal; deaths have resulted from wounding the bladder in the sac, its presence not having been recognized by the operator. The writer has also heard of unreported cases in which fatal intestinal obstruction followed, due in one instance to imprisonment of a loop of bowel by the inverted sac in Kecher's operation, and in another to the intestine becoming entangled in adhesions about a diligree.

#### 2. *The Prospects of Cure after Operation.*

*Inguinal Hernia.* The introduction of the Bassini method has greatly improved the results in adults. The older methods gave as high a proportion of relapses as 30 to 40 per cent (Bull and Coley), simple ligation of the sac, without shutting up the external oblique, in adults, was followed by recurrence in nearly 30 per cent of the cases (Pott). In children, however, it is almost always successful; Keck had no failures in 52 cases.

#### CURES AFTER VARIOUS OPERATIONS FOR HERNIA.

Author	BASSINI		KECKER		POTT	
	Cases	Cures	Cases	Cures	Cases	Cures
Keck	52	50	52	50	—	—
Keck and Keck	183	196	—	—	—	—
Keck and Keck	847	92	—	—	—	—
Keck and Keck	—	—	143	93	—	—
Keck and Keck	—	—	43	97.9	—	—
Keck and Keck	—	—	—	—	27	88
Keck and Keck	—	—	—	—	—	—

11 cases, 73 per cent cured.

The Bassini operation gives much better results. Pott's huge collection of German figures, published in 1903, shows about 40 per cent of recurrences, but other results are much more favourable. Simmons gives the statistics for 1905 for Massachusetts Hospital, 100 cases being examined in 1909; in 113 cases followed, there were 7.07 per cent of relapses. Dreesman, 1913, quotes only 2.7 per cent of 403 operations. Bull and Coley quote less than 1 per cent, but a large number of their patients were children. The true figure, nowadays, is probably about 1 in 20. If relapse is going to occur, it usually happens in the first year.

Kecker's operation gives equally good results, according to Pott's statistics.

*Femoral Hernia.* According to Bull and Coley, there were no relapses in 125 cases of operation for femoral hernia, but this merely

means that no patients returned to them; they did not examine, or hear from, those alleged to be cured. Pott's figures are by no means flattering to surgery: of 158 cases operated on before 1803, without closure of the ring, more than a third recurred; and when the ring was sutured, nearly 30 per cent relapsed. At the Bristol Royal Infirmary, of 44 cases treated by various methods, 30 were well from eighteen months to four years afterwards, and 14 had relapsed, that is, 27 per cent.

Making use of the new method of closing the ring above Poupart's ligament, C. A. Morton found 7 cases free from recurrence, and Fagge had 3 failures after 48 operations.

*c. Umbilical or Incisional Hernia.* The results in these cases appear to be less satisfactory than in either of the others, and failures are often seen in English hospital practice after operations by the older methods. Of 86 cases followed through by Pott, 51·7 per cent were cured, but nearly half relapsed. Capelle's figures for 35 cases are rather better. Probably the newer methods, the filigree operation and the transverse line of suturing, will show improvement on these results. At the Bristol Royal Infirmary, of 9 cases of umbilical hernia followed eighteen months to four years, 5 were cured and 4 relapsed.

REFERENCES.—Pott, *Deut. Zeit. f. Chir.*, 1903, lxx; Bill and Coley, *Jour. Amer. Med. Assoc.*, 1907, xlix, 1017; Kellock, *Proc. Roy. Soc. Med. (Surg. Sect.)*, 1912, pt. iii., 26; Simmonds, *Boston Med. and Surg. Jour.*, 1910, cxlii, 847; Capelle, *Beitr. z. Klin. Chir.*, 1909, lxxii, 264; Fagge, *Proc. Roy. Soc. Med.*, 1911 (*Surg. Sect.*), 165.

A. Rendle Short.

**HERNIA, STRANGULATED.** If we use the term in its strict sense, excluding cases in which the herniated loop of bowel is merely obstructed by feces, strangulated hernia, apart from treatment, is practically a death warrant. It would be impossible nowadays to obtain figures showing in how many patients the hernia would discharge its contents through the skin, and so save life at the expense of a local fistula. In the great majority of cases in which this happens, death nevertheless supervenes, and until this release occurs the patient's condition is most pitiable, on account of burrowing abscesses and very violent and extensive dermatitis set up by the irritation of the contents of the small intestine. The percentage of spontaneous cures in cases of strangulated hernia is said to be about 2 per cent (Coley, in *Keen's Surgery*).

**Gangrene of the Gut.**—The occurrence of this complication depends upon three factors: the tightness of the constriction, the length of time that the hernia has been strangulated, and the situation. Of these, the first is the most important. In a series observed during five years at St. Thomas's Hospital, Corner found gangrene in 4 per cent of the inguinal, 10 per cent of the femoral, and 25 per cent of the umbilical cases of strangulated hernia. Usually it takes about three days to develop; there are, however, very many recorded instances in which gangrene has supervened in a day. Out of 119

cases of strangulated hernia at the Bristol Royal Infirmary, 2 had become gangrenous in less than twenty-four hours, and 1 in less than twelve hours; there is a case in the literature which gangrened in four hours. Of course, gangrene makes the prognosis as to life much worse.

**Duration of Life and Cause of Death.**—Apart from operation, the average duration of life, according to old figures supplied by Maerckx, is about seven to ten days. It may be much shorter; there are many recorded instances of a fatal issue within twenty-four hours, and many have been known to die within a couple of hours.

The cause of death is usually peritonitis; next to this, profound œdœma. Others die of various lung complications, either from aspiration of foul vomit, or from embolic pyæmia.

**Treatment by Taxis.**—In the days of pre-antiseptic surgery, prolonged and vigorous taxis was employed in almost all cases. Of course it frequently failed, and recovery by no means always took place even when it succeeded in reducing the hernia. Thus, according to Erichhoffer (1860), of 300 cases of strangulated femoral hernia reduced by taxis, 149 per cent died, and of 518 cases of strangulated umbilical hernia, 78 per cent died. The deaths were due to retraction of gangrenous gut, rupture of the gut, *reduction en masse* (or reduction of another sort), pre-existing peritonitis, or paralysis of the bowel.

Nowadays, taxis is only employed with gentleness, and for a few minutes, in early cases; in late cases, it is usually possible to tell almost immediately by the feel that taxis would be hopeless.

In young children, the writer has had considerable success in getting back a hernia strangulated less than twelve hours by tying the child up in an inverted position and giving chloral. This is often valuable, as it allows an immediate operation to be converted into a deliberate one.

Used only in early cases, for a short time, and with a light hand, taxis is not likely to cause any damage, and if the bowel can be returned the patient will almost certainly get well. I have seen it cause bloody diarrhoea follow. Of 24 cases reduced by taxis at the Bristol Royal Infirmary since 1900, every one recovered. If the patient is reasonably fit it is better to operate so as to cure the hernia.

**Treatment by Operation.**—One of the oldest of surgical operations, herniotomy for strangulated hernia has improved immensely in its results of late years.

Between 1836 and 1841, of 183 herniotomies in Paris, 62·2 per cent died. Between 1869 and 1888, of 283 herniotomies for strangulated umbilical hernia in four London hospitals, 59 per cent died.

At the present time, the results may be gathered from the table on the next page.

It will be observed that the mortality for inguinal and femoral hernia is approximately the same, a little under 20 per cent; that umbilical hernia is decidedly worse, and that in the majority of crural hernias the patients die.

## RESULTS OF OPERATION FOR STRANGULATED HERNIA.

Hospital	C. Moore		J. Moore		C. Moore		C. Moore	
	Cases	Died	Cases	Died	Cases	Died	Cases	Died
St. Thomas's, <sup>1</sup> 1907 to 1911	111	21	103	24	30	11	2	0
Middlesex, <sup>2</sup> 1907 to 1911	37	8	29	3	11	2	3	3
Bristol Royal Infirmary, 1900 to 1912	119	22	96	14	11	2	0	
Total	267	51	228	41	52	18	34.5	5 3 60

This agrees well with the experience of seven German writers quoted by Meyer<sup>3</sup>: out of 1129 cases of various hernia strangulated, 20.7 per cent died; in 56 cases of obturator hernia, Meyer reports 32 deaths, that is, 57 per cent. At the present time I feel sure that the mortality of strangulated inguinal and femoral hernia is less than 20 per cent, because patients are sent up sooner.

We have next to consider the results of operation under certain special conditions.

*The Age of the Patient.*—All writers agree that the prognosis is much more grave in elderly persons. Children usually do well. According to Collins,<sup>4</sup> the mortality in 1902 was 23 per cent, but it is now 3 to 10 per cent, given early interference. Of 12 cases in infants under two years of age treated by operation at the Bristol Royal Infirmary, every one recovered.

*The Time of Operation.*—It is no doubt true, in the main, that good results depend on early operation. M. Creedy<sup>5</sup> calculates from 129 cases:—

Operation within 24 hours	-	-	12.5	per cent died
.. 24-48 ..	-	-	26.1	.. ..
.. 48-72 ..	-	-	36.3	.. ..
.. after 72 ..	-	-	44	.. ..

It is a remarkable fact, however, in the figures of the Bristol Royal Infirmary, that the correspondence is by no means so close as might have been expected. After three or more days of strangulation, 55 cases (25 inguinal, 30 femoral) were operated on; of these, 3 died, that is, 6 per cent, positively less than in those operated on early! It would be most calamitous, of course, to use this as an argument for delay. The truth is that cases with marked symptoms are likely to obtain help and get treated early, whereas there is a type of strangulation which comes on more quietly and is not so rapidly fatal.

The best results were obtained by operation within twenty-four

Of 88 such cases at the Bristol Royal Infirmary (femoral and inguinal), only 7 died, that is, 8 per cent, instead of the general average of only 20 per cent. Of these 7 cases, some showed gangrenous gut, and some were very aged.

*The Various Methods of dealing with Gangrenous Gut.*—When gangrenous gut is found at operation, two courses are open. We may either resect the loop, including any dilated paralyzed coils on its proximal side, or we may content ourselves with making an artificial anus. From a study of the literature and hospital records, Hesse<sup>2</sup> gives the results as follows:

Operation	Cases	Cured	Died
Artificial anus	604	431	173
Resection of loop	860	382	478

It must not be concluded from these figures, however, that resection is invariably the best treatment. No doubt the higher mortality is partly due to the fact that the very worst cases were treated by making an artificial anus. Like all literature figures, the results are probably given in an unduly favourable light, owing to the publication of successes and suppression of failures.

Of 50 cases recently seen at St. Thomas's Hospital:

18	were treated by resection;	8 cured, 10 died.
10	..	enterostomy; 1 cured, 9 died.
2	..	invagination; 2 cured, 0 died.

**Prognosis in Individual Cases.** *Before operation,* the principal factors to an accurate prognosis are the age of the patient, the degree of collapse, and especially the frequency and nature of the vomit. If the latter consists of foul jejunal contents, the outlook is grave; if it is definitely faecal in odour, the patient is usually doomed. The presence of peritonitis makes an almost hopeless prognosis; so does the occurrence of rupture with sudden cessation of the pain.

*After operation,* a Richter's hernia makes for a rather worse prognosis; and, of course, the presence of gangrene is very ominous. Meyer reports 252 German cases in which gangrene was found; the death-rate in various statistics was from 50 to 85 per cent.

*After operation,* persistent vomiting is a grave sign; it may mean paralysis of the gut. Sometimes washing out the stomach may give some relief if the vomiting is only due to jejunal contents therein. Purgative extract, physostigmine, salines, or croton oil may overcome the paralysis of the loop of bowel.

As already stated, strangulated umbilical hernia is worse than femoral or inguinal, partly because the patient is likely to be old, fat, and cachectic, and also because there is a tendency to consider it merely obstructed, and so to delay treatment. Strangulated inguinal hernia is dangerous because it is often diagnosed late.

REFERENCES. <sup>1</sup>St. Thomas's Hosp. Rep.; <sup>2</sup>Middlesex Hosp. Rep.; <sup>3</sup>Meyer, *Ann. Chir. Chir.*, 1914, ciii, 497; <sup>4</sup>Collins, *Ann. Surg.*, 1913, lvi, 188; <sup>5</sup>Wright, *Treatise on Ruptures*; <sup>6</sup>Hesse, *Beit. z. klin. Chir.*, 1907, iv, 1; <sup>7</sup>*Lancet*, 1908, i, 1692.



**HIGH TENSION, ARTERIAL.** (See ARTERIAL TENSION, HIGH.)

**HIP, CONGENITAL DISLOCATION OF.** Apart from surgical interference the outlook in this deformity is not favourable. Natural cure appears to be unknown, although there are a few records of improvement in patients with partial dislocation or subluxation. In ordinary, the lameness, shortening, and difficulty in walking increase rapidly during the years of growth, and even those children in whom the deformity is at first scarcely noticeable are eventually seriously crippled. In bilateral cases a good deal of spasm often develops, and the patient may become a chronic invalid.

We shall have to consider the results of two methods of treatment: (1) *The open operation*; and (2) *The 'bloodless' reduction by Lorenz's method*.

1. **The Open Operation.** This is seldom performed now, though favoured by Birkhard. There has been a considerable mortality, and it is apt to cripple the muscles a good deal. Tubby has performed it 10 times: 4 gave a good result, and 6 relapsed.

2. **The Lorenz Operation.** This operation is only suitable within narrow age-limits, from three years old up to eight in bilateral, or ten in unilateral, cases. The risks are small. There is almost no mortality, 1 death in 1235 cases, according to Deutschlander—that is, about 0.3 per cent. Occasionally the femur may be fractured; R. Jones mentions that he has seen this happen 4 times in 38 cases, and in the records of five Continental surgeons it appears 35 times in 856 cases (4 per cent). A transient paralysis sometimes follows the manipulation—23 times in 755 French and German cases (3 per cent)—but it soon clears up.

The results obtained are almost always an improvement on the previous condition, and often terminate in a more or less perfect cure, but usually there is some slight deviation from the normal, such as a tendency to abduction. Putting the femur in place undoubtedly makes it grow; Joachimstal used to reduce one leg at a time in bilateral cases, and found that the leg first replaced became longer than its fellow.

It is difficult to tabulate the success of the operation, because writers classify their results so differently. Lorenz, dealing with 572 cases, claims a cure in 63 per cent; his unilateral cases gave slightly better results. Hodta gives only 30 per cent of 250 unilateral cases as showing real anatomical restoration, and only 7 per cent in 65 bilateral cases. Out of 49 treated by Nauth, 18 gave an ideal result, 12 very good, 16 good, and 3 medium or bad. Stern quotes 2593 cases from the literature, with the following results: 4 per cent ideal anatomically and functionally; 7 per cent ideal functionally; 40 per cent good; 12 per cent poor.

All the figures given are previous to 1905; there has been some improvement in technique since that date.

We may conclude that in careful hands, accustomed to the method,

but that give a thoroughly good, almost ideal, result, and that about 10 per cent is a failure.

REFERENCES.—Tubby, *Difficulties, including Diseases of Bones and Joints*, 87th, New York Med. Rev., 1906.  
A. Rendle Short.

**HIP, TUBERCULOUS.**—(See ARTHRITIS, TUBERCULOUS.)

**HODGKIN'S DISEASE.**—(See LYMPHADENOMA.)

**HYDATID DISEASE.** Hydatid disease of the liver and other organs in the upper abdomen will here be considered.

**Prognosis apart from Treatment.**—The condition may last for 20 years without giving rise to trouble; Rolleston mentions a patient who had been tapped for hydatid twenty years before, and whom the cyst had recurred. But a hydatid large enough to be tapped is always a source of danger to the host, the principal risks being rupture and suppuration.

*Rupture* may be sudden, or a gradual leakage. Sudden rupture is the most fatal. According to Cyr: from rupture into the peritoneal cavity, 90 per cent die; into the pleural cavity, 80 per cent; bile-ducts, 70 per cent; bronchi, 57 per cent; stomach, 40 per cent; testicles, 15 per cent; on the surface, 3 per cent. Occasionally the cyst may burst into the pericardium or inferior vena cava; these are usually fatal accidents. If leakage takes place into the peritoneal cavity, an immense number of hydatids may keep on growing in the abdomen and pelvis. The writer has seen a patient whose abdomen had to be opened again and again for obstruction and pelvic pressure. *Suppuration* produces a large abscess of the liver which, apart from treatment, is likely to be fatal.

**Results of Treatment.** The principal methods of treatment are aspiration and by enucleation of the cyst.

*Aspiration* has the advantage of simplicity, but not of safety. Leakage through the puncture may follow and give rise to peritonitis or to dissemination, and there are cases on record where fatal hemorrhage has resulted. Although this treatment is often successful, the parasite is not always killed, and may grow again.

*Enucleation* is both more certain and less risky. It is well to inject the cavity of the hydatid with a little corrosive sublimate solution to kill the scolices and prevent dissemination if any fluid is spilled.

Both after aspiration and after enucleation, but especially the former, curious symptoms, called by the French 'intoxication hydatidique,' may be met with. In the milder cases there is no more than an attack of urticaria. In severe cases, which are however very rare, there may be collapse, convulsions, dyspnoea, and death within a few hours, without urticaria. Inasmuch as this result has been met with even when it is certain that very little of the fluid could have been spilled, it is probably a variety of anaphylaxis.

REFERENCES.—Rolleston, *Diseases of the Liver, Gall bladder, and Bile ducts*, 1902, 110; Deye, *Rev. de Chir.*, 1911, 513.

A. Rendle Short.

**HYDRONEPHROSIS.** Prognosis in regard to life in hydronephrosis depends on the following factors: (1) *The nature of the obstruction*; (2) *The condition of the second kidney*; (3) *The presence of complications*; (4) *The success of operative measures.*

1. **The Nature of the Obstruction.** Hydronephrosis may be due to malignant disease of the bladder or other pelvic organ. In such cases the dilatation of the kidney is moderate in degree, and there is rarely the development of a large abdominal swelling. The obstruction is, however, bilateral, and on that account, as will be seen later, the prognosis is grave. The chief factor governing the prognosis is, however, the malignancy of the growth causing the obstruction. The growth in such cases is extensive, and from the point of view of radical cure is inoperable. The condition develops most frequently in malignant disease of the bladder, causing obstruction to the ureteral orifices. It is seldom that this stage is reached without sepsis being superadded, and pyonephrosis results. In malignant growths of the pelvic organs, obstruction of the ureters takes place less frequently. It is surprising how the ureter may be surrounded by malignant growth and still remain pervious.

Congenital hydronephrosis is usually due to obstruction in the urethra, although occasionally no obstruction can be discovered. The resulting dilatation of the kidney is bilateral, and the prognosis is very grave, death taking place soon after birth in most cases. Occasionally congenital hydronephrosis is unilateral, but in these cases other congenital lesions are usually present, such as cleft palate, congenital atony of the colon, or other conditions, which contribute to a fatal result in early life.

2. **The Condition of the Second Kidney.**—This factor, which governs the prognosis in all diseases causing destruction of the kidney tissue, is especially important in hydronephrosis.

*a. Bilateral Hydronephrosis.* Of the various diseases which may affect the second kidney when one kidney is hydronephrotic, hydronephrosis is the most common; about two-thirds of the cases are bilateral. In 665 collected cases, Newman found 217 unilateral and 448 bilateral.

Bilateral hydronephrosis is a progressive and fatal disease. When the obstruction remains unrelieved, death takes place after a period which varies greatly, but which always extends to several years. The cause of death is destruction of kidney tissue and resulting uræmia. The picture presented by the patient is one of gradual failure of the renal function. There is progressive emaciation, listlessness, headache, thirst, loss of appetite, and in the later stages, vomiting with complete anorexia, and recurring attacks of uræmia. The temperature, apart from intercurrent infection, is subnormal throughout. In some cases of bilateral hydronephrosis, few symptoms are observed until the very latest stages. A patient may have two hydronephrotic kidneys which form large abnormal tumours easily recognized by the eye, and appearing at different times or simultaneously, and yet present

symptom of renal failure, and enjoy good, if not robust, health. It is, however, the certainty that the balance of renal secretion may easily be upset by a chill or other cause, and death takes place usually from uremia; or that, if the recurring obstruction remains unrelieved, slow progressive renal failure will eventually supervene. The prognosis in bilateral hydronephrosis depends also upon the cause. Congenital hydronephrosis, and hydronephrosis due to malignant growths in the pelvic organs, are, as already stated, beyond surgical aid, and are invariably fatal. Where the obstruction is removable, as in unilateral obstruction, stone, obstructing bands, vessels, valves, etc., the prognosis depends upon how far the destruction of renal tissues has been allowed to progress before operation; in other words, upon the ability of the medical attendant to make an early diagnosis. The results of operation will be referred to later.

*Other Diseases of the Second Kidney.* In 8 collected cases of pyelitis following operation upon a hydronephrotic kidney, the second kidney was hydronephrotic in 2, atrophic in 2, the seat of nephritis in 2, and there was no second kidney in 2 cases. The prognosis in all these cases, apart from any operation, is very grave, and the fatal issue cannot be long delayed.

#### **6. The Occurrence of Complications.**

*Infection.* The most common complication is infection of the hydronephrosis, and this has an important bearing on the form of operation, and on the ultimate result of the disease. A hydronephrosis is dangerous to life merely from the destruction of kidney tissue. If infection is added, this destruction takes place more rapidly and completely, and further, the danger of absorption from a large pus-containing cavity is superadded.

A very considerable proportion of cases of hydronephrosis eventually become infected. The entrance of bacteria may take place by way of the urethra and bladder after catheterization, but much more frequently the infection is hematogenous in origin. Whether infection takes place directly through the wall of the hydronephrosis from the colonizing and occasionally densely adherent bowel, is not certainly known. It appears likely that infection may take this route. It may be of a mild character, so that the contents of the dilated kidney are cloudy, and the deposit small in amount; such an infection does not endanger life from absorption, or militate against the success of plastic operations on the kidney. On the other hand, the infection may take a more active form, and the dilated kidney contain a large quantity of pus, while there are a high swinging temperature and other signs of toxemia. The prognosis in such a case is much more grave, death taking place in unrelieved cases from toxic absorption, or from this combined with uraemia. It is rarely possible to operate in such cases with the object of preserving the remaining kidney substance, and the choice lies between a palliative nephrotomy and nephrectomy.

*Rupture of Hydronephrosis.* This is by no means common, and almost invariably the result of injury, although this may occasionally

be of a trifling character. In children, rupture into the peritoneal cavity may take place, causing fatal peritonitis; in the adult the rupture is extraperitoneal, and may cause death from suppression of urine. Recovery may, however, follow prompt operation.

*c. Uremia.*—This is the last stage of hydronephrosis when the second kidney is absent, or so far diseased as to be incapable of performing the renal function.

**4. The Success of Operative Measures.** The success or failure of operation for the removal of obstruction in the urethra, bladder, or renal pelvis depends upon the nature of the obstruction.

Nephrotomy has been performed in congenital bilateral hydronephrosis, without averting a fatal result. It may be used as a preliminary to plastic operation on the kidney.

Nephropexy, nephrolithotomy, the removal of bands and of aberrant renal vessels, and plastic operations on the renal pelvis, its outlet, and the ureter, may be required.

The degree of success attending any of these operations depends upon the early diagnosis of hydronephrosis. It is now possible by means of pyelography to make a diagnosis before the kidney has reached such a size that enlargement can be detected on palpation of the abdomen. If this is done and the obstruction remedied, the kidney can be saved with little damage to its secreting substance.

In the later stage of hydronephrosis, when a palpable tumour can be detected in the abdomen, the kidney tissue is expanded and much destroyed. The removal of the obstruction does not restore the kidney to its normal state, and only saves what remains of the secreting substance. In the fully developed hydronephrosis, when the layer of kidney tissue is reduced to half an inch or less in thickness, the organ still retains a considerable degree of functional power. I have operated on both kidneys in a case of bilateral hydronephrosis, when each organ was reduced to a thin shell, and the patient is well and without renal symptoms four and a half years after the operation. There are cases of bilateral advanced hydronephrosis in which the patient has lived for many years, and there are other cases where a solitary kidney has been converted into a hydronephrotic sac, and yet carried on a renal function sufficient to maintain life.

Schledler collected 86 plastic operations with the following results:—

OPERATION	CASES	DIED	CURED
Section of valves	12	1	3
Uretero-pyeloplasty	18	1	4
Uretero-pyeloneostomy	19	2	6
Lateral anastomosis (ureter)	13	2	3
Plastic operation in renal pelvis	1	—	1
Pyeloplication	4	—	—
Orthopædic resection	8	1	—
Combined operations	11	—	—
	68	7	17

Nephrostomy, or incision and drainage of the sac, without any attempt to overcome the cause of the obstruction, is sometimes performed. It is said to have resulted, in from 30 to 45 per cent of cases, in the establishment of the flow of urine through the inciter and healing of the nephrostomy wound; in the remaining cases a fistula persisted. Primary nephrectomy is only indicated when the sac is very large, its wall so thin and fibrous that no renal tissue is present, and it can only be undertaken when it can be proved that a second kidney is present and efficient. Kummel performed nephrectomy on 35 cases of unilateral hydronephrosis, with 4 deaths, and the late results of the operation were uniformly good. *J. W. Thomson Walker*

**IDIOCY.** (*See MENTAL DISEASES.*)

**IMPERFORATE ANUS.**—(*See ANUS, IMPERFORATE.*)

**INFANTILE CONVULSIONS.**—Convulsive attacks, with symptoms more or less resembling those of epilepsy, may occur in infants of various ages. Here, as in all other diseases, the prognosis depends on the accuracy of diagnosis of the underlying cause.

In newly-born children, convulsions may occur immediately after birth, or within a few days. They are specially common after a prolonged and difficult labour, and first-born children are, therefore, more liable to such convulsions than later-born children. In these birth-convulsions, the convulsive movements, if limited to one side, are strongly suggestive of a cortical hæmorrhage, generally from rupture of meningeal veins. If such hæmorrhage be so severe as to produce structural changes in the cerebral cortex, the unilateral convulsions are likely to be followed by permanent hemiplegia, more or less profound. Bilateral cortical hæmorrhages, from the same causation, produce bilateral symptoms of the same kind, and are amongst the commonest causes of bilateral hemiplegia (diplegia). As birth-hæmorrhages are generally situated on the vertex, the cortical centres which are situated nearest to the middle line—i.e., the centres for the lower limbs—are most severely affected; hence the resulting hemiplegia or diplegia is usually most intense in the legs.

Other newly-born children suffer from convulsions which are apparently the result of excessive venosity, or other morbid condition, of the blood, without actual cortical hæmorrhage. Such children are diagnosed, and may be severely convulsed, but the convulsions do not show the same constant commencement on the same side; they vary in their mode of onset, starting sometimes on one side, sometimes on another. In such cases, the prognosis as to the absence of subsequent paralysis is better than in persistently unilateral convulsions.

Many cases of generalized convulsions occur later in infancy, independent of any evidence of difficult labour. Such cases are most commonly toxic in origin, e.g., during attacks of diarrhoea from dietetic faults. In these cases, if the gastro-intestinal irritation be treated

ly suitable food and intestinal antisepsis, the convulsions rapidly subside—nor do they tend to recur or to have any paralytic sequelæ.

Still later in infancy, at the age of eight or nine months, we meet with so-called 'bathing convulsions.' Doubtless the irritation of the first dentition is an exciting factor, but the predisposing and underlying cause is usually rickets. Convulsions in rickety children are generally bilateral. In severe cases, they may resemble an epileptic fit: in other cases, the symptoms are much less severe, consisting in sudden pallor of the face and lips, with fixation of the eyes, and sometimes transitory squint, the limbs and trunk meanwhile becoming rigid: in other cases again, clonic movements appear, especially in the face, hands, and feet. Whatever be the particular variety of symptoms present, they are always bilateral. Unilateral spasms generally indicate focal disease, and have a quite different prognosis.

The onset of any acute fever in an infant may be accompanied by convulsions: these are generalized and bilateral, and do not tend to recur after the temperature has become normal. Even in the absence of fever, conditions of temporary exanthema—e.g., during a paroxysm of whooping cough—may cause a generalized convulsive attack.

Convulsions of unilateral distribution, often associated with high temperature and delirium, indicate a localized cortical lesion of some sort, most commonly due to the virus of acute polo-encephalitis. If the morbid process destroys a portion of the motor cortex, it is followed by a corresponding permanent hemiplegia or monoplegia of the face, arm, or leg, as the case may be, such weakness varying in intensity from a slight paresis to a profound hemiplegia. Moreover, in this variety of infantile hemiplegia, there is a subsequent tendency to recurrent convulsions on the hemiplegic side of the body.

In the convulsions of meningitis—tuberculous, meningococcal, etc.—the prognosis is that of the underlying disease. In cases of this sort, examination of the cerebrospinal fluid will give us valuable diagnostic and prognostic indications. (See MENINGITIS.)

*Purves Stewart.*

#### INFANTILE DIARRHŒA.—(See DIARRHŒA, INFANTILE.)

**INFANTILE PARALYSIS.**—Polomyelitis anterior was formerly regarded as a disease *per se*, but recent observations have established the fact that it is but one variety of a widespread malady of infective origin, which attacks the central nervous system and its meninges, having a selective action upon the motor nerve cells. When the brain cortex is affected, we call the disease polo-encephalitis superior: when the motor nuclei in the bulb are attacked, we call it polo-encephalitis inferior: and when the anterior cornua of the spinal cord are affected, we term it polomyelitis anterior.

**Polio-encephalo-myelitis**, then, fore, is a febrile disease. It has an incubation period of six to eight days, and a febrile phase lasting about three or four. The muscular paralysis appears during the stage of pyrexia. If the cortical motor cells are affected (**polio-encephalitis**

superior) there are usually convulsions at the start; these subside, and may leave the child monoplegic, hemiplegic, or diplegic, according to the extent of permanent cortical destruction. If the cells of the spinal cord are mainly attacked (*poliomyelitis anterior*), there is a widespread flaccid paralysis of the trunk and limbs, varying in distribution in different cases, and corresponding to the extent of grey matter that is affected. The initial paralysis reaches its maximum in a few hours, and is always more widespread than the permanent minimum of muscular atrophy; for many of the nerve cells during the acute stage of the disease are merely affected by inflammatory and oedematous changes, and if there is nothing beyond an inflammatory oedema, there is a possibility that the cells may still recover. If, however, some of the nerve cells are actually destroyed by the inflammatory process, as is generally the case, the corresponding muscle fibres undergo permanent atrophy and paralysis.

It will be seen, from what we have said, that the prognosis of this disease differs according to the stage at which it comes under observation.

During the acute febrile stage, if there is no implication of the vital bullary centres, and the patient survives, the probabilities are that the paralysis will, in time, clear up to a certain extent. It is even possible that if the cells have been merely oedematous, and not actually destroyed, they may all recover, and the initial flaccid paralysis or paresis of the limbs or trunk clear up completely. This, however, is uncommon, and it is more usual to find that, whilst some muscles recover, other muscle-groups remain feeble and undergo wasting, indicating that destructive changes have occurred in the anterior cornual cells.

When the acute febrile stage has passed off, the question of the amount of permanent recovery arises. This question is best answered by a consideration of the electrical reactions of the affected muscles, especially the faradic reactions. We wait until ten days, at least, have elapsed from the onset of the paralysis, in order to allow time for any degenerative changes in the nerve cells and muscle fibres to be recognizable. After ten days or a fortnight, when some of the muscles have recovered voluntary power, whilst others are still flaccid and paralyzed, we proceed to examine these paralyzed muscles electrically. Those which still react to faradism will ultimately recover, those in which faradic excitability is lost will probably remain permanently paralyzed. Other muscles, again, show mere diminution in the response; these will recover to some extent. The recovery of those muscles which are recoverable will be hastened by assiduous manual massage and passive movements.

If the patient is already in the chronic stage by the time he comes under observation, we have now to deal with the relics of an antecedent disease. Presuming that all the surviving muscles have been brought to their maximum development by a preliminary course of suitable massage and electrical treatment lasting six months or longer, we



have to consider the prospects of preventing or diminishing deformities, and of enabling the patient to make some use of his paralyzed limb. This is largely a matter for the ingenuity of the orthopaedic expert. When the limb is flaccid and flail-like, the question of fixation of certain joints arises. This can sometimes be accomplished by arthrodesis; at other times by the application of a light splint, preferably made of celluloid. In other cases again, where the muscles on one aspect of a joint are paralyzed, whilst their antagonists are still active, translocation of the insertions of muscles or tendons from the healthy to the paralyzed aspect of the joint, together with division or lengthening of shortened tendons, may serve to restore a certain measure of useful mobility to a joint, and to correct deformities. Surgical measures, however, should not be thought of until the limb has had a previous thorough course of massage and passive movements for several months at least. It is astonishing how often a limb, which at first seemed hopelessly paralyzed, recovers part of its motor power, without the necessity for surgical interference. (*See also TUMORS.*)

*Purves Stewart.*

**INFERIOR VENA CAVA, WOUNDS OF.** The inferior vena cava is occasionally ruptured by contusion of the abdomen, and this is a cause of very rapid death. The writer has seen one such case. The effusion of blood was very small, but apparently the heart failed because it received an inadequate quantity.

The inferior vena cava has several times been torn in removing a right kidney. Albarran considers that the best treatment is to ligature it; he collects from the literature records of 5 cures and 2 deaths following this procedure.

*A. Rendle Short.*

**INFLUENZA.** The prognosis in influenza depends primarily on the violence of the organism, which varies greatly in different epidemics. Uncomplicated influenza is rarely dangerous to life. The mortality in the epidemic of 1889-1890 was in Munich 0.6 per cent, in Mecklenburg-Schwerin 1.2 per cent, in Leipzig 0.5 per cent, in the German army 0.1 per cent, in fifteen Swiss towns 0.1 per cent. These figures do not include cases of death from influenzal pneumonia; the mortality from this varies from 15 to 26 per cent.

The increase in the general mortality-rate during an epidemic of influenza is chiefly due to increased mortality from acute diseases of the respiratory organs, and to a rise in the death-rate of pulmonary tuberculosis. In the whole of Germany during the epidemic of 1889-1890, about 136,000 succumbed. Owing to the more malignant character of subsequent epidemics, both in England and Germany, the death-rates were higher. Thus, deaths from influenza in London from January to March, 1890, were 578; from May to July, 1891, 2401; from January to March, 1892, 2078.

The influenzal bacilli may remain for a long time in the sputum in phthisical cases, especially in patients with pulmonary cavitation.

as they generally disappear after a few days in a typical acute case arising in a previously healthy person.

In some cases the initial symptoms are extremely severe and sudden in onset. For example, the disease may be ushered in with convulsions, coma, severe vertigo, or even acute mental symptoms, and yet the patient may be well in a few days. As a rule, after an uncomplicated attack, the patient passes through a rapid convalescence; but in other cases, when the course of the illness has been apparently in all respects identical, convalescence is extremely long and tedious, owing to great debility, loss of energy both bodily and mental, insomnia, anorexia, and gastric disturbance.

Influenza is prone to relapse after a few days' interval, and not very frequently the relapse is much more serious than the original attack. Moreover, pulmonary trouble, which was at first absent, may now supervene.

With reference to the pulmonary form, in addition to the prognostic points common to any form of pneumonia, a guarded prognosis should be given even when the temperature has fallen to normal, as it is not unusual to have a second or even a third pneumonic attack following closely one on the other. A particularly fatal form is that of acute hyperemia of the lungs, associated with dyspnoea and cyanosis, sometimes with sanguineous sputum, but without pneumonic consolidation. Such patients very often die after a few days with cardiac oedema and tachycardia.

In some cases, resolution of the pneumonic lung may be delayed for weeks, sometimes even for months, after which the lung may become completely clear. It is well, therefore, not to be too premature in asserting that the patient is suffering from an indurative pneumonia, and that the lesion happens to be at the apex, that the patient is becoming tuberculous. On the other hand, an influenzal infection certainly does not infrequently pave the way for a tuberculous lesion. Former latent phthisis may become active, and healing foci break out afresh. Phthisical patients show a special predisposition to influenza, and influenzal patients to an increase of any tuberculous lesion present.

With reference to the prognosis of influenzal encephalitis, it is usual for the resulting paralysis to clear up entirely if the patient does not succumb to the severity of the attack. The prognosis is grave in cases, which generally occur in children, which assume all the characters of meningitis, including convulsions, headache, vomiting, coma, cervical rigidity, strabismus, mydriasis, inequality of pupils, grinding of teeth, tachycardia, and irregular respiration. According to some authors, the prognosis of influenzal epilepsy is decidedly better than in many other forms. The prognosis of uncomplicated influenzal psychosis is in a rule favourable, but it may last for weeks, or even months.

Influenza occasionally exerts its influence almost entirely on the heart, and when this occurs the outlook is very grave. There is a great tendency to syncope, the pulse is rapid, irregular, and feeble, with pallor and precordial distress, and sometimes sweating. When

recovery takes place, convalescence is extremely tedious as a rule, and is associated with prolonged disturbance of the heart's action; this is generally rapid and irregular, though sometimes bradycardia with intermittent action persists.

An attack of influenza influences patients suffering from diabetes very unfavourably, and they not infrequently die in coma. It may also lead to abortion in a pregnant woman, and in this way render the prognosis exceedingly grave if pneumonia is also present. In some rare cases, repeated rigors occur throughout the course of the illness. These may arise without the formation of pus, pneumonia, or obvious visceral changes, and although the prognosis must be guarded, owing to the severity of the cases, too gloomy an outlook should not be given.

*J. R. Charles.*

#### INSANITY. — (See MENTAL DISEASES.)

**INTESTINAL OBSTRUCTION.** — Under this heading we shall include cases of acute intestinal obstruction due to cancer, fecal impaction, bands, apertures, Meckel's diverticulum, and yodulus. Intussusception, strangulated hernia, and chronic obstruction due to cancer of the colon or rectum are dealt with in other articles.

The most essential element in the prognosis is to make a careful distinction between fecal impaction and organic obstruction. Many cases of simple impaction recover with ordinary treatment such as purgatives and enemata; when organic obstruction is present, recovery apart from operation is next to impossible. In practice, however, the distinction between the two may be extremely difficult, and most surgeons have seen a patient refuse a laparotomy, and recover nevertheless. Of course, if a mass of hard feces can be felt in the rectum or colon, or if copious enemata immediately bring away a large evacuation, the diagnosis is clear. The difficult cases are constipated elderly people with a swollen or flat abdomen in which nothing can be felt, who have vomited once or twice, and are not relieved by enemata. It is much safer to explore the abdomen, if enemata fail and nothing can be felt in the rectum, without waiting to see if spontaneous recovery will take place.

It is probable that in a few rare instances the bowel has escaped, by some lucky accident, from an organic strangulation; but almost invariably it is paralyzed soon after it becomes ensnared. Still, these occurrences will lead a practitioner who values his reputation not to be too 'cock-sure' in threatening death to a patient who refuses operation. The practical rule, however, is that if repeated enemata fail, and vomiting, abdominal pain and distention, and constipation are present, death within a few days is all but certain, apart from operation. One ought not to wait for fecal vomiting; that is a death door phenomenon. Patients with *faul* vomit may recover after operation; those with vomit smelling of feces, very, very seldom. The most common cause of death is toxæmia, then peritonitis, and

occasionally lung complications. Death on the table from tubalizing the ovary is by no means a negligible cause of fatality.

**Results of Operation**—It is not easy to gauge accurately the present-day mortality of intestinal obstruction treated by surgical means: cases are operated on at all stages, for so many types of obstruction, and in so many different ways. Some statistics, such as McClaurin's, and Denver and Ross's, are complicated by the inclusion of a large number of strangulated hernia cases. They give the mortality as 15.7 and 12 per cent respectively. Both these series were published in 1915. The most reliable figures available are the records for the years 1887 to 1907 from St. Thomas's Hospital, and those published by Gibson, though they are by no means recent. With a combined study of the literature and hospital reports, Gibson published in 1910 the results of 646 cases, whereof 312 died, that is, 47 per cent. This includes patients with intussusception, but does not include cancer. Treves (1899) and Moynihan (1906) both agree that the actual mortality is probably 50 per cent, but Moynihan declares that this is a reproach, and that "anything over 40 per cent is the mortality of delay." In the St. Thomas's figures the death-rate in simple cases was 56.7 per cent, and in malignant cases 65 per cent. How much the time of operation influences the death-rate is shown in Gibson's figures, as given in the following table (the figures do not include intussusception, hernia, or cancer).

MORTALITY ACCORDING TO DAY OF OPERATION.

Day of Operation	Number of Cases	Number of Deaths	Percentage
First	16	6	37
Second	44	17	38.5
Third	61	25	41
Fourth	70	27	38.5
Fifth	62	30	48
Sixth	44	29	66
Seventh	28	15	53.5
Later	107	59	55

**The Varieties of Obstruction.**—We must now take up each form of obstruction separately.

*Faecal impaction and foreign bodies* produce a form of obstruction which is relatively favourable, and which will usually yield to simple measures such as enemata. Death from faecal impaction is very unusual, unless the patient is utterly neglected. It is astonishing how long they may survive without an action of the bowels; one patient, reported by Harris, was seen fifty-three days after the last evacuation!

*Obstruction by bands or kinks* is not favourable, because the small intestine is involved. The higher the block, the worse the outlook. According to Treves, the average length of life is about five days,

the extremes being eight hours and twenty days. In Gibson's 186 cases, 41 per cent died. The treatment was usually division of the band; on 17 occasions resection was necessary; and an artificial anus was made in 22. Practically all these last died. Of 102 cases at St. Thomas's, 35 recovered and 67 died. In Deaver and Ross's series, of 81 cases, 49 per cent died.

*Volvulus*, when not treated by operation, has an average duration of six days, the extremes being sixty-four hours and twenty days (Treyes). Corner and Sargent, reporting on 57 cases from St. Thomas's Hospital over many years, found 19 recoveries and 21 deaths. Gibson gives the death-rate as 51 per cent; when the loop was untwisted, 31 out of 79 died; when resected, 13 out of 16; when an artificial anus was made, the fatalities amounted to 16 out of 20.

Finsterer, using the published records of various German and Austrian surgeons, believes that resection gives better results than detorsion. In his whole series (up to 1912) of 110 cases, 37 per cent died; resection and immediate end-to-end anastomosis had a mortality, if the gut was not gangrenous, of only 7 per cent in 29 cases. It is difficult to accept this as a fair representation, however. Most surgeons consider end-to-end anastomosis in the presence of acute obstruction very dangerous. Finsterer's cases probably include a disproportionate number of published successes.

Jankowski has reported 5 cases of volvulus of the cecum, of which 2 were cured and 3 died; he also reported 48 cases of volvulus of the pelvic colon operated on in Riga during ten years (1903-1913). The results are shown in the following table:

RESULTS OF OPERATION FOR VOLVULUS OF THE PELVIC COLON  
(JANKOWSKI).

	Survived	Died	Total
Detorsion and fixation of mesocolon	11	11	0
Lateralotomy and fixation	4	3	1
Short-circuiting (cecum to rectum)	6	1	5
Resection of loop	3	2	1
Gangrene already present	24	2	22

*Gall-stone impaction*, for some reason or other, is not as favourable as one would have thought. In Gibson's series of 40 cases, 57 per cent died; and in two long lists of 280 and 105 respectively, quoted by Treyes in 1899, the mortality was about the same (see GALL-STONES). These statistics are all somewhat ancient.

*Meckel's diverticulum* caused obstruction in 42 of Gibson's cases, and 62 per cent died. Division or excision was practised 30 times, with 17 deaths; resection of bowel 5 times, with 4 deaths; and an artificial anus was made in 4 cases, with 3 deaths. At St. Thomas's Hospital, 14 out of 22 died.

MORTALITY ACCORDING TO FORM OF OBSTRUCTION (GIBSON).

Case of Obstruction	Cases	Died
Foreign bodies	16	25
Worms	186	41
Polypus	121	54
Gall-stone impaction	40	57
Morley's diverticulum	42	62
Bowel snared in openings or fossae	34	62

RESULTS OF OPERATION FOR INTESTINAL OBSTRUCTION AT ST. THOMAS'S HOSPITAL, 1887-1897.

Source	Total	Recovered	Died	Mortality per cent
Intussusception	202	109	93	46
Worms	29	10	19	65.5
Peritoneal adhesions	60	24	36	60
Colonial bands	42	11	31	74
Polypoid nodules	5	0	5	100
Morley's diverticulum	22	8	14	64
Colonial stricture	9	1	8	89
Gall-stone impaction	5	1	4	80
Worms	26	9	17	65
	400	173	227	56.7
Permanent disease of bowel	137	48	89	65

*Intussusception in openings or retroperitoneal hernia* is also a serious condition. In Gibson's series of 34 cases, 62 per cent died. During the past eight years, however, of 15 cases found in the literature, 10 were cured by operation, including one of my own.

*Cancerous growth* is, unhappily, one of the commonest forms of chronic intestinal obstruction. At St. Thomas's Hospital, out of 137 cases, 65 per cent died. The growth in the great majority was situated in the pelvic colon or rectum. In Paul's series of 24 private cases treated by colostomy, 9 were fatal. Of 23 cases at the Bristol General Infirmary all suffering from acute obstruction, and excluding patients with a band, hernia, gall-stone, polypus, or intussusception, 6 died; these were nearly all suffering from cancer of the bowel treated by colostomy. (For further progress of the cases, see CANCER OF THE COLON.)

**The Prognosis in Individual Cases.**—There is a remarkable sex difference; the mortality in women is only 33 per cent, against 54 per cent in males (Gibson). This is difficult to explain.

The principal factors in judging the prognosis in any particular case

- (1) *The time of operation;*
- (2) *The nature and frequency of the attack;*
- (3) *The presence or absence of gangrene when the bowels are opened.*

1. *The importance of early operation* has already been emphasized. The first two days are relatively favourable; after the fifth day the chances are against survival.

2. *The nature and frequency of the vomiting* is very important. A high up obstruction, near the duodenum, causes very frequent and urgent vomiting, without much distention of the abdomen, and the vomit becomes foul but not fecal; these cases are very fatal unless operated on early. When the obstruction is low down in the colon or rectum, vomiting is late and infrequent, and there is more time before the patient passes beyond the reach of surgical help. If the vomit becomes foul, the outlook is grave; if fecal, it is almost hopeless.

3. *If a gangrenous area* is found at the operation, the chances of recovery are small, but not hopeless.

A 'chesty' patient, or one suffering from grave toxæmia, is not likely to be saved, and the advent of peritonitis is practically a death warrant.

The method of giving the anæsthetic and of conducting the operation counts for something. If there is incessant vomiting or bronchitis, intraspinal or local anæsthesia is probably safer. It is very important to operate quickly, and to empty the distended, paralyzed coils of bowel by Moynihan's tube or some similar device. Physostigmine salicylate and pituitary extract will probably reduce the mortality a little by averting post-operative intestinal palsy.

REFERENCES.—Gibson, *Ann. Surg.*, 1900, XXXII, 186; Treves, *Intestinal Obstruction*, 1899; Moynihan, *Abdominal Operations*, 1906; Finsterer, *Arch. f. Klin. Chir.*, 1902, 910; Paal, *Brit. Med. Jour.*, 1912, ii, 172; Tankowski, *Deut. Zeits. f. Chir.*, 1913, Sept.; Makus, *Burghard's System of Operative Surgery*, ii, 521; Deaver and Ross, *Ann. Surg.*, 1915, ix, 198; McClamant, *Jour. Amer. Med. Assoc.*, 1915, lvi, 673.

A. Rendle Short

#### INTESTINE, INJURIES OF. (SEE ABDOMINAL INJURIES.)

**INTRACRANIAL COMPLICATIONS OF EAR DISEASE.**—It is stated by Haseler that of 81,684 cases of suppurative otitis media, 116 died of various intracranial complications (lateral sinus thrombosis 48, meningitis 40, abscess 28), a percentage of about 0.14. Some London figures agree with this. The risk, therefore, is about 1 in 700.

It is very difficult to find in the literature a sufficient number of reliable records by which we may judge the prognosis of these affections. Some statistics are altogether too favourable; in others a few successes have been reported and many failures overlooked. It must be remembered that, in practice, two intracranial complications often exist together, and obscure both the diagnosis and the prognosis.

**Lateral Sinus Thrombosis.**—Apart from operation, these patients nearly all die of pyæmia or meningitis, the duration of life varying from two to six weeks. Natural recovery does occasionally take place, but it is rare; the writer has seen one case. The prognosis depends upon early operation, but patients may occasionally be saved even after abscesses have formed in the lungs.

According to Hunter Tod, about a third of the patients operated on recover. Macewen's results were much better than this (20 out of 28). At the Bristol Royal Infirmary, 5 patients out of 11 recovered; 4 of the fatal cases had an abscess as well. No doubt earlier diagnosis would improve the prospects very much.

I have interviewed three patients some years afterwards. One was cured; another suffered for months from pyæmia, and then recovered except for otorrhœa; the third complained of persistent deafness, due to labyrinthitis.

**Intradural Abscess.**—All five of Macewen's cases recovered; but unfortunately many of these patients die, in spite of operation.

**Abscess of the Cerebellum or Temporosphenoïdal Lobe.** Unfortunately the difficulties of diagnosis, especially of cerebellar abscess, are very great. The classical signs, nystagmus, ataxia, or paralysis are very frequently absent; optic neuritis is inconstant; and the abnormal temperature is only present in about half the cases. At the Bristol Royal Infirmary during ten years, 6 cases of cerebellar abscess were missed, but of 8 cases of temporosphenoïdal abscess a successful diagnosis was made in every instance.

MOBILITY IN CASES OF INTRACRANIAL COMPLICATIONS OF EAR DISEASE TREATED BY OPERATION.

	TEMPOROSPHE-NOÏDAL ABSCESS			CEREBELLAR ABSCESS			INTRADURAL ABSCESS		
	OPERATED	DIED	CURED	OPERATED	DIED	CURED	OPERATED	DIED	CURED
Macewen	28	8	20	9	1	8	1	0	1
Henke				37	20	17	10	9	1
Bristol Royal Infirmary	11	6	5	10	7	3	4	4	0
Politzer's Clinic							28	21	7
Miligan							27	10	17

In our experience, the main point in the prognosis is to operate within three days of the onset of drowsiness (not coma). Of 4 cases treated, 3 recovered; later than the third day none recovered.

The prognosis after operation is very much better in temporosphenoïdal than in cerebellar abscess. Once again Macewen's results are much better than those ordinarily obtained; but according to the statistics of Henke and of the Bristol Royal Infirmary, from a third to half of the patients may be saved in cerebral cases, and a quarter or less (7 out of 28 in Politzer's clinic) of the sufferers from cerebellar abscess. Of 100 patients treated at the London Hospital during ten years, 20 temporosphenoïdal and 10 cerebellar cases recovered; probably this is abnormally bad. Miligan's series of



27 operations for cerebellar abscess at Manchester during ten years is very gratifying, 17 being saved and 10 dying.

After operation the patient may remain in a drowsy state for days, and yet recover if the pulse and temperature are normal; but symptoms often return and end fatally.

If the patient recovers, there is some fear of persistent liability to convulsions; the writer has seen one such case.

**Meningitis.**—The onset of evidence of meningitis (head retraction, Kernig's sign, nerve palsies, irregular fever) is usually a death warrant, but a few cases have undoubtedly been saved. Macewen operated on 6 out of 12 cases where there was intracranial meningitis only, and saved them all; only 1 out of 6 patients with cerebrospinal meningitis recovered. The writer has seen a case saved by operation and drainage combined with repeated lumbar puncture. Urotropine probably helps.

REFERENCES. Macewen, *Pyogenic Diseases of the Brain and Spinal Cord*; Neumann, *Cerebellar Abscess* (Lake's translation); Hunter Tod, "Intracranial Complications of Ear Disease," *Burghard's System of Operative Surgery*, ix, 429; Milligan, *Brit. Med. Jour.*, 1914, ii, 833. A. Rendle Short.

**INTUSSUSCEPTION.** It will be necessary to consider, first, the acute intussusceptions, usually of children; and, secondly, the chronic intussusceptions of adults.

*Acute Intussusception.*—There is a *natural cure* of intussusception by sloughing of the intussusceptum. It is very difficult to arrive at any idea of its true frequency. Wiggins (quoted by Child) puts the spontaneous cures at approximately 1 per cent; but there is always the probability that such a curiosity would turn up with undue frequency in the medical literature. The main point is that it is an event of excessive rarity in infancy; only 8 per cent of the recorded cases were in children under eight years of age. In adults it is not so very infrequent, and the slough may come away several weeks afterwards. A few cases die (said to be 3 per cent) even after passage of the slough. Apart from this very exceptional occurrence, the average length of life, in infants, is about three days. Cases have died within nine hours. Three or four reports in the literature appear to suggest that an intussusception may in very rare cases reduce itself spontaneously. I have seen one in a young man, verified by operation, which seemed very convincing. Several inches of the ascending colon remained swollen, red, and oedematous. The symptoms were characteristic, and lasted about twelve hours.

**Cure by Injection of Water** is now attempted by very few surgeons, because it often fails even in early cases, and it is impossible to tell for many hours whether it has succeeded or not, so that the necessary operation may be dangerously delayed. Chubb, of Sydney, tried it in 138 cases, but it was only successful in 14 of these (10 per cent).

In Copenhagen, it is apparently the routine to treat cases of intussusception by injection of water under an anæsthetic, even two or

three days after the onset. Koch and Oerum have furnished details of 27 cases, 60 per cent under twelve months old, treated between 1850 and 1909. One to two pints are injected with an enema syringe, and then taxis is used. Deep anaesthesia is required. In 2 cases the bowel was ruptured. In the worst cases only, a primary operation is performed. If the injection fails, a secondary operation is undertaken.

#### RESULTS OF TREATMENT IN COPENHAGEN BY INJECTION UNDER CHLOROFORM.

	Cases	Cured by Injection	Failed by Injection		Total Cured	Total Died
			First	Second		
Under 12 months	187	87	13	30	100	87
Over 12 months	114	65	24	16	89	25
TOTAL	301	152	37	55	189	112
					63%	37%

Set forth as they are in the authors' tables, the results of injection course appear to be much better than those of operation. We have recalculated the figures according to the data furnished, so as to be able to compare the consequences with those of the English school of practice.

It will be observed, first, that about half the cases are capable of cure by injection and taxis under an anaesthetic, but secondly, that the eventual results are not so good as the figures furnished by St. Bartholomew's Hospital or by Chubbé. When it is remembered that the injection method was only used for the more favourable type of patients, and that in 65 graver cases primary operation was performed, it is clear that the Danish figures do not establish a powerful argument in favour of bloodless measures. It must further be borne in mind that perhaps few recoveries were not cases of intussusception at all. If it is possible to administer an anaesthetic, it is usually also possible to operate.

**Reduction of the Intussusception by Operation** is the routine treatment. Judging by the published statistics, about two-thirds of the cases recover and one-third die. Records are given in the table

#### TABLE OF CASES OF ACUTE INTUSSUSCEPTION TREATED BY LAPAROTOMY AND REDUCTION.

	Cases	Recovered		Died	
		No.	Per cent	No.	Per cent
St. Bartholomew's Hospital*	59	46	78%	13	22%
Chubbé†	116	83	73%	33	29%
St. Royal Infirmary‡	46	28	61%	18	39%
Thomas's Hospital§	202	109	54%	93	46%

\* Copenhagen. † Vienna. ‡ London. § London.

of 39 children treated by reduction at St. Bartholomew's Hospital from 1901 to 1911, 124 cases operated on by Clulbe, and 46 cases of all ages similarly treated at the Bristol Royal Infirmary from 1903 to 1912. The St. Thomas's Hospital figures are less favourable, but they go back to 1887.

The success of treatment depends principally upon early diagnosis. Clulbe quotes 123 Glasgow cases, of which

Operation within 6 hours gave	60 per cent cured
.. .. 6 to 12 hours gave	73.3 .. ..
.. .. 12 to 24 .. ..	57.5 .. ..
.. .. 24 to 48 .. ..	26.6 .. ..

Acute cases operated on after forty-eight hours nearly all die, but there is a more chronic type, in which the results are fairly favourable: thus, 8 out of 12 such at St. Bartholomew's recovered. The higher death-rate within the first six hours than in the next six hourly period is a common phenomenon in the records of abdominal surgery: it must not be used as a plea for delay, as it means no more than that the ultra-acute cases are soonest diagnosed.

Prognosis in older persons is worse than in infants: thus, in the St. Bartholomew's Hospital series, of the patients over two years, 9 out of 19 died, and of those under two, only 24 out of 48.

**Treatment by Resection** is a last-resort method, and usually leads to a fatal result. There are a few instances of successes on record. At the discussion in 1910 at the Royal Society of Medicine, 4 cures were mentioned: 2, aged two and four respectively, at the Queen's Hospital for Children, and 1, aged seven months, at Great Ormond Street, under spinal analgesia. Clulbe reports a recovery in a child of eleven months: 5 other resected cases all died. I have had one successful case in a boy of six, and have seen a recovery in a young man in whom five feet of gut were resected by Hey Groves. Four out of 24 resection cases, all patients over a year old, recovered in the Copenhagen series.

**Relapse** is uncommon. The only case which has come under the writer's notice is one in which an appendicostomy was performed, partly for feeding purposes, and partly to prevent relapse!

**Prognosis in Individual Cases** depends largely upon the length of time before treatment is instituted: over twenty-four hours turns the chances against the child. Much vomiting, listlessness and lack of interest, and a depressed fontanelle are all grave signs. There does not appear to be much evidence that one anatomical variety of acute intussusception is more dangerous than another.

**Chronic Intussusception.** This rare disease is usually of grave import, because it is likely to be diagnosed late, and reduction will probably be impossible. Of 6 cases treated by resection at St. Bartholomew's Hospital (1873-1908), 1 recovered and 5 died.

Maxwell, of Formosa, reports 6 cases there, whereof 3, treated by lateral anastomosis, recovered, and 3 died. The writer has seen one

which was resected, but died. It would, therefore, appear to be best to leave the intussusception and do a short-circuiting lateral osteostomy.

REFERENCES.—Cahbe, *On Intussusception*; Child, "Diseases of the Jaw," *Proc. Roy. Soc. Med.* 1901, vol. iii, pt. 1, 195; Eccles, *St. Bart's Hosp.*, 1911, 97; Maxwell, *Ibid.* 1908, 153; Koch and Oberm., *Path. Med. Jour.*, 1907, 227; Makins, *Burghard's System of Operative Surgery*, vol. ii, 521.

A. BIDDLE SHUTT

ISCHEMIC CONTRACTURE. (See MUSCULAR ATROPHIES.)

JAWS, TUMOURS OF.—Although there is no reason to believe there is any difference between the prognosis of growths of the upper and of the lower jaws, we shall follow the example of most writers and discuss them separately, at least as far as malignant disease is concerned.

Epulis.—There is some difference of opinion as to what is meant by the term 'simple' epulis. Under this name the older writers described what they took to be a fibroma. According to Lyle, out of 17 cases he has seen at the London Hospital, 2 were fibrosarcoma, 8 were myeloid, and 7 were granulation tissue; he doubts, therefore, whether there is any such thing as a fibrous epulis. In Kulmer's series, out of 20 microscopied there were 2 fibromas; of the remainder, 20 proved to be myeloid, 7 sarcoma, and 1 granulation tissue. Both these series refer to surgical clinics; in the reports of dental clinics, the smaller and more chronic growths are likely to be seen, and epulis is much commoner.

When we take epulis to mean a tumour of the gum, the majority of the cases will be myeloid or fibrosarcoma. Nevertheless, the end-results appear to be very satisfactory if an efficient operation is done at the first place—that is, if a small margin of healthy bone is removed together with the growth. It is not usually necessary to divide the jaw, or to encircle on the antrum, but even if this has to be done—as in a case of the writer's, it is remarkable how the antrum fills up in time, so that a small addition to a dental plate closes it normally. The operation has almost no mortality.

RESULTS OF OPERATION FOR EPULIS.

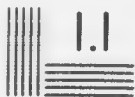
Author	Cases	Cured	Deaths
Lyle, London Hospital	30	0	6
Kulmer, Tübingen clinic	79	0	7

Of the 7 recurrences at the Tübingen clinic, 5 were cured by a second operation; in 2 patients death followed recurrence. The microscopical findings in 30 of the cases are quoted above. We have no doubt, therefore, that even a so-called malignant epulis can usually



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be cured by a small operation—namely, removal of the portion of the alveolar process containing it.

**Tumours of the Upper Jaw.**—Coming now to the consideration of tumours involving the body of the jaw, or growing from the antrum, we find a very much graver state of affairs. There are a number of published records on which to base an opinion as to the prognosis—mostly German and derived from a study of the end-results in various university clinics.

These growths are nearly all cancer or sarcoma, and apart from operation are as a rule fatal in from one to three years. The usual treatment is by partial or complete removal of the maxilla. Gland involvement appears to be late and infrequent, so that it is not usually necessary to clear the lymphatic area in the neck.

The mortality of removal of the superior maxilla is undoubtedly high. The figures for three London hospitals from 1886 to 1897 give a death-rate of only 12.6 per cent in 127 cases, but this probably includes a good many partial operations. The carefully described records of Eyr, Butlin, and the Göttingen clinic under Koenig, running up to 1897, are more worthy of confidence, and these show a mortality of 46.6, 28.5, and 32 per cent respectively. Eyr's figures are more recent (1907), and he practises a preliminary laryngotomy. Kronlein's estimate from the literature since 1875 is probably the most reliable figure we have for present-day surgery, and we therefore conclude that the mortality is about one in four or five. A partial resection is, of course, less dangerous. The fatalities are usually from pulmonary complications.

OPERATION-MORTALITY AND END-RESULTS OF REMOVAL OF SUPERIOR MAXILLA FOR MALIGNANT GROWTHS.

Author	Cases	Deaths	Survived	Recurred	Not Recurred
Eyr	12	16.6	—	—	—
Butlin	14	28.5	10	5	5
Kronlein (literature)	158	21.5	—	—	—
Three London Hospitals	127	12.6	—	—	—
Greifswald clinic	—	—	17	0	17
Estlander's clinic	—	—	12	2	10
Göttingen clinic	72	32	49	16	33
Berlin clinic	—	—	47	5	42
Von Bergmann's clinic	—	—	21	6	15
Erlangen clinic	—	—	17	1	16
Total	—	—	173	35	138
				22.5	77.5

Turning now to the *prospect of cure*, we find here also plenty of room for improvement. Butlin records 10 cases, of which 5 recurred,

were alive and well less than three years, and 3 were alive and well more than three years afterwards—but in one of these the diagnosis was doubtful; two patients with epithelioma appeared to be cured, though the orbital plate was left. In the Grafswald clinic no cases out of 17, at the Erlangen clinic 1 out of 16, and in Estlander's clinic 1 out of 12, were successful. At von Bergmann's clinic 13 cases of epithelioma were operated on without success; but of 8 cases of sarcoma, 6 were apparently cured. In the Berlin clinic only 5 out of 27 were cured by a total resection; but when partial removal could be practised, half the patients were cured. The most detailed figures available, albeit rather old now, are from the Göttingen clinic up to 1897, where, of cases recovering from the operation, 16 out of 49 were apparently cured; of these, 14 were followed over three years (one to eighteen years in one instance), and 2 less than three years. The microscopic report on these 16 growths showed 8 epithelioma, 3 myeloid, 3 sarcoma, and 1 endothelioma. In the cancerous cases the orbital plate was always removed, because it was found that recurrence followed if this was not done. In non-cancerous cases the plate was sometimes left: of 13 such, 1 died of the operation, 10 recurred, and 5 were apparently cured (2 under, 3 over, 1 three years). We may conclude, therefore, that in cases of malignant disease calling for removal of the upper jaw, about 1 in 5 is likely to be cured. The cancer cases are more serious than those with sarcoma or myeloid. In the great majority, recurrence takes place within four months, and death in a year.

A serious deformity is, of course, left by the operation, and an artificial jaw will be required. Also, if the orbital plate is removed, the eye may drop and cause diplopia.

To summarize, we may estimate that of 100 patients with growths of the upper jaw treated by operation, about 22 will die of the surgical procedure, and about 16 will obtain lasting cure—rather more in the non-cancerous group and rather less in the cancerous.

**Tumours of the Lower Jaw.** The material for judging the prognosis in this variety of malignant disease is old and inadequate. Oschin has collected the records of 60 cases of excision of the lower jaw, with 8 fatalities. The growths which call for the operation are osteal sarcoma, myeloid sarcoma, and epithelial odontome. Of 10 cases of periosteal sarcoma collected from the literature by Butlin, 10 cases well nearly three years after, 1 died of pneumonia within a year, 10 recurred. Of 43 cases of myeloid, 8 died of the operation, 2 were cured, 30 were not followed up, and 13 were 'cured'—but only 1 of these was followed three years. I have seen a boy with periosteal sarcoma treated by excision of half the jaw, well after four years. Of 2 cases of myeloid of my own, one was cured by excision of a segment of jaw and a very satisfactory prosthesis was fitted; another was cured after scooping out, but was cured by excision. Both have been followed over three years.

As in the case of the upper jaw, grave deformity follows the



operation, but it can be remedied by the application of a denture prosthesis, even to such a degree that the patient may be able to bite an apple; or a piece of rib may be grafted in.

REFERENCES.—*Exc. Brit. Med. Jour.*, 1907, 1: 1525; *Bull. The Operative Surgery of Malignant Disease*, 2nd ed., 1900; *Langg.*, "Diseases of the Jaws," *Baigland's System of Operative Surgery*.

V. Rendle Short

#### JOINTS, GUNSHOT WOUNDS OF. (See GUNSHOT WOUNDS.)

**JOINTS, INJURIES OF** (see also KNEE JOINT, INJURIES OF; HIP, CONGENITAL DISLOCATION OF). We shall treat the subject under three headings: (1) *Sprains*; (2) *Dislocations*; and (3) *Perforating wounds*.

1. **Sprains.** An ordinary sprained ankle, wrist, or other joint, given proper treatment such as rest, cold, and compression at first, and massage and movements later, will recover completely in a month or two. Trifling injuries will be well in a correspondingly shorter time. There are, however, certain exceptions to the rule.

The first of these is the *sprain-fracture*. Not at all an uncommon injury is a so-called sprained wrist accompanied by a fracture of one of the carpal bones, not by the scaphoid. This accounts for a large proportion of those cases in which pain, stiffness, or discomfort persists for years. The diagnosis is made, even after a long interval, by skiagram. If recognized early, something may be done to avert the prolonged disability, by advising against all movement, and fixing the wrist in the hyperextended position on a splint for a month, taking care to reduce any deformity, if necessary by open operation.

A second obstacle in the way of a confident prognosis is the possibility of the development of some form of *arthritis*. Rarely, the regional joint disease may follow the injury. More often, and especially in the shoulder, a traumatic arthritis may make itself evident a few weeks after the sprain; there is marked tenderness over the coracoid, and limitation of movement in all directions. It is very important not to attempt to treat this condition by forcible movement, or it may go on to permanent incapacity. The proper treatment is rest. But in any case the trouble is likely to remain for a long time, and there will probably be some loss of range of movement.

A third source of disappointment is the *formation of adhesions*. This can and ought to be prevented by early recognition of the nature of the limitation of movement. It calls for exercises, and if necessary the breaking down of the adhesions under gas. In the case of the shoulder-joint, there is no tenderness on direct pressure over the coracoid, and movements are more painful in one direction than in another. This distinguishes it from the arthritis just described. No joint ought to be moved whilst there is still synovitis, heat, or redness in or about it.

Given early diagnosis, including a skiagram, and proper treatment, the surgeon is able to give a fairly accurate prognosis, except for the

own factor of arthritis: this cannot be foretold, but it may only probably occur if the patient is known to be 'gouty' or 'rheumatic' in the old-fashioned sense.

Old persons usually do not recover well.

2. **Dislocations.** *Apart from treatment* a dislocation is found to lead to a great deal of disability; but in the case of the shoulder, if in young adults at any rate, a very fair degree of usefulness is still recovered.

*Excision for unreduced dislocation*, or operative replacement, gives results much less favourable than those of immediate bloodless reduction, but sometimes a very fairly useful joint is obtained, and, in the shoulder, rotation even may be preserved. Scudder and Gray report 11 cases of unreduced dislocation of the shoulder treated by excision and examined several years afterwards. Of these, rather more than half obtained a fair, but not perfect result, the rest was always marked limitation of movement. The best success was obtained in a child.

*Immediate reduction* by manipulation is, of course, the best treatment when possible, and in the majority of cases leads in the course of two or three months to a perfect cure, at any rate in patients under forty, and given proper treatment after reduction. Of 15 adult cases of dislocation of the shoulder investigated as to the end-results at London Hospital, 10 obtained a good result, 5 fair, and 1 bad. In less cases in children may be said to do very well; in middle-aged and elderly people there will probably be some permanent limitation of movement.

A too favourable prognosis, however, has to be guarded against, since each of the complicating factors which we have passed in review as spoiling the prospects of a cure after a sprain may also be operative after a dislocation. There are two other unfavourable conditions to be added to the list: first, after some dislocations, and especially those of the hip, *the muscles may be so torn* as to lead to permanent lameness; and second, dislocations of the shoulder, patella, and clavicle sometimes show a remarkable *tendency to relapse*.

In the case of the clavicle and patella relapse is not very serious, but it may become a great nuisance to the patient if the jaw or the humeral keeps on getting out of joint. It is related that a certain stout barrister was subject to the former affliction, and used sometimes to be taken when in the act of addressing 'my lord' or the like; on which occasions he used to envelop his face in a handkerchief, though overcome by emotion, and hurry from the court. He gained the reputation of being full of sympathy for the woes of clients.

Recurrent dislocation of the shoulder is prone to occur in epileptics. Mas has recently published a series of 18 shoulders treated by sewing a reef in the capsule. In 13 of these a cure was obtained; in 3 others a further dislocation occurred, but only as a result of

severe injury, such as in wrestling: in 2 cases the operation was successful. Thomas makes use of a posterior approach to the joint. I was very well pleased with the end-result, seen eighteen months after, in a case of my own dislocated eleven times.

Dislocation of the elbow is sometimes followed by traumatic myositis ossificans in the brachialis anticus muscle.

**3. Perforating Wounds.**— Given immediate diagnosis, and thorough cleansing within a few hours, more or less perfect recovery can usually be obtained, with at worst a certain amount of stiffness.

Many wounds of joints do not lead to suppuration, and the prognosis is then approximately that of a sprain. But if septic arthritis makes its appearance—usually by the third or fourth day—the outlook as regards the joint is grave indeed, and even the patient's life may be in jeopardy. Repeated incisions for drainage may fail to give relief, pyæmia often supervenes, and at last in despair both patient and surgeon are glad to end the struggle by an amputation. If this is avoided, bony ankylosis will probably take place, with or without displacement.

REFERENCES.—<sup>1</sup>Scudder and Barney, *Ann. Surg.*, 1909, xlv, 696; <sup>2</sup>Warton, *Lancet*, 1909, ii, 138, 249; <sup>3</sup>Thomas, *Surg., Gyn., and Obst.*, 1914, xviii, 107.

J. Rendle Short.

#### JOINTS, TUBERCULOUS. (See ARTHRITIS, TUBERCULOUS.)

**KALA-AZAR.**— This term was first applied to the epidemic fever which carried off about one-third of the inhabitants over some two hundred miles of country in Assam in the course of twenty years. The mortality among several hundred carefully recorded cases of Dods Price, on tea gardens, varied from 96 per cent early in the outbreak to 78 per cent latterly, the disease being thus almost as deadly as sleeping sickness. Subsequently kala-azar was found to be endemic in Bengal, Bihar, and parts of Madras (having been previously confused with malarial cachexia), the case mortality in Bengal being certainly less than in the Assam epidemic: but accurate figures cannot be given, as only the worst cases come to hospital, and it is very probable that a fair proportion of the more chronic cases recover spontaneously: it is probably between 60 and 75 per cent, but possibly lower. A form of the disease especially affecting children occurs in North Africa; the mortality is less than in the Indian variety.

Death rarely occurs from the actual fever, but nearly always from some complication, of which the most deadly are cancerous (especially in children) and other septic infections, pneumonia, dysentery (usually bacillary), cirrhosis of the liver, hemorrhages, and occasionally phthisis, all of which are extremely fatal in emaciated kala-azar subjects. In Calcutta, 82.5 per cent of fatal cases showed some such terminal affection post mortem.

Apart from such complications, unfavourable signs are extreme emaciation with persistent loss of weight, especially if diarrhoea is

present) great enlargement of the liver, as well as of the spleen, with distention of the veins of the anterior abdominal wall, sometimes with ascites, indicating cirrhosis of the liver; oedema of the lower extremities; petechial hemorrhages in the skin; and great anaemia.

By far the most important aid to the prognosis is the degree of leucæmia present, and especially the reduction in the total number of polymuclear leucocytes. Cases showing 1000 or less leucocytes, and more those with under 250 total polymuclears per cubic millimetre, do not recover, while the prognosis improves with every increase in number, until, if 10000 white corpuscles are present in a typical report from any temporary leucocyte-increasing complication, the prognosis is fairly good. In cases which recover, the most favourable signs are steady gain in body weight, which may occur in spite of persistent low intermittent fever, and a rise of the leucocytes towards the normal number. Once a patient, who has been much emaciated, becomes fat in the face, recovery is practically assured, however large the spleen may still be, although this also subsides in time and often appears beneath the ribs. Recovery is permanent in spite of continued residence in the endemic area, as proved by the scores of coolies working for years on tea gardens in Assam after recovery from chronic kala-azar. Although cancrum oris and other septic infections and pneumonia are very deadly if, as is usually the case, they produce no marked and lasting increase of the leucocytes, yet in the few cases in which the leucocytes rise to or above the normal in such conditions, early and permanent recovery not rarely ensues. Some recoveries have been reported by the writer following leucocyte-increasing measures, especially injections of staphylococcus vaccines. Vitality-increasing drugs may also apparently be of some use in the later stages, although they fail in advanced ones.

During the last two years the outlook of kala-azar patients has been greatly improved by the report of a number of consecutive cures having been effected—both by Italian writers in the African form, and independently by the writer and others in Indian kala-azar—by intravenous injections of tartar emetic, and there is good reason to hope that a specific for the disease has at length been discovered.

*Leonard Rogers.*

#### KIDNEY, INJURIES OF. (See ABDOMINAL INJURIES.)

**KIDNEY, MOVABLE.**—We have to consider the outlook from the patient's point of view, first, apart from operation, and secondly, when operated on by some of the many methods now in use.

It is well known that the doctor often finds a movable kidney in the course of a routine examination, when there have been no special symptoms connected with it, and it frequently happens that nothing is ever heard about it. On the other hand, severe pain or a wearying use of drug may make the patient's life a misery.

A number of secondary consequences may appear.

1. *Doll's Crises*.—These are violent attacks of pain, with haematuria, due to kinking of the pedicle. Typical cases are not common.

2. *Intermittent Hydronephrosis*.—A swelling may be felt in the loin, which periodically disappears, and a large quantity of watery urine is passed. This may be due to other causes than kinking of the ureter by a movable kidney.

3. *Secondary Gastric Symptoms*.—It has recently been recognized that all the symptoms of gastric ulcer (pain, vomiting, fecunateness, hyperchlorhydria, etc.) may be induced as a reflex from movable kidney, as well as from other abdominal conditions, such as appendicitis and gall-stones. Indeed, the hyperchlorhydria may actually lead to the development of a gastric ulcer. Of 38 cases of movable kidney operated on at the Bristol Royal Infirmary, 5 developed sooner or later a gastric ulcer, one of which perforated fatally. In another case a patient was explored for gastric symptoms and nothing was found, so the kidney was fixed, great improvement resulting.

4. *Mental Disturbance*.—According to Suckling, 40 per cent of all women attending a neurological clinic have a movable kidney, and their nervous symptoms are relieved by its fixation, so that he takes it to be causative. The great majority of English surgeons, however, do not think it justifiable to operate unless there is definite evidence of local symptoms referable to the kidney.

The prospects of cure by various forms of pads, felts, and corsets are difficult to estimate. Treves states that nineteen cases out of twenty obtain some relief from Ernst's apparatus, and that it may be left off after two years, but other experience is much less favourable, and the patients frequently declare that the pain is no better, or that the pressure is intolerable.

**Results of Operation for Movable Kidney.**—The death-rate is not very serious. Edelholz collected records of 846 cases from the literature, with a mortality of 1.65 per cent. Billington has operated on 515 patients, of whom 4 died. At two Bristol hospitals there was 1 death (from sloughing of the wound) in 104 cases. Probably the mortality is about 1 per cent.

Reliable end-results are not easy to obtain, most authors giving very inadequate details, or only following the cases for a few months. Keen mentions 116 patients whose condition was investigated afterwards, but in some cases this was only three months after the operation. He found 58 per cent cured, 43 per cent better, and 20 per cent without relief; but details are lacking.

Wilson and Howell examined 44 cases who had had various operations at St. Bartholomew's Hospital at least a year previously. Twelve were quite cured and 8 greatly improved; 9 were no better. The acute cases did better than the chronic. In several patients the kidney had broken loose again, but nevertheless there was considerable relief.

Billington has followed up two series of his end-results. In the first, 87 cases were communicated with at least a year after the operation; 60 per cent were almost or quite cured, 20 per cent much better, 10 per

— better, and 10 per cent no better. In a second series, 7 out of 92 patients were reported by their doctors to be no better; the rest were cured or improved. Billington, however, operates on a type of patient that most surgeons would not consider to be sufficiently disabled by the symptoms of movable kidney *per se* to warrant surgical intervention, for instance, neurasthenics and even invalids. His results are therefore not comparable with those of others. His method of operation is to make a sling out of the capsule of the kidney, combined with Coelet's sutures.

Rovsing, of Copenhagen, reports on a series of cases operated on one to twelve years previously. Out of these, 107 were cases of uncomplicated movable kidney, whereof 85 per cent were quite cured, 10 per cent better, 1 per cent no better, and 2 died of the operation. In 13 cases complicated by pyelitis, appendicitis, or gastric ulcer, 50 per cent were cured, 25 per cent better, 22 per cent no better, and 3 per cent died of the operation. The method was to make a sling out of the capsule. It is probable that patients with mild symptoms, as most surgeons would judge them, were submitted to operation.

Mills has collected the results of nephropexy at the General Hospital, Birmingham. He investigated 57 cases up to four years afterwards, and found that 33 per cent were cured, 10 per cent better, 57 per cent no better. In 23 per cent the kidney was again movable. The method of fixation varied. He points out that the patients cured were all characterized before operation by a very significant feature, that the symptoms were relieved when they lay down. Thomson Walker lays stress on the same observation.

At the discussion by the Royal Society of Medicine in 1911, the assistants of three London hospitals presented reports on 83 patients one or more years after operation. Of these, 52 per cent were cured or greatly improved, 12 per cent better, and 36 per cent no better.

#### END-RESULTS OF OPERATION FOR MOVABLE KIDNEY.

Surgeon	Number of cases	End-Results		
		Cured	Better	No better
Wilson and Howell	41	40	29	22
Billington	87	60	30	10
Rovsing				
a) Uncomplicated	107	85	9	4
b) Complicated	64	50	25	22
Mills	57	33	10	57
London hospitals	83	52	12	36
Bristol hospitals	69	58	18	24

The writer has investigated the end-results of 69 operations at two of our hospitals under the care of various surgeons. Of these, 40 were cured as far as the kidney trouble was concerned, but some still had

indigestion, or pain in the other kidney; 16 were not improved. Several of these were undoubtedly incorrectly diagnosed; one proved afterwards to have a dilated stomach. Another suffered from intermittent hydronephrosis. In 6 cases the kidney appears to have broken loose again, but nevertheless 3 of these are much improved. Relapse of pain took place respectively five weeks, six weeks, four months, nine months, a year, and two years after operation. In the last case the kidney slipped during a sudden strain, but the symptoms have almost entirely passed off again. Cases associated with hydronephrosis did not do well.

Although the number of cases is small, some evidence is forthcoming as to the best method of operating. Four procedures are represented:

1. *Transcortical Suture*, catgut or silk sutures being passed through the kidney substance and the muscles, or over the last rib. The failures are 5 out of 11, which is a large proportion; 2 kidneys became loose again.

In 18 cases the kidney was sutured to the muscles with catgut, but it is not clear whether the cortex or the capsule was pierced. Of these 11 were cured, 4 relieved, and 3 no better.

2. *Suture of Capsule*.—In 8 cases the capsule was sutured to the muscles with catgut. Here again the results were poor, and 2 worked loose.

3. *Phenol and Slung*.—The kidney was painted with pure carbolic acid, and an iodoform gauze sling put in beneath the lower pole and left ten to fourteen days. The end-results are quite good, only 3 out of 19 failing. One case (not examined) is said to have relapsed. The writer has seen laceration of the kidney, with hemorrhage and escape of urine, follow removal of the gauze.

4. *Goch's Method*.—The capsule is secured by two mattress sutures of silkworm gut passing through the muscles and skin at a higher level. Only ten cases appear, but the results are not so good as the last-named.

#### RESULTS AFTER VARIOUS OPERATIONS.

Method	Cured	Relieved	Failed	No better
Suture to muscles	40	22	7	11
<i>Transcortical suture</i>	11	5	1	5
<i>Suture of capsule</i>	5	3	2	3
Phenol and slung	19	12	4	3
Goch's	10	6	2	2

We may conclude, therefore, that by nephropexy probably 50 per cent will be cured, but one in three or four will not be relieved at all. Better selection of cases will doubtless improve on these results in the future, and, in particular, operation is not advisable unless the pain is relieved by recumbency. The third and fourth methods just mentioned

with a higher proportion of cures, namely, about 60 per cent, and only 15 per cent of failures.

REFERENCES.—Billington, *Movable Kidney*, Cased., 1910; Wilson and Howell, *Movable Kidney*, London, 1908; Royce, *Archiv. f. Klin. Chir.*, 1911, 18; Mills and others, *Proc. Roy. Soc. Med. Surg. Sect.*, 1914, Vol. 137.

*A. Rendle Short*

**KIDNEY, NEW GROWTHS OF.** The following factors are important in considering the prognosis of renal new growths:—

1. **The Malignancy of Kidney Growths.** A small number of benign tumours in the kidney have been described. Some of these, however, are known to develop malignant characters at a later date. The writer has removed a kidney, the seat of extensive malignant growth, from a patient who for over five years had passed in the urine portions of papillomatous growth from the renal pelvis which were examined by an eminent pathologist and pronounced non-malignant. Cases of papilloma of the renal pelvis are on record where symptoms had been present for twenty years, and nine and a half years, before operation. The writer also knows of a case where a growth, after removal, was published as an adenoma of the kidney; the patient afterwards developed multiple bony metastases, from which he died within two years. The number of growths that remain benign must be quite insignificant.

All new growths of the kidney should therefore be looked upon generally as malignant. Some variation is said to exist in regard to the relative malignancy of the different forms of malignant growths of the kidney, and an opinion based on this might be given after removal and examination of the kidney. Hypernephroma is believed to be less rapid in its course as compared with sarcoma and carcinoma of the kidney. It is, however, unwise to make definite statements based upon the histological varieties. The new growths grouped under the name of hypernephroma show, in some cases, a rapidity of local spread and metastatic deposit that is not exceeded by any of the other forms of renal growth.

2. **The Duration of the Disease.** Cases are recorded where symptoms had been present for eight (Kronlein), twelve (Israel), and fifteen (Lombeau) years before operation was performed. The average duration of the illness from the commencement of the symptoms to the fatal issue is, however, much less than this. It was two and a quarter years in 32 cases collected by Garreau, and two and a half years in 40 cases collected by Richards, while Keen, Stahler, and Ellis found an average of two and three-quarter years. The duration of the disease is shortened by the appearance of metastases. When extensive metastases are present in vital organs, such as the lungs or liver, the patient will only survive a few months.

### 3. Results of Operation.

*a. Immediate Results.* The operative mortality, including under this head deaths occurring immediately, or any time during the first six months after the operation, has been much reduced during the



last decade, but it still remains high compared with nephrectomy performed for other diseases.

Bloch reports Israel's cases of nephrectomy for malignant growth. There were 121 cases with 28 deaths, an operative mortality of 22.2 per cent. Gaucan collected 143 nephrectomies for growth, with 33 deaths, a mortality of 23 per cent. The mortality, however, was under this figure in cases operated in the last ten years. Shock, collapse from hemorrhage, and cardiac failure were the causes of death. Brousch records a primary death-rate of 41 per cent in the Mayo Clinic.

*b. Remote Result.*—The remote results of operation upon kidney growths are to a large extent dependent upon an early date of operation and the thoroughness with which the operation is performed. Certain conditions of the growth facilitate early recognition, or militate against a timely diagnosis.

A tumour situated in the lower pole of the kidney is in a position favourable for an early diagnosis by palpation. Israel recorded a case where a tumour in this position, the size of a nut, was diagnosed. On the other hand, a growth situated in the upper pole is concealed beneath the ribs, and usually reaches a considerable size before it can be detected on palpation. The last change that can be noticed in such cases is a pushing down of the kidney, which is felt lower than normal. The occurrence of hæmaturia is another factor in early diagnosis. It is present in 90 per cent of adult cases. Where it is absent, diagnosis is not likely to be made until a later stage, when the size of the growth attracts attention. The form of hæmaturia is intermittent, and there may be long intervals between the attacks. The significance of this form of hæmaturia is frequently not recognized by those in general practice in this country, the disappearance of the symptom being sometimes regarded as an indication of cure. Until the practitioner recognizes to the full the importance of hæmaturia as a symptom, and insists upon every case being carefully investigated by cystoscopy, catheterization of the ureters, and, if necessary, by radiography, the time for early diagnosis and favourable operation in a large proportion of cases will pass unheeded, and the prognosis, on this account, will remain very grave.

The operation performed for growths of the kidney should aim at the removal of the perineal fat and the lymphatics included in the perineal fascia, which should, if possible, remain unopened, and should be traced to the great vessels.

A collection by Watson and Cunningham of 143 nephrectomies for malignant growth of the kidney showed the following results: Death from operation, 33; death later, after operation, 43; survival, 31; not stated, 36.

The 43 cases that died later, after an operation, were distributed as follows: one year or under, 22; one to two years, 11; two to three years, 6; three to four years, 1; four to five years, 1; seven to eight years, 1; ten to eleven years, 1. Death, these authors note, has

erated from metastases ten years after operation, the patient leaving the hospital in perfect health in 1903 (1894).

The following were the periods of survival after operation in the 100 cases that remained well: one year or under, 9; one to two years, 6; two to three years, 7; three to four years, 2; four to five years, 1; five to six years, 2; six to seven years, 1; nine to ten years, 1.

Bloch describes the 100 (1,000) of Israel's cases of nephrectomy for malignant growth in 124 cases, of which 93 survived the operation: one to two years (limit), 26 remained well and 3 died of accidental causes; thus, of 34 the patients who survived the operation 32.6 per cent, and of all the operated cases 27.7 per cent, remained well. At the end of five years, 19 patients were known to be well. This writer remarks that the permanent results of nephrectomy for renal tumours are better than those of the operation for stomach and rectal tumours, and quite as good as those for mammary carcinoma.

Braasch states that the results in the Mayo clinic showed 40 per cent of cures at the end of five years.

In 29 cases recorded by Rahn, 10 remained well for longer than five years.

4. **Age**—The statistics already quoted are for new growths of the kidney in adults. In children, a number of factors combine to make the operation mortality higher, and render the probability of recurrence greater. Haematuria occurs in only about 16 per cent of cases, and is rarely present until after an abdominal tumour is discovered. As a result, diagnosis is only made after the growth has assumed considerable dimensions. It follows that the operation is always of a formidable character, while the age of the patient renders him less able to withstand heroic surgical procedures.

Walker puts the general mortality in children from operation and recurrence at 93.22 per cent. Albarran and Imbert give the mortality from operation as 25 to 30 per cent, Simon at 32 per cent, and Leene as low as 12.44 per cent. Recurrence in patients surviving the operation takes place, according to Albarran and Imbert, in 81 per cent of cases, and Simon states the percentage of recurrences at 67. Recurrence usually takes place rapidly, and appears within the first year. Occasionally it may be delayed, and cases where the growth reappeared three, four, and even five years after are on record.

Simon has collected 11 cases in good health a year or more after operation, among which the longest were Israel five years, Doderlein four years, Schmidt three years, and Shend and Roysing each two years. Recently Bastianelli recorded a case well four years after operation. The longest survival of which I have definite information is a case operated upon by Mr. J. D. Malcolm in November, 1892, which was well in February, 1911, eighteen years and three months after operation. Abbe, of New York, recorded two cases of prolonged survival: in one the patient died of new growth of the remaining kidney four and a half years after operation; the other patient was alive and well over ten years after operation. Notwithstanding such

results, the prognosis in children is very grave, and some surgeons even advise against operation.

**5. Clinical Points in estimating Prognosis.** The important points to take into consideration are the probability of spread beyond the capsule, the formation of metastases, the general condition of the patient, and the condition of the second kidney.

*Spread beyond the capsule* is indicated when the kidney is fixed, or is very irregular in outline. Free mobility is a favourable sign, but a large renal growth which is fixed to the liver or diaphragm shows a considerable range of vertical mobility with respiration. A large growth may appear fixed, yet be confined within the capsule of the kidney; but the detection of fixity in a small renal growth is significant of perirenal spread.

Pain, constant or localized, or radiating along nerves, indicates nerve pressure outside the kidney. Renal colic from clot obstruction should be carefully distinguished from this.

The appearance of varicocele on the side of the growth is due to the engorgement of the perirenal veins, but does not necessarily indicate spread of the growth beyond the kidney. It disappears after nephrectomy, and should not be considered a contra-indication to operation. Hochneegg states that if the varicocele does not disappear in the genupectoral position, it is due to compression of enlarged glands, and the growth is inoperable.

*Metastases* are most commonly deposited in the lungs, liver, lymph glands, and bones, and careful examination of these, including radiographic examination, should be made.

*Cachexia* rarely appears unless the growth is advanced, and has spread beyond the kidney. The cardiac muscle is frequently affected by toxins from the growth, and cardiac failure immediately or some time after operation is not uncommon. Dilatation of the heart, with a feeble, irregular, unequal pulse, is a contra-indication for operation.

*As regards the second kidney,* the urine should be obtained and examined. A trace of albumin and a few tube casts are frequently present, and they disappear after nephrectomy; but if there are signs of advanced nephritis, and of a reduced renal function, operation is contra-indicated. Bilateral growths are rare. They occur especially in childhood.

J. W. Thomson Walker.

**KIDNEY, POLYCYSTIC.** This condition is almost invariably bilateral. Luzzato collected 226 cases, of which only 41 were unilateral; Lejars found only 2 out of 63 cases were unilateral, and Ritchie only 2 out of 72 post-mortems. The disease is invariably fatal, but the duration may extend over many years. Josseland found that the age at death in 187 cases was as follows:

Age	Cases	Age	Cases
10-20 years	2	50-60 years	17
20-30 "	13	60-70 "	17
30-40 "	26	70-80 "	11
40-50 "	69	80-90 "	2

Nephrectomy has a very high mortality. Seiber found an operation mortality of 32.7 per cent in 69 cases. Of the 44 cases that survived the operation, only 8 were known to be alive after three years. The longest survivals were 4 after three years, 1 after eight years, 1 after 8 years, and 2 after seven years.

*J. W. Thomson Walker*

**KIDNEY, TUBERCULOSIS OF.** Primary tuberculous of the kidney is said to be present when the kidney is the part of the urinary system first affected. It is obvious, however, that, unlike the lung or bowel, the kidney cannot be directly infected by the tubercle bacillus from without, but must always receive the infection secondarily from some tuberculous focus elsewhere in the body. The nature and activity of this extrarenal tuberculous focus have a considerable influence upon the prognosis.

In the majority of cases of renal tuberculous that come before the surgeon, either no other tuberculous focus can be found, or, if one exists, it is quiescent or obsolete. In most cases no other lesion can be discovered clinically. Post-mortem evidence goes to show, however, that in such cases the primary focus lies in a tuberculous bronchial or mediastinal lymphatic gland. In other cases there is evidence of old-standing but apparently long-quiescent tuberculous disease of bones, such as Pott's curvature, or old sinuses connected with bones, or there are ankylosed joints, or a foot has been amputated, or a knee excised. In such cases the tuberculous of the kidney may be considered on its own merits, for the other foci affect hardly at all the future progress of the disease.

In a smaller number of cases there is active tuberculous disease in some other part of the body. A typical example of this is active pulmonary tuberculosis. Here the prognosis is dominated by the pulmonary condition. In such cases the outlook is very grave, and the patient usually succumbs in about two years, though occasionally after symptoms of only a few months' duration. Less unfavourable cases are those in which the active tuberculous is in a position where radical treatment is possible, such as the foot, the epididymis, or the cervical glands. When, however, there are found a number of foci of tubercle distributed over the body—as, for instance, where there is renal tuberculous, bilateral tuberculous epididymitis, tubercle of a joint, and possibly evidence of bygone tubercle of the lung—the assistance is so low that the results of operation are unfavourable, while the outlook under general treatment is very grave. Renal tuberculous with tuberculous epididymitis is not uncommon, and is not usually so serious. Radical operation may be successful in permanently curing the disease.

In the remarks which follow, renal tuberculous is considered as primary in the kidney, with no active tuberculous lesions elsewhere, unless specially mentioned.

**1. Can Tubercle of the Kidney Heal Spontaneously?** A few servers hold the view that a kidney which has been the seat of

tuberculous disease may heal spontaneously; but the great majority of those competent to judge believe that when tuberculous disease attacks a kidney, it is not arrested until the organ is totally destroyed.

In support of the view that spontaneous healing may occur, fibrous scars, some of which show calcareous deposit, have occasionally been observed. It is not certain that such scars are of tuberculous origin, but even should this be so, the few cases that have been recorded suffice to show that such an outcome is rare. A portion of the kidney affected with tubercle may be shut off from the rest of the organ by occlusion of that segment of the pelvis, and clinically, this corresponds to a disappearance of the pus and tubercle bacilli from the urine. After a time, however, another part of the kidney is infected, and symptoms reappear. It is not unusual to find, at operation, that one part of the kidney, corresponding to a division of the pelvis, is distended with tuberculous material, and is isolated by occlusion of the outlet, while more recent active tubercle is seen in the open part of the kidney. Finally, the whole kidney may be distended with fluid or with semi-solid tuberculous material, and the ureter be thick and occluded, so that the entire organ is destroyed and shut off (closed tubercle). The tuberculous disease here is quiescent or obsolete. It may be stated that, short of complete destruction of the organ, tuberculous disease of the kidney does not, with the rarest exceptions, heal spontaneously.

**2. Is Tuberculosis of the Kidney Unilateral or Bilateral?**—Renal tuberculosis is unilateral in the earlier, and very frequently bilateral in the late, stage. This accounts for some discrepancy between the statistics of different observers. Kronlein states that 32 per cent, Albarran 80 per cent, Brongersma 86 per cent, and Leguen 85 per cent of cases are unilateral, and clinical evidence obtained by catheterization of the ureters, and the results of nephrectomy, certainly support this view. Such statements must always be subject to the qualification that they apply to the early stage. In the late stage the disease, in a large proportion of the cases, is bilateral. Post-mortem statistics given by Gaultier show 57 per cent, by Isenmeyer 62 per cent, and by Halle and Motz 33 per cent bilateral.

*Whence does the second kidney derive its infection?* Do the bacteria come from the same focus as those that infected the first kidney? Direct evidence on this point is very difficult to obtain, but the results of nephrectomy in unilateral renal tuberculosis show that the second kidney is infected, not from the original primary focus, but from the first kidney. During the first two years after nephrectomy for tuberculous kidney, there is a mortality of 40.6 per cent from tuberculosis of the remaining kidney. The tuberculous disease in the great majority of these cases, if not in all, was present at the time of the nephrectomy. If the mortality due to tuberculosis of the second kidney after surviving two years be examined, it is found to be only 3 per cent. If this figure be compared with the 33 to 62 per cent of infection of the second kidney with tubercle where no operation has

then performed, the influence of nephrectomy upon the prevention of tubercle of the second kidney will be realized.

3. **The Introduction of Sepsis.**—Infection of a tuberculous kidney with pyogenic organisms may result from blood-borne bacteria, but more frequently it is an ascending infection up the ureter from a bladder infected by catheterization. Pyonephrosis very frequently develops, and the patient is dangerously ill. Nephrotomy obviates the urgent symptoms, and should the second kidney be healthy, nephrectomy can be performed at a later date with a good prospect of success. If the bladder is infected, there is a danger of ascending pyelonephritis of the remaining kidney.

#### 4. **Results of Medicinal, Climatic, and Tuberculin Treatment**

*The administration of drugs* has no effect upon the progress of the disease, but symptoms such as pain and bladder irritation can be ameliorated.

*A climate* which is warm and dry, with an even temperature, moderates some of the more distressing bladder symptoms which accompany renal tuberculosis; but climatic treatment does not permanently influence the progress of the disease.

*Tuberculin treatment* gives varying results. In some cases of unilateral renal tuberculosis, with or without involvement of the bladder, considerable benefit has resulted from prolonged administration of tuberculin. After one or two years, tubercle bacilli and all signs of inflammation have disappeared from the urine, and there has been no immediate recrudescence of symptoms. Information obtained by the cystoscope and by operation upon such cases shows that the tuberculous focus has become isolated by occlusion of a part of the ureter pelvis, or of the entire pelvis, by closure of the ureter. The recrudescence of the tuberculous disease in other parts of the kidney or urinary tract is to be expected in such cases, and it is a mistake to suppose that the temporary disappearance of signs in the urine and of symptoms, means a permanent cure.

In bilateral renal tuberculosis, tuberculin has a more legitimate field, for emulative operation cannot be undertaken. Undoubted improvement takes place in a good proportion of cases under tuberculin treatment, but I have not seen any case of cure.

In cases where there is tuberculosis of one kidney with tuberculous lesions in other parts, tuberculin treatment is often of service, either in combination with nephrectomy, or apart from operation. After nephrectomy, tuberculin treatment of genital tuberculosis is likely to be successful.

When tuberculosis of the kidney occurs with active tuberculosis of the lungs, bones, and joints, tuberculin treatment does not give encouraging results. In some cases an improvement in the renal disease takes place; but the extrarenal foci are frequently unaffected, and may even appear to increase under the treatment.

In estimating progress in the treatment of tuberculosis of the kidney by tuberculin, attention should be paid to the increase or

decrease of body weight, the general feeling of vigour, the effect on pain, frequency of micturition, tenderness and enlargement of the kidney, and haematuria. Where vesical symptoms are present, the amelioration of these frequently provides a striking demonstration of improvement.

The specific gravity and pigmentation of the urine increase as the renal condition improves. The quantity of pus, and the presence and numbers of tubercle bacilli, are critical tests of progress.

**5. Immediate Results of Operation.** Nephrectomy in the early stage of renal tuberculosis is the only method by which a cure can be assured, and the operation is indicated whenever the diagnosis of unilateral tuberculosis is made. A preliminary to modern operative treatment of renal tuberculosis is the examination of a specimen of the urine of the second kidney, obtained by catheterization of the ureter. Nephrectomy, as a curative operation, depends upon the absence of the tubercle bacillus and the proof of a satisfactory renal function, as shown by the examination of this specimen. If this is not carried out, the death-rate of nephrectomy reverts to that of the older statistics (25 per cent), and patients who would have lived for some years under palliative treatment, die from anaemia after the operation.

Brongersma collected 515 cases operated by various surgeons, with a mortality of 7.18 per cent. He states that when only the statistics of surgeons who use modern methods of diagnosis as a routine measure are taken, the mortality of nephrectomy for unilateral renal tuberculosis falls to 2.85 per cent.

A series of statistics published in 1911 shows the following figures:

Israel	1023 (collected) 170 (personal)	12.9 per cent	10 to 15 per cent
Wildtetz	139	2.8 ..	15 ..
Asakura	70	5.7 ..	7.1 ..
Anhe	57	3.5 ..	(up to four years) 15 per cent
Von Frisch	100	10.0 ..	9 ..

**6. Late Results of Operation.** The after-history of 369 patients on whom nephrectomy was performed for primary tuberculosis shows that death occurred after a considerable interval in 56 (15.2 per cent). In these cases the interval varied from one or two to fourteen or sixteen years. In 329 cases of nephrectomy, 35 (10.3 per cent) of the patients died during the first two years; in these cases the fatal result was due to a spread of the tuberculous process. Of 184 patients surviving two years after nephrectomy for tuberculosis, only 6 (3.2 per cent) died of tuberculosis later.

It may be stated, therefore, that there is a risk amounting to 10.6 per cent of the patients dying of tuberculosis during the first two years, and a risk of 3.2 per cent of a fatal result from tuberculosis after this.

*J. W. Thomson-Walker.*

**KIDNEY AND URETER, CALCULUS OF.**—In the early stage of a dangerous disease of the kidney, there is a danger of a small stone becoming impacted in the ureter and causing anuria. In the later course, sepsis and uræmia are the chief conditions to be feared. The following factors are intimately concerned with these dangers, and are therefore important in estimating the prognosis: (1) *The size and number of calculi*; (2) *Unilateral and bilateral calculi*; (3) *Asepsis—Infection*; (4) *Results of operation*; (5) *Recurrence after removal*; (6) *Calculus anuria*.

1. **The Size and Number of Calculi.** In the early stage a primary calculus of the kidney is single and small, and the kidney is healthy, or nearly so. Slight interstitial and parenchymatous changes, described by Albarran under the name of diathetic nephritis, may be present, but it is probable that if the calculus is removed early, no serious permanent damage to the kidney will remain.

At this stage the chief danger is impaction of the calculus in the renal outlet, or in the ureter, during an attempt to expel it. When the obstruction is incomplete or recurrent, a hydronephrosis results. When the impaction is sudden, and obstruction complete, there is danger of anuria (calculous anuria) resulting. The prognosis in these conditions is discussed elsewhere.

As the calculus increases in size, pressure upon the kidney substance causes interstitial nephritis and atrophy, until eventually, in the case of a very large calculus, the kidney substance is reduced to a mere shell. The renal function is now carried out entirely by the second kidney, and if this should fail, uræmia follows.

At any period in the history of a renal calculus, but especially when the stone becomes larger, or there are a number of calculi present, there is a risk of infection being superadded. The infection usually occurs spontaneously, and the path by which it arrives is the blood-stream (hæmatogenous infection). Occasionally it follows septic catheterization and washing out the bladder (ascending infection). The influence of this complication on the prognosis will be discussed later. Removal of a calculus in the early, small, aseptic stage can be performed without any destruction of renal tissue, and will prevent this complication.

The use of the x-rays in diseases of the urinary organs has been the means of greatly improving the prognosis in calculi of the kidney and ureter. In the early stage a small stone will throw a shadow on the x-ray plate, and its exact position is demonstrated. It is thus possible to operate with certainty, and to extract the calculus with a minimum amount of destruction of kidney tissue. When multiple calculi are sent, their number and position are accurately shown on the plate, and each shadow is accounted for at the operation by a corresponding



stone. The danger of overlooking a small calculus is thereby greatly reduced. By means of the *x*-ray plate, the operative measures required can usually be planned beforehand. Thoroughness and rapidity of operating are thus facilitated. When the calculus lies in the ureter, it frequently happens that the symptoms afford no guide to the exact position of the impacted stone. In such a case an exploratory operation, which may be of a very formidable character, is avoided by the discovery of a shadow in the line of the ureter on the *x*-ray plate.

From the foregoing it may be stated that a good prognosis is justified when the calculus is single, aseptic, and of small size, although the condition is not without some immediate risk of calculous anuria. The prognosis is much less favourable, and may be very grave, when calculi are large, multiple, and septic.

**2. Unilateral and Bilateral Calculi.** When one kidney contains a calculus, the most frequent form of disease that affects the second kidney is the development of a calculus in this side also. In the early stage of calculous disease, bilateral calculi are not very common; but in the late stage, the second kidney is frequently the seat of calculus.

Israel found bilateral calculi in 27 per cent, Grant in 16.6 per cent, Kuster in 11.78 per cent, and Morris in 10 per cent of cases operated; while Leguen found calculi in both kidneys in 50 per cent of 76 post-mortem cases. The latter may be taken to represent the late stage of the disease, while the former gives an indication of the frequency of bilateral calculi in the early stage. With the more general use and the development of radiography, the diagnosis of stone in the kidney is being made at an earlier date, and the number of bilateral calculi is likely to be reduced.

The significance of bilateral calculi depends upon the extent of the disease and the presence of sepsis. The development of calculi in the second kidney, when one organ is already affected, is a grave complication. There are cases where small aseptic calculi are formed in each kidney, and passed at intervals. In such cases the kidneys appear to suffer little change, so long as the calculi pass freely along the ureters. The danger of anuria from impaction of a calculus is, however, much greater, the prognosis after operation graver, and the course of the disease shorter than in unilateral calculi.

When one kidney is the seat of a large calculus or of multiple calculi and the second kidney contains a small calculus, when large calculi are present in both kidneys, and when bilateral calculi are infected, the prognosis is very grave. Nephrectomy in any of these conditions is unwise, and a permanent cure after removal of the calculi is unlikely. In very large bilateral calculi it is a question if the patient will not live longer and in greater comfort without operation. In such cases, recurrence of stone after removal is frequent, and at each operation there is very considerable destruction of renal tissue. The mortality of nephrolithotomy in bilateral calculus is much higher than in unilateral.

In 22 collected cases of calculous disease where fatal anuria followed operation, there were calculi in the second kidney in 12, atrophy and

degeneration in 4, the organ was the seat of fatty disease in 2, amyloid disease in 1, hydronephrosis in 2, and interstitial nephritis in 1.

In order that the prognosis may be estimated in any case of renal calculus, a careful examination must be made of the second kidney (the ureter by means of the *x* rays); and the condition of the urine, and the activity of the renal function of the second organ, must be ascertained by examination of the urine, and by the use of the tests of the renal function after catheterization of the ureter.

Kuster reports 20 cases of operation on bilateral calculi, in 10 of which a good result followed; fistula persisted in 3 cases, and there were 7 deaths from uræmia. Leguen had 8 double operations: of these, 1 died of uræmia, and 7 recovered. Of the 7 survivors, 2 died of uræmia within a year.

4. **Asepsis and Infection.** At some period in the history of unoperated calculi, infection occurs. In rare cases, large bilateral calculi develop in both kidneys and run their course till the final uræmia, with nothing more than the very mildest infection of the same occurring. Usually, however, the urine is contaminated with

NEPHROLITHOTOMY IN HEALTHY OR SLIGHTLY INFECTED KIDNEYS.

Author	Cases	Deaths
Brongersma . . . . .	17	0
Nicolich . . . . .	18	0
Zuckerkaudl . . . . .	8	2
Reysing . . . . .	115	7
Kapsammer . . . . .	21	2
Israel . . . . .	61	9
Kuster . . . . .	160	15
Leguen . . . . .	20	2
<b>Total</b>	<b>420</b>	<b>37</b>

NEPHROLITHOTOMY IN INFECTED KIDNEYS.

Author	Cases	Deaths
Schmieden . . . . .	211	43
Kuster . . . . .	251	50
Brongersma . . . . .	2	2
Nicolich . . . . .	4	3
Leguen . . . . .	5	1
<b>Total</b>	<b>473</b>	<b>100</b>

*B. coli communis*, or with a mixed infection. In some cases calculi develop in an already infected kidney. The prognosis in infected calculus is much graver than when the kidney remains aseptic. The mortality of operation is higher, the probability of recurrence is greater, and the destruction of kidney tissue is much more rapid.

Leguen quotes the statistics given in the tables on the previous page in regard to stone operations on aseptic and on infected kidneys.

**4. Results of Operation.**—The results of operation for renal calculus are governed by a number of factors, such as the size and number of the stones, the condition of the second kidney, the presence or absence of sepsis, the operation performed; and, it may be added, the experience and skill of the operator, for a successful operation may demand a high degree of both.

Some of these have already been discussed, while others require no elaboration. It remains to compare the results of the different operations under varying conditions.

The operations performed for renal calculus are (*a*) nephrolithotomy, (*b*) pyelolithotomy, and (*c*) nephrectomy.

*a. Nephrolithotomy.* The results of nephrolithotomy are largely influenced by the presence or absence of sepsis previous to the operation. Some authorities, notably Morris, regard as cases of nephrolithotomy only those in which the kidney is healthy and there is no infection. Most surgeons look upon all cases of removal of calculi from the kidney as cases of nephrolithotomy.

The results in cases uncomplicated by sepsis or dilatation show a very low death-rate. Waton collected 135 cases with 3 deaths (2.2 per cent), and Roysing 115 cases with 7 deaths (6.08 per cent). Other results have already been quoted.

In infected cases the mortality is high, as the results of Schmieden (20.3 per cent) show. After nephrolithotomy the wound usually heals rapidly, even when mild infection has been present. In infected cases a fistula may persist, and this is occasionally due to calculi having been left in the kidney pelvis, or to ureteral obstruction. In Schmieden's cases (infected) a fistula followed the operation in 22.2 per cent, while in Watson's collection (infected and non-infected) there were fistulae in 8 per cent.

*b. Pyelolithotomy.* This operation is confined to a small class of cases when there is a small or moderate-sized calculus occupying the renal pelvis or calices, or where the pedicle is comparatively long and the loin not too deep. In Schmieden's statistics there are 54 cases of pyelolithotomy, of which 36 (66.7 per cent) were completely healed. There were 12 (22.2 per cent) recoveries with fistula, and 6 (11.1 per cent) died.

In the writer's experience, the percentage of fistula following nephrolithotomy and pyelolithotomy, given in the statistics quoted, is much too high.

*c. Nephrectomy.* Nephrectomy for calculus is, compared with the operations already discussed, a rare operation, and is reserved for

where uncontrollable hemorrhage occurs during nephrothomy, where the calculi are very numerous and large, and where the ureter is atrophied or destroyed by dilatation or suppuration, or where malignant growth complicates the calculus.

Secondary nephrectomy may be called for in urinary fistula, recurrence of stone, or prolonged renal suppuration. The conditions under which the operation is performed are, therefore, of a serious nature, and the outlook is very grave.

The following statistics were collected by Watson: primary nephrectomy, 176 cases, 14 deaths (8.0 per cent); secondary nephrectomy, 27 cases, 6 deaths (22.2 per cent).

**5. Recurrence after Removal.** The recurrence of calculi in the kidney after an operation for their removal depends upon a number of factors. Incomplete removal of the stone or stones at the operation is a frequent cause. A deep loin with a narrow space between the rib and the crest; a large, fleshy kidney with a short, melastic pedicle; multiple calculi; an inefficient x-ray examination; nervousness and inexperience on the part of the operator; these are factors which bear an important bearing on the incomplete removal of stones. Occasionally an aseptic, single, hard stone may be clipped in removal, and the tiny fragment form the nucleus of a fresh concretion. This is much more likely to occur where the calculi are multiple and crumbling.

Sepsis is a prolific source of recurrence, phosphatic stones being especially re-formed even after complete removal. The repeated formation of oxalate-of-lime stones, and of uric-acid stones, either after expulsion along the ureter and discharge from the bladder, or after operation, is the unfortunate habit of some patients, and the underlying diathetic condition is very difficult, and sometimes impossible, to control.

**6. Calculous Anuria.** Calculous anuria results from the impaction of a small stone in the ureter of one kidney, the second kidney being absent, atrophied, or diseased in varying degree. Rarely the ureters of two functional kidneys are simultaneously blocked by calculi. If the anuria is untreated by operation, death occurs in 71 per cent of cases according to Leguen, and in 67 per cent according to Donnayhen. It takes place usually about the tenth or twelfth day, after two or three days of uramic symptoms. In cases that have recovered, the date of spontaneous relief was the third day in 1, the fifth to the tenth in 10, the thirteenth in 1, the fourteenth in 1, the fifteenth in 1, and later than the fifteenth in 2.

Operation should be performed at the earliest possible moment in the cases of calculous anuria. It has been held that the operation may be delayed until the fifth or sixth day, as uramic symptoms rarely supervene before that time. This delay could only be justified by a large proportion of spontaneous recoveries, and such does not exist. Death, if it take place, is a result, not of the operation, but of the condition for which the operation was performed.

Hick's statistics show that the mortality rises each day that operation is delayed. Before the fourth day there is a mortality of 25 per cent, before the fifth day of 30.7 per cent, and before the sixth day of 42.4 per cent. The presence of uræmic symptoms does not contraindicate operation; successful cases of operation under these conditions have been recorded.

Watson collected 245 cases of calculous auria, and found the following results of treatment:

Treated without operation, 140; deaths, 80; mortality, 72.7 per cent.

Treated by operation, 95; deaths, 41; mortality, 43.3 per cent.

These results are capable of great improvement if the necessity for early and rapid operation is fully realized. *J. W. Thomson Rubber*

**KNEE-JOINT, INJURIES OF THE.** Year by year we obtain a more complete knowledge of the many, various consequences of an injury to the knee joint, and we are gradually becoming more accurate in our prognosis and treatment.

Fractures of the patella and long bones are considered elsewhere. We have here to discuss the outlook in the following conditions: (1) *Synovitis and hamarthrosis*; (2) *Ruptured ligaments*; (3) *Dislocation of the knee or of the patella*; (4) *Recurrent disability (internal derangement of the knee-joint)*; (5) *Perforating wounds*.

**1. Synovitis and Hamarthrosis.** The signs of these conditions are well known, but it is often impossible at first to decide whether the effusion constitutes the whole trouble, or whether there is also some injury to bone, ligaments, or cartilages; and the prognosis depends principally on this very point. In all but the slightest cases a skiagram should be obtained to show any bony lesion, such as a fracture of the patella or of the condyles, separation of the tibial spine, or a foreign body composed of bone and cartilage dislodged from a condyle. Marked lateral mobility with a tender area over the site of rupture points to tearing of the lateral ligaments. Rupture of the ligamentum patelle is usually obvious, and the patient is powerless to extend the knee. Antero-posterior mobility, either in extreme flexion or extension, is a sign of tearing of the crucial ligaments.

When any evidence is obtained of one or another of these injuries, it is necessary to expect a prolonged disability and perhaps an imperfect final result. Even when no special signs are present beyond the synovitis, it is impossible to promise a complete permanent recovery, because there may be bruising or tearing of a meniscular cartilage.

Apart from this, however, it is usual for a simple synovitis of the knee to be restored to normal in a month in mild cases, and in two to three months in severe cases, assuming that the treatment is efficient—rest and cold applications or pressure at first, followed by massage and, when the acute inflammatory signs pass off, exercises and liniments.

If considerable effusion comes on within an hour of the injury, and

especially if there is deep ecchymosis of the skin appearing a day or two later, it is probable that the joint contains blood, and this is apt to absorb badly and to leave a permanent stiffness. This result is too often seen in a hemophilic knee.

It must be borne in mind in giving a prognosis that in rare instances osteoarthritis, osteoarthrosis, or acute epiphysitis passing into chronic arthritis may follow an injury; but in the first and last of these the original mischief is seldom severe enough to cause synovitis.

**2. Ruptured Ligaments.** The special signs of these injuries are as follows:

*Ruptured Ligamentum Patellæ.*—A gap between the patella and tibia; inability to extend the knee.

*Ruptured Lateral Ligaments.*—Excessive lateral mobility; tenderness of the torn ligament.

*Ruptured Crucial Ligaments.*—If complete, antero-posterior mobility; extreme flexion or extension. If incomplete, persistent inability to extend a right angle, even after synovitis has cleared up.

Any of these signs would lead the surgeon to give a guarded prognosis; recovery will take several months, and there will often be some permanent disability, happily seldom preventing the patient from walking. Several weeks' fixation will be necessary to allow of healing.

**3. Dislocations.** Partial or complete dislocation of the knee, a rare event, is necessarily accompanied by tearing of the important ligaments on which the integrity of the joint depends, and it is therefore bound to be many months before restoration to the normal can be expected. Usually there is some permanent weakness and limitation of movement, not sufficient to prevent the patient from walking. It is remarkable however, that the end-result is usually better than one of the injuries of the joint which look less alarming at first.

*Dislocation of the Patella* especially the outward dislocation, is habitually liable to relapse, especially in patients with genu valgum, and various methods of operative treatment have been suggested for the relief of this condition, but none are very satisfactory. The disability is usually not serious, even if the patella is left unreduced.

**4. Internal Derangement of the Knee.** This convenient term includes those cases in which, nearly always as a sequel to some acute traumatic injury in the first place, the joint repeatedly gives way, or suffers from recurrent attacks of pain and synovitis whenever it is wrenched or twisted. Very similar symptoms may be due to one of five conditions, arranged in order of frequency: (a) *A torn, loose, or loose semilunar cartilage*; (b) *A loose body* (bone, cartilage, fibrous tag, old clot); (c) *Nothing obviously wrong*; (d) *Hypertrophied synovial fringes or alar ligaments*; (e) *Hypertrophied subpatellar synovium*.

It is sometimes possible to make the diagnosis without opening the joint. A very definite history of locking, with a tender spot and always a depression over the internal semilunar cartilage, suggest that

it is at fault. Loose bodies can often be felt both by patient and surgeon, and if both, a skiagram will reveal them.

The prognosis in internal derangement of the knee joint has to be considered under the headings of *non-operative* and *operative*.

It is agreed that many cases, apparently of this disease, can be restored to fair comfort without operation by massage and rest immediately following the first occurrence of the trouble. Sir William Bennett found it necessary to operate on only 12% out of 500 patients. But it is seldom that the knee can be trusted for football or other violent exercises. Also, if two or three recurrences take place, non-operative treatment will scarcely succeed in restoring the joint to normal, though a good form of knee-truss may prevent severe attacks of pain and synovitis.

The end results after operation have been studied by D. Arce Power in 89 patients at St. Bartholomew's Hospital. Of these it was found by correspondence that:

- 73 had no recurrence of attacks,
- 50 regarded the knee as good as the other,
- 77 reported movements perfect,
- 68 had no change in shape; and
- 43 found the knee painful, whereof 11 had some aching on wet weather, and 37 always had pain.

Many were well enough to play football again. The writer has investigated the after-history of 40 cases operated on at the Bristol Royal Infirmary. In all of these, at least six months had elapsed since the operation, and in all but 6, at least a year. Of 56 operations, none died, and since rubber gloves were introduced, only 1 case out of 47 supplicated, the patient having taken off his dressings and fingered the wound. He finished with a stiff, swollen knee.

#### END-RESULTS OF OPERATION FOR INTERNAL DERANGEMENT OF KNEE.

	1910-1911	1911-1912	1912-1913	1913-1914	Total
Cartilage torn or very loose	17	16	1	0	34
Loose bodies	7	2	2	2	13
Nothing abnormal, or cartilage slightly loose	8	1	2	1	12
Synovial fringes	3	1	1	0	5
Notes of lesion inadequate	5	2	1	1	9
Total	40	25	7	4	76

It will be observed that when there was a definite lesion of the semilunar cartilages the results are almost uniformly excellent. Six patients are able to play football again, and several are miners: one does his work with comfort after having parted with both his internal

—linear cartilages. In every case the injured cartilage was removed; remaining in place usually leads to recurrence. It had been performed elsewhere in one of our patients, but he had to come to have the cartilage excised.

The cases of loose body, though few could be traced, are decidedly unsatisfactory. Apparently a loose body means an osteoarthritic condition in most cases, which relapses after the operation, and in one of our cases a second loose body was removed two years afterwards.

When nothing abnormal is found, removal of the internal semilunar plate nevertheless gave a good result in 6 out of 8 of our cases. In another patient, the after-history suggests that a loose body was overlooked.

We may conclude on the whole that the operation for internal derangement, provided a sepsis is secured, is usually followed by the best results, except in the loose body cases, where the outlook is so certainly favourable.

*Hypertrophied Subpatellar Fat pad* is due to repeated bruising and rubbing between the bones, and produces inability to extend fully, attacks of slight synovitis, and a little fullness beneath the patellar ligament. It will not usually improve until the leg is fixed in slight flexion for a month to allow of recovery. There is no locking, and traction is useless.

**Perforating Wounds of the Knee.** The vital element in the prognosis after this injury is, of course, the occurrence of suppuration, and its degree. Provided that this can be avoided, the joint will be restored to normal in a few weeks. If suppuration take place, there will probably be one or two months spent in bed, and a permanently stiff knee following, though fortunately it is usually not painful.

In a small proportion of the cases the inflammatory reaction is violent, and the patient suffers a desperate illness, with, it may be, the formation of pyæmic abscesses and occasionally a fatal result. This could nearly always be averted by early and efficient cleansing and drainage. In such bad cases, the knee may ankylose at right angles and remain painful; the writer recollects seeing one patient who, after many operations and narrowly escaping death from pyæmia, finally had to suffer amputation.

For GUNSHOT WOUNDS, see p. 302).

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A. Reacle Short.

**KNEE, TUBERCULOUS.**—(See ARTHRITIS, TUBERCULOUS.)

**LARYNX, CARCINOMA OF.**—In this disease it is necessary to divide the cases into the two following classes: (1) *Intrinsic*, i.e., those arising from the vocal cords true and false, the interarytenoid region, the ventricles, and the subglottic region; (2) *Extrinsic*, i.e., those arising from the upper aperture of the larynx and from the back of the cricoid cartilage.



1. **Intrinsic Carcinoma** is not very malignant in type. Owing to the arrangement of the lymphatics within the larynx, which do not communicate with those of surrounding parts but empty into a pair of small glands on either side, glandular infection is uncommon, and metastases are so rare as to be practically non-existent.

Growth is often slow, and, in the absence of treatment, cases have been recorded in which life has been prolonged for ten<sup>1</sup> and thirteen<sup>2</sup> years respectively.

*Treatment* is essentially surgical, and consists in either intralaryngeal removal through the natural passages, or opening the larynx by thyro-fissure. The former operation is generally condemned, and no statistics are available, although 7 cases of removal with no recurrence for three years are reported by Frankel,<sup>3</sup> while in 5 cases operated on by Schmiegelow<sup>4</sup> recurrence took place in 3.

Removal of intrinsic laryngeal carcinoma by thyro-fissure is probably now the most successful operation in the surgery of malignant disease. Only recent figures must be considered, as, owing to improvements in technique, results have become better of late years.

#### RESULTS OF THYRO-FISSURE IN LARYNGEAL CARCINOMA.

Operator	No. of cases	Deaths	Recurrence	Cure	Time
Tilly	5	1	1	3	0
Simon	25	1	4	14	3
Jackson	14	0	7	1	3
St Clair Thomson	10	0	4	1	2
Bothri	21	1	—	—	—
Koscher	5	1	1	—	—
Schmiegelow	20	1	9	—	—
Total	100	8	20	25	8

Thus, in 100 operations, the mortality as a result of operation was 8 per cent. Of 79 cases observed for over one year, there was no recurrence in 54, or 68 per cent; while in 38 cases observed for more than three years, a cure was established in 25, or 65 per cent.

Simon<sup>5</sup> has given reasons for considering that if recurrence has not taken place in one year it will not do so.

Thus, the results show an operative mortality of 8 per cent, with cure in either 65 per cent or 68 per cent, compared with figures for amputation of the breast of an operative mortality of 5 per cent and a cure in 42 per cent.<sup>6</sup>

As a result of this operation, owing to the formation of a cicatricial band to replace the cord which has been removed, the patient is as a rule left with a fair voice. Thus, in 20 cases operated on by Simon,

the voice was good in 11, fair in 5, and only a whisper in 4 cases, while Jackson states that in all his cases the voice was fair except where recurrence had taken place.

2. **Extrinsic Carcinoma** has a very much more serious prognosis. The disease spreads to surrounding parts, glandular infection occurs early, and life is seldom prolonged beyond three years without operation, death usually taking place from aspiration pneumonia.

Operation is the only *treatment* which holds out any hope of cure; a large number of cases, however, do not come under observation until too late a stage.

The operation consists of a partial or complete laryngectomy, usually accompanied by removal of a portion of the oesophagus and trachea. The great risk of the operation is aspiration pneumonia, but this risk has been diminished recently owing to the method of fitting off the tracheal opening from the septic pharyngeal discharges.

In all cases, the glands on either side should be removed with the larynx, as recurrence in glands is the most frequent form met with after operation. I have combined together figures for partial and complete removal of the larynx, as, from the point of view of prognosis for one operation, one frequently cannot tell how much of the larynx will be necessary to remove.

#### PARTIAL OR COMPLETE LARYNGECTOMY.

Operator	Number of Cases	Operative Mortality	Cure
Koscher	13	—	4
Schneegebow	9	6	1
Simon	5	1	0
Gluck	84	5	20*
Jackson	8	11	3
Cole	24	2	—
Butlin	7	1	—
Delavan	56	29	—

\* See Table 1.

Thus, of 193 cases operated on, the mortality as a result of the operation was 41, or 22.7 per cent, while as a result of operation on 10 cases, a cure was obtained in 28, or 28.5 per cent.

Von Bruns<sup>7</sup> gives, as a result of figures collected for complete laryngectomy since 1890, an operative mortality of 49 per cent, with freedom from recurrence of 28 per cent in cases observed less than a year after operation, of 16 per cent from one to three years after, and of 10 per cent over three years after.

Therefore, an operation with a mortality of about one-fifth of the cases gives a prospect of a more or less permanent cure in about one-fifth the number.

As a result of this operation, except in a few cases in which only a very partial removal of the larynx has been performed, the patient is speechless. A faint whisper may be developed by using the air in the pharynx, but at the best this is only intelligible to those who are in constant contact with the individual. In addition, especially if the pharynx has been much encroached on by the operation, there may be some considerable difficulty in swallowing.

There is also, owing to the impossibility of an effective cough without a larynx, an increased liability to bronchial and pulmonary affections, and the impossibility of fixing the chest by closing the glottis makes manual labour difficult if not impossible. All these disadvantages may cause a condition of great mental depression.

In considering the advisability of this mutilating operation, however, it must be remembered that the condition of a patient dying of a laryngeal carcinoma is a wretched one. Frequently there is great dyspnoea and dysphagia, and a palliative tracheotomy becomes necessary.

REFERENCES.—Gluck, *Ann. Laryngol.*, xvi, 481; Smith, *Laryngoscope*, 1910, Feb.; Frankel, *con Benjamin's System of Surgery*, ii, 241; *Arch. Laryngol. u. Rhinol.* 1910; *Ann. Laryngol.* 1903, Sept., 473; Von Bergmann, *System of Surgery*, ii, 602; *Handbuch der Pract. Chirurg.*, 3067.

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**LARYNX, PAPILLOMA OF.** This condition usually arises in infancy or childhood. In the absence of treatment the growths may persist for a prolonged period. As a rule, at some time, frequently about puberty, the growths will spontaneously disappear. This does not, however, always take place, and cases have been recorded in which the condition persisted for thirty<sup>1</sup> and thirty-five<sup>2</sup> years. The alternative treatments are:

1. *Surgical*.—(a) Local removal through the natural passages; (b) Removal by opening the larynx from the exterior; (c) Tracheotomy.

2. *Medical*.—The internal administration of calcined magnesia in large doses.

3. *Radium applications*.

The great risk of the condition is asphyxia, and many of the cases have to be tracheotomized for acute dyspnoea when first seen.

1. *Surgical*.—

a. *Local Removal through the Normal Passages*.—This is the treatment now most commonly adopted, the operation being performed by the direct method, and frequently accompanied by the application of the cautery or caustics to the base of the growths. It will relieve the symptoms for a time, but the growths almost always recur and the operation has to be repeated many times until eventually recurrence ceases. A case has been recorded in which operation was performed 17 times.<sup>3</sup> It is almost without risk to life.

b. *Removal by Thyro-fissure*.—This method, formerly much employed, is little used now. It gives no greater security against

gence than the former method, although a greater risk to life is incurred. It is too serious an operation to be lightly repeated, though a case is recorded in which it was repeated 17 times without result.<sup>4</sup>

*Tracheotomy.*—In a large number of cases this has to be performed as a matter of urgency. It has also been thought that it will afford a cure by giving rest to the larynx, but it is doubtful if this is so. Thus, cases have been recorded in which the growths persisted sixteen<sup>5</sup> and thirty-five<sup>6</sup> years, in spite of this operation.

#### Medical.

*Calined Magnesia.* The administration of this remedy in large doses has been recently tried. Cures are recorded by Cloué,<sup>7</sup> Dorthu<sup>8</sup> and Masini, a total of 5 cases, all of which had been under treatment by other methods. Rose,<sup>9</sup> however, reports failure in 2 cases. The remedy is therefore on its trial.

*Radium.*—This has been tried on 2 cases recently by Delavan<sup>10</sup> and Abbe,<sup>10</sup> with complete success.

Harris<sup>11</sup> has collected records of 13 cases treated by himself and others. In all the growths disappeared, but recurrence took place

in 5. Thus radium, if obtainable, would seem to give the best hope of an immediate cure. Calined magnesia may cure in some cases, and can do no harm. Tracheotomy is often necessary, but will not cure of itself. Local removal is almost without risk, and can be repeated. It is impossible in any given case to say when cure will occur.

*LITERATURE.*—<sup>1</sup>Pa-kapf, *Ann. of Otol., Rhinol., and Laryngol.*, 1910, Sept.; <sup>2</sup>Ucci, *Boll. della Mal. dell' Orecchio*, 1912, March, 49; <sup>3</sup>Tilley, *Jour. Laryngol.*, xxvii, 218; <sup>4</sup>Simon, *Proc. Laryngol. Soc. Lond.*, 1891, Jan. 1, 62; <sup>5</sup>Delavan *Presse Otol. Laryngol. Belge*, 1910, July; <sup>6</sup>Masini, *Ibid.*; <sup>7</sup>Cloué, *Bull. des Mal. de l'Oreille, etc.*, xxxvi, pl. 1; <sup>8</sup>Rose, *Jour. Laryngol.*, 1913, July, 318; <sup>9</sup>Delavan, *Ann. of Otol., Rhinol., and Laryngol.*, 1910, Sept.; <sup>10</sup>Abbe, *Surg.*, 1912, Sept. 170; <sup>11</sup>Harris, Int. Congress of Medicine, 1913.

A. J. Wright.

#### LARYNX, TUBERCULOSIS OF.

Laryngeal phthisis is for all practical purposes only a complication of pulmonary tuberculosis.

The prognosis is essentially that of the lung condition. The laryngeal disease usually occurs when the pulmonary condition is advanced, and the prognosis is always grave, the mortality being probably about 90 per cent.

Although the laryngeal and lung conditions usually progress together, not infrequently cases are seen in which the larynx improves under treatment while the lung gets worse, and the reverse. The situation of the disease in the larynx is of importance, especially in cases in which the epiglottis is involved having the worst prognosis, partly because of the dysphagia and consequent difficulty in taking food, and partly because epiglottic involvement usually occurs when the lungs are extensively diseased. Lake and Barwell

give the following figures of the number of deaths taking place while cases were under observation:—

## MORTALITY IN LARYNGEAL TUBERCULOSIS.

	No. of cases	No. of deaths	Percentage
Epiglottitis	72	11	1 in 6 $\frac{1}{2}$
Arytenoids	118	16	1 in 2 $\frac{1}{4}$
Vocal cords alone	35	1	1 in 35

The results of general treatment are those of pulmonary tuberculosis, except that the prognosis is always rendered worse by the presence of laryngeal disease. Sanatorium figures are unreliable in this respect, as the majority of laryngeal cases have pulmonary disease too far advanced for sanatorium treatment. Cases of healing of the larynx under tuberculin are recorded by Wilkinson, Parker and Blumentfeld,<sup>7</sup> and the latter gives the number healed by this treatment as about 5 per cent.

The following *treatments* are directed solely to the healing of the laryngeal disease: silence, the use of various pigments and caustics, Pfannenstill's nascent-iodine method, the galvano-cautery, diathermy and X rays, removal of disease with punch-foreeps and curettes, and major operations such as tracheotomy and laryngectomy.

For the relief of the most distressing symptom, dysphagia, without any idea of cure, amputation of the epiglottis and the blocking or section of the superior larynx,<sup>8</sup> have been employed.

Silence, in conjunction with sanatorium treatment, has met with some success. Felix Senon<sup>9</sup> and Bardswell<sup>10</sup> have recorded 7 and 6 cases respectively in which healing of the laryngeal condition took place under these conditions.

StClair Thomson<sup>11</sup> records arrest of the laryngeal disease in 37 out of 178 cases (20.7 per cent) with sanatorium treatment and voice rest, aided in 15 of them by local applications of the galvano-cautery. These were all selected cases.

The use of lactic acid and other pigments is less employed than formerly, and although isolated cases of healing have been described, they are few, and no statistics are available.

Pfannenstill's nascent-iodine method,<sup>6</sup> in which the patient inspires ozone while taking large doses of iodides, has been employed on only a limited number of cases. The inventor has cured 2 patients on whom he tried the method, and Tidstrom obtained healing in 8 out of 12 cases; but Staugenberg only found slight improvement in 1 case out of 4 treated, so that the method is at present on its trial.

The galvano-cautery<sup>7</sup> also produced healing in a number of isolated instances. X rays and diathermy have only been used in experimental cases.

The active local treatment by punches and curettes has been largely employed. Heryng, in the treatment of 252 cases, obtained healing lasting for from one to six years in 20 cases, or 7.8 per cent; and

As well, out of 211 cases, obtained healing in 20 per cent, but these cases were only watched for a short period and were not seen after leaving hospital.

Major operations are seldom employed, and the results have usually been disastrous. Gluck gives:

MAJOR OPERATIONS.

Operation	Number	Healed	Per cent
Tracheotomy	7	1	7
Embryngectomy	2	2	100
Laryngectomy	20	4	20

Granwald, of 64 collected cases of laryngostomy, found that only 5 per cent were alive a short time after operation.

Amputation of the epiglottis, in cases in which it is ulcerated and the cause of dysphagia, will usually relieve this symptom, and is an operation without risk to life.

AMPUTATION OF EPIGLOTTIS.

Operation	Number	Healed	Per cent
Holt	24	0	100
Lockard	151	0	84
Moeller	25	0	100

The relief of pain by the section of the superior laryngeal nerve, or injecting alcohol into the nerve in order to block it, has been successfully and largely used recently, and no risk seems to accompany this method. The relief of pain, in the case of alcohol injection, usually lasts about thirty days, and the injection can be repeated.

ALCOHOL INJECTION OF SUPERIOR LARYNGEAL NERVE.

Operator	Number	Successes
Logan Turner	1	1
Betterhoff	15	14
Holst	3	3
Bertram and Castello	6	6
Grant	2	2
Total	27	26

Blumenthal has recorded 2 successful cases of section of the nerve.

Thus, laryngeal tuberculosis is a serious complication of a serious disease. Cases with epiglottic involvement bear the worst prognosis. Cases in which the lung condition remains stationary, or improves, will usually heal with silence and sanatorium treatment. Galvanic cautery and minor operative measures may assist healing. Major operative measures are disastrous. Removal of the epiglottis and blocking of the superior laryngeal nerve give certain relief of dysphagia, without risk, in suitable cases.

REFERENCES. Blake and Barwell, *Laryngeal Phthisis*, 1905; *Zeits. f. Laryngol.*, iv, 4; Simon, *Brit. Med. Jour.*, 1906, ii, 1623; Painswell, *Id.*, 1907, i, 1370; Stur Thomson, *Ibid.*, 1914, April 11; *Hugena*, 1910, No. 5 and 6; Spheerium, *Verhandlungen des Vereins deutscher Laryngologen*, 1909.

A. J. WOOD

**LATERAL SINUS THROMBOSIS.** (See INTRACRANIAL COMPLICATIONS OF EAR DISEASE.)

**LEAD POISONING.** Metallic lead and practically all its salts are poisonous. Even the sulphate and chromate are soluble in the gastric juice, and it has been found that the addition of 1 per cent pepsin increases the solubility of the metal and of white lead. Probably the most harmful compound is  $PbO$ , while there is only one insoluble and therefore harmless salt, viz., the sulphide. The mechanical as well as the chemical composition of the salt has some bearing on prognosis, for a less soluble salt may be more dangerous than one which is more soluble but less easily powdered. Individual susceptibility is very marked; e.g., one man in a white-lead factory began to have symptoms in two weeks, and died of acute plumbism after five and a half months' work. In the same factory was a man who had worked in white lead for thirty-two years and had felt no ill effects. Probably about a quarter of all workers are not susceptible. There appears also to be a family susceptibility; hence the son of a lead-poisoned father and mother should avoid all work connected with lead. Females are more susceptible than males, especially if they are anemic. The disease is liable to be very much more severe if there is a constant absorption of small quantities of the poison over a lengthened period than if a large quantity is taken on a single occasion. Further, when lead is absorbed into the respiratory tract by inhalation, the onset of the symptoms is frequently earlier, and they are of a more severe character, than when it is absorbed from the alimentary tract. In connection with the length of time of exposure necessary before symptoms arise, A. Hamilton, in an analysis of 120 cases, found 1 case of paralysis at the end of one week's work, 1 case of colic at the end of one week's work, 1 case of colic with neuritis after three days; 8 of the workers became ill in less than two weeks, 36 in less than a month, and 89 in less than a year.

Reurrences have a worse prognosis than first attacks. Lead, once absorbed into the system, may remain latent for long periods, and may make itself felt. The symptoms of lead poisoning may therefore appear for the first time after a man has given up all lead work for many months, and in certain cases even a few years have intervened before the manifestation of the symptoms. One attack predisposes to another. It is not possible, however, to assert positively that a patient entirely recovered from an acute attack, as insidious disease in one of the internal viscera, such as kidneys or liver, may have irritated.

With reference to the prognosis of lead colic, the outlook is as a rule very good, provided there is no gross organic disease; but if the colic is exceedingly severe, the patient may die during the attack.

Cerebral symptoms are dangerous, especially if the patient becomes comatose. Epileptiform fits may follow each other in rapid succession and prove fatal. If the patient gets over these attacks, recovery will be far from complete, and blindness and aphasia may follow.

The mental condition may also be permanently deranged, or memory extremely defective; lead may be responsible for a condition very much resembling general paralysis. As a rule, however, the onset is much more rapid, and the prognosis very much better, for very considerable improvement may occur even in the third stage, the patient improving, paralysis diminishing, and the intellectual faculties (speech becoming more clear. Much mental irritation, however, usually persists even in the most favourable cases. Haemo-retinitis may occur with, or apart from, these cerebral symptoms. About 50 per cent. out of those who develop this eye trouble get permanent optic atrophy. In the haemo-muscular form, the prognosis as to ultimate recovery depends much on the intensity and duration of the paralysis, whether or not there is persistent atrophy, and on the state of the reflex reactions. Paralysis of the deltoid, biceps, brachialis anticus, and supinator longus occurs in the long-established cases, and hence the prognosis is worse in this form than in the usual forearm type.

In very severe cases paralysis may extend to the muscles of the trunk, the diaphragm, and even the intercostals, and so prove fatal on a failure of respiration.

In plumbic pseudo-tetanus, recovery is sometimes remarkably rapid, even when inco-ordination, loss of muscle sense, and ataxy have been marked.

The chronic cachectic form undermines the general resistance of the body, rendering it more prone to intercurrent infections. It shortens life by inducing chronic disease of the internal viscera, more especially of the kidneys, arteries, and heart. It also predisposes to it in all its various manifestations. Lastly, plumbism leads to abortion, with its own dangers.

*J. R. Charles*

**TRICHINIASIS.**—(See KALIAZAR)



**LEPROSY.** Leprosy has hitherto been considered an inerrable disease, although considerable and sometimes prolonged improvement may take place spontaneously. The majority of cases run a very chronic course of many years' duration, terminating with some intercurrent disease. A few cases, especially of the tubercular type, have an acute course with fever, the patient succumbing to the disease in a few months with extensive lesions in the internal organs. Anæsthetic cases may die from the effects of burns indirectly due to loss of sensation.

The only remedy known to influence the disease in some degree is chaulmoogra oil, although the effect when it is taken by the mouth is usually only temporary. Hoiser has reported several apparent cures after prolonged intramuscular injections of the oil, while Rogers records great improvement, and in one case apparent cure, from the oral and subcutaneous and intravenous injections of the soluble glycocharates prepared from the oil; but it is too early to say if these methods will materially improve the prognosis of the disease. *Lawford Rogers.*

**LEUCOCYTHEMIA.** No question with regard to leukaemia can be discussed without some preliminary understanding concerning the terminology employed.

It has been customary to classify cases into the splenomedullary and lymphatic types. It is now recognized that the enlargement of the spleen is a passive process, and consequently the first term is often spoken of as medullary or myelogenous. In recent years there has been a growing tendency to distinguish between ordinary large and small lymphocytes on the one hand, and large and small myeloblasts on the other. These latter can be demonstrated, by special methods, to have a more regular chromatin network and more nucleoli than the lymphocytes, and they are regarded as the precursors of the granular myelocytes, neutrophil, eosinophil, and basophil, which in turn develop into polymorphonuclear leucocytes with the corresponding type of granules.

It is unnecessary for our present purpose to discuss the relationship of these cells, but it is necessary to point out that cases of 'myeloblastic' leukaemia are not infrequently recorded as myelogenous. We are not disposed to quarrel with this, but if such a description leads to the belief that these 'myeloblast' leukaemias are to be classed in the same category as the granular leukaemias as regards symptoms or prognosis, then either the description is unfortunate or the belief is wrong.

We may perhaps best get over the difficulty by classifying the leukaemias in terms of the characters of the preponderating cells as regards the presence or absence of granules. If the cells which are unduly increased are non-granular, it is a matter of little practical importance whether they are to be labelled lymphocytes or myeloblasts.

We thus have to deal with (1) *Lymphatic (non-granular) leukaemia,*

form is usually acute, rarely chronic. (2) *Medullary (granular) leukaemia*. This is usually chronic, very rarely acute. (3) *Mixed forms*. (4) *Chloroma*.

**Lymphatic Leukaemia.** The great majority of cases run an acute course. An early fatal result is the usual outcome, the only exception being the very occasional transition of a case from the acute to the chronic type of the disease. Some cases end fatally within forty-eight hours of coming under observation; the greatest number die between the fourteenth and thirtieth day; and an intermediate number live for from three to six months. Among the symptoms which indicate an early termination are suddenness of onset and high temperature.

The early onset of hemorrhages is a serious symptom. Once a case shows a definite tendency to bleeding, an early fatal termination is practically certain. A single hemorrhage from the nose or other mucous membrane has not such serious significance, but when bleeding from both nose and gums, haematemesis, or haematuria has appeared, it is likely to be persistent. Purpura may occur, and a hypodermic abscess may lead to the formation of a haematoma. Advancing anaemia is another very grave omen. The anaemia is not merely due to the hemorrhages, but to the unchecked proliferation of lymphocytes in the bone-marrow. The onset of diarrhoea weakens the patient, but in the absence of more serious symptoms it is not of much significance in this form of the disease. Attacks of pneumonia or pleurisy may occur, and may determine an early fatal issue in a case which otherwise might have lasted a few months. Rupture of the spleen is a contingency which has occurred.

Local necroses, ulceration, and the formation of diphtheritic membranes on the gums or cheeks, may lead to a condition of profound toxæmia. Hemorrhages into the eye or ear may lead to blindness or deafness.

Little significance can be attached to changes in the leucocyte count. It is certain that a falling count is no indication of improvement. A falling lymphocyte percentage would be a favourable omen, but we have never known it take place.

No known form of treatment has any beneficial influence on the course of the acute cases. X-ray application does harm.

In the chronic form, the spleen is enlarged and there is also great enlargement of the lymphatic glands. Indeed, the enlargement, specially that of the spleen, may be taken as an index of the previous duration of the case.

The liver also enlarges, and lymphomatata may occur in the skin and elsewhere.

The counts in the chronic form are much larger, as a rule, than in the acute, but the actual figures have little relationship to the course of the disease.

A fatal result is sooner or later to be expected. Duration in most cases does not exceed a year, but chronic cases lasting for several

and even for many years are not unknown. Advancing marasmus, cachexia, intercurrent affection, or the onset of hemorrhages and acute symptoms, may bring about the end. On the other hand a few cases undergo remission and may have a precarious existence for a few years. In the remissions the leucocyte count falls, but, as a rule, the lymphocyte percentage remains unduly high. We have, however, notes of one case, that of a tumor, aged sixty nine, when a remission appeared to be complete.

The application of *x* rays in chronic lymphatic leukaemia occasionally does good, and has not the harmful influence it exerts in acute cases. Arsenic appears to do good. We have seen remissions follow the use of naphthalene tetrachloride.

**2. Medullary Leukemia.** Prognosis is absolutely unfavourable. In the usual chronic form, it is difficult to make any statement about duration, on account of the insidious onset. Most cases are likely to live for at least six months after they first come under observation. They probably all die within five years.

The course of the disease is not uniformly downwards, and remissions and relapses are often seen. When remissions occur, the spleen usually diminishes in size and the leucocyte count falls, but the blood picture generally retains its pathological qualitative features. In some cases, symptoms ameliorate without improvement of any kind in the blood or the size of the spleen. The subject of myelocytæmia is liable to many disabilities. Fatal hemorrhage has been known to follow such contingencies as an abortion or the extraction of a tooth. Diarrhœa may be a troublesome symptom, and may persist to such an extent as to shorten life. Pressure by enlarged glands on important organs may give rise to serious symptoms. Intercurrent disease may have a remarkable influence on the blood-picture. The leucocyte count may fall to normal as the result of an attack of influenza, and in some cases the count becomes subnormal.

Such complications do not much influence the general course of the disease. The more serious complications of a chronic disease, such as pneumonia and pleurisy, are uncommon in myelocytæmia, possibly on account of the large number of polymuclear cells in the blood.

Myelocytæmia occasionally runs a very acute course. In these cases the duration is from fourteen days to eleven months.

*Effect of Treatment.* In the *x* rays we have a powerful agent for combating the symptoms of myelocytæmia. Their effect is not curative, but the excessive output of leucocytes may be temporarily checked, the organs are probably freed to some extent from the packing of their substance with white cells, and their functions are for the time being improved.

The treatment may succeed in establishing remissions on successive occasions, but sooner or later its power fails. In all cases the application must be closely checked by the examination, not only of the leucocytes, but of the red cells also. It is possible to carry on the

s of irradiation to such an extent as to exhaust the marrow. In many cases toxic symptoms follow the use of  $x$  rays.

The administration of arsenic is another measure which has a beneficial influence on the disease. The patient who is in a position to submit to a combined treatment by  $x$  rays and arsenic has a better chance of a moderate prolongation of life than a patient not so favourably circumstanced; the organic preparations of arsenic offer no special advantages. Sarsaparil has no good influence on the course of the disease. Some strikingly good results have recently been obtained as the result of treatment by benzoin capsules. We have obtained such favourable experience, and consider that the treatment by benzoin has more risks, and confers less benefit, than treatment by  $x$  rays and arsenic.

**Mixed Forms.** Mixed leukemia may arise in two ways.

In lymphatic leukemia, a considerable number of myelocytes make their appearance. This is the result of marrow disturbance; the lymphocyte proliferation acts as a stimulus to the parts of the marrow not yet affected. A large number of nucleated red cells generally appear in the blood at the same time. The advent of the myelocytes does not very materially influence prognosis. Any advance which may be attached to their presence is certainly not reliable.

In medullary leukemia, the blood-picture may become mixed before the failure of the marrow to elaborate the granulations in the blood. In this way a larger number of myelocytes (myeloblasts) than usual are present in the films. A high percentage of non-granular leucocytes in a case of myelocytæmia is to the gravity of the outlook.

3. **Choroma.**—This condition may be regarded as leucocythæmia associated with the formation of green-coloured tumours, particularly in connection with periosteum. Prognosis is quite hopeless. In a general way the outlook is the same as in simple leukemia of the corresponding type, but owing to the tumour-formation, the likelihood of pressure-symptoms arising is much greater. There is also a tendency to more rapid emaciation.

In no form of leukemia is any good result to be expected from leucotomy. The patients in whom the operation has been performed rarely recover from it, and if they do, the course of the disease is not influenced.

G. L. Gulland,  
F. Goodall.

**LICHEN PLANUS.**—It is difficult to lay down any criteria on which to base a prognosis in this disease. Except in a few cases of the acute type which develop rapidly and tend to clear up in a few weeks, lichen planus is apt to be progressive, and may last for many months. Its course may be shortened by treatment, and the most important point in the successful management of the severe cases is absolute rest, both mental and bodily. Chronic patches of the disease are best treated by the  $x$  rays, or by radium applied on a flat plate. The

affection may run a relapsing course, but when once it has cleared up it shows much less tendency to recurrence than psoriasis. The writer has, however, seen a few cases in which the disease has recurred after intervals of from two to four years. *L. H. S. (1911)*

**LIP, CANCER OF.** As is well known, this is one of the least malignant varieties of epithelioma, but there are cases even of this disease in which the prognosis may be very grave from the first.

**Prognosis apart from Operation.** Probably every case would at first prove fatal, but the rate of progress is extraordinarily varied. Sometimes death follows within a few months; in other cases the growth may last for ten years or more. The average duration is about two or three years. Extensive total ulceration of the lip, face, and jaw takes place, and the glands in the neck enlarge, extend, and may suppurate. Death is usually due to lung troubles. In all autopsies, Rowntree found bronchitis, pneumonia, or gangrene of the lung recorded in 29. Metastases in the viscera are uncommon. Rowntree mentions four in the lung, three each in the kidney and liver, and one each in the thyroid, larynx, brain, adrenal, heart, pancreas, and testis. The writer has seen large metastases in the ovaries.

#### RESULTS OF OPERATION FOR EPITHELIOMA OF LIPS.

Author	Cases	Survival				
		1 year	2 years	3 years	5 years	
Worner, Bruns' Klinik (pre-1886)	896	7	4	3	38	62
Fricke, König's Klinik (1871-90)	114	7	106	3	66	31
*Bristol Royal Infirmary (1890-1912)	70	0				
(a) Lips only removed			29	2	10	31
(b) Palpable glands; lips and glands removed			11	2	27	70
(c) Lips and glands removed; glands not palpable			12	2	83	17
Mayo Clinic:						
(a) All cases; glands cleared			99	12	84	16
(b) Glands showed cancer			12	12	50	50
Bloodgood:						
(a) Glands not cleared			10	5	70	30
(b) Glands cleared						
1. Microscopically cancerous			12	5	50	50
2. Not cancerous			21	5	95	5

than six years after the original growth in the lip of a woman smoked a clay pipe.

**Mortality of Operation.** The operation death-rate nowadays is low even if the glands are removed. None died out of seventy operated on at the Bristol Royal Infirmary. Old German tables give a mortality of 7 per cent, but they go back to pre-antiseptic days.

**the Prospect of Cure.** It will be observed that even the methods of antiseptic surgery were able to report about 38 per cent cured. In a later period the proportion rose to 66 per cent. No doubt modern methods even better results can be obtained. Out of 100 cases treated by operation and followed up afterwards in the Bristol Hospital 33 (33 per cent) were well two or more years after. Admittedly, it is rather early to judge of success; but out of a dozen in which the neck was cleared although no glands could be felt, 83 per cent were free from recurrence. When lip only was removed, 69 per cent were well. The figures are, however, small.

Beckman has reported the figures for the Mayo clinic, but unfortunately some of the cases have only been followed a year, though the majority are over two years. In 84 per cent, out of 99 cases, a "cure" was obtained; in all these the glands were removed. Bloodgood has followed a series for five years, and finds that clearing the neck improves the prognosis. When the glands were found to be cancerous, 6 out of 12 were cured; when not cancerous, 20 out of 21.

It is quite clear that when the glands are already palpably enlarged, the outlook is very much graver. Only 3 out of 11 of our cases were cured and well two years after, and in none of these were the enlarged glands proved by the microscope to be cancerous, although the growth in the lip showed as typical epithelioma in section. When the glands were cancer microscopically, both Beckman's and Bloodgood's figures demonstrate that half the cases may be cured.

We conclude, then, that if the neck glands are not enlarged, the prospect of cure is probably about 80 per cent if the neck is cleared and a free removal made of the growth in the lip.

Recurrences in the lip are often amenable to treatment, and 3 out of 7 of our Bristol cases did well.

Even if a cure is not effected, the patient is relieved of what might afterwards be a foul growth, unless, of course, it recurs in the lip.

**Date and Place of Recurrence.** Of 25 recurrences in the Bristol cases, 13 affected the lip (often glands as well), and 12 only the glands. Under removal, therefore, is still called for. In our cases, recurrence of the neck was usually within six months, but, according to Rowntree's statistics, the average was seventeen months. This is probably too long. The growth may come back again in the lip after great lapse of time. According to Rowntree's tables, the average is only four months. We had cases three, six, and even twenty-four months after. Rowntree records one sixteen

In the Bristol Royal Infirmary statistics, death in the failed case took place about eighteen months after operation. One survived for three years; another died in five weeks.

REFERENCES.—Rowntree, *Maddox Hospital Reports*, 1906, vii, 118; Pathy, *Operative Surgery of Malignant Disease*, 1900, 103; A. Rendle Short, *Brit. Med. Jour.*, 1910, ii, 426 (an amplified account is here utilized); Beckin, *Jour. Obst. St. M. Assoc.*, 1913, vi, 185; Bloodgood, *Surg., Gyn., and Obs.*, 1914, April, 103.

A. Rendle Short

**LIVER ABSCESS.**—(See AMERICAN OR TROPICAL LIVER ABSCESS; DYSSENTERY.)

**LIVER, ACUTE YELLOW ATROPHY OF.** Until recently, the disease was regarded as necessarily fatal, because the diagnosis was considered to be established only by death or necropsy. It is now recognized that cases presenting the acute symptoms, but not terminating fatally until several months later, show areas of hyperplasia of the liver cells which compensate for the areas of acute atrophy and thus enable life to be maintained. These cases, called sub-acute atrophy from their duration, are examples of partial recovery from the disease, and as this compensatory hyperplasia has been seen in cases surviving for months and years, the possibility of permanent recovery cannot be denied; but in the absence of exact confirmation, scepticism as to their nature may be expressed, though a fatal issue would have silenced my doubts. I have seen three such cases. There is still much critical reserve about the acceptance of such conclusions, for though in 1880 Wickham Legg<sup>1</sup> collected twenty-eight reputed cures, F. W. White in 1908 estimated the recoveries at about the same figure. In fatal cases of toxic jaundice due to trinitrotoluen (T.N.T.) the liver shows acute yellow atrophy; as about 30 per cent of the cases of this form of toxic jaundice prove fatal, the outlook is much better than in ordinary acute yellow atrophy.

**Medical Treatment.**—Recovery has been recorded after repeated transfusions of saline solution in a few cases, and the treatment of acid intoxication by transfusion with sodium bicarbonate and enemata containing sugar should improve the outlook. In one case to which I gave horse serum, which has an anti-antolytic action, on the ground that the hepatic change is due to autolysis, recovery followed; but it is obvious that no real conclusions can be based on an isolated observation.

Efficient prophylactic treatment in cases which may possibly pass into acute yellow atrophy has some bearing on the prognosis. Thus, jaundice in pregnant women should contra-indicate chloroform anaesthesia in childbirth, and the use of chloral and chloroform, as chloroform causes autolysis of the liver cells, and should call for the prevention of acidosis and constipation. The benign jaundice which may occur in secondary syphilis readily yields to mercury, and this method of treatment may therefore be regarded as a means of preventing the onset of the rare sequel, acute yellow atrophy. In a

number of cases, of which Parkes Weber<sup>1</sup> has collected fifty. Acute yellow atrophy supervenes in the course of secondary syphilis, and may thus be compared with acute myelitis in similar instances. It is much commoner in women than in men, and follows the specific jaundice occasionally seen in secondary syphilis. The available observations show that the *Treponema pallidum* is not present in the liver of syphilitic acute atrophy, and hepatic change therefore appears to be due to poisons manufactured elsewhere and conveyed to the liver. If this is true, special treatment should cut short the supply of poisons and so improve the prognosis, but I cannot bring any figures to substantiate

**Prognosis in Individual Cases.**—Although it be admitted that this disease is not invariably fatal, the outlook in any given case is gloomy. It is worst in pregnant women. Children, probably on their greater power of repair, show the changes of subacute atrophy more often than adults do, and the prognosis is therefore more favourable in them.

**Special Danger Signals.**—Rapid diminution of the liver dullness, the onset of grave renal changes as shown by blood-casts and albumin in the urine, acidosis, a hemorrhagic tendency, the early onset of convulsions, coma, and a very high or very low temperature, show that a fatal termination is near.

**REFERENCES.** <sup>1</sup>Wickham Legg, *Bile, Jaundice, and Bilious Diseases*, 1880, p. 276; <sup>2</sup>F. W. White, *Boston Med. and Surg. Jour.*, 1908, clviii, 729; <sup>3</sup>F. P. Wood, *Proc. Roy. Soc. Med.* (1909), n (Path. Sect.), 113. H. D. Rolleston.

**LIVER, CIRRHOSIS OF.**—Under this heading the following forms of cirrhosis will be considered: (1) *Portal*; (2) *Biliary*, (a) *hyperplastic*, (b) *obstructive*; and (3) *Syphilitic*.

#### I. PORTAL CIRRHOSIS.

(*Synonymus*: Multilobular, 'Alcoholic,' Laennec's cirrhosis).

The subject will be treated in the following order: first, some general considerations on the prognosis of the disease, then the prognosis of hæmatemesis, of jaundice, and of ascites and its treatment, then the influence of treatment generally on prognosis, and finally the prognosis in individual cases.

The hepatic change is often latent, for in about half the cases in which a cirrhotic liver is found at necropsy, death is due to other causes. The prognosis is thus much better than in biliary cirrhosis. Taking into account the greater frequency of cirrhosis in males, the disease is less often latent in females, possibly because alcoholism once established is even more difficult to control than in males. In adults, a comparatively early age appears to be favourable as regards greater tendency to improvement, provided alcoholic excess is stopped, probably because the nutrition is better preserved and



compensatory processes are more readily effected. Thus the average age of 37 patients in which temporary or prolonged improvement occurred was thirty-nine years (Cheadle<sup>5</sup>), which is about ten years less than the average age of fatal cases of cirrhosis. In children the prognosis is generally considered to be very grave; but from a study of 74 cases of cirrhosis due to alcohol, E. Jones<sup>6</sup> concludes that "the prognosis is better in children than in adults when the condition is slightly marked, but worse when definite symptoms of hepatic inadequacy have set in."

**Hæmatemesis** occurs in about one-quarter of the cases, is usually an early symptom, and is directly fatal in only some 5 per cent of the cases dying from the effects of cirrhosis. In Peck's<sup>7</sup> 60 collected cases of fatal gastro-intestinal hemorrhage in cirrhosis, death followed a single hemorrhage in a third of the cases. As hæmatemesis may induce the patient to alter his habits of life at a comparatively early period of the disease, it is possible that in this way it exerts a favourable influence on the course of the disease. When, as occasionally happens, hæmatemesis occurs late in the disease and in the presence of ascites, the outlook is very gloomy. The occurrence of general hemorrhages is always a grave sign.

**Jaundice**, which occurs at some time or another in rather more than a third of all the cases, may be due to several causes, and the prognosis varies accordingly. Often it is transient, and of the form usually spoken of as catarrhal, or it may be slight, without bilirubin in the urine. In these circumstances it does not exert any appreciable influence on the prognosis. On the other hand, the onset of jaundice in the late stage—or when accompanied by fever, multiple hemorrhages, and nervous symptoms, is a very grave indication; cases of this character may run an acute course, and are more often seen in comparatively young subjects who have been drinking heavily.

**Ascites.**—The onset of ascites always makes the outlook bad. It is true that ascites may be due to factors associated with cirrhosis, especially chronic peritonitis, and that the prognosis is then not nearly so grave as in ascites due to uncomplicated cirrhosis. But when ascites first appears, it is seldom possible to distinguish between these two conditions, though the presence of œdema of the feet before the onset of ascites is in favour of uncomplicated cirrhosis. As time goes on, a decision can be arrived at on the ground that frequent tapplings are required in ascites due to chronic peritonitis complicating cirrhosis, whereas in uncomplicated cirrhosis this is not the case. These points are borne out by the following statistics of Ramsbottom<sup>8</sup>: in 31 cases of uncomplicated cirrhosis, the interval between the onset of ascites and death was on an average 188 days, the average number of tapplings two, and the interval between the first tapping and death 46 days; whereas, in 12 cases of cirrhosis associated with chronic peritonitis, the interval between the onset of ascites and death was on an average 334.6 days, the average number of tapplings 6.7, and the

interval between the first tapping and death 288 days. For statistical purposes, cases in which the condition of the liver and peritoneum had been examined must be employed, for in those which recover it is not possible to say with any certainty that some doubt as to the underlying condition must remain. In the majority of cases recovery certainly occurs after one or more tapplings in patients who appear to have cirrhosis; this has also been confirmed in cases in which the ascites have proved fatal from other causes, years after the disappearance of the ascites.

*The Influence of Paracentesis.* Although the prolongation of life after tapping first became necessary was only 46 days in 31 cases of uncomplicated cirrhosis (Ramsbottom), there is no reason to believe that tapping *per se* accelerates the end, for with the present aseptic methods the risk of infection of the peritoneum is practically negligible compared with the discomfort and bad effects due to pressure on other organs exerted by an unrelieved ascites.

*Individual Cases of Ascites.* The prognosis is rendered gloomy when ascites is preceded by great tympanitic distention, or by oedema of the legs, as these show that there is grave toxæmia; by the occurrence of fever synchronously with the onset of ascites, as this may indicate some complication, such as tuberculosis of the peritoneum or other parts; by concomitant hæmatemesis or melæna; or by such a re-accumulation after tapping as to require its repetition in two or three days, as these events may indicate thrombosis of the portal vein.

*Surgical Treatment of Ascites* of cirrhosis has taken several forms, of which the production of vascular peritoneal adhesions, or the Talmier-Morgan operation, is the best known. The operation is contraindicated in an advanced stage of the disease with much toxæmia, by considerable jaundice, and by definite cardiac or renal disease. On the basis of cases observed in Calcutta, Rogers<sup>5</sup> considers that leucocytosis renders any operation inadvisable. The prognosis is influenced by the stage at which the operation is performed. But it can be urged that cases in the earlier stages are those which might recover if left to nature. From analysis of 227 cases, Sinclair White<sup>6</sup> estimated that 37 per cent were cured and 43 per cent improved, whereas Willcms<sup>7</sup> concluded that only 4 per cent out of 250 cases were really successful.

Other operations, such as introducing the omentum into a subcutaneous pocket in the abdominal wall (Narath), or establishing permanent drainage of the ascitic fluid into the subcutaneous tissues of the abdomen (Paterson) or thigh through the femoral ring (Wynter and Handley), entail much less operative shock and have been successful in some cases. Possibly the mechanism by which improvement results is on the same lines as in 'autoserotherapy,' or the reabsorption of ascitic fluid, after its removal, into the abdominal wall; by injecting 3 dr. every other day, Vitry and Sèzary<sup>8</sup> induced profuse diuresis and cure of the ascites. Of Rouffe's operation, which consists in making an anastomosis between the peritoneal

cavity and the internal saphenous vein. Celso<sup>4</sup> in 1911 collected 10 cases, of which 2 only were successful.

In Egyptian splenomegaly, which, as in Banti's disease, becomes complicated by hepatic cirrhosis, splenectomy, or removal of the supposed focus of the disease, has been employed as a curative measure in the early stages when there is evidence of only moderate hepatic cirrhosis (Roussels and Day<sup>5</sup>). It is not advisable when ascites or jaundice has appeared. This surgical procedure, therefore, improves the prognosis, but the disease is not the same as ordinary cirrhosis. Splenectomy in 7 cases of cirrhosis in France proved fatal in 2 (Julhien<sup>6</sup>), and at present appears a risky and heroic procedure.

**The Effect of Treatment** is greatly influenced by the period of the disease at which it is undertaken, and thus depends on early diagnosis. Hematemesis, the earliest symptom of striking importance, may, under efficient treatment, temperance, and care in diet, be succeeded by years of life, and the underlying cirrhosis may remain permanently latent. But the disease is compensated, not cured, and the compensatory mechanisms may fail; the hyperplastic areas of liver cells may degenerate, or the dilated oesophageal veins may rupture and give rise to hematemesis.

**In Individual Cases.** An advanced stage of the disease, with emaciation, is obviously ominous. Fever points either to a rapidly progressive change in the liver or to the presence of some complication, such as tuberculosis, and is therefore a bad prognostic. The onset of drowsiness is a most grave sign, as showing that lethal coma due to hepatic toxæmia is imminent. The gravity of ascites, œdema of the feet, and multiple hemorrhages has been referred to already.

The size of the liver, if taken alone, is not of much value in prognosis, for though an enlarged liver due to compensatory hyperplasia is found in latent cases, enlargement also occurs in cases running an acute course, and may be temporary and due to recent alcoholic excess. The general symptoms must also be taken into account; in the absence of well-marked gastro-intestinal symptoms, a large liver is a favourable sign, and vice versa. Since the spleen is usually large and palpable in progressive and acute cases, and comparatively small in latent cirrhosis, the association of a large liver and spleen is less favourable than a large liver without a palpable spleen.

Occasional glycosuria after indulgence in alcohol or a large amount of sugar has no special bearing on the prognosis. But in the cirrhosis of haemochromatosis, in which diabetes may result, death usually occurs within a year after the onset of glycosuria. The presence of diacetic acid in the urine, which is rare in ordinary cirrhosis, shows the presence of acidosis, and is therefore ominous. Very well-marked anaemia is a grave sign, and, from his experience in Calcutta, which has not been confirmed for this country, Rogers<sup>5</sup> considers that a high leucocytosis is a bad sign.

## 2. BILARY CIRRHOSIS.

**Hypertrophic Biliary or Hanot's Cirrhosis** is always, or nearly fatal. It runs a chronic course with exacerbations, and lasts as long as ten or more years, but the average duration is not more than five years, and acute cases terminating within two years are sometimes seen. In India, especially in Calcutta, it is a form of endemic cirrhosis clinically somewhat resembling the cirrhosis of Europe, which attacks infants. It is probably of different origin, and is conceivably allied to kala-azar. It runs a more rapid course than ordinary biliary cirrhosis, and it is said that 90 per cent of the cases in Calcutta terminate fatally before the end of the second year of life (Ghose<sup>15</sup>). An endemic form of interlobular cirrhosis characterized by jaundice, fever, ascites, enlargement of the liver but not of the spleen, and by a rapid course in six to eight months, is said to occur in Mexico City (Carmona y Valle<sup>16</sup>).

*Prognosis of Treatment.* A quiet life in a healthy sunny place, with protection from cold winds and damp, will prolong life. Catnip has been stated to exert a really beneficial influence on the disease, but to cause the jaundice to disappear, but more evidence is necessary before this can be accepted.

*Surgical Treatment.* Drainage of the gall-bladder has been stated to give good results; out of 17 cases, 13 were relieved (Greenough<sup>17</sup>). It is probable that at any rate of these cases may have been examples of chronic infection of the biliary tract rather than of Hanot's cirrhosis.

*Individual Cases.*—The patient's general nutrition, inasmuch as it indicates the progress of the malady, naturally influences the prognosis as regards prolongation of life. Clubbing of the fingers is only met with in long-standing cases, and therefore shows that the course of the disease has been slow. Wasting and the recurrence of febrile exacerbations or crises at shortened intervals indicate that the disease is advancing rapidly. The onset of widespread haemorrhages and the appearance of ascites and oedema of the legs are very serious indications, and the occurrence of complications such as pneumonia and peritonitis is most serious. Erysipelas, however, may not be fatal, provided the urinary excretion is well maintained.

**Obstructive Biliary Cirrhosis.** Fibrosis of the liver may be associated with obstruction of the larger bile-ducts. Thus, in congenital obliteration of the bile-ducts, cirrhosis of the liver is constant; and in some cases of chronic obstruction of the ducts by gall-stones, there is increase of fibrous tissue in the liver. The prognosis of such cirrhosis is largely bound up with that of the associated condition, and cannot be considered independently. Thus, in congenital obstruction of the ducts the outlook is hopeless, and death nearly always occurs before the eighth month of life. In gall-stone obstruction operation may, if the hepatic fibrosis has not become excessive, lead to a cure; but much enlargement of the liver and the presence of secondary fibrosis add to the gravity of the outlook in gall-stone

obstruction and render operation more serious than in cases not so complicated.

### 3. SYPHILITIC CIRRHOSIS.

In acquired syphilis it is probable that an intercellular cirrhosis, resembling the well-known lesion in the congenital form, occurs: but opportunities for verifying its presence are very rare. It is possible that it may be a causal factor in the benign jaundice of secondary syphilis, and that when excessive it may lead to acute yellow atrophy—a very rare event (*see* LIVER, ACUTE YELLOW ATROPHY *op.*). The prognosis of intercellular cirrhosis in adults, assuming that it occurs, is very good as regards the immediate future, for jaundice and acute yellow atrophy very seldom follow. It is, however, reasonable to believe that, if untreated, gummatous change would be more likely to supervene.

**Syphilitic Cicatrices.** The deformed and widely-tissured or 'botryoid' liver, due to contraction of gummata and syphilitic cicatrices, is often called 'syphilitic cirrhosis,' and no doubt has a superficial resemblance to a coarsely lobulated portal cirrhosis. But it would be more accurately described as syphilitic 'fibrosis' than 'cirrhosis.' The prognosis of syphilis of the liver is discussed elsewhere (*see also* ASCITES), but it is important to remember that whereas gummata melt away under efficient treatment, cicatrices are not affected. Antisyphilitic measures are therefore disappointing, and in addition misleading, if failure to obtain a good result be regarded as necessarily eliminating the existence of syphilitic change in the liver.

**Portal Cirrhosis** in the subjects of congenital syphilis, or the occurrence of portal cirrhosis in a liver which, having formerly been affected with intercellular cirrhosis, is left with its resistance so weakened that portal cirrhosis is easily induced, probably explains some cases of portal cirrhosis in early life, and possibly, though this is difficult to establish, some cases in adults. The prognosis is much the same as in ordinary cirrhosis in early life.

**Intercellular Cirrhosis of Congenital Syphilis.** Prompt and efficient antisyphilitic treatment has a most important bearing on the prognosis, not only in curing the condition at the time, but in preventing the occurrence of the delayed congenital lesions such as gummata and amyloid change. Injection of neosalvarsan into the scalp veins is said to be more effective than mercurial treatment, and ante-natal treatment of the pregnant syphilitic mother by neosalvarsan has a markedly good prognostic influence (Findlay and Robertson<sup>19</sup>).

In individual cases the outlook depends on the general condition of the patient, and on the degree of enlargement of the liver and spleen, which may be regarded as an index of the severity of the infection. General hemorrhages and jaundice, which are often due to secondary infection, are very grave signs. Cases with ascites, which is very rare except in infants born with the disease in an advanced stage, are nearly always fatal. The earlier in life the general manifestations of congenital syphilis appear, the graver the outlook.

- W. B. Cheadle, *Some Cirrhoses of the Liver*, 1900, 72; 1900, exis, 263; 1907, iv, 1; Preble, *Amer. Jour. Med. Sci.*, 1900, exis, 263; Ramsbottom, *Med. Chron.*, Manchester, 1906, 7, 1; Rogers, *Lancet*, 1912, ii, 375; Sinclair White, *Brit. Med. Jour.*, 1901, 1287; Williams, *Rev. de Char.*, Paris, 1901, xiv, 606; Vitry et al., *Rev. de Med.*, Paris, 1913, xxxiii, 86; Celso, *Magnan*, Milano, 1911, 675; Richards and Day, *Trans. Soc. Trop. Med.*, 1912, v, 1; Jullien, *Arch. prov. de Char.*, Paris, 1911, xx, 90; Ghose, *Lancet*, 1921, 321; Carmonoy Valle, *Gaz. hebdom. de Med.*, Paris, 1897, N.S., xi, 873; Smith, *Amer. Jour. Med. Sci.*, 1902, cxxiv, 979; Emmellay and Young, *Quart. Jour. Med.*, 1914, xv, viii, 175.

H. D. Rollstone.

LIVER, INJURIES OF. — (See ABDOMINAL INJURIES.)

LOCOMOTOR ATAXY. — (See TABES DORSALIS.)

LUNACY. — (See MENSTRUAL DISEASES.)

LUPUS ERYTHEMATOSUS. — There are two types of this disease: —

1) *Acute*, and (2) *Chronic*.

1) *Acute*. — In this form the lesions are erythematous, with little or no obvious infiltration. The eruption develops rapidly, in bright red flush areas of the cheeks, the root of the nose, the backs of the fingers and hands, sometimes the elbows, knees, and ankles, and occasionally the trunk. The patients are nearly all young girls or young women. When pyrexia and general symptoms exist, the prognosis is unfavourable, and I have seen several cases end fatally. The mortality is about 15 per cent. The fatal issue may be due to pneumonia, acute nephritis, or pulmonary tuberculosis. In some instances the eruption is hemorrhagic, and this factor is of grave omen. The prognosis depends mainly upon the general symptoms, and upon the pulmonary and renal condition. In many cases the disease can be controlled, and sometimes cured, by large doses of quinine; but relapses are common.

2) *Chronic*. — In the more common localized form, the lesions are limited to a small area, slowly spreading from one or more foci on the cheeks, nose, ears, or scalp, or rarely, the trunk. The patches are infiltrated, and more or less scaly or crusted, with a tendency to produce scars in their centre and to spread peripherally.

Beginning in adolescence or early adult life, the disease has many variations in its activity, and may last for many years. Even when the lesions are quite removed by treatment, or heal spontaneously, it is impossible to promise a permanent cure. The chronic scaly patches are removed temporarily by applications of carbonic-acid snow, by scarification, and by the local application of caustics such as iodine, but recurrence is the rule. These recurrences are more common in the winter months and in the spring. Residence in a warm dry climate prevents relapses, but a return to a humid region is almost invariably followed by a recrudescence of the eruption. We are in complete ignorance of the cause of the disease, but attention

directed to the general health and the administration of quinine and tonics, are of service. Many cases gradually improve with the lapse of time, but cases in which the disease has been present for twenty or thirty years are not uncommon.

Epithelioma is a rare complication. In two cases which I have seen, it has followed prolonged x-ray treatment. J. H. Sequoyia.

**LUPUS VULGARIS.** The prognosis in a case of lupus vulgaris depends on: (1) *The presence or absence of disease of the mucous membranes;* (2) *The extent of the cutaneous affection;* (3) *The character of the lesions, whether ulcerated or non-ulcerated;* (4) *The general condition of the patient, and the conditions under which he lives, as regards the supply of proper nourishment, the hygiene of the home, etc.;* and (5) *The treatment.*

1. **Involvement of the Mucous Membranes.** This occurs in 43 per cent of the cases seen at the London Hospital, and the presence of disease in the nasal cavity, on the palate, on the gums or the lips, or in the pharynx or larynx, materially increases the difficulty of treatment, and necessitates a guarded prognosis. It is my experience also that pulmonary affection is more likely to occur in the cases in which the upper air-passages are involved. Where, however, the diseased areas in the nose are within reach, and can be thoroughly destroyed by the curette, cautery, or caustics, or combinations of treatment of this kind, a cure is frequently effected; but if the surgeon is unable to remove the disease entirely, relapses *in situ*, with secondary involvement of the skin, are the rule. Where the cartilages of the septum and alae are involved, the outlook as regards permanent cure is less hopeful. The use of nascent iodine (Pflümenstill method) after operation is of great assistance in preventing recurrence in the intranasal cases.

In lupus of the gums, lips, and pharynx, the prognosis depends upon the thorough eradication of all the foci by the cautery, or the application of caustics, such as iodine (1-5).

2. **The Extent of the Cutaneous Affection.** The size of the area involved depends, of course, in the main upon the duration of the disease, and therefore upon early diagnosis. Large single areas require prolonged treatment, but if of the dry type, the prognosis is not materially influenced. Multiple lesions scattered about the face, limbs, and trunk, such as occur after the acute exanthems, do not yield so readily as the extensive single-focus cases, but many of the foci may heal spontaneously if they are of small size.

3. **The Character of the Lesions—Ulcerative or Non-ulcerative.**—The dry, non-ulcerative form responds most readily to the Finson treatment, and the most permanent results, with the least deformity, are obtained in it. X-ray treatment is extremely tedious in this variety, and cure can only be effected at the risk of producing a telangiectatic scar, which may become epitheliomatous. The ulcerative form responds readily to treatment by local antiseptics, followed by

response to the  $x$  rays. Relapses are, however, more common, and with greater disfigurement.

6. **The General Health of the Patient and the Condition under which he lives** are of great importance. The resistance of the individual to the tuberculous process obviously depends to a large extent upon his general health and upon a sufficiency of good food, clean air, and proper hygiene. Where these are unsatisfactory, as in the crowded children of our large cities, the effects of efficient local treatment are often nullified.

7. **The Treatment.** Complete excision of the affected area with a good margin of skin around, and the removal of a sufficiency of the adjacent tissue, give admirable results: grafts may be applied where the area is extensive. Lang, of Vienna, has reported a remarkable series of results. In many cases the operator does not go deeply enough, and, on the face, the fear of increasing the deformity is an important drawback: the result is that patients return with deep-seated nodules which can be seen through the graft. These, I find, are extremely difficult to destroy, except by puncturing with the cautery. Where the lupus occurs in regions in which the character of the scar is of but little moment, the method of excision is to be regarded as giving excellent results with the minimum loss of time or treatment.

The Finsen treatment is especially indicated where the lesions are of moderate size, and on the face or exposed parts. The permanency of the results is now assured by a lengthy experience. I have more than 100 cases which have been cured by this method, and which have been free from recurrence for ten to sixteen years. Of 1639 completed cases treated in the Finsen light department at the London Hospital during thirteen years: 514 were free from recurrence for more than three to thirteen years; 186 had been well for less than three years; 117 patients require occasional treatment (they have never been free from recurrence for a long period, but are able to follow their employment); in 161 cases we were only able to report improvement (these patients had usually had extensive disease before treatment was begun, or there had been severe affection of the mucous membranes of the nose, nasopharynx, or buccal cavity); only 31 cases were found to be uninfluenced by treatment.

It should be mentioned that these results were not entirely due to the light treatment, as ulcerated areas received preliminary applications of the  $x$  rays, and the nasal, palate, and buccal cases received local treatment, either by operation or the application of strong antiseptics and caustics.

I should like to take this opportunity of protesting against the prolonged treatment of lupus, especially of the dry form, by the  $x$  rays. I have seen a large number of cases in which several hundreds of applications of the rays have been made. The results in some instances have been satisfactory as regards the disappearance of the lupus, though the scar was an ugly one. This, however, is of small



moment in comparison with the grave complication of epithelioma. Chronic lupus is followed in about 2 per cent of the cases by epithelioma, but prolonged treatment by the  $\gamma$  rays unquestionably increases the liability to cancer, and I regret to say that I have seen cases in which the prolonged radiation has without doubt been the cause of this grave complication.

Treatment of lupus by tuberculin is unsatisfactory. In some cases of the necrotic type, and in many of scrofuloderma, improvement follows the careful exhibition of this remedy; but care is required, for there is no doubt that its uncontrolled administration has been followed by an aggravation of the disease, and also by the stimulation of latent pulmonary foci.

Lupus is not in itself a fatal disease, but in cases in which the nose, pharynx, and larynx are affected there is considerable risk of pulmonary complications: 6 of my 544 patients cured of lupus died from pulmonary tuberculosis, and 7 others died while under treatment. Tuberculous meningitis also developed in 2 cases while the patients were undergoing the Finsen-light treatment.

J. H. Sequeira.

**LYMPHADENITIS, TUBERCULOUS.** We shall confine ourselves in this article to tuberculosis of the glands of the neck. The problems which present themselves are: (1) *The prospects apart from radical removal*; (2) *The mortality of operation*; and (3) *The end results of cases operated on*.

**1. Prospects apart from Radical Removal;** or, in other words, the effects of medical and general treatment. Included under this heading are cases in which the bursting of an abscess may be hastened by incision. We have to ask what prospect there is of natural cure, and what is the danger of tuberculosis arising elsewhere. Reliable statistics of a sufficient number of cases are not abundant; but we may probably accept Wohlgenuth's figures as showing that about 24 per cent are permanently cured. The majority either advance and retrogress alternately; or remain stationary for many years (the glands often becoming calcareous); or, more commonly, softening eventually takes place, and an abscess bursts through the skin, often discharging for a long time, and leaving an ugly sore. In children, the majority of the cases eventually break down; in adults, the glands have often been present for a long time already, and frequently show no tendency to change further.

Given the best possible conditions, fresh air, good food, etc., the results would no doubt be better. Sea air, especially that of the Kent coast, has a great reputation in this particular complaint. But even under the best circumstances a considerable number of the cases come, or ought to come, to operation.

**Tuberculin.** The value of tuberculin is not yet definitely determined by statistics, but it often appears to help. Carmalt-Jones has published a study of 79 cases treated at St. Mary's Hospital inoculation department: he describes 27 as cured, 21 as much better, 18 better, 8 not

good and 4 worse; it is not stated how long they were observed, but 3 of 4 had had a previous operation. Patients under ten and twenty did well; those between ten and twenty did poorly.

We may conclude, therefore, that, given the best conditions, about 50 per cent are likely to be cured apart from operation; that the majority will be improved for a time, or brought into a comparatively quiescent state; but that many of these will eventually suppurate; and further, that tuberculin is probably helpful.

*Recurrence Elsewhere.*—As to the danger that tuberculous may develop elsewhere, the figures obtained by Denme from the Children's Hospital at Bern, where cases could be followed up for many years, are as long as twenty, are probably the most reliable we have; of 62 cases treated without operation, 145 eventually developed phthisis, or 24 per cent, and 57 developed tuberculosis elsewhere, or 8 per cent, or a total of 29 per cent.

It does not follow, of course, that this was always due to softening and migration from the tuberculous glands of the neck.

*Prognosis in Individual Cases.*—If the glands are already softening, the result will only result by the long and uncertain process of external drainage. The ability to obtain fresh air and good food, and the response to a few months of this treatment, are the principal guides to prognosis.

**2. Mortality of Operation.**—This must be very small indeed. Of 639 cases at the Mayo clinic, none died of the operation; the nearest approach was a fatality, four weeks afterwards, from generalized tuberculosis. Dowd had 2 deaths in 465 operations. We may take it, then, that apart from the irreducible minimum of surgical calamities, such as anæsthetic deaths, status lymphaticus, etc., the danger is practically nil.

Nerves may be cut, but it is very unusual for section even of such important structures as the vagus or spinal accessory to give rise to any permanent trouble; nor does ligation of the jugular vein appear to do any harm. Cutting the thoracic duct is another harmless bogey.

**3. End-results of Operation.** It is difficult to quote figures as to prospects of permanent cure, because operators differ so much in the thoroughness of their methods.

*Local Recurrence.* The number of local recurrences is given by different collectors of statistics as follows: Wohlgenuth, 30 per cent; Dowd, 25 per cent out of 100 cases; Judd, 8.6 per cent out of 649 cases in the Mayo clinic; Miller, 13.4 per cent out of 67 cases.

Wohlgenuth's records are getting old now, and are probably much too high. The true recurrence rate, judging by what is seen in ordinary hospital practice, is probably about 4 in 5 or 6, and it would be less if a more complete clearance of glands were made in the first place. Some writers attach great importance to removing enlarged tonsils and carious teeth as a considerable help in preventing recurrence.

*Recurrence Elsewhere.*—Another inquiry must be made concerning the prospects of subsequent development of tuberculosis elsewhere

after removal of glands from the neck. A. W. Neudorfer quotes 149 cases, followed from three to sixteen years after operation, whom 28 per cent showed evidence of tuberculosis in other organs. He watched his cases for three to twelve years; 26 per cent developed phthisis and 44 per cent tuberculosis elsewhere. Dowd, on the other hand, found only 1 case of tuberculosis of the lung and 3 of bone disease following on 100 operations, but his end results are not so late as the others. Dowd, reporting on 619 cases from the Mayo Clinic, found that 19 afterwards died of phthisis and 19 of tuberculosis elsewhere; at the time of operation, only 40 were known to be consumptive. Muller found that 6 out of 17 cases eventually died of tuberculosis.

From these figures we may conclude that removal of the glands is by no means a sure preventive of further tuberculous mischief. It looks, at first sight, as though operation were of no value in averting such mischief, because there is very little difference between the figures quoted for tuberculosis developing elsewhere in the medical and surgical groups. In each group, probably about 1 case in 4 will eventually show signs of phthisis, bone disease, etc.; but it must be remembered, of course, that the non-operated group mostly includes the milder types of the disease, and the operated group the severer types, in which a much larger proportion of cases of dissemination might have been expected, so that it is probable that removal is of some value in preventing recurrence.

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V. Ruddle, St. J.

**LYMPHADENOMA.** In considering the prognosis of lymphadenoma, it is important to understand exactly what is meant by that name. Until 1904-2, when the histological work of Andrews, Reed, and others definitely established the structural characters of lymphadenoma, cases of lymphatic glandular enlargement which did not fit into any other group, and would now be spoken of as lymphocytoma or pseudoleukemia, were often included; and at an earlier period, confusion occurred with some forms of sarcoma, of leukemia, and of tuberculosis. At the present time, microscopic examination of a gland should be regarded as essential to a diagnosis of lymphadenoma, and for strictly accurate statistics only cases, such as Longcope's collection<sup>1</sup> of 86, in which this has been done, can be accepted. Otherwise, cases of tuberculous large-celled hyperplasia of lymphatic glands might be thought to be examples of lymphadenoma cured by operation.

True lymphadenoma appears to be invariably fatal sooner or later. The duration of life after the onset of symptoms varies considerably; the rare acute form may run its course in some weeks or a few months, but usually the disease proves fatal within three years; thus, out of 19 cases followed to their termination, Longcope found that 34, or 69·4 per cent, died within two years, but 2 survived for seven years and another for six years. The question of prognosis is therefore

ended with the duration of life rather than with recovery. (See also Yates and Binding's<sup>2</sup> after an experience of 63 cases, concluding that recovery, meaning thereby freedom from signs of recurrence for five years, is possible in 20 per cent of their cases. The usual course of the disease is that the glandular enlargement is at first and usually confined to the neck, local, and with periods of quiescence or remission, but is progressively and that eventually it generalizes more or less widely, and is then accompanied by fever. When the local phase is over it is possibly absent, the disease appears acute from the start.

**Medical Treatment.** Arsenic has a marked effect in reducing the size of the glands, and may apparently bring about a long intermission in the course of the disease. Organic compounds of arsenic such as cacodylate, and silyvarin have also been employed. Silyvarin produces a rapid and striking effect, but it should not be used in advanced patients late in the course of the disease. Arsenic does not seem equally well on all cases of lymphadenoma; sometimes it may exert any influence; and although it may be most successful at one time, it may lose its effect and no longer control the glandular enlargement; or in a case in which the glands have become normal after the use of arsenic, a recurrence is quite uninfluenced by that drug. In this connection it is possible that in its progress the disease undergoes some alteration in character, such as its transformation into sarcoma (Yamamoto, Katsner<sup>3</sup>), or that some secondary infection of the glands has occurred.

X-rays prolong life but do not destroy the unknown cause of the disease. This is shown by the occurrence of relapses. Soft glands containing much cellular elements, and the spleen, diminish in size, but hard fibrous glands are unchanged. According to McNalty,<sup>4</sup> x-rays do not influence cases with the relapsing type of fever. In most cases, although striking diminution in size follows x-ray treatment, the glandular enlargement recurs when the exposures are discontinued. The application of x-rays may induce a grave toxemia and, as shown experimentally, normal lymphoid tissue may be extensively destroyed and grave damage be done. In 42 collected cases Pancoast<sup>5</sup> found that a "symptomatic cure" occurred in 18, improvement in 14, and no change or slight improvement only in 10. A further report on 27 of these cases showed that 17 had died of the disease, and that 2 more would shortly succumb; 7 were well three or four years after the first symptomatic cure, and 1 a year after; but 4 of these 8 had had relapses. Thus, as a cure for three or four years was obtained in 25 per cent of the cases, the influence of x-rays on prognosis is better than that of any other form of treatment.

**Surgical Treatment** is only admissible in the early stage when the disease is localized to a group of superficial glands, as in the neck. From *a priori* considerations it is perfectly logical to remove the primary focus so as to prevent generalization; in some instances this has been thought to delay the course of the disease. In a case under my care there was an interval of five years between operation and death.

Recently stress has been laid on the importance of removing the focus of entry, such as the tonsil or carious teeth (Nates and Bunting<sup>2</sup>). On the other hand, it is often impossible to remove all the glands involved when the parts are exposed, and in some instances recurrence and generalization occur rapidly after operation and after the removal of a gland for diagnosis; the later event, however, is not necessarily due to operation, as it may have begun before the surgical procedure. It is possible that x-ray exposures soon after operation might be beneficial by acting on the inoperable glands. Although operation may be desirable to relieve pressure symptoms or to prevent deformity, its influence from a prognostic point of view is probably bad.

**Prognosis in Individual Cases.**—The prospect of life varies according to the stage and site of the disease: when it is confined to a single group of glands, two, three, or even more years may elapse before death, provided pressure is not exerted on some important structure such as the trachea or bronchi.

In the late stage, when generalization has taken place, the end is nearer, but considerable variations are met with. Thus, a mediastinal growth may, by mechanical pressure, precipitate the end. Intra-thoracic and intra-abdominal lymphadenoma is more rapidly fatal than widespread, superficial glandular implication. This is incidentally shown by the figures given below in connection with the bearing of relapsing fever on the prognosis. Fever of one form or another almost always occurs in the course of the disease, and generally speaking its presence points to an advanced stage with generalization of the disease. The average duration of life after the onset of the relapsing type of fever is about seven and a half months (Batty Shaw<sup>7</sup>), but cases have been known to last more than a year. The cases which present the relapsing form of fever appear to run a more rapid course than others. In 27 cases of lymphadenoma with relapsing fever collected by McNalty,<sup>5</sup> the extremes of life from the onset of the glandular enlargement were five weeks and four years, and the average 12.7 months; or excluding 3 exceptional cases with durations of two and a half, three, and four years, 9.3 months. In 18 out of these 27 cases in which the superficial glands were enlarged, the average duration was 11.6 months, or excluding the 3 cases of exceptionally long duration, ten months. In 7 cases in which the internal glands only were affected, the duration was eight months.

Hæmorrhages and a grave secondary anaemia show that the end is near. There seems some evidence that a relatively high polymorphonuclear count with a very considerable fall in the lymphocytes, a decided leucopenia, and a small number of platelets in the blood (Bunting<sup>8</sup>), indicate a late stage of the disease. Pruritus, which is rather rare, has appeared to me to be associated with a rapid course of the disease.<sup>9</sup>

Disappearance of glandular enlargement is not necessarily a good sign, for the disease may advance in the internal organs while the superficial lymphatic glands are disappearing. Further, although the

amount of growth left is small, the patient may pass into an extremely anæmic and cachectic condition and die. I have seen this after prolonged x-ray treatment. The appearance of complications, of which tuberculosis is the most frequent, renders the prognosis very grave.

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H. D. Rolleston.

**LYMPHATIC FISTULA.**—(See THORACIC DUCT, WOUNDS, &c.)

**MADURA DISEASE.**—This disease produces much deformity, and often results in the loss of a foot or hand. It is not a fatal affection, except rarely through secondary septic infection.

Leonard Rogers.

**MALARIA.**—Malaria is so widely distributed and so commonly prevalent that in spite of a low case mortality it is responsible for a very large total mortality; not so great, however, as stated by some writers, who have assumed that a very large proportion of the deaths returned as due to 'fever' in India are malarial, whereas investigations have shown that even in very malarious parts of Bengal not more than 20 to 25 per cent of 'fever' deaths are due to malaria, a large proportion of which occur in children during the autumnal months at the end of the monsoon. Epidemics of malaria, such as that following exceptionally heavy rain in the Punjab in 1908, cause a high mortality due to heavy infections and lack of adequate treatment.

The case mortality of malaria under efficient quinine treatment is low, having been 2.9 per cent among 210 cases in Europeans in Calcutta, while Daniels records a mortality of 0.91 per cent in more chronic relapsing forms seen at the London docks. In Calcutta the case mortality was twice as high in the malignant as in the benign tertian, while none of the few quartan cases died. The majority of the fatal cases were admitted unconscious and died within a few hours of cerebral malaria, the blood showing extremely numerous parasites. Once unconsciousness has been produced by blocking of the cerebral capillaries by the parasites, recovery is unusual, so it is of the utmost importance to recognize in good time the cases in which this is likely to occur. This can only be done by the microscope, which reveals the danger by showing extremely numerous parasites in the blood, usually of the malignant tertian type. When many parasites are found in every field of an oil-immersion lens the case is a dangerous one, and especially so if the parasites are nearly as numerous as the red corpuscles, when the danger is great and imminent, as the ordinary method of administering quinine by the mouth will fail to save the patient's life. In such cases intravenous or subcutaneous injections of highly diluted soluble dihydrochloride of quinine are necessary, by

which means the mortality has been much reduced in the Panama Canal zone recently. The writer has seen deaths result from the refusal to adopt this treatment in cases in which he had found very numerous parasites present from one to three days before urgent symptoms appeared; while, on the other hand a grave case, suspected to be typhoid until the blood was examined, was saved by intravenous quinine. The rare intestinal malaria with choleraic symptoms is also very fatal if not detected by the microscope and adequately treated, as in a case the writer rescued from the cholera ward by a timely blood examination.

Apart from the microscope the clinical symptoms are often a very fallacious guide in the prognosis of malaria, except when cerebral symptoms have already set in, when it is usually too late to save the patient. The height to which the paroxysm rises is of little importance, for temperatures of 106° or more, for a short time, most frequently occur in the relatively innocuous benign tertian form. Of much more importance is the persistence of the remittent type of fever without any fall to the normal line, indicating numerous broods of parasites, producing an approach towards a typhoid-like chart; and the higher the lower limit of the temperature curve, the more severe is the case as a rule, except in the terminal stages, when a low temperature may be seen. In benign tertian cases the failure of the temperature to reach the normal line between the paroxysms indicates an exceptionally severe case. The pulse is always rapid during fever in malaria, but if it is exceptionally high, such as 140 or over, and feeble, it is a bad sign.

**Chronic Recurrent Malaria.** Native patients often suffer from repeated attacks of malarial fever through neglect of quinine treatment, when further symptoms occur which affect the prognosis. Severe anaemia and debility, predisposing to dangerous intercurrent diseases such as pneumonia and phthisis, are the most important. Abortion, or premature delivery of an immature infant which soon succumbs, is a common sequel to chronic malaria, being largely responsible for the high infant mortality and low birth-rate in malarious countries. The size of the spleen is of little guide in the prognosis, as the largest are often seen in the mild quartan malaria, while the organ may be but little enlarged in the severe malignant tertian variety. A normal proportion of leucocytes is a favourable sign in spleen cases, as it indicates an amenable chronic malaria and not the deadly kala-azar. (See also BLACKWATER FEVER.)

*Leonard Rogers.*

**MANIA.**—(See MENTAL DISEASES.)

**MEASLES.** The most important points to which attention must be paid in the prognosis of measles are: (1) *The age of the patient*; (2) *The presence of certain complications*; (3) *Certain special symptoms*; (4) *The social status of the patient*; and (5) *The virulence of the epidemic.*

1. *Age.*—It can with confidence be stated in general terms that the younger the patient the worse the prognosis, but that only for infants under two years of age is it really serious. The exact gravity of the prognosis when considered from this point of view varies with the character of the epidemic and the circumstances of the patient. The tallest figures bearing on the subject are those from the city of Aberdeen, where measles was a notifiable disease for the twenty years 1883 to 1902. During that period 40,374 cases were notified, and there were 1346 deaths. For all ages and for the whole period the fatality was thus 3.3 per cent. The following table shows the fatality in different age-periods. From this it is seen that the fatality is considerable, highest in infants under one, and next high in those between one and two. After that age it drops considerably, and remains low at all other ages.

It is possible that the Aberdeen notifications contained a considerable number of cases of rubella. As the latter disease is very rarely fatal, its inclusion in notifications of measles would cause the fatality from this disease to appear to be lower than it really is.

FATALITY ACCORDING TO AGE (ABERDEEN).

Age	Fatality per cent	Age	Fatality per cent
Under 1	13.9	9-10	0.6
1-2	10.1	10-11	0.2
2-3	3.4	11-12	0.0
3-4	1.5	12-13	0.1
4-5	0.9	13-14	1.2
5-6	0.7	14-15	0.0
6-7	0.5	15-25	0.9
7-8	0.5	25-60	0.5
8-9	0.4	60 and over	0.0

The only statistics available in which corrections for errors of diagnosis have been made are those of various hospitals. But inasmuch as the worst cases are, as a rule, sent to hospital, while the less serious are treated at home, the fatality of cases treated in hospitals is usually high. The table on the next page shows the cases admitted into the hospitals of the Metropolitan Asylums Board during the four years 1911 to 1914, with the number of deaths and fatality per cent.

The figures in this table bear out the statement made above as to the diminution of the fatality with the increasing age of the patient. Sex makes no difference in the prognosis.

2. *Complications.*—*Lung Affections.*—By far the most formidable, as well as the most frequent, complication is bronchopneumonia. It accounts for a large majority of the deaths from measles. During the four years 1911 to 1914 there were 1688 cases of measles under



## FATALITY ACCORDING TO AGE (METROPOLITAN ASYLUMS BOARD).

Age	Cases	Deaths	Fatality Per Cent
Under 1	1600	247	22.8
1-2	2728	582	21.3
2-3	2125	251	11.8
3-4	1871	133	7.0
4-5	1170	76	5.1
Under 5	9277	1289	13.8
5-10	2037	56	2.7
10-15	149	3	2.0
15-20	60	0	0.0
20 & over	105	2	1.9
Total	11,628	1,350	11.6

treatment at the Eastern Hospital, Homerton, and in 309, or 15.5 per cent, bronchopneumonia supervened. Of the 309 cases, 220, or 71.1 per cent, were fatal. Besides these there were 18 fatal cases of bronchitis. The total number of measles deaths for the three years was 303; so that in 78.5 per cent of the fatal cases death was due to acute bronchitis or bronchopneumonia. These figures suffice to indicate the gravity of pulmonary complications.

*Cancerum Oris* and *Acute Tuberculosis* are extremely serious, but fortunately they are relatively uncommon. Chronic and latent tuberculous lesions are prone to be stirred into activity by an attack of measles.

*Secondary Inflammation of the Fauces* should be regarded with apprehension. Not infrequently it results in extensive ulceration and septicaemia.

*Implication of the Larynx* occurs in between 4 and 5 per cent of the cases. The prognostic significance depends on the period during which it arises. There is less cause for alarm when it occurs during the initial period, before the appearance of the rash, than when it sets in as the latter is fading, or during convalescence. The laryngeal symptoms of the initial period are usually due to simple laryngitis, and in many cases subside when the rash comes out. Late laryngeal symptoms betoken either diphtheria or laryngeal ulceration, both of which conditions are serious, but especially the former. Indeed, hardly a more formidable combination of acute infectious diseases is to be found than that of diphtheria and measles.

But even non-diphtheritic inflammation of the larynx is a very serious complication. During the four years 1911 to 1914 there were

80 cases of laryngitis or ulceration of the larynx at the Eastern Hospital. Of these, 32 were fatal, or 37.2 per cent. In a considerable number of the cases intubation or tracheotomy was necessary. Bacteraemia, too, is not uncommon in the laryngeal cases. The incidence of laryngeal complications varies in different years. In 86 cases were distributed amongst the four years, as follows: 1911, 30 cases with 17 deaths; 1912, 28 with 6 deaths; 1913, 20 with 7 deaths; 1914, 8 with 2 deaths.

*Eye Affections.* The eye is prone to become inflamed in measles. This complication occurred in nearly 4 per cent of the cases at the Eastern Hospital. Usually the inflammation is limited to the conjunctiva, but occasionally the cornea is involved, in which case an ulcer and an opacity may result. But these sequelae are rarely seen in cases in which early and assiduous treatment has been applied. One form of ophthalmia is particularly dangerous—namely, that in which not only the conjunctiva, but also the eyelids are inflamed. There is usually brawny swelling, and the lids are with difficulty separated. These are the cases in which loss of sight results sometimes even though every attempt is made to save the eye.

*Otitis Media* occurs in from 11 to 14 per cent of cases treated in hospital. The prognosis is much the same as in scarlet fever.

3. **Special Symptoms.**—If the respiration becomes hurried and the lips and extremities cyanotic before the rash comes out, the prognosis is grave. When convulsions occur, recovery seldom takes place. Should pulmonary symptoms not clear up within two or three weeks after their onset (which is mostly while the rash is out), tuberculous disease should be suspected. Progressive wasting with pyrexia, with or without diarrhoea, is also suggestive of the same disease. Frequent vomiting and diarrhoea are ominous, especially if they come on early in the disease and are accompanied by a fall of temperature and other signs of collapse.

4. **The Social Status of the Patient.**—It is a matter of common observation that measles is much more fatal amongst the poor than the well-to-do. Perhaps, indeed, in no other acute infectious disease, with the exception of whooping-cough, is this class-distinction more marked. In Aberdeen it was found, during the twenty years already referred to, that the fatality varied inversely with the number of rooms occupied by the family in which the cases occurred. Thus, in one-roomed houses it was nearly 7 per cent; in two-roomed, 3; in three-roomed, just under 2; and in four and five-roomed, less than 1. The average fatality for all houses was 2.4 per cent.

5. **Virulence of the Epidemic.**—The effect of this has also been shown by the Aberdeen figures. In that city the fatality from measles varied from 0 to 25 per cent in different years. E. W. Goodall.

**MEDITERRANEAN OR MALTA FEVER.**—(See TROPICAL FEVERS.)

**MELANCHOLIA.**—(See MENTAL DISEASES.)

**MELANOTIC SARCOMA.** The prognosis in this dreaded form of malignant disease has been painted in tones as black as the characteristic nodules of the malady, a view which requires some modification.

Melanotic sarcoma, broadly speaking, arises either in the choroid coat of the eye, or in the skin. In the latter situation it originates either from a congenital pigmented mole, or in rare cases from punctured wounds, which presumably carry a group of the pigmented connective-tissue cells of the skin into a situation favourable to their proliferative activity.

The duration of life in melanotic sarcoma is usually about two to three years. The disease is generally painless until towards the end, but subcutaneous deposits of the disease, when ulcerated, become painful. The patient is usually able to go about and follow his occupation without any feeling of illness until a few months before death. Lymphatic oedema of the affected limb then begins to manifest itself if the disease has begun on one of the extremities, or the deposits in the internal organs, and especially in the liver, which may attain an enormous size, interfere by pressure with the activities of the vital organs, and cause serious effusions which are the usual proximate cause of death. On the whole, melanotic sarcoma is a very merciful form of malignant disease.

As stated in my Hunterian Lectures on melanotic growths, I have obtained strong microscopic evidence that the process of dissemination in malignant melanoma, just as in breast cancer, is primarily one of centrifugal lymphatic permeation. There is, it is true, strong evidence from the results of necropsies that in many cases the blood-vessels are the channels of spread in the later stages of dissemination. The crucial point to settle as determining the prospects of surgical interference in malignant melanoma is this: At what period is lymphatic dissemination supplemented or replaced by blood dissemination? When once viable fragments of the growth are launched into the blood-stream the surgeon's hand is paralyzed, and the patient must depend entirely on the natural forces, always inadequate, and frequently altogether absent, which tend to the destruction of the embolized fragments.

Fortunately it would appear that, as a general rule, blood invasion does not take place at an early stage. This is indicated *prima facie* by the comparatively long average duration of the disease, which has been estimated at three years: if malignant cells reach the blood in the early stage of the disease, the natural powers of resistance must inhibit their further development, or obviously the patient would succumb within a few months. In the second place, cases of death from intercurrent disease occur, in which lymphatic dissemination sufficiently widespread to be inoperable is seen, unaccompanied by evidence of blood dissemination. Lastly, most extensive lymphatic distribution of the disease may take place in the glands, the subcutaneous tissues, and upon the serous membranes, without any of the nodular visceral metastases which are the usual result of blood

lysis. In the museum of Guy's Hospital there is a specimen which bears very directly on this point. It is a kidney, itself entirely free from disease so far as the naked eye can see, but embedded in a mass of melanotic growth which is replacing the perinephric fat. It is very certain that, as frequently happens in breast cancer, the melanotic growth originated from malignant infection of the lymphatic vessels. If this is the case, it is evident that widespread lymphatic dissemination may occur in melanotic sarcoma, without obvious evidence in the kidneys of embolic blood invasion.

To sum up, pathology indicates that if the operation for melanotic sarcoma is rightly planned, its prospects should not be so hopeless as is generally assumed.

The principles upon which the excision of a malignant melanoma should be carried out are, in my opinion, as follows: A circular incision should be made through the skin round the tumour, at what is judged to be the present standards to be a safe and practicable distance. The incision, situated as a rule about an inch from the edge of the tumour, should be just deep enough to expose the subcutaneous fat. If necessary, two radial linear incisions extending from the circular one should be made on opposite sides of the tumour in order to facilitate the elevation of the skin flaps, which forms the next step. The skin, with a thin attached layer of subcutaneous fat, is now to be separated from the deeper structures for about two inches in all directions round the skin incision. At the extreme base of the elevated skin flaps a ring is drawn down to the muscles surrounds and isolates the area of deep dissection and overlying deeper subcutaneous fat to be removed. The exposed area is next to be dissected up centripetally from the muscles upwards, to a line which corresponds with that of the circular skin incision. Finally, the whole mass with the growth at its centre is removed by scooping out with a knife a circular area of the muscle immediately subjacent to the growth. The edges of the wound are to be brought together as convenience dictates.

Writing in 1903, Eyle<sup>1</sup> said: "The removal of the nearest chain of lymphatic glands, whether palpably enlarged or not, should never be omitted, for it may be taken as a matter of certainty that in a great majority of cases they are infected." In the same paper, Eyle enforces this lesson by recording a case of melanoma of the palm in which, although the axillary glands were not palpably enlarged, they were infected even to the naked eye. Yet Acton<sup>2</sup>, writing in 1905, found in nearly every case of which the records were available, that the primary growth was removed and the lymphatic glands were left.

Admitting the imperative need for removal of the lymphatic glands as a part of the first operation, it must be remarked that in cases which show palpable enlargement of these glands, simple excision of the glands is likely to be quite useless. I have shown that permeation of the lymphatic plexus of the deep fascia soon takes place around the infected glands, just as it occurs round the primary tumour. The excision of the glands must therefore be carried out on exactly the

same principles as the excision of the primary tumour. That is to say, a large circular area of the surrounding deep fascia must be exposed, dissected up from its circumference towards the infected glands, and removed in one piece with them. In late cases it may even be right to remove an area of skin over the infected glands, but such cases are probably inoperable. Lastly—and this is most important—the apparently healthy set of glands above those obviously enlarged should be completely removed.

The case which follows illustrates the successful application of these principles.

Miss C., age 40, was sent to me by Dr. Ruxstal, of Staines, on October 21, 1909. In September, 1907, Dr. Moreton Palmer removed an ulcerated papilloma which had been present on the dorsum of the left wrist for three or four years. In September, 1908, some small lumps were removed just above the epitrochlear gland. These lumps were subcutaneous, and were not glandular. A week or two later, a small dark nodule appeared just below the incision. It was removed under local anaesthesia, and was reported by the Clinical Research Association as a malignant melanoma. Subsequently, the patient suffered much pain in the bi-carpal region, thought to be due to an involvement of nerves in the scar. On examination, I found a vague induration running up the brachial vessels about the middle of the upper arm midway between the axilla and the scar of the second operation, and it appeared probable that the growth was recurrent in this situation; moreover, a large gland, nearly as big as a chestnut, could be felt in the axilla. I therefore advised a thorough operation, which should include removal of the supraclavicular glands, clearing of the axilla, and excision of the deep fascia extending from the axilla almost to the elbow. The patient consented to undergo the operation, and was admitted to the Brompton Hospital. A semilunar flap of skin, involving most of the inner aspect of the arm, was turned backwards, and the deep fascia was widely removed, with exposure of the brachial vessels and accompanying nerves. The axilla was next opened by a prolongation into its fornx of the first incision, and was completely cleared of its fat and glands, which were removed in continuity with the deep fascia of the inner side of the arm. The supraclavicular triangle was now cleared of its fat and glands through a separate incision. The patient made a good recovery from the operation.

About a year later, a recurrent nodule appeared over the lower part of the triceps at the back of the arm. It was excised on December 15, 1909, and on section was a typical sarcoma, unpigmented and degenerate at the centre. (It is well known that unpigmented metastases are not rare in melanotic sarcoma.) Since this time the patient has remained well, and the neuralgic pains from which she suffered in the arm have greatly improved, especially since a visit to Sidmouth, where she had hot sea-bathing treatment.

The absence of any sign of recurrence up to the present time, a period of over four years, encourages me to hope that in this case a permanent cure has been obtained.

In this connection I may repeat what I said in my Hunterian Lectures in 1907: "The methods still employed in dealing with melanotic growths of the skin are precisely those which years ago gave such deplorably bad results in the treatment of carcinoma of the breast. Formerly the tumour, with a small circumferential area of skin, was cut out from the breast, and the axillary glands were removed, if at all, only when palpably enlarged. Even when the glands were

and, the surrounding zone of permeated lymphatics in the breast, in the deep fascia, and in the muscles, was left intact to reproduce the disease. "Nowadays, the improved operation for breast cancer produces prolonged or permanent immunity in about 50 per cent of cases. And upon the evidence I have laid before you, I venture to predict that the application of more thorough and scientific methods to the surgery of cutaneous melanomata will produce a corresponding, though perhaps a smaller, improvement in the results of operation."

I trust that the case I have recorded is the beginning of the fulfilment of the prediction then made, though, owing to the fortunate rarity of the disease, the evidence can only accumulate very slowly.

Only one other opportunity has occurred to me of applying the principles which I advocate in the treatment of melanotic sarcoma.

The case was that of a middle-aged man lying in the inoperable cancer ward of the Middlesex Hospital, with a small, non-pigmented, pedunculated growth of the foot, and a mass of confluent and adherent melanotic inguinal glands. I had no sanguine expectation that he would escape local recurrence after the removal of these glands, but since only slightly enlarged glands could be felt above Poupart's ligament, I thought it worth while to attempt radical treatment. After removing the primary growth, I excised the inguinal glands with a large area of fascia. I then divided Poupart's ligament, and removed the glands along the external iliac vessels nearly as far as the bifurcation of the aorta. But even the highest glands which I could reach already showed signs of early malignant deposit, and it was impossible to carry out the principle which I believe to be so important, namely, the removal of the apparently uninfected set of glands above those engaged. I was not surprised that this patient returned a few months later with inoperable recurrence in the region of Poupart's ligament.

To sum up, the prognosis in melanotic sarcoma is not nearly so bad as it has been represented, provided that the disease is recognized early, and that it is operated upon on the lines indicated by the pathological evidence of its mode of spread.

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W. Sampson Handley.

### MENINGITIS.

**Meningococcal Meningitis (sporadic).**—In this form, where the diagnosis can generally be clinched by the demonstration in the cerebrospinal fluid of the characteristic diplococci, the prognosis as to life is relatively more favourable than in other forms of meningitis. Thus, in the 94 cases collected by Lee and Bachow, 50 per cent of the patients admitted to hospital survived; but, of these, only some 5 per cent recovered completely, the remainder being left with hydrocephalus, blindness, or varying degrees of mental deficiency, sometimes amounting to idiocy.

The results of intrathecal injection of antimeningococcal serum are less striking than in the epidemic variety of the disease. Nevertheless, lumbar puncture—by relieving the intracranial pressure—and the administration of the above-mentioned serum, when available,

will sometimes turn the balance and may save a patient who would otherwise die.

The prognosis as to the future mental condition of those patients who survive should be guarded. Even after an apparently complete recovery from all the meningeal symptoms, it may be found that the child's subsequent mental development is arrested or delayed. Further, a considerable proportion of the cases which survive develop hydrocephalus, probably due to adhesive obstruction in the foramen of Monro or in the other foramina in the neighbourhood of the fourth ventricle, thereby preventing the downward flow of fluid from the ventricles into the spinal theca. Other patients, again, become permanently blind or deaf from inflammatory changes in the optic or auditory nerves.

**Meningococcal Meningitis (epidemic).**—The prognosis in cases of this type, untreated by serum, is extremely bad. According to the statistics of Flexner, the mortality is usually from 80 to 90 per cent, and never less than 70 per cent. Since the introduction of serum treatment by intrathecal injection, however, the gross mortality of cases thus treated has fallen to a remarkable extent. Thus, out of 1295 serum-treated cases collected by Flexner, 893 recovered and 402 died, a mortality of 31 per cent. The earlier in the disease the specific treatment is begun, the better are the prospects, as shown by the following table of 1211 cases:—

MORTALITY ACCORDING TO TIME OF SERUM TREATMENT.

Time of Treatment	Number of Cases	Percentage of Mortality
Within first three days	199	18
Fourth to seventh day	346	27
Later than seventh day	666	36

The mortality amongst infants under two years of age is usually very high, rarely being less than 90 per cent, according to Flexner. But of 125 serum-treated infants under one year old, 63 recovered and 62 died; of 21 infants injected within the first seven days, 17 recovered and only 4 died, a mortality of less than 20 per cent.

Whereas recovery is a gradual process, lasting about four weeks, in the small proportion of epidemic cases which spontaneously survive, in serum-treated cases, on the other hand, recovery by crisis is not uncommon, and the duration of the disease averages only about eleven days.

**Pneumococcal Meningitis, etc.**—Pneumococcal meningitis may occur as a primary malady, or it may be secondary to pneumococcal infection of other parts of the body, especially after empyema or otitis media. Untreated cases are practically always fatal. Lumbar

ing are undoubtedly relieved symptoms, and may in some cases tip the balance in favour of recovery. The same remark applies to *Staphylococcal* and *Streptococcal*, and also to *Influenzal*, *Typhoidal*, and *Gonococcal Meningitis*. I myself observed a case of gonococcal meningitis in a young man aged twenty-nine, in whom, three weeks after the articular infection, gonococcal arthritis developed in the knee and hand. Three weeks later, i.e., six weeks after the original infection, he developed all the signs of meningitis. The cerebrospinal fluid was turbid, with a large deposit of pus. Antigonococcal serum injected intrathecally, and, on three subsequent occasions within one week, antimeningococcal serum. After a temporary relapse, the patient ultimately made a complete recovery in about three months.

**Tuberculous Meningitis.** Here the prognosis is always grave. Once the diagnosis has been established, by the presence of headache, vomiting, convulsions, stupor, by the occurrence of a pleocytosis of the cerebrospinal fluid, and, most conclusive of all, by the discovery of tubercle bacilli in the fluid, we must be very guarded in our prognosis. The prospects of recovery depend upon various factors. If the disease is limited to a small part of the meninges, and if there be no extension to the substance of the brain, there is still a possibility of recovery. If, however, the meningitis be widespread, and accompanied by numerous signs of focal brain affection, the hope of recovery is almost nil. The occurrence of glycosuria is of bad omen; when present, it generally presages death within two or three days.

In making our prognosis in any individual case of meningitis, from whatever cause, we have to bear in mind that the immediate causes of death are two in number: first, mechanical distention of the cerebral ventricles (acute hydrocephalus); and second, toxæmia resulting from the products of the infective organism. The toxæmic element, unfortunately, is not at present directly amenable to treatment; but if this factor be not too intense, we may, by relieving the mechanical distention, sometimes save the patient's life. This is best done by early and repeated lumbar punctures. After withdrawing cerebrospinal fluid until the intrathecal pressure falls to normal, we generally obtain distinct improvement in the clinical symptoms, so that the coma or stupor clears up, temporarily at least, and the headache and vomiting are relieved. By repeated lumbar punctures at intervals of one or two days, life may thus be prolonged, and cure may even result. I may quote a case of my own, a young man of twenty-two, with headache, vomiting, stupor, head retraction, absent knee-jerks, etc., in whom a patch of chronic lupus on one leg gave clinical evidence of tuberculous infection, and in whom the cerebrospinal fluid contained no fewer than 3467 lymphocytes per c.mm. Repeated lumbar punctures, five in all, about once a week, produced not only disappearance of all the clinical symptoms, but the pleocytosis of the cerebrospinal fluid fell successively to 827, 787, 39, and 16 cells per c.mm., and the patient made a perfect recovery. Such cases, it must be admitted, are the exception, but the fact that they do occur must



modify the view hitherto almost universally held, that the result must certainly be fatal, once the diagnosis of tuberculous meningitis is established.

**Meningism** is a condition in which the patient, usually a child, either during the course of some specific fever or in any febrile condition, develops many of the clinical phenomena of meningitis, but where the cerebrospinal fluid withdrawn by lumbar puncture contains neither excess of cells nor organisms. It is more frequent in children with a tuberculous diathesis and may thus raise the suspicion of tuberculous meningitis. The symptoms rapidly clear up after the lumbar puncture.

*Purves Stewart.*

**MENTAL DISEASES.** Prognosis in mental diseases is affected not only by the nature and causes of the particular malades, but also largely by the special anatomical construction and physiological functions of the brain. A correct prognosis is easy in some forms of disease—for instance, in many forms of skin disease. But in dealing with an organ such as the brain, the most important in the body in its constitution and functions, the most highly integrated, the most complex, and the most sensitive to the effects of every environment outside the body, and to everything that takes place in its own working, it would be unreasonable to expect a very definite prognosis in most cases when it becomes diseased or disordered. Especially when its highest function of mind is disturbed, the difficulty of saying whether it will again resume its normal condition is often extreme. In addition to physical conditions of disorder, we are face to face with an entirely different set of conditions, viz., states of consciousness, intelligence, emotion, and passion. Disturbance of each of these may not only be a result of brain disease, but they may be its causes, and they may also act as a means of cure. Mental diseases are unquestionably the most difficult department of medicine. The higher forms of the brain cell, being the vehicle of mind, are Nature's last and greatest effort in the evolutionary process which has been going on during the past aeons of time. The full knowledge, treatment, and cure of these will be the high water-mark of medicine. Every such cell carries, in its molecular structure and in its biochemical mode of action, the organic memories of its ancestral cells, and with those memories it becomes subject to ancestral reversionisms and weaknesses. How subtle and imponderable must be the changes which cause the mild emotional depression perhaps felt in the morning and gone within an hour! Yet that depression in a more marked form may constitute a mental disease. The human brain is a cosmos in which are represented the working and the condition of every other organ in the body. There are few diseases to which the mind is subject where some organ or function of the body is not also disturbed, and there are many cases where, as a result of mental disease, we have also peripheral bodily disturbances. There are, however, some cases of mental disease where we cannot, by any means at present at our disposal, discover

bodily symptom whatever, the mind alone seeming to be affected, and where the prognosis seems to depend on mental means of cure. Prognosis in such cases must depend on reactions to mental touch, but it may be said generally that prognosis depends chiefly on bodily reactions to environment, diet, and medicine. If those reactions are favourable and there is no organic brain disease, the prognosis is usually good. The subjective state of the patient must always be taken into account, and especially his feelings of optimism, belief that he will overcome the disease, and his power of will to fight against it. Personal equations of all sorts come in both in regard to the doctor and the nurses, as well as the patient himself. See also on prognosis.

The prognosis in mental disease must depend chiefly on the twelve following considerations, namely:—

1. The causes of the disease.
2. Its form and symptoms.
3. Its previous duration.
4. The brain heredity of the patient.
5. The possibility of response and reaction of mental and bodily symptoms to suitable treatment, especially to the restoration of sleep.
6. The sequence of the mental and bodily changes that have taken place during the attack.
7. The period of life of the patient.
8. The existence or not of signs of organic disease in the brain cells.
9. The existence or not of certain abnormal bodily conformations or stigmata.
10. The tendency or not that may exist to relapse and recurrence of the symptoms.
11. The completeness or incompleteness of the improvement in the attack under treatment.
12. The temperament and race of the patient.

It need hardly be said that in almost every case both the mental and bodily symptoms present at the time, and that have existed during the attack, must be taken into account in any attempt to predict the course and duration of unsoundness of mind. In one case the mental symptoms will give better indications for prognosis, while in another the bodily symptoms, or the absence of them, will be more to be relied on.

The really scientific study of mental diseases only began in the end of the eighteenth, and the first part of the nineteenth, centuries. The physiology of the brain and its minute structure were only able to be scientifically studied well into the nineteenth century, and without the knowledge gained by this study a scientific psychiatry could not have been attained. The classification of mental diseases and defects was at first founded on mental symptoms alone. It consisted of four families, namely, mania, or states of mental exaltation; melancholia, or states of emotional depression; dementia, or conditions of permanent mental enfeeblement coming on in a brain that had

once been normal; and idiocy, or congenital forms of mental weakness. During the latter part of the nineteenth century an enormous number of varieties of mental disease have been segregated, their foundation in different cases being etiological, pathological, and psychological. Some of these varieties, like general paralysis, must be permanent. Many of them are obviously transitory and experimental. Prognosis must depend to a large extent on a true classification, where that is possible, and in the present article I shall adopt the varieties which seem to me to have a scientific and practical basis.

Early in the scientific study of mental diseases attempts were made in this country, on the Continent, and in America, to draw up statistical tables showing the number of recoveries, the number of deaths, the liability to relapse, and the duration of the attacks, but in all these insanity was regarded as a whole, and its forms and varieties were not taken account of. The science of medical statistics was then in its infancy, and the registers of the various existing mental hospitals were very imperfectly kept, while there were no available facts to be obtained from records of private practice. Esquirol in France, Jacobi in Germany, and especially Thurnam in England, were the pioneers in the statistical department of prognosis in mental diseases. Farr helped greatly by pointing out the errors of previous writers and in laying the foundation of general medical statistics on scientific principles. The figures and the general results of these authorities need not be discussed in detail in this article, as the chief aim of this work is not statistical but clinical, and to help the practitioner of medicine. Thurnam sums up the general results of the treatment of insanity in institutions in his time, that is, about 1845, in this way: "A proportion of much less than 10 per cent of recoveries on the admissions is, under ordinary circumstances, to be regarded as a low proportion, and one much exceeding 45 per cent is a high proportion." He says, in regard to the mortality rate among the mentally afflicted, "a mortality that exceeds 9 or 10 per cent is decidedly unfavourable," and one which is less than 7 per cent is "highly favourable," in asylums where all classes are treated. In regard to pauper asylums, a mortality which exceeds 12 or 13 per cent is "a very unfavourable one," and one which is much less than 10 per cent is "highly favourable." Since that time the rate of mortality has remained nearly stationary, in spite of the fact that far more cases of senile breakdown and organic brain disease with resulting mental symptoms are now certified as insane. My personal experience of 115 recoveries in 11,346 patients treated by me in the Royal Edinburgh Asylum during the thirty years 1871-1903, was that 39.4 per cent of them recovered. They included every variety of mental disease and defect which can be certified under the Scottish Lunacy Laws as unsoundness of mind or idiocy, but the number of cases of idiocy or congenital imbecility was comparatively small. I shall have in the course of this article to refer to the recovery rate in the various forms of mental disease which have been under my care in two mental hospitals and

my private practice. The figures from the Royal Edinburgh Asylum have this advantage over those of county asylums and the registered hospitals of England, that they comprise the whole population, and are not confined to the rate-paid class as in the county borough district asylums, or the class in a better social position who can afford to pay for their maintenance as in the registered hospitals. They also have this advantage, that they include the period (fifty years ago) when the number and variety of persons counted as technically insane, and certified as such for institutions, were more restricted than in the older times, and also the more recent years, when under the influence of an extension has been given to the meaning of the term 'insanity.' Forty years ago, before the Government grant was given towards the maintenance of every pauper patient, it was not so common as it is now to send to mental hospitals patients who suffered from various forms of senile decay, paralysis, and other incurable brain diseases. It is now done for two reasons: first, the great convenience and the benefit to such helpless persons of being properly treated in the hospital wards of county asylums; second, the change of opinion that has taken place in regard to its being a discredit, if not a disgrace, to have a relation in a mental hospital. The general effect of this change of opinion and practice has been to reduce the percentage of recoveries in British institutions. There has been, however, another tendency in the opposite direction, namely, to send cases at an earlier period of their disease, and to send more transitory and alcoholic cases, both of whom are apt to recover soon. In considering the statistics of institutions and of certified patients, this fact must be kept in mind, that mental disease in all civilized countries is not looked at and defined through the clinical symptoms present and from a scientific point of view, but largely through the provisions of the Lunacy Statutes. In this respect mental disease differs from all other diseases.

An important series of tables are given in the Reports of the Scottish Board of Lunacy for 1898 and 1913 (the 40th and 55th Reports), showing the 'progressive history' of 3858 patients for fifteen years after admission into mental hospitals. These throw a valuable but not a complete light on the prognosis of mental diseases, in regard to recovery and mortality. Of the patients of all classes, ages, and forms of mental disease, admitted into Scottish asylums in 1868 and 1898, the chief results in the fifteen years are as follows: There were 2252 'recoveries,' or 58.6 per cent of the whole. But those included included recoveries in many of the patients. In fact, there were 1230 readmissions to the institutions, most of which resulted from relapses to mental disease, and some had such relapses several times. Some of the readmissions were, no doubt, of the 781 who had left the institution not recovered. On the hypothesis that one-fourth of the 'recoveries' had been those of relapsed cases or of the previously discharged non-recovered, it would show a recovery rate of 43 per cent. The deaths during the fifteen years amounted to 1361, or 35 per cent of the total admissions.

One of the most striking and instructive facts about these tables is this, that it was in the first two years after admission that the greater number of the recoveries, the relapses, and the deaths took place. In fact, the general results of the mental attacks showed themselves in that time. Seventy per cent of the recoveries occurred then, 60 per cent of the re-admissions, and 45 per cent of the deaths.

Unfortunately these tables do not show how many of the recoveries relapsed into insanity. If the returns had shown how many of those who recovered had relapsed, and how many times, their value would have been enormously increased. If the heading after the first column had been "Relapsed after Recovery," instead of "Re-admitted," this result would have been obtained.

At the end of the fifteen years there were 691 patients of the 3858, or 17.9 per cent, left incurred in the institutions. An enormous "movement of the population" takes place, in fact, among the insane as compared with the general population, as might have been expected.

In addition to the twelve general considerations which I have mentioned, there are many particular symptoms and indications which apply in all cases of mental disease in forming a prognosis, some of which I shall describe. Most of them are of importance in determining this particularly difficult point.

We ask in every case of mental disease, when trying to solve the question of the chances of recovery, How did the disease come on? Had it the characters of a sudden brain explosion, a cloud coming into a clear sky, or was it a gradual evolution of mental symptoms beginning with slight psychical changes and evolving gradually from these into a more acute and marked disease? In making inquiries to determine this important point, we have to go into the normal psychology and mental habit of the man or woman. For instance, we have to inquire into the ordinary strength and the indications of the social instinct. This differs widely in different individuals; but if we find that the patient became, at a certain period, considerably anterior to the mental attack, less inclined to mix with his fellows in social intercourse, to be more self-contained, more reticent, more secluded in his habits, and that this gradually went on to an active dislike of social intercourse, this becoming a real pain to the man; if this went on further to a morbid suspicion of others, a misinterpretation of their conduct in regard to him, passing into organized and fixed insane delusion, leading perhaps to assaults or homicidal attacks on others. This whole sequence of changes in the social instinct, if it took years to accomplish, would lead to an extremely bad prognosis of the case, while if somewhat the same symptoms were rapid in their course and sequence, say within a few months from their beginning to their full mental development, they might not mean anything like so grave an outlook for recovery.

Taking another form of mental disease, namely, that characterized chiefly by maniacal excitement with emotional elevation, the outlook in such a case differs greatly according to the finite and original quali-

of the brain that suffers from it. If we have a case, let us say, with a bad mental or neurotic heredity, where during childhood there have been convulsions, night terrors, or other such signs of brain irritability, and if we have, during the developmental period of the brain, tendencies to delirium or even short attacks of maniacal or depressed conditions or periods of lethargy and stupidity, the prognosis in such a case need not be unfavourable, at all events until after twenty-five or thirty years of age.

The various epochs of life also, and their effects on the mental condition of men and women, cannot be left out of account in the prognosis of any of the diseases to which they are specially subject, but especially of those diseases are mental in character. Each epoch of life has its distinctive physiological and psychological characteristics. The prevailing dynamical and trophic activities are different at different times of life. The child period, when growth in bulk is the characteristic, the onset of sex, child-bearing, the decadence of power which marks the character of old age, have all to be taken into consideration in prognosis. In almost any case of insanity we cannot dissociate the mental from the abnormal psychology — one influences the other. The insanity is often an evolution of the natural temperament. The same symptoms occurring at twenty-five and at seventy may mean a quite different prognosis in the two cases.

The time element in all forms of mental disease is of the greatest importance: in fact, in many cases this determines the prognosis. It may be laid down as an almost universal axiom that the chances of recovery diminish after the first year in the ratio of the duration of the attack, except where the epochs of life of which I have been speaking come in. We never give up hope of recovery in such cases until the particular epoch during which the attack has begun is passed. Different mental symptoms also affect the time limit differently. For instance, I was in the habit of laying down to my students this dictum: "Never give up hope in the case of melancholia while the depression of mind lasts." It is different with conditions of exaltation. If they persist for over a year or two, and take on the signs of chronic mania, the prognosis is bad; if symptoms of general enfeeblement of mind come on and last, say, for a year, the prognosis is almost hopeless. The same rule applies to conditions where we have regular periodic recurrences of the mental symptoms. If such persist for over a year or two they certainly make the prognosis bad. The typical instance of a recurring and alternating insanity is *folie circulaire*, and that is now regarded as almost incurable. There are certain gross diseases of the brain, such as certain forms of apoplexy and paralysis, which on their first onset are apt to be accompanied by mental symptoms; some of these are recovered from: at all events, the patients partially improve in mind, in such a way that they can no longer be regarded as technically insane; but if such mental symptoms persist more than, let us say, six months, the prognosis is unfavourable. The same rule applies to many of the cases of insanity caused by alcohol,

opium, and other toxins. If the mind is disordered as the result of an acute toxin such as influenza, we expect it to be very short in duration.

Acuteness of symptoms is very apt to be considered by relations to be a bad sign in regard to the prospects of recovery. That is not so. I always like an acute case of any kind where organic brain disease does not exist, and tell the relations that it is one of the best signs that the case will recover quickly and perfectly. For instance, one of the acutest of all forms of insanity is that caused by child-birth, and yet none recovers so certainly, quickly, and completely. There is, of course, a greater risk of death in the acute cases, and this should always be explained to relations. Eight per cent of all cases of acute mania die of the disease, and the mortality in puerperal insanity is even greater.

**Facial Expression in Prognosis.** The mental expression of the face and eyes in most cases of mental disease should be carefully observed. It is changed for the worse, and in some of the more acute varieties it is so changed that the man is almost unrecognizable by his friends. The only exceptions to this are in the case of persons who are, by temperament and natural disposition, slow, stupid, and lethargic. I have seen many such who, during a mild attack of mental excitation, were brighter and better looking than ever they were in their lives. There are only two facial disturbances of a decided kind that I think are unfavourable in prognosis. One is the heavy wiped-out expression of the face and eyes in the young man, and particularly in the young woman, who, towards the end of an attack of adolescent insanity, has passed, or is passing, into dementia. The other is the cunning, suspicious expression of the patient who suffers from paranoia of the persecutory type. All the ordinary disturbances of expression but these, however extreme they are, may be recovered from, and the patient resume his normal appearance.

The muscular expression of the emotions is not sufficiently realized in mental practice. There are fifty mind and eye muscles, not including all those of speech, the action of which makes all the difference in their mental expressions between one man and another. They are extremely small in size, but they are innervated to an enormous degree. Their motor nerves together are as bulky as those of the arm muscles, which weigh a hundred times as much. It is only when these mind-muscles of expression and eye show a certain disturbed mode of action which lasts for a long time, that such changes indicate a bad prognosis. Commonly they change quickly from good to bad expressions, and vice versa.

**Causation and Prognosis.** The cause or causes of a mental attack have often much relation to the prognosis in the case. The causes which may determine an attack of mental disease are almost innumerable, and I cannot in this article refer to all of them. Commonly, when the history of a case is gone into, one finds that there existed more than one cause of the attack. There is often a predisposing, an exciting, and a proximate cause. For instance, a man may have a bad

from heredity as a predisposing cause, may have taken alcohol to excess as an exciting cause, and had a fall on the head as the proximate cause of his attack. Then in some cases there are even more than one exciting cause. I shall further on refer to heredity, which is the chief and most common of all the predisposing causes. There is a strong natural craving to find a cause for such a tragic event in life as an attack of mental disease. Relatives will press their doctor on this point very unduly, and if a cause can be assigned there is very often a sense of relief and a more hopeful feeling as to the chances of recovery. I often hear this remark: "I feel happier now I know the cause of my illness." The relations of our patients are exceedingly apt to assign causes which by no possibility can be the real ones. The cause which a mother will assign for idiocy in her child may be almost grotesque in their unreality. To account for a mental attack, relations will always seek a mental or a moral cause. In reality we know that only about one-fourth of all the cases of mental disease are due to mental causes, the other three-fourths resulting from bodily causes. Looking over the tables of the causes of the diseases which are usually attached to the annual reports of our large mental hospitals does not always help us very much. Many of the terms are too general to be of any scientific or prognostic use.

It may be assumed generally that a cause, or what may be reasonably assumed to be a cause, of a mental attack, will be less likely to produce an incurable brain malady if it is removable. Taking such causes as toxins affecting the higher brain cells, most of them either exhaust their action on the brain quickly, or an immunity is set up, or they can be more or less counteracted by suitable treatment. I take as examples, cases of mental disease caused by or following the action of the influenza poison or syphilis or alcohol. These together cover a very considerable part of the era of mental disturbances. Then there are causes which are in their nature transitory, such as child-birth, many forms of bodily disease and exhaustion, surgical operations, etc. In regard to the mental and moral causes of psychical disease, many of them soon exhaust their deleterious action, or can be counteracted by changes of circumstances and environment: of such are overwork, some forms of domestic worries, love affairs, and mental shocks. On the other hand, there are causes that are almost necessarily irremovable, which therefore lead to a bad prognosis, such things, for instance, as traumatic injuries to the head, senility, alcoholic excess so long-continued that the organic structure of the cells or vessels are changed, gross cerebral disease, epilepsy, etc. The mental symptoms may not be the main or original element in the case. They may be so secondary to bodily disease that the prognosis may depend almost entirely on the nature of such bodily causes. I would take as an example cases dependent on heart or uterine disease, on cancer, on diabetes, or on pernicious anemia. Finally, the innate vulnerability and power of resistance of the brain have to be taken into account when estimating prognosis in regard to causation. One brain may be upset by a cause which on



another would produce no serious result at all. The unstable and vulnerable brain may, however, throw off bad effects far more readily and quickly than the more stable brain. Our modern methods of examination have enabled us to discover changes in the spinal fluid and blood and micro-organisms which are very valuable in regard to the prognosis in some cases.

**Response to Treatment.** Every medical man is influenced in his prognosis by the effects of his treatment, using treatment in its larger sense of environment, nursing, and diet, and not confining it to drug treatment alone. If a patient, for instance, falls into depression of mind on account of unfavourable or local circumstances, and when he is sent away for a change at once begins to brighten and leave his attention taken up with his new surroundings, it is necessarily a favourable sign in prognosis; or if, in any case, we have to do with thinness and general want of nutrition in a patient suffering from any form of mental disturbance, and our efforts to increase his weight by diet or drugs or change of air are successful, we think better of his chances of recovery. I have sometimes watched with so much anxiety the putting on of the first pound or two of weight in a patient whom I was treating, that my whole outlook became more optimistic when that took place.

**Insomnia**, so very common a symptom in most cases of mental disease, both as preliminary to and during the disease, gives us the greatest anxiety in regard to the effects of treatment. It is so very intractable, in some cases, that we feel the patient cannot recover his mental balance until it is subdued. Nothing is more exhaustive to the higher mental functions of the brain than prolonged insomnia. If by drugs, by change of air, by medical treatment, we find that the normal periodicity in the occurrence of sleep is restored, we feel that the patient will almost certainly recover in due time. Volumes have been written as to what sleep is, and as to the best methods of restoring it when insomnia is present, but we all feel that as yet neither of these problems has passed into the region of scientific certainty. We do surely know that sleep is the greatest and most important of all the examples of periodicity in the physiological and mental life of a human being. We also know that it is Nature's most important method of resting the higher functions of the brain and of restoring to a proper state of nutrition the brain cells. Everyone who has thought about the subject realizes that the physiological unconsciousness of sleep is quite as mysterious as the occurrence of any mental disease whatever. Dreaming is the nearest physiological analogy to insanity. I believe that when we discover the secret of sleep it will lead to the discovery of the prevention of much mental disease.

**Mental Hospital.** The response, favourable or otherwise, to the removal of a patient to a mental hospital undoubtedly affects prognosis in his case. Unfortunately, the ideas of many of the public regarding mental hospitals, and the feelings of repulsion and distress which those ideas have produced, in some cases tend to counteract the good effects

of the control, discipline, regime, and medical treatment which are afforded in such institutions. Happily such wrong ideas are now undergoing a marked change, and a great many patients are willing to place themselves under treatment voluntarily in mental hospitals. This is the most satisfactory method of all in the cases where it is suitable. Unfortunately, the majority of cases of mental disease do not recognize this, are ill, and therefore resent such treatment as being unjustifiable. But if a patient shows a marked betterment during his first month's residence in the hospital, it improves the prognosis in the case very much. Before going to such a hospital, the doctor has commonly to estimate the likelihood of an improved prognosis if sent there his chief argument for that course being adopted, and undoubtedly in the larger number of cases such a prognosis is justified by the results. Unfortunately, at present, the risk of danger to himself or others is rather too much of an element for the sending of patients to mental hospitals. Ideally the great reason should be the improved chances of recovery, and the impossibility among the poor of securing proper treatment otherwise.

There are a certain number of cases where the prognosis is distinctly improved by removing patients from mental hospitals to other environments. This occurs sometimes in a too prolonged convalescence, where such a change restores the interests in life and stimulates the patients to a greater amount of self-control. Speaking generally, however, I am of opinion that the best chance of complete recovery and of non-recurrence of the disease is secured by the patient's residence in the hospital until such recovery has not only taken place, but may be said to be established.

**Danger of Recurrence.**—In many forms of ordinary disease the patients are liable to a recurrence at some time or other after recovery has taken place. Gout, rheumatism, bronchitis are common examples of this tendency. Mental disease is liable to recur in at least 20 per cent of those who have recovered, and in many cases this tendency occurs over and over again. There are a certain number of cases where the more frequent the occurrence the greater the danger is of a total incurability, but this not apply to all of them. I have known many cases recover and relapse on very many occasions, the recoveries being good ones while they lasted, and the patient able to take his place in society and do his usual work. The classic case of Charles Lamb and his sister is an example. In many cases that have this tendency, the treating of the symptoms in time, before they have developed into serious mental disease, is the great principle to be adopted. Cure the insomnia, restore the nutrition, give a chance for brain rest, change the current of ideas and thoughts, remove causes of irritation or exhaustion, give a fillip to the mental life—these are all modes of effective treatment, and they improve prognosis in most cases.

Statistically the danger of recurrence is scientifically brought out in the Scottish statistics referred to on page 429.

**Heredity as an Element in Prognosis.** — The influence of a bad heredity in making any man or woman liable to mental disease has always been taken into account by those with experience in the medical profession. It was evident, on even casual observation, that some families were more liable to such diseases than others. Of recent years much more careful clinical and statistical knowledge on this point has been obtained. The ordinary methods of scientific statistics, and those of biometrics, have been called in to attain accuracy, with much, but not as yet complete, success. Dr. Karl Pearson and Dr. Mott are the latest authorities on this important subject, and their work has undoubtedly advanced our knowledge. For myself, I have much more faith in what may be called the clinico-statistical methods of Dr. Mott than those of the purely mathematical methods of Dr. Karl Pearson. Two things in regard to heredity I would especially impress on the readers of this article — the worst and the most direct heredity need not imply the occurrence of mental disease in any family, and the existence of heredity, even strong heredity, does not necessarily imply incurability in any case. We are nowadays continually asked about the liabilities to mental and nervous disease in certain families where there are intentions of marriage, proposals of insurance, uncertainties about taking to certain occupations or professions, and thoughts of going to live in certain climates. This reading of the horoscope of human beings is, or ought to be, a department of prognosis, and as our scientific knowledge increases it will become an extremely important part. It is already affecting the great science of education in a marked degree. It is affecting certain acts of the legislature that relate to social questions. It may be said to be affecting men's views of ethics and of human conduct. It has also a relation to literature, especially in history and biography. Long ago, in reading Carlyle's biography of Frederick the Great, one was impressed by the fact that that shrewd writer devoted his first volume entirely to Frederick's ancestry and relations, their history and characters. He did not use the word heredity, but that volume is a treatise on the subject notwithstanding.

The keynote of the new science of eugenics depends on heredity, and as a result of the perfecting of that science, prognosis, in a large sense, will be made far more accurate. It may be described indeed as the most comprehensive field of prognosis at present in existence, for all its aims consist of looking to the future in human life.

In the prognosis of mental diseases it is to be remembered that it is not the special mental defect or disturbance that is inherited, but a general defect of brain nutrition, or an instability of action in the higher brain cells, or a deficiency of resistance against toxins or against mentally upsetting causes. Heredity may consist, and in many cases of mental disease at the adolescent period does consist, of a want of ability to adjust the action of the brain cells — the vehicles of mind — to the more complicated and evolved life of civilized man as compared with that of primitive ancestors. Dr. Mercier says: "The stability

— "stability of a person's highest nervous arrangements depends not only and chiefly on inheritance." Without evil mental heredity there would be very little unsoundness of mind in the world. It is one of the chief problems of psychiatry. In considering the heredity of any case of mental disease with a view to prognosis, we must inevitably consider whether the defects in fathers or mothers, if any such — if, were personally acquired, or derived from an ancestry further back. To a large extent the belief as to the non-transmissibility of personally acquired characters held the field till lately, but a newer generation of scientists are of opinion that, in certain circumstances, they may be transmitted. Professor Cossar Ewart, a great authority, as the result of practical experiments, says that "the germ cells are liable to be influenced by fever and other forms of disease that, for the time being, diminish the vitality of the parents," and we have also the great authority of Darwin, Maudsley, and Hertwig for holding the same views.

If we find, in addition to a bad hereditary history, that there are bodily abnormalities in our patients, which we now call 'stigmata of degeneration,' the prognosis is considerably worsened. In inquiring into the heredity of any case, we must take into account not only mental but also neurological facts, such as epilepsy, malformations, convulsions, chorea, asthma, stammering, hysteria, and many other such allied diseases. One law of mental heredity laid down by me long ago, and now fully confirmed on larger statistics by Dr. Mott, is that any mental defect in ancestry is liable to occur at an earlier age in posterity than the age at which it occurred in parents. It is also a fact that the maternal heredity towards mental and other nervous diseases is stronger than the paternal, and the mental defects tend to cross the sexes from mother to son, etc. It is also certain that while a strong heredity does not imply invariability to any one attack, yet it does produce a greater tendency to recurrence of the disease; and, finally, as a most important consideration in prognosis, few of us now doubt that in a vast number of cases a bad heredity can be counteracted, in some degree at least, or modified, by favourable environment and modes of life.

**The Age of the Patients.**—Youth, in mental diseases, as in all others, is a favourable element in prognosis, *ceteris paribus*. Some mental diseases, such as senile dementia, are incurable simply because the patient is old. Some others are apt to recover because they occur in the developmental period of life. Nature always tends towards health if she has a fair chance. Some diseases, such as choreic insanity, will almost necessarily recover because they are developmental in their character.

**Completeness of the Recovery.**—The prognosis in all our cases largely depends on whether the attack has been absolutely and completely recovered from. In mental disease, unfortunately, there are apt to be left certain of the slighter peculiarities of character and conduct. These, if they persist too long, are liable to become brain habits difficult to get rid of.

**Temperament.** The original temperament of the patient, to a certain extent, determines the prognosis of his attack if he falls into certain forms of mental disease. Melancholia in a markedly melancholic temperament is not so curable as in a sanguine temperament. Mania is not so curable in the case of an excitable, boisterous, nervous temperament as in a man with an ordinary average working brain.

#### CONDITIONS OF SIMPLE MENTAL DEPRESSION AND ELEVATION MANIC-DEPRESSIVE INSANITY.

Whatever classification of mental disease may ultimately be adopted, I am satisfied that there are certain morbid conditions which for the general practitioner and the relatives of patients it will always be necessary to reckon with and to treat as distinct forms of disease. The chief of these are states of mental depression and mental elevation with diminished self-control. From the earliest times in the history of medicine these have been recognized. The terms melancholia and mania have become a part, not only of medical books, but of popular language and of literature. The conditions I am to describe are those which are apt to come under the notice of the medical practitioner in his ordinary work, commonly before a specialist is called in. It is essential, therefore, that right conceptions regarding their nature, causes, risks, prognosis, and treatment should be held by every doctor. Especially when they exist in a minor degree and constitute what we now call the 'borderland,' it is important that they should be subjected to the right kind of treatment, and that their prognosis should be well considered. I believe if proper treatment is carried out they may be arrested in many cases, and recoveries may be brought about before they reach their more serious stages, the necessity of being placed in mental hospitals thus being avoided. I shall refer both to my experience in treating them in a mental hospital, and also as a consulting physician where I had to advise as to their treatment in private houses, in rooms, or in nursing homes.

Among the practical classifications adopted in most mental hospitals, conditions of depression are usually asserted into the varieties of simple, hypochondriacal, delusional, suicidal, resistive, excited, and stuporose. The cases of simple melancholia are those which the general practitioner of medicine sees most of from start to finish. It is the most rational of all the insanities. The patients themselves and their relations usually object to its being called mental disease at all. They talk of it as 'nervous depression,' 'melancholy,' 'low spirits,' being 'out of sorts,' and being 'run down.' I am not of course alluding to the cases of mere physiological depression of mind from natural emotional causes. Mere physiological melancholy might be defined as a sense of ill-being and a feeling of mental pain, with no real perversion of the normal reasoning power, no morbid loss of self-control, no impulses towards suicide, the power of working not

being abolished, and the ordinary interests of life only lessened, not destroyed. The simple melancholia, whose prognosis I am to treat as a really pathological condition of the brain cortex, accompanied by mental pain, emotional depression, a sense of ill-being more intense than melancholy, with some loss of self-control or volitional power, perhaps a tendency to delusion of a depressed character, the power of doing ordinary work being greatly diminished or abolished, the interests of life interfered with, and with discoverable bodily symptoms in nine cases out of ten.

In the examination of such cases the patient himself is of the greatest assistance, because he knows he is ill, sometimes perhaps exaggerating his symptoms. The patient's 'objective consciousness' is usually acutely, while his 'subjective consciousness' is exaggerated. Such a patient is usually run down in body, and has had some physical or mental antecedents which have been the cause of his trouble. There is usually more or less insomnia. The patient has either a chill or a more or less irritable feeling, his work instead of being a pleasure is a conscious toil, he has a sense of ill-being, the opposite of that normal sense of well-being which is to all mankind the best proof of health. The nutrition of the body is lowered; commonly there is want of appetite and constipation. The depression is nearly always worst in the morning. This is a fact well worth keeping in mind in treatment and prognosis, for certain measures can often be taken to rouse the brain from this morning depression into somewhat normal action. It is not often kept in mind that sleep, in addition to the marvellous condition of unconsciousness which accompanies it, does so alter the working of the higher cortical cells or their capillary circulation that they do not resume work for a little time after sleep is past. In a minor degree this is a common enough thing in people who are far from being mentally diseased.

Although the definition of this simple state of melancholia cannot be exact, it having no definite boundary lines from either sanity on the one hand, or the more severe varieties of the disease on the other, we can for practical purposes ask: What are its chances of recovery and its general prognosis, its liability to relapse, and the fear, if any, of a fatal result? The general prognosis is unquestionably a favourable one; but in order to give a statistical basis for that opinion I shall take my experience during the last ten years I was Physician-Superintendent of the Royal Edinburgh Mental Hospital, from 1897 till 1908. I must explain that while this condition of simple melancholia may usually be quite well treated at home if the patient's finances admit of it, it is expensive if practicable. For the poor and the lower middle class, most of the cases have to be sent to mental hospitals, on account of there being no means of proper treatment, and of the patients not being able to earn their own livelihood. In the ten years I had under my care altogether 4319 cases of mental disease. Of these, 411 were cases of simple melancholia. It is therefore one of the most frequent of all the varieties of mental disorder.

Of the 414 cases, 225 recovered, or 54.3 per cent. Considering that two-thirds of the remainder were discharged (technically relieved) and one-third of those probably completed their recovery after their return home, I think it would be a reasonably correct estimate to say that 70 per cent is the chance of making a recovery in this class. The rest of the cases, the 30 per cent, passed either into the more severe varieties of melancholia or into dementia, while a few died. Less than 1 per cent died, and that was through the exhaustion of acenter symptoms coming on, or through their becoming so low in nutrition that intercurrent diseases, such as phthisis, pneumonia, etc., carried them off. I may say very few of these cases of simple melancholia were really suicidal. All the suicidal cases, or rather the worst of them, I included under the separate heading of suicidal melancholia, but no doubt the general idea that life is not worth having, and some little risk of suicide, was present in some of them.

It is interesting to compare all the cases of melancholia, the simple and the more severe, as to prognosis, with the special group that I have called simple. There were altogether 1465 cases grouped under melancholia, including the simple variety, and of the total number 43.7 per cent recovered. Adding the proportion of the relieved, which is not so great as in the simple variety alone, the general prognosis as to recovery in conditions of depression of mind sufficiently severe to be sent to institutions may be put down at about 55 per cent.

*Duration.*—Patients themselves and their relations are commonly very urgent, not only as to whether recovery will take place, but how long the symptoms will last. This is the most difficult part of the prognosis in all mental cases. The grounds for giving a time limit are always somewhat uncertain; the data are commonly insufficient.

Simple melancholia, however mild in its symptoms, is not one of the mental disorders that we expect to pass off suddenly; its recovery is usually gradual, and we cannot count on a case recovering speedily because its symptoms are specially mild. There are some cases of simple melancholia that recover within three months, but, taking them all, their duration is over that time. We may, however, reasonably expect a recovery in this disease within six months from its beginning. Only about 10 per cent persist for over a year before recovery. Certainly three-fourths of the recoveries take place in that time. Its symptoms are so mild in many cases that it is difficult to say when a complete recovery has taken place. In the above estimate of recovery I assume that the patient has been for a month free from any symptoms of mental depression before the statistics are drawn up. Simple melancholia is one of the diseases from which a complete recovery is not only possible, but is likely to occur.

*Indications of Improvement.*—In nearly all cases of melancholia the symptoms are worst in the morning and forenoon, while the patients improve towards afternoon and evening. It may be held to be a good sign when the evening remissions are complete, the patient



being quite well; and if along with this the morning exacerbation is not so severe as at the beginning of the disease, it is also a good indication. In most cases of melancholia the patients are not able to follow their usual occupation or any occupation in a continuous and efficient way, or if they do some work it is done with little interest and somewhat forced. It is always a good sign when a patient is able to resume any kind of occupation for any part of the day. We often treat such patients by keeping them in bed at first. If that has a good effect, it is a good sign as making for recovery. I can distinctly find, in the case of women who have been accustomed to that kind of employment, that simple knitting is a most excellent occupation being simple, not requiring any great amount of attention, and requiring some muscular effort. When the patients become more inclined for active outdoor exercise it is always a good sign. If the trochanteric nerve tones, which we usually employ as a remedy in such cases, manifestly have an effect for good on the brain action, that is a good sign. Above all, if the patients gain weight steadily, and if their appetites and digestion improve, it is a favourable sign. Constipation being a frequent accompaniment of melancholia, if always means a general betterment when the bowels resume their normal action. If the skin becomes softer and the perspiration more normal, it may be looked upon as favourable in prognosis. If the patients have had, as most of them have, an idea that they will not and cannot get better, and cease to be obsessed in this way, and begin to believe that there is a hope of their recovery, it is a sure sign that they are on the way to recovery. It is one of the great means of mental treatment to assure every melancholic patient that he will certainly get better, and I am in the habit of telling my nurses to repeat this to every such patient at least a dozen times a day. This is a legitimate 'mind cure.' If the patient has been restless and that symptom diminishes, it is a good sign. If there had been any tendency to delusion and that diminishes in force, it is also a good indication that recovery is soon going to take place. There is a symptom which I have often noticed in cases of melancholia. The patients, during the earlier part of the disease, are often abnormally deficient in will-power and are too calm in temper. If a stage of irritability comes on I look on it as a good sign. I had one patient whom I was always glad to hear using strong language. I knew then that he was going to recover. The conscious sense of organic well-being is the last to come, that being the best subjective sign of health. A symptom worthy of observation is the return of minor neuroses or symptoms to which the patient may have been subject, e.g., headaches, asthma, skin troubles, etc. When these are seen it is a good sign of approaching mental recovery. If a patient has had a quick and reliable pulse, and that disappears, it is a good sign.

*Unfavourable Indications.* The following symptoms are those which make the prognosis more uncertain or entirely unfavourable. If the onset of the depression has been exceedingly slow and gradual, and



its symptoms more and more serious in their development, if there is a gradual decay of bodily vigour, like a premature old age, and a persistent loss of nutritive tone and bodily weight that will not yield to diet and treatment, it is a bad sign. If hallucinations of hearing come on, we do not like it. If there are convulsive attacks or slight shocks of paralysis, we know that organic disease of the brain cells has set in and that there is little hope of mental recovery, but I have seen many exceptions to this. If the patient in facial expression takes on a prematurely old appearance it is not a good sign, or if the emotion of depression of face and eye gets permanently fixed without any shade, or if muscular expressions of mental pain come on such as wringing of the hands, groaning, etc., or if a suicidal tendency develops and gets extremely intense, these are bad signs. If there are proofs of marked arteriosclerosis or other vascular degenerations, they add much gravity to the prognosis. If there is seen a general weakening of the mental power, the memory, power of attention, and interest in life, the patients becoming somewhat facile and too content, it is an indication that dementia is threatened, but simple melancholia is of all mental diseases one of the least subject to pass into dementia. As I have mentioned, however, hope of recovery should be entertained as long as anything like decided depression of mind exists, even for years. I have known a case of melancholia recover after twenty years. If the disease has come on during, or in consequence of, an epoch in life like adolescence, pregnancy, or the climacteric, recovery may be looked upon as more likely when such an epoch has passed away. Sanity is not in itself an absolute sanity, that its melancholic forms recover in a reasonable proportion of the cases.

*Periodicity and Recurrence.* The patients themselves and their relations are nearly always anxious as to whether the trouble is likely to return. The prognosis in regard to this must be somewhat guarded in all forms of mental disease, which, taken all together, recur in about 20 per cent of the recoveries. Simple melancholia is not a disorder that is specially apt to recur unless the temperament of the patient is an extremely sensitive one. A certain mental hypersensitiveness of disposition is, in my opinion, the psychological basis on which most cases of melancholia are implanted. It may be put down, in fact, as its chief predisposing cause. This hypersensitiveness is so extreme in some cases that its unfortunate possessors may be said to be always on the verge of simple depression of mind. I had a lady patient once who was liable to be thrown into such a condition on almost the slightest occasion of worry, distress, disappointment, or loss. She had several attacks when she lost relations, she had one when her favourite dog died, and she could never stand a too exciting sermon at church. Some persons with a strong neurotic heredity of brain are liable to depression during the epochs of life I have referred to. Some people are liable to an attack whenever

they overwork themselves, mentally or physically, whenever they have an attack of indigestion, or whenever they are 'run down.' Taking simple melancholia as a whole, the liability to recurrence or periodicity may be put down at about 15 per cent of all the cases. It is always a right thing for the doctor, when he is in attendance on such a case, to assure his patient that there is no chance of recurrence if he will keep his health in good condition and adopt means of treatment at the very earliest stage, or if he should feel the least symptom of depression, loss of weight, or sleeplessness. I advise most of my melancholic recoveries to weigh themselves regularly. It is to be kept in mind that the slighter forms of depression are liable to occur as prelude to most other forms of insanity, and during the very first part of those attacks the doctor has to think of this in his prognosis.

**Other Forms of Melancholia.**—As I mentioned, melancholia occurs in the proportion of 35 per cent of all the cases of insanity sent to institutions. Taking all the cases who consult doctors privately on account of mental symptoms, I would say that mental depression stands in the proportion of at least 80 per cent. The general prognosis of all forms of melancholia is represented by the 43·7 per cent which I have referred to. While the simple melancholia of which I have treated is by far the most curable variety, it is not the only one that is curable.

**Suicidal.**—First let us look at the most serious of all the complications of melancholia, namely, the suicidal impulse. This is so common that it exists in lesser or greater degree in about four-fifths of all the cases of melancholia, but, in great intensity and constituting a serious risk, it only applies to two-fifths of the cases, and those we classify as emphatically the suicidal variety. It is a common idea that when a patient is strongly suicidal he is therefore incurable. This is certainly not a correct view. Its gravity and its risks should not make one take a despairing view of even a very suicidal case. They recover in as great a proportion as the ordinary cases if we exclude the simple variety.

**Delusional Melancholia.** The next variety of melancholia, which we call the delusional form, is much more serious than the suicidal in the prognosis. By this term is not meant melancholia with delusions. It is used to indicate that variety of the disease in which a delusion or delusions are from the beginning the most prominent symptom, in which they remain throughout the disease of the same nature, giving the attack a distinctive character, being what are called fixed delusions, in contradistinction to milder delusions that change in kind, or subject, or degree. The relatives of such patients are apt to call it the cause of the disease, when scientifically it is merely the most marked symptom. The real disease consists of the depression, the mental pain which is at the bottom of the delusion and underlies all the other symptoms. In such a case of delusional melancholia the prognosis is undoubtedly unfavourable, especially if the delusions last for over the first six months of the case. The

delusional cases constitute about 25 per cent of the melancholies. The delusional and the suicidal symptoms may combine in the same case, and this constitutes a grave prognosis.

*Homicidal feelings and attempts* sometimes occur in melancholia, and constitute a grave element in the prognosis, without, however, indicating neurability. I have known many cases of simple melancholia with vague homicidal feelings, but the real danger of homicide is found chiefly in the excited variety of which I am about to speak, and at the beginning of the attack.

*Excited and Resistive Melancholia.*—Extreme agitation and excitement as a part of the disease may be the distinguishing characteristic of an attack from the beginning till near the end of its course, or it may occur as one stage in its complete clinical history. The patients in such cases rush about, may be violent to those about them, wander ceaselessly, walk up and down, and cannot sit still for any length of time, roll about on the floor, bite their finger-nails, or wring their hands, or shout, or groan, and weep loudly, or tear their clothes. In short, the muscular expressions of the pervading morbid emotion are strong and uncontrollable by their wills. This really constitutes the worst variety of the disease, and by far the most difficult to manage, rendering institution treatment necessary in almost all the cases. The presence of this agitation is determined either by the intensity of the disease or the temperament of the patient. The Celtic races are apt to show it more than the Teutonic. Delirium tremens in the acute form may be taken clinically as representing excited melancholia. There are apt to be hallucinations of the senses in this form, and a toxic element in the etiology.

Along with excitement, or, in some cases, without much motor excitement, there are cases of melancholia which are intensely obstinate and resistive in their conduct. They will not go to bed, they will not dress, they will not do what they are wanted to, and some of them are stuporose in their character. The expression of face in these cases is utterly changed from the normal.

The excited and resistive varieties constitute what is often called 'acute' melancholia. The prognosis in such cases is worse than in any form of the disease. It is apt to run on into a chronic condition, or the patient dies of exhaustion. Certainly not more than one-fourth of such cases recover. These forms are often associated also with a strong suicidal tendency.

*Hypochondriacal Melancholia.*—A somewhat distinctive form of the disease is characterized by hypochondriacal symptoms in which the mental pain has a certain want of intensity, and takes the form of fancies which centre round the patient's own health. He thinks he is all out of sorts, that his digestion is wrong, that his stomach is all out of order, that his heart is weak, that he is certainly going to die of paralysis or some other trouble which is really imaginary. There are no limits to the fancies of the hypochondriac. Now this class of symptom adds considerably to the gravity of the prognosis. Such

patients are not apt to recover quickly, and more than one half of them do not recover at all. They are a very troublesome class to the doctor, because the patient is continually wanting to see him and pour out accounts of his imaginary illnesses to him. Although he tells the patient complaints of may be entirely absent as real objective facts, yet they represent an organic sense of ill-being and are quite real to his consciousness. There is little risk of suicide in the prognosis in these cases, except in the very worst class of them. Suicide is often talked of and threatened, but seldom carried out. In ordinary cases of melancholia, when a patient is deeply depressed, he says little about suicide but thinks a great deal of it. These are the really dangerous cases. When a man is constantly talking of suicide, as sometimes in the hypochondriac, there is certainly very much less risk of his committing the act; but still I have known it occur even when it had been much spoken of previously.

**States of Depression as seen in Private Practice.**—The statistics of these conditions as met with in private and consultation practice are perhaps more instructive to the general practitioner than those of institutions, even if they are not quite so exact. The patients are mostly in the early stages of the disease, and they are still living under the ordinary home conditions of treating disease. They are in every way more analogous to cases in ordinary practice. As the results of such treatment are not to be found in the text-books, I give them here.

I have taken the last 200 consecutive cases that I have seen in consultation and have analyzed them. I find of the 200 there were 104 who laboured under depression of mind, who mostly knew they were ill, and had themselves desired or were persuaded to consult a mental specialist for their symptoms. I usually had the advantage, too—a great one—of getting the previously acquired knowledge of the family doctor as to the patient's previous history and mental symptoms that had appeared. I was not able to follow the mental history of all these patients—that is one of the disadvantages of a consultant. At least 21 of them thus passed out of my medical knowledge. But I know that 88 of the 104 were said to have 'recovered,' that is, a total recovery rate of 84 per cent. That represents the curability of the *present attack* in the milder cases of melancholia. If one relied on this experience, a condition of depression would seem to be a very curable disease indeed. But I knew many of them would be likely to relapse, some of them over and over again. My inquiries into that point brought out this fact. I ascertained that 36 of them had recurrences or relapses, and I have no doubt that number does not represent the full facts. Deducting this 36 from the 88 'recoveries,' it leaves a proportion of exactly one-half as being possible permanent recoveries. The relapses did not take place in many of the patients for years, so that in those cases the 'recoveries' were just as real as recoveries from gout or rheumatism and many other diseases often are. I knew that at least ten of these relapses

passed into *folie circulaire*, or dementia, or other incurable mental states. Almost all these patients were in comfortable circumstances, so that they could afford to obtain skilled nursing, changes of environment, etc.

Melancholia is apt to be the first form of mental disturbance when it occurs in any family up to that time free from it. Being the sanest form of mental disturbance, it is the most curable and the least damaging to the brain when it is recovered from.

**Premonitory Symptoms.** In the early stages of melancholia, the patients very frequently have a sense of impending danger, of loss of self-control, and that they may take away their own lives. This feeling causes great distress, and aggravates the painful symptoms of the disease very much. It is certainly a symptom that is not to be disregarded in the prognosis, and especially in regard to the precautions to be taken. The patient perhaps does not speak of it to anyone but his doctor. Relatives usually pool-pool the symptom as not being worth taking much notice of, because the patient at the time is self-controlled, and can pull himself together and look very much as usual in the presence of strangers. One of the difficulties of its treatment and prognosis is this, that constant watching, though it may be necessary in many cases, may add greatly to the patient's depression, thus aggravating the disease; the watching against the symptom, in short, acts as a continual suggestion that it is present. There are three kinds of cases which, in my experience, make it almost impossible to provide absolutely against attempts at suicide. Those are, first, these latent early cases, and secondly, those where, during the course of the disease, explosions, as it were, of suicidal impulse come on suddenly without any preliminary symptoms. The third is where the patient exhibits extreme cunning in concealing his impulses and extreme determination in carrying them out. As regards the doctor or attendance, wherever there is any suicidal impulse, or any reasonable clinical risk of it, he is bound to take precautions and to intimate its existence, in an earnest, impressive way, to the nurses and attendants and to the responsible relatives of the patient.

#### CONDITIONS OF MENTAL EXALCATION—MANIA.

Both the symptoms and the prognosis are different where we have emotional and intellectual exaltation as the chief symptom, as compared with the depression of which I have been speaking. Exaltation in any form is a more unsafe symptom than the milder degrees of depression. The patients usually do not recognize they are ill, as the melancholics so frequently do. There are conditions of what may be called physiological exaltation, as in healthy childhood. A grown-up man or woman who behaved like such a child would be in a condition of mental disorder. Then there is the natural exaltation of feeling resulting from good news or good fortune. This may, in some cases, pass into pathological exaltation in certain temperaments. A certain

transitory kind of morbid elevation is apt to occur as a complication of fevers and other diseases in children of a strongly neurotic temperament. We think differently of conditions of depression and of exaltation. The former we are apt to think of chiefly from the patient's own subjective point of view, the latter from the objective evidences of his conduct and speech. There are certain conditions of exaltation where pleasure, and happiness are the characteristic emotional states, and there are others where rage, discontent, and irritability are its chief manifestations. Most cases of mania are accompanied by 'excitement,' that is, have visible muscular acts as its symptoms, whereas in simple melancholia no such excitement need be present.

As a clinical fact, mania divides itself into varieties, just as melancholia does, and the character of these varieties markedly affects the prognosis in individual cases. The chief of these varieties are the simple, the acute, the delusional, and the chronic.

**Simple Exaltation.**—I had under my care, during the ten years 1898-1907, in the Royal Edinburgh Mental Hospital, 800 cases of simple mania out of 1754 maniacal cases altogether, and, of that 800, 348 recovered, giving a favourable prognosis of 43·5 per cent. In addition to those recoveries, a certain number more were discharged relieved, some of whom no doubt completed their recoveries after leaving the institution, but there were not nearly so many of such relieved patients among them as among the melancholies. I think if 5 per cent were added to the 43·5 per cent of recoveries, it would represent the total curability of conditions of exaltation so marked as to be certifiably insane. This gives a prognosis in such states of 48·5 per cent less than that among the depressed, in the simple varieties of the disease.

In the general outlook of a patient who suffers from morbid mental exaltation, there are different risks and different things to be considered from those suffering from depression. An exalted patient will commonly not commit suicide, or think of it. He will attract more attention from others of an unfavourable kind; he will be looked on as more of a 'fool.' He will have far more chance of losing any work or situation he has, he will be more likely to run himself by foolish action or speculation, he will run more risk of getting into the hands of the public authorities, and he will be far more apt to produce disturbances in his family and social relations. The greatest of all human faculties, that of will power and self-control, is very much more weakened. His moral sense is lessened in such a way that he is liable to commit acts of immorality; the conventionalities of life are lessened for him, and he sets them aside. In his dress, and in the company he keeps, he changes his normal habits. He is much more frequently, and is sooner, certified to be insane and sent to an institution for care and treatment, and from the beginning this contingency is to be kept in mind by the doctor and explained to the relations. It is more easy to persuade relatives that this step is necessary than in the case of depression of mind. Mental exaltation is not so apt to be gradual in

its beginnings as depression. It comes to a head faster. There are few cases of simple mania in the total number of cases of exaltation compared with melancholia. It is characterized less by nutritional defects. The man suffering from simple mania eats well, sometimes an excessive amount, and keeps up his strength. His temperature is slightly higher than the melancholic. Instead of putting him to bed and giving him rest and massage as a form of treatment we tend in most cases to give him a great deal of exercise in the fresh air, to put him to dig, or to send him away on a walking or bicycling tour with his attendant or a friend. We are far less sure of what he will do and of how the case will turn out than where we have simple depression.

Comparing simple exaltation with all the other forms of mania, the percentage of recoveries is only about 3 per cent greater, thus showing that there is not so great a difference between simple mania and its other forms as between simple melancholia and other forms of depression. It is in fact not so curable a disease. The brain is more disturbed in its action and not so liable to recover when exaltation is present as when the disturbance consists of depression. The 44 cases of simple depression sent to the institution in the ten years, as compared with the 800 cases of simple exaltation, is not a proof, in my opinion, that the exalted conditions are more frequent, but that they are of a character that cannot readily be managed at home and are therefore sent to asylums much more frequently.

*Recurrence.* I have no quite definite statistics showing the liability to recurrence in cases of simple mania, but my opinion is decided that it is more liable to recurrence, and certainly it is more liable to pass into other and deeper forms of mental disease, than states of depression.

*Acute Mania.* This state, being the most vivid and dramatic of all forms of mental disease, is very often taken as the type of all the insanities. It is the 'raving madness' of literature. It is the least rational, the least conscious, the most noisy, and most unmanageable of all the forms except general paralysis. Unfortunately, being thus so very distinctive, it has affected the conception, the treatment, and the prognosis of all forms of mental disease in a very unfavourable way until recent times. The man in the street thinks of every case of mental disease as of this type. Its treatment in old times consisted of manacles, chains, darkness, and stripes, and its prognosis was usually put down as entirely hopeless. It is not really a common variety of mental disease, for, out of 2377 admissions into the Royal Edinburgh Mental Hospital during the seven years 1871-1880, only 207, or about 8 per cent, were so classified.

Acute mania begins in various ways, sometimes by the condition of simple mania, but often quite suddenly. At times it has the melancholic prelude to which I have alluded. Bodily symptoms are more apt to be present than in most varieties of insanity except general paralysis. The temperature is raised, weight is rapidly lost, and great exhaustion occurs in a short time in most cases. The prognosis as regards recovery is not nearly so bad as was formerly thought. My



erience was that 60 per cent of the asylum cases recovered,  $7\frac{1}{2}$  per cent died, 32 $\frac{1}{2}$  passed into chronic mania and dementia. This liability to a fatal issue is greater than in any other form of mental disease, except puerperal insanity and general paralysis. There is no form of mental disease where there is more liability to the brain losing its higher powers of mind and sinking into an incurable mental condition. That is the greatest risk of all, and the greatest anxiety to the doctor is responsible for its treatment. There is a very acute form of mental disease, called by many authors 'delirious mania,' or acute delirium, which clinically may be reckoned as the worst type of acute mania. In that form the prognosis, in regard both to recovery and length, is very much worse than in ordinary acute mania. Some authors say that delirious mania is almost invariably fatal, but that is not my experience. In some books this is called typho-mania. The present opinion in psychiatry tends to put down almost all cases of delirious mania, and many of acute mania, as being forms of brain fever, although no specific organism has as yet been detected. Usually the high temperature, and many of the other symptoms, point to a toxin whose action has focussed itself, as it were, on the cerebral brain cells.

*Good Indications for Prognosis.*—If the disease has come on suddenly, if the great organic functions of the body are not especially affected, if there are of course good signs. If the stomach and bowels and digestion are acting in a normal way, if the heart's action is not unduly weakened, if the temperature does not rise above 101°, if the common sensation is not unduly impaired, if the mucous membranes of the mouth and throat are not dry, if weight is not lost at the rate of more than four pounds a week, and if the general strength shows no signs of exhaustion during the first fortnight, then we may have good hopes of the patient's ultimate recovery under proper treatment. If he begins to put on weight rapidly, it is perhaps the most favourable bodily sign approaching recovery that can appear. If the disease does not last in its acute form more than a month, if there are no signs of a general debility of mind after the first six or twelve months, if there is no tendency to fixed delusion, these are all good indications in the prognosis. Nowadays we commonly put our acutely maniacal patients to bed for the first few weeks, and if this is successful in calming them, to look on it as a favourable indication. If prolonged bathing treatment is adopted, and the patients submit to this quietly and are the better for it, that shows that the attack will probably be recovered from. If this treatment by warm baths, with perhaps the use of mild diatives, has the result of soothing the patients' excitement in a marked way, their recovery will probably be speedy. If the habits are not very uncleanly, and improve under care, that is a good sign.

*Unfavourable Indications.*—If the temperature is persistently over 101°, if there is a great loss in weight amounts, as I have seen in some cases, to more than ten pounds in a week, if the mucous membranes are persistently dry, if there is a 'muttering delirium' at night, and if there are marked



signs of general exhaustion with heart failure, these are all unfavourable indications as to recovery and life. Some cases of acute mania die from exhaustion in spite of everything that can be done, and some of these die very quickly and suddenly, within the first fortnight. We now think that in such cases the toxæmia has been of a very acute character. If there have been hallucinations of the senses and they show a tendency to persist, it is an unfavourable sign. If the acute symptoms are entirely intractable and go on for perhaps a year without much change, we fear that it may pass into chronic mania. But the result which we dread above all things is that of dementia, of which I have spoken, and the early symptoms of this consist of a diminution of the active maniacal symptoms, a dulling and deterioration of the expression in the face and eye, a lack of the power of attention to what is going on, a want of interest in the people about him, or in suitable occupation, a persistent lack of orientation, and a lowered emotional condition, with a loss of social instinct and the persistence of very dirty habits—all these, especially if the patient is in the period of adolescence, are unfavourable indications for complete recovery. They mean that the brain cells are undergoing demonstrable deterioration or atrophy. This affects at least 50 per cent of all the cells in bad cases.

*Tendency to Recurrence or Complete Recovery.* Acute mania is a condition which is not apt to recur, and when it has been of short duration it may be completely recovered from and leave the brain and the man in a normal condition.

**Chronic Mania.** This is really, as to its symptoms, acute mania somewhat modified in certain particulars and running a chronic course. I put down the time limit here as twelve months, but undoubtedly there are some cases of acute mania who recover after that time. Chronic mania is an incurable disease, but many patients live a long time suffering from this condition. There is a species of enfeeblement of mind in chronic mania, the memory is impaired, the habits and fine feelings are degraded or dulled, the emotional power and social instinct are usually almost paralyzed, and the power of attention is usually much lessened, although some patients are extremely sharp and observant.

**Delusional Mania.** Some cases of mania have from the beginning a strong and fixed delusional element on which the symptoms of excitement seem to hang. A man believes that he has been persecuted by his relations and friends, and he seems to get excited *in consequence* of this delusion. I had a patient who shouted, scolded, and was violent, almost all day, alleging as the reason of her conduct that her children were below the boards of the floor, and that she heard them constantly being tortured by villains who were killing them. The prognosis in this form of mania is certainly unfavourable, though individual cases sometimes recover. It is often accompanied by vivid hallucinations both of hearing and sight, and these are unfavourable, particularly the auditory hallucinations, if they last long.

**Mania in all its Forms—Statistics.**—Taking every form of morbid mental exaltation, I had 1757 cases in the Royal Edinburgh Asylum during the ten years I have referred to, of which 715 recovered, which gives a percentage of 40.7, being 3 per cent less than that of melancholia, and I think that the patients who were discharged relieved did not recover at home in anything like the same proportion as the melancholics did. About 5 per cent may be added to the 40.7, making about 45 per cent as a general prognostic chance in mania. The whole number of cases of mania were 1757, as compared with the 1465 melancholics, during the ten years; but, as I have stated, this does not represent the real liability to depression and exaltation of mind in the population.

Turning to conditions of morbid exaltation seen in private practice, I had 31 of these out of 200 consecutive cases, or 12 per cent, concerning thus with the 52 per cent of cases of depression. Twelve of the 31 recovered, a percentage of 39, as compared with the 88 per cent of the melancholics. I ascertained that 5 out of the 12 recoveries had relapses, or 41 per cent, which is the same proportion as the melancholics. The lesser number of elevated cases I saw as compared with the depressed may not necessarily prove a lesser occurrence of morbid exaltation in the brain-working of the community, but be due to the fact that patients suffering from mania are less apt to come or be brought to a consultant. They usually do not recognize they are ill, and they are so decidedly more insane that they are much more apt to be removed to mental hospitals at once. The lesser percentage of recoveries I met with in private practice among the cases of mania may be partly accounted for through the greater mildness and manageability of the symptoms in melancholia, so that many more of them could be treated at their homes or in rooms during the curable stage of their attacks.

**'Manic-depressive' Mental Disease.** All authors on mental diseases had noticed a certain relationship between cases of mania and melancholia. I stated in my "Clinical Lectures" that "there exists in the majority of nearly all the acute cases, at some time or other, in some form or degree, in some stage of the disease, a tendency to alternation, periodicity of symptoms, remissions, or recurring relapses." My statistics showed that about 44 per cent of all my cases of insanity showed those characteristics, but, by confining ourselves to cases of mania and melancholia, at least 46 per cent had these special features. All physicians in charge of mental hospitals knew that certain cases of mania might become depressed, and vice versa, during the same attack, also that a patient might come in at one time with mania and his next attack would be melancholia. We all considered that those two conditions had a certain relationship to each other, but it was reserved for Kraepelin, of Munich, to throw the two conditions into one for purposes of classification, and call it "manic-depressive insanity." He maintained that a very large number of cases of either condition actually had some symptoms of the other, if the whole mental life were taken into consideration. His subsequent

experience and more careful study of the subject has led him to the belief that there are practically no cases of mania that have not had a melancholic phase, and that there are perhaps a few more, but not many, cases of melancholia that have not a maniacal phase. His general conclusion from these facts is that, in essential nature and as forming the basis of a true classification, they all ought to be thrown together and called by one term—not two. That there is a great deal in this view few of us doubt, but our experience as to the almost universal frequency of the association of the two conditions has not been the same as that of Kraepelin. Either we have not observed these phases, or Kraepelin has been misled and has seen slight depression and elevations which have not been visible to most psychiatrists. From a clinical point of view, especially as to treatment and management, a case of depression is largely different from one of mania and, as we have seen, the prognosis is different. One can scarcely imagine telling the relatives of a typical case of simple depression of mind that it is one of 'manic-depressive insanity.' It would obviously be more satisfactory and intelligible to both the medical attendant and to the relations to call it a case of mental depression. The psychological, and especially the emotional, condition in the two varieties is so essentially different and opposite that, even from a scientific view, Kraepelin's classification does not seem altogether satisfactory. It is only in the very decided cases, where the depressed and elevated states alternate regularly and have a definite and calculable relationship to each other, that we are bound to regard them as different phases of the same brain condition.

The general prognosis in Kraepelin's manic-depressive insanity is represented, according to my experience, by a 42 per cent recovery rate in the cases treated in institutions, and if we add 8 per cent for recoveries at home, we arrive at a prognostic chance of 50 per cent.

**States of Marked and Regular Alternation and Periodicity—'Folie Circulaire.'** This is not the place to go into the most interesting subject of the physiological periodicity of function in all living creatures, except in so far as it relates to prognosis in mental diseases. The two most marked periodicities in man are sleep and the processes of reproduction. Both are disturbed in mental disease, and disturbances in both markedly affect its symptoms and prognosis. We cannot dissociate the physiological periodicities from the pathological alternations and similar changes in disease. Many recurrences and changes in mental disturbances are accounted for by reference to the physiological periodicities, especially in youth, when we have to do with sex and menstruation. An attack of mental depression or of elevation may be a pathological representation of the physiological effects of menstruation. If we have such a pathological mental periodicity established as a morbid habit, it is very difficult to get rid of, as might have been expected from this relationship to a physiological process. The prognosis therefore becomes bad in such a case.

There is no doubt that when we have a neurotic diathesis and a bad

and, therefore we are more apt to have an exaggeration of physiological periodicities in the direction of disease. Everybody who observes men and women from a psychological point of view knows that the slight morning change of mental condition as compared with the evening, which may be said to be physiological, is greatly exaggerated in the neurotic subject, taking the form of a regular morning depression or want of power of energizing, or some vague feeling of general discomfort. Few men and women of the finer and more sensitive artistic temperament but experience some such feeling, and we have seen that simple melancholia often has the same features. The periodicities of morning and evening temperature are markedly marked in the acute insanities. There is no more common symptom in all forms of recent mental disease than insomnia, which means the absence of a brain periodicity. Seasonal periodicities exhibit themselves in many of the neurotic and the insane. They are not always in the same condition of mind in the spring as in summer. Some people are subject to moods, cravings, obsessions, and tempers generally. There are many persons whose mental life is one long alternation of action and reaction, activity and torpor, as if by a natural law of their organization. There are very few of the neuroses, in addition to the mental disturbances, that are not more or less periodic; for instance, neuralgia, asthma, migraine, and, above all, epilepsy.

There is a form of mental disease, called *folie circulaire*, first described by French medical authors, in which, when it occurs in a typical form, lasts for weeks or months, or even, in some cases, years of morbid depression, followed by somewhat the same periods of morbid elevation, and then by a condition which is practically sane. This sequence, forming a kind of circle with three sections, goes on during the whole of the life of the patient in most cases. Once fully established the prognosis is extremely bad. In my experience there are not more than 5 per cent of recoveries. The terminations of this disease, other than these few cases of recovery, are: first, exhaustion during the elevated phase of the disease; second, death from old age at the usual periods of life; third, a sort of settling down into either a milder form of periodicity or into a stuporose condition during old age. Nearly 20 per cent undergo this change. Very few indeed of such cases pass into dementia, however acute the elevated phases may have been.

In the majority of cases of my 'adolescent insanity' there is a tendency to remission and periodicity before either recovery or dementia supervenes, and we must be very careful in the diagnosis and prognosis not to pronounce them cases of *folie circulaire*. In fact, we must have several years' duration and very many successive and regular states of alternation before we definitely make the diagnosis.

Patients suffering from *folie circulaire* usually live long. The milder cases are very troublesome, and usually need institution treatment; and there are many people in the world who have what is virtually a very mild form of *folie circulaire*, and during the elevated periods do the commonly good and sometimes brilliant work, and during the



MICROCOPY RESOLUTION TEST CHART



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depressed periods are simply 'lazy,' stupid, and inactive. They do not need to be put under care at all. I could quote from literature many examples of men who put out their best work during periods of slight mental exaltation.

The favourable indications in *folie circulaire*, in the rare cases where such are met with, are a lengthening in the periods covered by the whole circle, a mitigation in their character, and an improved self-control during the period of elevation, the depression being less intense and the elevation less maniacal. I have been in the habit of trying in the early stages of *folie circulaire* to control and stop the elevation by the use of the bromides, sometimes combined with sulphonal and cannabis indica. I think I can say that in a certain number of cases this has been done and the morbid mental habit has been, as it were, stopped. This is worth trying; but I can recall one or two cases where the result of this treatment has been that the patients sink into a kind of lethargy and do not come out of it, ceasing to have any elevations and depressions. On inquiring into family history we find that cases of *folie circulaire* have nearly always a mental or a neurotic family history. It is found in a typical form more frequently in members of 'old' families, and many such families have had other members of great intellectual distinction.

#### OTHER FORMS OF MENTAL DISEASE.

**Delusional Conditions. Monomania, Paranoia.**—Delusion is a term which is not easy of definition. It has a popular and a medical meaning. If any man or woman has a fixed belief in something that would be incredible to people of the same class, education, or race as the person who expresses it, this belief persisting in spite of proof to the contrary, we say he or she has a fixed delusion. If such a delusion continues month by month and year by year, the prognosis is extremely unfavourable. It is only in exceptional cases that such persons recover and do good work in the world. The *fixity* in such cases is the character which means the incurability. Such false beliefs and delusions may assume almost every character. They may refer to the patient himself, his health, his organic and primary instincts, such as sex, food, and social relations, or they may be of a general and impersonal nature, referring to society, to other individuals, to political matters, etc. They may or may not be accompanied by hallucinations of the senses, but if they are so it is a particularly incurable sign. A man's whole mental life may be of a delusional character, or the delusion may refer to one subject alone, being then called monomania. Delusional conditions are usually divided psychologically into two kinds, one of elevation and often unreasonably happiness, the other of persecution, suspicion, unseen agencies, and irritability—danger, and general unhappiness in life. Delusional insanity is often founded on the temperament of the individual. A vain man falls into the delusion that they are much more able or hold higher positions than is the case. Suspicious men

do not believe that their relatives and friends or society are persecuting them.

A modern psychiatrist, when he is consulted about a case where there is a tendency to insane delusion, or where there are hallucinations of recent origin, first looks out for some bodily cause of this brain and mental change. He endeavours to ascertain whether there is any toxin circulating in the brain from without the body or from within. It is one of the common results of the excessive use of alcohol to find delusions of suspicion and hallucinations of the senses. The syphilitic poison often produces the same result. I believe the toxic effects of the breaking down of tubercle bacilli in phthisical patients sometimes causes mental disturbances through their action on the brain cells—a condition which I have called "phthisical insanity." There is a common but well-known form of mental disturbance, liable to occur during attacks of acute rheumatism, which is undoubtedly caused by the rheumatic poison or micro-organism. There are also the myxoedematous and exophthalmic forms of mental disturbance. I would advise every medical practitioner not to come to an absolutely unfavourable prognosis in cases of delusional insanity before he has made a thorough investigation into such possible bodily causes for the disease and estimated the chances of counteracting or getting rid of them. No doubt toxins may have the effect of damaging the brain cells irremediably, but in some cases of delusion they may be counteracted, and in that way the patient cured if taken in time. Of recent years many of our younger psychiatrists have been trying the effects of various serums and vaccines, used in the early stages of such cases, as cures and counteractives, but their success has not as yet been great. This is a field, however, from which we hope much in the more acute delirium, but I cannot say that in the cases of paranoia there has been as yet much success except in certain cases of syphilitic origin, and then I have seen marked benefit, and even cure, by the use of antisiphilitic remedies, combined of course with moral and mental treatment, occupation, changes of environment, etc. There are now a considerable number of cases on record where a condition of fixed delusion was caused by traumatic injury to the head, and where surgical operation by trephining cured the disease.

There is a legal aspect of insane delusion, as there may be in most forms of mental disease, where we have homicide, suicide, and serious bodily injuries done as the result of delusions. It is often important to be able to give evidence that such cases are the result of mental disease. There are a certain number of the cases of paranoia where delusions are concealed, and their presence is even consistent with occupying positions of responsibility and doing good work in the world. In such cases the prognosis specially applies where wills are made and are influenced by the delusions present in the patient's mind. I have been frequently consulted about persons with delusions who have admitted them to no one except their nearest relations.

Magnan, of Paris, has described what he terms a "progressive



systematized delusional insanity," characterized by four stages: (1) Insane interpretations and slight depression; (2) Ideas of persecution, with hallucinations of hearing; (3) Delusions of grandeur; and (4) Dementia. My experience is that this systematic course, which is undoubtedly seen in some cases, is a rare one. Delusional insanity is sometimes a part of that "degeneracy" and "hysteria" which Max Nordau so vividly describes as influencing our present-day literature and art. If this is so, and where it exists, it is certainly an incurable human tendency.

**Defective Control, Insane Impulse, Insanity without Delusion, Exaltation, Depression, or Enfeeblement.** There can be no doubt that man's power of will, his self-control, and his ability through the exercise of his volition to regulate his conduct so that he lives within the limits of the law and of good morals, is his highest faculty. When this great power fails in a marked degree and men and women act from pure unreasoning impulse, and especially if such action is sudden and explosive, it undoubtedly means disease. Under the influence of such uncontrollable impulses suicide and homicide are sometimes committed, and many crimes and anti-social acts result. Such loss or weakening of the power of mental inhibition must, however, be very marked to class it as a disease. After all, control in all men is a question of degree. Mental inhibition is a faculty which does not exist in early childhood, and it grows during childhood and adolescence just as the bodily powers and faculties develop. A careful study of different children shows that there is an extraordinary difference between the degree and the development of this power in different children of the same ages. That development is, or should be, associated with a growing sense of right and wrong, and of duty in regard to parents, relations, society, and the Almighty. There are cases where such power of action and such a sense of right and wrong is never developed at all. We now call such "moral imbecility," and for the first time the condition has lately been recognized in Bills before Parliament, and statutory provisions are now proposed for the care of such persons, just as we have similar provisions for the care of the insane. The Royal Commission on the Care and Control of the Feeble-minded thus defined such moral imbeciles: "Persons who, from an early age, display some mental defect, coupled with strong vicious or criminal propensities, on which punishment has little or no deterrent effect." It will be observed that the words "mental defect" are used by the Commissioners, and it is quite true that there is a real mental defect, which, in most cases, involves the intelligence and the emotions; but there is a condition of loss of will power and moral sense in a few grown-up men and women without intellectual impairment. Some such are sometimes extremely acute intellectually, and use that ability to the detriment of society. They have been called "congenital and instinctive criminals." Most fortunately for society such persons are rare. When this condition of moral and inhibitory defect exists, after a careful inquiry, and after allowing for the effects of bad environment,

Example, and no moral teaching, its subjects may be proved quite incurable. Society must forcibly segregate them, as is proposed in the Report of the Commission I have referred to, which usually come of us by ancestry.

*Dipsomania, et c.* The most common, and the most troublesome to society, of these uncontrollable impulses and moral defects is that of craving for alcohol, opium, cocaine, and such drugs. They have been called 'dipsomania,' 'morphinomania,' etc. There are many forms of drunkenness, some of which are curable, but the true dipsomania accounts in nine cases out of a hundred, an incurable malady. It is a chronic disease. It is often recurrent and periodic in its symptoms, and a careful psychological study of a number of cases has led many physicians myself among the number, to the conclusion that one usually associated with the drunk craving more or less of a real mental weakness in character, in intellect, and common sense, as well as in power. The effects of the excessive use of alcohol have been so injurious to society that many Government Commissions have been appointed to investigate the causes and to suggest remedies, while books of a great number by doctors and laymen have been written on the subject. I was lately a member of a Departmental Committee which investigated the subject of inebriety and its social consequences. We had many witnesses who had had every sort of social experience, and was greatly impressed with this fact, that the opinion of the public on this matter is now so advanced that we could get no witnesses to support the thesis that the principle of the liberty of the subject should be invariable when we have to deal with certain forms of inebriety. Some distinguished witnesses from the legal profession, whose duty it was to protect the liberty of the subject, admitted that some statutory provisions must be made to control persons suffering from dipsomania and certain kinds of inebriety. Until the legislature finds time and inclination to pass such measures, the prognosis of such diseases is almost hopeless. The exceptions of recovery only prove the rule. These exceptions, in my experience, apply only to such cases, and they are very few, who lose the drink craving at about the age of thirty or from some sort of physiological change which has taken place in the brain action at that time; but even when they recover they are not usually good for much as citizens. I shall speak of the prognosis of alcoholism — an entirely different disease from dipsomania — later on.

The forms which defective inhibition, insane impulse, and explosive habit may take are innumerable — destructiveness, fire-raising, pyromania, kleptomania, suicide, homicide, etc. The medico-legal aspect of all these tendencies is extremely important, and we must certainly be prepared to state on oath in the courts our views of the prognosis in reference to them. Regarding them as a class, the prognosis is unfavourable.

**Conditions of Mental Confusion and Stupor.** — I have already referred to the stuporose conditions as sometimes forming a part of

the sequence of clinical symptoms in melancholia, but there are conditions of stupor and confusion, not associated with melancholia or mania, that form of themselves a symptomatological group of mental disease. A certain amount of confusion may be present in almost any form of insanity, but it may also exist *per se*. Typical cases of stupor are characterized by negative symptoms. There is no exhibition of active mind at all present, there is no mental reflex as the result of any mental or bodily excitant, and there are many bodily symptoms which show that the higher brain cells are almost in a condition of suspended function.

There are certain striking bodily symptoms in typical cases of mental stupor which are always of importance in prognosis. The circulation is very disturbed, so that the capillaries have lost their tone, the extremities look blue and feel cold, the whole action of the central nervous system is, to a certain extent, lowered and devitalized, the ordinary motor reflexes are sometimes almost abolished, and the general effect is very alarming to the non-medical mind. The relatives think that a person in such condition is pretty sure to die. The voluntary motor system is found to be in three conditions in different cases: (1) Passive and unresistive ('anergic' stupor); (2) Cataleptic, with a decided tendency to keep fixed attitudes, and the muscles 'waxy'; (3) Resistive, so that a strong resistance is made to change of positions, to walking, etc. Now none of these necessarily means a bad prognosis. They may be all recovered from in time and with proper treatment. Most of the cases of stupor occur before the age of thirty. They are sometimes mixed up with hysterical symptoms. In the cataleptic and non-resistive condition there is no expression of the face or eye whatever. In many of the resistive cases there is a marked melancholic expression. It has been called *melancholia attonita*. While many of the cases result from purely bodily causes of exhaustion, many of them are also the result of terrible mental shocks.

A few of the cases of stupor die, in spite of all treatment, of exhaustion and inanition. As a group, however, they recover in the proportion of 50 per cent, but there is an unfortunate tendency in about 30 per cent to pass into dementia, and those Kraepelin would call *dementia praecox* (see p. 475). Stupor sometimes occurs as a phase in cases of mania or melancholia; and at the end of a prolonged attack of acute mania, in a young person, there may be a stage of stupor which may closely imitate true incurable dementia. One must be careful not to give an unfavourable prognosis in such cases.

Some authors use the term 'primary dementia' to describe certain cases of stupor. I altogether object to the use of the term 'dementia' except to describe incurable conditions of mental entelechment. It is also sometimes called 'confusional insanity,' but confusion requires to be present in an extreme degree for it to be called stupor, although psychologically and physiologically the two conditions have a close relationship, and the one may be simply an aggravated degree of the other. In some few cases of stupor we may have sudden, automatic,

impulses or explosions, like a mental epilepsy. Such symptoms do not necessarily indicate a bad prognosis.

**States of Mental Enfeeblement ; Dementia.**— While the term 'mental enfeeblement' may be used in a semi-popular sense, the term 'dementia' should only be applied to a condition of weakness of mind in regard to memory, power of attention, interest in the outside world, power of reasoning and of emotion, these in by far the larger number of cases occurring as a secondary condition to some more or less acute form of mental disease. Mental exaltations, especially acute mania, are the most common prelude to a condition of dementia; but there are a very few cases where slow, progressive enfeeblement occurs in young people, just as senile dotage slowly draws on as a physiological process. Formerly we were apt to think that the cell damage, caused by toxins, and in acute mania, produced a state of damage in these cells with a tendency to atrophy; but further study of the subject has shown that the primary state of morbid exaltation and the secondary condition of mental deterioration and cell-death are really parts of the same process and are the result of a possible toxæmia with a strong hereditary tendency towards mental disease. We find that by far the greater number of cases of dementia occur as a sequel to, and a part of adolescent insanity, occurring before the age of twenty-five. I have sometimes called it a 'postponed imbecility.'

Unfortunately in secondary dementia the prognosis is always bad. The patient in fact cannot recover, because 50 per cent of the higher brain cells in the higher and anterior parts of the cortex have undergone a process of atrophy or degeneration, as can now be demonstrated microscopically. Demented may live for a long time, in the less marked cases even to an extreme old age; but there is always a tendency for them to be induly irresistible to the ordinary causes of disease and death. In the older mental hospitals, where there was overcrowding and imperfect ventilation, and where the diet was not as carefully attended to as it is now, 30 per cent used to die of phthisis pulmonalis. In many cases of secondary dementia the 'stigmata of degeneration,' to which I shall presently allude as being present in congenital enfeeblement, are found.

**Conditions of Congenital Mental Weakness ; Amentia.** In the process of growth and development of the brain there is liable to occur an arrest, either in utero, or in the first five years of life. This results in a mental enfeeblement, an incapacity for education, and most frequently also in changes in the normal appearance, strength, and power of the body generally, or in some of its chief organs. Of recent years these conditions have attracted great social attention, and have been subject to an inquiry by a Royal Commission, as previously stated. By scientific observers, conditions of idiocy and congenital mental defect have been classified in various elaborate ways, etiologicaly, symptomatologically, and pathologically. Several observers, especially of the Italian school, have been inclined to put down a considerable proportion of them to ante-natal toxic conditions. This,

though undoubtedly applying to some of them, has not yet been proved to be the cause in by far the majority of cases. The Royal Commission to which I have referred classified these patients as:—

1. *Idiots*, i.e., persons so deeply defective in mind from birth, or from an early age, that they are unable to guard themselves from common physical dangers, such as, in the case of young children, would prevent their parents from leaving them alone.

2. *Imbeciles*, i.e., persons who are capable of guarding themselves from common physical dangers, but who are incapable of caring their own living by reason of mental defect existing from birth, or from an early age.

3. *Feeble-minded*, i.e., persons who may be capable of earning a living under favourable circumstances, but are incapable, from mental defect existing from birth or from an early age, (a) of competing on equal terms with their normal fellows, or (b) of managing themselves and their affairs with ordinary prudence.

They add a fourth class, *moral imbeciles*, the class of which I have already spoken.

This classification is, as will be readily seen, largely founded on administrative grounds, for the purpose of enabling the legislature to adopt different measures and to provide different kinds of institutions for these classes of defectives.

Looking at the whole class from a prognostic point of view, it may be said that they are all incurable. Idiocy is not only incurable, but is only improvable to a limited extent, in regard to the habits and ways of the patients, by placing them in institutions and by special treatment. Their lives may thus be rendered somewhat more human than if left alone, and undoubtedly may be prolonged. As showing the fact that, in this condition, not only the brain and mind are defective, but the whole nutrition of the body is weakened, it is found that about two-thirds of all the idiots are subject to, or die of, tuberculous disease. The second class, the 'imbeciles,' are educable, in special institutions and by special means, to a considerable extent: but there is a limit to this, and all their lives they will require to be cared for by others. It is now proposed to provide special institutions for such care at the public expense, as a great philanthropic measure, for all of them who have not means to provide it for themselves. Undoubtedly the imbecile may be enabled to lead a happier life and to live longer through such special care. The third class, of the 'feeble-minded,' often called 'defectives,' have attracted more public interest than the other two classes, because they are nearer ordinary humanity, and some of them exhibit special capacities, e.g., in music and mechanical work, etc., in a stronger degree than even average humanity. There is a great social and eugenic question connected with this class also, namely, the risk of their propagation, the liability of some of the female defectives to fall into the ranks of prostitution, and other social and moral risks to which society is liable through their existence. The curability of many of them, during childhood and youth, is such that

may be made self-supporting members of society, but always require supervision. None of them can ever attain the position of responsible citizen. The whole question of prognosis is mixed up with conditions of congenital enfeeblement, with legislative, social, and administrative measures on their special behalf, and improvement can only be obtained at the best in the great majority of cases. The few cases that are really restored to mental capacity are those resulting from pathological conditions, capable of recovery and cure, like hydrocephalus and traumatic injury to the brain.

**Stigmata of Degeneration.**—There are certain kinds of bodily and mental abnormalities that are found in most congenital cases, which are of importance, both in diagnosis and in prognosis. These have been called 'stigmata of degeneration.' They assume innumerable forms. The shape of the head may be so altered that they make it abnormal in type, and so alter the expression of face, producing the effect of 'cross.' Malformations of the hard palate are the most frequent of all the bodily stigmata. It may have a 'V' shape or a saddle shape, or it may be cleft. The teeth may alter in their number or type or disposition: the bones of the thorax may be affected so that they have pigeon breast. The fingers may be short or irregular: the feet may be of that shape that we now call 'neurotic.' There may be supernumerary fingers or toes, or club-feet. The organs of special sense, especially the eyes and the external ear, may be abnormal; strabismus or attached lobes occur. The angle of the eyelids may be so deep so as to produce a Mongolian appearance. The heart, the stomach, the bowels, the tongue, the genito-urinary system, may be all abnormal. There may be a general arrest of bodily function producing 'antilism' and dwarfishness. The general power of expressing emotion in the face may fail. Certain mental stigmata also are liable to appear. Arrested, or postponed, or unrelational development of mental faculties is common. Speech may be defective or postponed in coming on. The power of reasoning may not be absent, but so disturbed that the victims are never able to draw right conclusions from premises, however obvious they may be. There are cases where the memory is so prodigious that whole pages of a book can be repeated after once reading it. Many cases of an abnormal power of calculation are on record. All these things give a bad prognosis in any case. They are found, but not so frequently, in some cases of adolescent insanity, and are extremely common among developmental epileptics.

**Cretinism Thyroid.**—There is one class of imbecile children where prognosis is not always unfavourable, viz., the cretins, and those whom the thyroid gland is affected in its functions. Many of these are either cured or markedly benefited by the administration of thyroid gland. Many physicians now try thyroid administration experimentally whenever they have an idiot or imbecile to treat, and occasionally good improvement is thus attained.

**General Paralysis.**—We now come to one of the most interesting of all forms of combined brain and mental disease—general paralysis.

Its prognosis has this profound interest, that while as yet there is an almost infinitesimal record of recovery, there is a strong feeling, founded on the facts of its etiology and of the results of recent developments in vaccine and other treatment, that its cure will become possible when our knowledge in regard to it still further increases, and that it may be prevented by an early cure of all cases of syphilis.

The chief difficulty in this disease is not its prognosis, but its correct diagnosis in the early stages. In addition to the well-known clinical symptoms of the disease, the Wassermann reaction has now taken a definite place as perhaps the most important of all in confirmation of the diagnosis. The disease may now be said, almost definitely, to have syphilis as its predisposing cause. Whether there is not another and proximate cause in syphilitized subjects to account for the disease is as yet in doubt. Considering that it only occurs in from 2 to 4 per cent of those who have acquired syphilis, and that it is not amenable to antisyphilitic remedies, it seems to me that there must be another etiological element, probably in the shape of some specific micro-organism. Dr. Ford Robertson, who has worked long and arduously at this subject, is of this opinion, and he believed, at one time, that a form of diphtheroid organism, which he called the *Bacillus paralyticus*, was the proximate cause of the disease; but this has not as yet been controverted. He has certainly been able to produce a morbid condition of the brain in some of the lower animals which, in symptoms and pathological appearance, closely resembles the disease, by using injections of cultivations of bacilli from general paralytic patients.

The duration of general paralysis, from its beginning, varies from a few months to over twenty years, but the average duration of life is a little under three years. One of the great things to remember in general paralysis is that no prognosis is justifiable until the disease has been definitely ascertained to exist. Further, there must be a combination of mental and bodily symptoms present. Certain mental and bodily conditions closely resembling general paralysis, produced by alcohol, syphilis, epilepsy, trauma, organic brain disease, acute mania, and chorea, must be eliminated before any diagnosis or prognosis is come to.

There are certain symptoms which at present usually mean a short duration of the disease. These are extreme acuteness of symptoms at the onset, congestive attacks, and rapid development of the three stages one after the other. There are other symptoms which indicate that the case will probably last long. These are a slow, insidious onset of mental enfeeblement, freedom from maniacal symptoms with amitious delusions, the prolongation of the first stage, and the occurrence of what appear to be remissions in the course of the disease.

We now recognize that, in addition to the classical three stages of the disease, there is a preliminary or prodromal stage, but the symptoms of this are as yet so uncertain that we must on no account give a lead prognosis because of any such apparent prodromal symptoms. The application of the Wassermann test will, however, in the future help

especially in regard to the prognosis by determining the character of the preliminary stages. The great hope for the future in regard to general paralysis is that it will be altogether prevented by the early cure of syphilis in all cases.

**Syphilitic Mental Symptoms.**—There are conditions of mental disease due to the direct action of syphilis on the brain, its neuroglia, its membranes, or its vessels, apart from general paralysis. The prognosis, in many of such cases, is exceedingly good, if treated in time. It is in these cases, rather than in general paralysis, that salvarsan comes in as a mode of treatment, and the Wassermann reaction is a means of diagnosis. If mental symptoms occur during the second stage of the disease, they are, in nearly all cases, curable under the proper treatment of the disease. These secondary mental symptoms are, however, very rare. The most common form of syphilitic insanity is caused by various forms of vascular disease. These may occur in any degree. Sometimes they are extremely localized. Usually they are slow in their course. They are very difficult to diagnose during the first stage, which is undoubtedly the most curable. If we have marked motor paralysis, indicating serious damage to the motor centres, the symptoms may be arrested, but we can seldom hope for cure. In such cases I have frequently known the patient recover in regard to his mental condition, but still remain more or less paralytic, and live for many years. The occurrence of convulsions, which usually take the form of Jacksonian epilepsy, does not necessarily indicate a bad prognosis if proper treatment is adopted. I can recall a case where, as a young man, the patient had both slight local paralysis and Jacksonian epilepsy, but who lived for fifty years and did good work during most of that time. There was no progression of the symptoms in his case.

There is a form of what I believe to be syphilitic insanity which lasts at first and often for many years, no bodily symptoms except diminutions of hearing, the mental symptoms being morbid suspicions and tendencies to impulsive violence. If such cases are diagnosed and treated by antisiphilitic measures very early, I have seen recovery take place; but if really established, the outlook is very hopeless; it becomes an ordinary case of delusional insanity. Such cases usually have a bad heredity, and the syphilitic brain poisoning seems to light up this heredity into actual mental disease, just as an excessive use of alcohol might have done, without causing very marked damage that can be detected microscopically after death.

We see a few cases of acute mental disease resulting from syphilitic meningitis, from gummata causing pressure, taking the form of focal convulsions and acute mania. This, if detected early enough, is amenable to treatment by the iodides in very large doses. The risk of death is, however, very great.

The actual number of cases of syphilitic mental disease is very small, in my experience being only 0.5 per cent out of 3115 cases of mental disease altogether. No doubt in minor forms, treated and cured outside institutions, it is much more common; and with



the Wassermann reaction and the use of salvarsan, we should expect syphilis to be much more curable and free from mental complications.

#### ALCOHOLISM AND ALCOHOLIC MENTAL DISEASE

The excessive use of alcohol is statistically the most frequent cause of mental disease in this country. Its prevalence ranges between 6 and 27 per cent of the cases sent to institutions. It acts both as a predisposing and exciting or proximate cause in different cases. Alcoholic mental disease takes very different forms in different cases, according to the kinds of alcoholic liquor used and the way in which it has been taken. The prognosis may in different cases be absolutely bad or the highest degree favourable. Its forms and characters range from acute delirium tremens on to complete dementia, from cases where its bodily symptoms are the most important, to others where there are scarcely any bodily symptoms present at all. It is therefore necessary, in considering its prognosis, to take its forms into account. I find that out of the 11,346 cases (5540 men and 5806 women) of mental disease sent to the Royal Edinburgh Asylum in the thirty years 1871-1903, there were 4614 cases diagnosed as the insanity of alcoholism, a percentage of 41.5. The percentage of alcoholics among the men was 18.5 per cent, and among the women 42.9 per cent.

**Delirium Tremens**, if caused by the stronger liquors, recovers in at least 80 per cent of the cases, 10 per cent dying, and other 10 per cent passing into the more prolonged insanities with hallucinations and a doubtful chance of recovery.

It is now stated by recent authors on alcoholism, like Dr. Hare, that delirium tremens should be preventable altogether if proper measures are taken when it is threatened or when its symptoms first appear. Hare calls delirium tremens an 'abstinence symptom,' and he believes Jaureg's theory that the real cause is a hypothetical substance called an 'anti-alcohol.' He strongly advocates its abortive treatment. This is carried out by not depriving the patient of alcohol suddenly, and giving it either by the stomach or by inhalation with oxygen, carrying out this treatment with 'adequate' quantities until the patient begins to improve. He states that not only is the disease better treated, if 'aborted' in this way, but the risk of death is less, and the risk of such complications as pneumonia is much lessened. I should like to see the term delirium tremens abolished and 'acute alcoholism' substituted for it. Patients not only recover from this disease but, Hare says, there is little risk of relapse, unless alcohol is again taken to, which, most unfortunately, is very apt to be the case. When the temperature falls, and the power of sleep is restored, the patient may be pronounced on the way to convalescence.

**Mania a Potu.** This is really a transitory alcoholic delirium to which patients of a certain neuritic type of brain are subject from a bout of drinking, or, in some cases, from even small quantities of alcohol. It does not imply previous alcoholic habit, and its symptoms almost invariably pass off in a few days. Its occurrence means that

object subject to it should never be abolished in any case of

**Chronic Alcoholism.** While we have been thus aware of the general disturbance of chronic alcoholism, the question of prognosis in a very general manner. While chronic alcoholism consists of its symptoms—so far as to the constitution of the patient, the time during which excessively diluted has been taken, and of the kind of liquor—1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18. 19. 20. 21. 22. 23. 24. 25. 26. 27. 28. 29. 30. 31. 32. 33. 34. 35. 36. 37. 38. 39. 40. 41. 42. 43. 44. 45. 46. 47. 48. 49. 50. 51. 52. 53. 54. 55. 56. 57. 58. 59. 60. 61. 62. 63. 64. 65. 66. 67. 68. 69. 70. 71. 72. 73. 74. 75. 76. 77. 78. 79. 80. 81. 82. 83. 84. 85. 86. 87. 88. 89. 90. 91. 92. 93. 94. 95. 96. 97. 98. 99. 100. 101. 102. 103. 104. 105. 106. 107. 108. 109. 110. 111. 112. 113. 114. 115. 116. 117. 118. 119. 120. 121. 122. 123. 124. 125. 126. 127. 128. 129. 130. 131. 132. 133. 134. 135. 136. 137. 138. 139. 140. 141. 142. 143. 144. 145. 146. 147. 148. 149. 150. 151. 152. 153. 154. 155. 156. 157. 158. 159. 160. 161. 162. 163. 164. 165. 166. 167. 168. 169. 170. 171. 172. 173. 174. 175. 176. 177. 178. 179. 180. 181. 182. 183. 184. 185. 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986. 987. 988. 989. 990. 991. 992. 993. 994. 995. 996. 997. 998. 999. 1000.

As the demonstrable changes in the form of cells, the vessels, and envelopes. In most cases there are motor symptoms, such as in some cases the form of general convulsions, in others tremors, sensory symptoms, slow motor paralysis, or muscular atrophy. The working of the mind is less in the face, as the facial and eye expression is invariably deteriorated in alcoholism. Mentally, the patients have either marked suspiciousness, or hallucination of hearing. There is always some moral loss, a loss of self-respect, and of truthfulness and of feelings.

The memory for recent events is, in the more chronic cases, impaired. There is often insomnia, the speech is often hurried, incoherent, or thick. The spinal reflexes are often abolished. There are sometimes peripneumonia. The patients have always lost some inhibitory power, and in some cases there are tendencies both towards and towards, as well as to other morbidly impulsive acts.

As to the prognosis of chronic alcoholism, it is, in most cases, favourable, in view of the organic lesions of the brain to which I have referred, but in a fixed and strong habit of excessive use of drink; but in my experience a certain number of the cases, with even marked symptoms, better if properly treated. The length of time the patient has been excessively, and the duration of marked mental symptoms, are two circumstances on which prognosis must chiefly depend. If a patient has been a chronic drunkard for many years, and if the symptoms are comparatively recent, and have in them some of the characters of acute alcoholism, then the prognosis may not be so favourable. I have seen some, even unfavourable, cases improve much under the use of tonic treatment that they were no longer generally insane; but in most of the cases who thus improve, a psychological analysis of the patient's mental and moral faculties, and especially of his power of mental inhibition, will show that there is some deterioration as compared with his normal condition. There are a few cases in which, when the chief symptoms of chronic alcoholism have disappeared, there also disappears the craving for drink, but I think this results more from a certain lowering of nervous and mental action than from a recovery in self-control. Complete recovery is usually a long process when it occurs.

**Alcoholic Dementia and Degeneration.** Patients who have taken drink in excess for many years are liable to a general lowering of the vital condition, to a diminished power of initiative and action, and

especially to defects of memory that are very characteristic. The expression of the face and eyes are altered and deteriorated, and the man is not at all 'the same' as he was. There need not have existed in such cases, any previous form of acute alcoholism or insanity. I need hardly say that this condition is entirely hopeless in regard to the prognosis, and the older the man is, the worse the outlook. Such a condition seems to bring on senile dotage prematurely. The brain cells are hopelessly degenerated.

**'Respectable' Excess.**—To anyone who is accustomed to observe carefully the expression of face and the intimate psychology of some of his friends and acquaintances who take much liquor, there are numerous mental degenerations to be seen, as the result, not of constant drunkenness, but of what has been really excess in the habitual use of alcohol, though it may not have been counted very unusual. They were 'respectable' drinkers. The finer traits of mind and character get lost. There is a coarsening of the moral tone, a lack of energy and activity in life; selfishness and egoism are seen in too marked a degree. Now, in the very beginning of this condition, if a man has judicious friends and a firm doctor, so that he is persuaded to abandon entirely the use of alcohol, to take a great deal of exercise, and resort to outdoor games, these suspicious symptoms may entirely disappear and the man may become his old self. I have seen many such cases.

I have already treated of *dipsomania* as one of the forms of defective inhibition.

**Morbid Cravings for Various Drugs.** Opium, chloral, cocaine, and various other drugs of the nerve-stimulant or nerve-sedative type may be taken to such excess that they become a morbid habit and virtually forms of mental disease. It may be said that in regard to most of them the habit may be broken and the patient cured, for the time being, but only through outside control and special treatment. The patients are not able, of their own accord, to cure themselves and abandon these drugs. The opium habit is the most common, and if long continued is more liable to end in death than any other, through stomach irritation and incapacity to receive food. My experience, however, is that the cocaine habit is really the most difficult to break, and the most apt to return. Cocaine is, in fact, the most fascinating and the most powerful destroyer of human inhibition of any substance known to us. I have seen a complete cure of the opium habit after thirty years' duration. I have never seen a cure of the cocaine habit at all. Special institution treatment is necessary in by far the majority of cases of the drug habit, though, where the means allow, a doctor's house or a home with special nursing may be effectual.

The prognosis in the opium habit depends on (1) The patient's resolution to undergo treatment; (2) His response to treatment in its early stages. During the gradual tapering down of the drug, which is the method now always practised, there is intense misery and prostration. If the sickness, diarrhoea, and consequent exhaustion are extreme, the patient may die, or the treatment may even, in a few cases, have to be stopped to save his life.

THE MENTAL SYMPTOMS OF ORGANIC BRAIN DISEASES.

Attacks of apoplexy or hemiplegia, especially those in advanced age, are almost invariably accompanied by mental symptoms. The same thing occurs as the result of tumours, atrophies, and many gross lesions of brain degeneration. These symptoms sometimes take the form of morbid excitement, but in essence they are an enfeeblement of mind. We find, in a large number of such cases, an emotion distimulated, a morbid suspiciousness, a loss of will-power, a diminished power of work, and a lessened mental energy. These symptoms do not, in most cases, constitute an insanity in the popular sense. The mental symptoms are apt to be more acute in the early stages of most organic diseases, and more those of enfeeblement in the later stages, especially in paralysis with softening of the brain. If we have an occlusion of one of the smaller brain arteries in a young person, it may produce local paralysis almost without any mental symptoms during the first few weeks, and the same is seen in syphilitic vascular disease. Taking the statistics of the Royal Edinburgh Mental Hospital for the nine years 1874-1882, we had, out of 3145 admissions, 91, or 2.9 per cent, of this kind of mental disease, which means that the mental symptoms in these were of a marked type. Of these 91 cases, 47, or about 51 per cent, recovered. I do not say that all these recoveries were so perfect that the subjects of them were not handicapped in some way, but this favourable result, I confess, surprised me. I had expected a considerably less 'recovery' rate. The treatment really consists in proper nursing and non-stimulating diet, and if the patient improves within the first month, his chances of at least a partial mental recovery are good, but it will probably be slow. The patient's age is always the most important thing in forming the prognosis. If his age is advanced and there are signs of arterial degeneration, it is bad.

EPILEPTIC UNSOUNDNESS OF MIND.

A study of the manifestations of epilepsy unfortunately shows it to be associated with mental disturbances or mental defect in a very large proportion of cases. These disturbances and defects assume a great variety of forms, and their degrees and intensity are strikingly different. For prognostic purposes we have to divide epileptic unsoundness into three groups: (1) Mental defect as an almost universal accompaniment of the disease when it occurs before seven years of age; (2) Mental defects and disturbances when they arise during the developmental period between seven and twenty-five years of age, the largest number of cases occurring during this period, and the most typical mental effects being then seen; (3) Epilepsy occurring in the fully developed and senile periods.

The defects in the first period are those of mental deficiency from retarded development of the brain, and the prognosis is the same as in idiocy and imbecility. It may be said to be hopeless if the fits are frequent and regular in course, but there are a few cases of convulsions

of the infrequent and sporadic character, at that period of life, in which the brain and mental development is not very seriously arrested or retarded. The epilepsy of this period of life is, in most cases, accompanied by such abnormalities and stigmata as I have described in rhoeo. We look on the mental defects, the badly stigmata, and the fits, as being all effects of the common factor of arrest in brain growth and development. As a matter of fact, however, the occurrence of epilepsy is a very unfavourable factor as regards educability and improvement in the mental condition, either when carried out in the form of special training in institutions or at home. Any improvement thus produced is apt to be arrested and put back by the frequent occurrence of the fits.

The second form of epilepsy may be consistent with technical soundness of mind between the fits, especially during the earlier part of the disease, but the general tendency is towards mental deterioration when it is long continued, and there is always a danger of conditions of mania occurring, often of a very severe type, and of delirious conditions connected with the fits. The prognosis is not absolutely bad, for men and women are met with who have occasional sporadic fits during many years, or during the whole life-time, without the occurrence of technical insanity or even marked mental deterioration. Efficient work in life may be done in these cases, but a careful observation of the character and whole life-history of the epileptic who is reckoned sane, is apt to result in the conclusion that even in them there are apt to be slight abnormalities in the emotions and character. The occurrence of epileptic fits at very rare intervals may, however, be compatible with great mental power, and even with genius. It is usually said, but the statement lacks definite scientific proof, that Julius Caesar, Mahomet, and Napoleon were subject to such attacks.

The mental symptoms in ordinary epilepsy usually occur after one or more fits. In such cases, the symptoms are acute and are often very violent, sometimes with attempts at homicide. The epileptic maniac is an extremely dangerous man. These acute mental symptoms commonly occur within twenty-four hours of the convulsions. There are many epileptics who are subject to mental disturbances as a prelude to the fits. These show themselves a day or two before the convulsions occur, and, in many cases, the mental symptoms cease apparently as the result of the fit. There are a few cases where a mental disturbance will, as it were, take the place of the fits; this is the mental epilepsy, the false consciousness, the *epilepsia larvée* of the French. If epilepsy persists year by year there is almost always a mental deterioration, a loss of memory, a change of affection, a blunting of the finer feelings, a morbid egoism and selfishness, all these symptoms getting worse as time goes on. This is, in fact, an epileptic dementia. The prognosis in this second class of epileptics is extremely bad in regard to complete recovery. Attention to the health and diet, abstinence from alcohol, a routine life of work in the fresh air, and a steady use of the bromides in suitable cases, will undoubtedly in most cases

result in a diminution in the number of attacks and in an enormous mitigation for the better of the acuter mental symptoms. I used bromide in the Royal Edinburgh Asylum, a steady average of thirteen admissions to the institution every year, and about forty constant patients, and after I put the greater number of them on constant doses of from 25 to 50 gr. of bromide of potassium every twenty-four hours, the acuter forms of epileptic mania practically ceased, and I was able in ten years, out of 115 admissions, to discharge 22, or 19 per cent, as 'recovered' mentally. This gives, however, too favourable a prognostic result, because, if the patient who has been certified as sane in an institution remains mentally free from technical insanity for twelve months, although he is still an epileptic and subject to partial attacks, we must legally discharge him as recovered from his mental disease, and many of the recoveries were contingent on patients steadily using the bromides, which, by the way, it is extremely difficult to get carried out when a patient feels himself pretty well and does not want the fits for a certain time. Statistics show that 51 per cent of epilepsy comes on before fourteen years of age, and 95 per cent before twenty-five. This fact clearly shows its definite relationship to the early period of life and brain development. The Royal Commission to which I have alluded gives some statistics in regard to epilepsy. It quotes one estimate as being one sane epileptic per thousand of the population. This would make the number in the country 15,216, but another investigator gives the number as only 2,516 for England and Wales. Such a discrepancy shows that these estimates are unreliable. The estimate of the Commissioners in regard to insane epileptics in asylums and workhouses, or in the general population, is that their number amounts to one in ten thousand, or 1521. As an actual matter of fact there are 11,078 epileptics out of 80,000 insane population in the county and borough asylums of England. My estimate is that there are 100,000 epileptics, sane and insane, in Great Britain and Ireland. The prevalence of epilepsy in different counties and districts of England differs enormously. It may be said that in those agricultural counties of England which are largely beer- or cider-drinking, the proportion of epileptics in the mental hospitals is much greater than in the manufacturing counties and large cities. It amounts to 11 per cent of all the admissions to county asylums, but in the large cities of England they amount to 8 per cent, and in Scotland to about 4 per cent of the admissions. It is a curious fact, as illustrating the possibility of treating epileptics and epileptic insanity at home and in private houses, where there are sufficient means, that the proportion of epileptics among private patients in mental hospitals is enormously less than among the rate-paid class of insane.

In regard to the third class of epileptic insane, where the disease comes on after twenty-five years of age, which amounts to 5 per cent of the total number, it is, to a large extent, the result of excessive alcohol or traumatism or vascular disease in old age. The prognosis in many such cases is more favourable than in the cases that have

occurred before twenty-five. I have no actual statistics, but I would give it at about 30 per cent if treatment has been begun at once.

In dealing with the prognosis of epileptic mental disease, one must not leave out of account the fact that most epileptics are exceedingly apt to have an uncontrollable craving for alcohol, and that, under the influence of alcohol, they become far more dangerous and homicidal. It is well known that, of the number of homicides committed in the country, a certain proportion of the murderers are epileptics. Any medical man having an epileptic to treat should certainly point out this note of possible danger in every case.

#### MENTAL DISEASES ASSOCIATED WITH CHILD-BIRTH.

The mental affections connected with child-birth have been naturally assorted into those which are liable to occur during pregnancy, those which occur soon after, and as the result of, confinement, and those that occur during nursing.

**Puerperal Insanity.** By far the most important and the most frequent of these is puerperal insanity, which term is somewhat artificially restricted to apply to cases occurring within the first six weeks after delivery. This does not present the same symptoms in all the cases, but the larger number and, as it were, the general type, consists of those occurring within the first fortnight after delivery. This type is about the acutest form of mental disease ever met with, and the most deadly, always excepting general paralysis. The temperature is high, rising sometimes to 106°. The pulse is extremely weak and thready, the patient looks extremely exhausted, the lochia cease, the mucous membranes are apt to be dry, the eyes are brilliant, and the bodily condition is one of great exhaustion and obvious risk. The mental symptoms are of the acutest type. The attention cannot be fixed, the patient is in a condition approaching delirium. She takes no notice of, and has no interest in, her baby; she gets violent and may have to be held in bed; she will not take food; and, above all, we have the gravest symptom that can occur in mental disease, she may try to injure her baby or put an end to her own life. Now this condition resembles a toxæmia so closely that it is difficult to believe it is not of that character; but no specific organism has been yet detected, though diphtheroid and other micro-organisms have been found, especially in the urine; some recent authors deny its toxic character. Looking at it from a clinical point of view, such acute cases certainly seem the result of some toxic poison. Their prognosis in regard to recovery is extremely good. They not only recover quickly, most of them within three months, but the recovery is a complete one, not subject to relapse. But there is one distinct risk in such acute cases, and that is of death, especially when the temperature goes much above 102°. The death-rate in these amounts to over 10 per cent. My experience is that *the* test of the risk of death is found in the temperature above all other symptoms.

I have found that over 80 per cent of such acute cases recover. They are subject to intercurrent diseases—septic inflammation of the womb and its surroundings, meningeal inflammation, and incidentally mammary abscess. As might have been expected, heredity comes in as a predisposing cause of mental disease after confinement, as it does in most other cases.

There is a type of puerperal mental disease of a milder type than that which I have described, constituting about one-half of the cases. In these, the symptoms are all milder, without much tendency to an abnormally high temperature, and with the risk of death greatly diminished. These recover in the proportion of about 70 per cent, some of them running on into chronic insanity and dementia. They do not recover quite so quickly as the very acute cases of the disease, taking sometimes six months to get better; but in the milder, as in the acute cases, the risk of the mother injuring the child has to be kept in mind in every case, and the nurses and relations must be seriously warned on that point.

**Lactational Insanity.** When a woman, in addition to having a child, fulfils the natural duty of nursing it, and she is perhaps not strong in general health, and is in poor circumstances involving hard work and insufficient nourishment, she may, if there is any innate liability to the neuroses or to insanity, become affected in mind during nursing. We call this 'lactational insanity.' It is apt to be a chronic disease attended by exhaustion of body and depression of mind. The mental symptoms are usually preceded by headaches, flashes of light, feelings of exhaustion, and irritability. If these are noticed and treated in time, the chances are that no mental symptoms will supervene. When they do appear, the risk of suicide should be kept in mind. In some cases the symptoms are those of mania. My experience is that over 77 per cent of the lactational cases recover, but the recovery takes a longer time than in the puerperal cases, as the general strength has run down to a greater degree. Lactational insanity seldom occurs among the better-off classes, the reason being, no doubt, that they have proper nourishment and are not being overworked while they are nursing their children. With proper nursing and good food we should not lose a lactational case. Most of these respond to such treatment at once.

**The Mental Disturbances of Pregnancy.** This is a rare form of mental disease. The symptoms are usually mild depression, but there is always a risk of this depression leading to suicide. Most cases of mental disease of pregnancy have a bad neurotic heredity. The worst class of cases, those sent to mental hospitals, only recover in the proportion of 60 per cent, and of those who do not recover, a large number pass rapidly into dementia. Women are more liable to have mental symptoms during the first than subsequent pregnancies, especially if they are over thirty-five. As a question of prognosis, the treatment of serious mental symptoms occurring during early pregnancy by abortion or premature labour is now a measure to be seriously



facial by the medical man. For myself, I am of opinion that this should be done, after consulting with another medical man and with the full written consent of the husband or nearest relation. It gives a better chance to the mother, which is the first consideration, and it prevents the entrance into the world of a human being who would be extremely liable to be mentally affected. Dr. Routh describes the 'toxæmias of pregnancy'; no doubt these, in predisposed subjects, account for some of the insanities.

The mental disturbances connected with child-birth occur in the proportion of 5 per cent puerperal, 4 per cent lactational, and 1 per cent pregnancy, in Edinburgh. In Cumberland and Westmorland my experience for the ten years 1863-73 was that they occurred in the proportion of 17 per cent of all the female cases. When they recover they remain well recitally with very small chance of relapse, except in those who have subsequent child-births.

#### THE EPISODIC MENTAL DISTURBANCES.

In addition to the mental disorders of which I have spoken connected with child-birth, certain other epochs of life are subject to mental disturbances of a somewhat characteristic kind, with many distinctive symptoms and marked differences in their prognosis. In the ordinary man and woman, with a reasonably good heredity, the various eras and epochs of life are passed through without much risk of mental upset. It is different with those of the neurotic and psychopathic constitution. The physiological characteristics are, in them, more liable to pass into pathological states. Each era of life has its own normal psychology, and the passing from one into the other may quite naturally be expected to have some influence on the mental working. The epochal psychoses will always be co-related with the epochal neuroses by the thoughtful physician, and we know that the 'critical' periods of life are often attended with nervous as well as mental symptoms.

**Childhood, Boyhood, and Girlhood.** This era has a singularly characteristic psychology, and is very free from such mental disturbances as can be rightly called insanity. When such disturbances are seen, they usually take the form of short attacks of maniacal elevation resembling delirium, which soon pass off, but may recur a few times before final recovery. A very few indeed have attacks of depression of mind which are apt to be recurrent. There are some children, always those of the neurotic diathesis, who, whenever they become feverish from any cause, are extremely liable to become delirious. Even temperatures under 100 may cause severe delirium in them. It may be said that the mental disturbances of children, except those in the very early periods of life which are either syphilitic or of the nature of idiocy and other mental arrests, are curable, and are speedily recovered from. Left to nature, or with the use of mild sedatives such as the bromide of ammonium, they speedily return to their normal state.

**Puberty and Adolescent Mental Disturbances.** The great physiological and mental changes that take place at puberty and go on for ten years through the period of adolescence, are attended with more serious mental and nervous risks than any of the epochs of life except childhood. It is unfortunately true that the prognosis is very serious in many of these cases. At least 70 per cent of the mental cases ultimately fall into that state of mental deterioration and death which I have described under dementia and dementia praecox.

The chief and the most characteristic phases of the mental disturbances at puberty, and more especially during adolescence, are a tendency to attacks of maniacal excitement, often very acute in character, each usually of short duration, not lasting long, and when it abates recovery seeming to have taken place. But these attacks have a tendency to return, often many times; in fact, adolescent insanity, as I have called it, is essentially a periodic and recurrent form. In forming a prognosis of this form of mental disturbance it is, in the first place, necessary to determine whether the patient is averagely developed and has no bodily indications of degeneration. These, unquestionably, may be bad signs in regard to recovery. If, in addition, he has been somewhat backward in mental development or prone to undue excitability, or has shown defects in morals and character in a marked degree, if he has been 'thoughtless' and not very educable, then the outlook is not very good, but not necessarily very bad. Even cases with such characters recover in many instances. If, on the contrary, he has been well developed and normal up to the time of the attack, in body and mind, and the attack has been of manic-depressive character, and if, after the first, we notice that the subsequent attacks are less acute and shorter in duration, we are entitled to form a favourable prognosis. As a matter of fact, mental disease of marked character does not occur so frequently until a later period of adolescence, namely from seventeen to twenty-five. I have always held and thought that the liability to such attacks was coincident, in persons with a bad heredity, with, not the actual gain in weight of the brain, which has virtually ceased before that time, but with its development in its highest function of mentalization. One need not be a physiologist or a psychologist to realize how momentous, during this time of life, are the subtle changes in brain working which mean full reasoning power, large powers of self-control and moral feeling, development in a normal form of the religious instincts, proper regulation of sex feelings, appreciation of the higher forms of literature, and manliness and womanliness of the best type. All these have not usually come to perfection at the age of seventeen; they have, or should have, by twenty-five. A moment's consideration shows that in the formation of the brain vehicle for these qualities, so momentous to a successful life, a certain strain is put on the organ and its higher cells. Now the period of this strain is the period of liability to adolescent insanity. If we closely notice the bodily developments at this time of life, we see marked changes in the direction of attaining the mental and bodily ideals of man and woman,

The man's form takes on a manly type, the beard grows, and the voice completes the change that has begun at puberty. In the woman, the form rounds up towards the ideal type of beauty, the maning develops, and the whole woman is perfected. Now, if we find those changes taking place normally during the time that a patient is subject to these recurrent attacks of mental excitement, then we form a favourable prognosis. Nature has in such adolescents gone through the strain laid on her, and there is a reasonable probability that the tendency to mental disturbance has passed, at all events until child-bearing or the climacteric occurs.

In a certain proportion of the cases of adolescent mental disturbance (about 22 per cent) this takes the form of depression, which is so apt to abate and recur, though not quite in the same degree as in the acutely excited cases. The prognosis in the melancholic cases is better than in those of mania. Taking the whole of the mental disturbances of adolescence into account, they recover at the rate of 60 per cent; limiting oneself to the depressed cases, the rate of recovery is about 10 per cent more.

Instead of exaltation or depression, we may meet with stuporose, confusional, and lethargic symptoms, sometimes, too, with cataplexy and 'trance.' The prognosis is not so good in such patients, but is by no means very bad.

The worst class of symptoms in regard to prognosis are those which Kraepelin selects as constituting his dementia praecox, of which I shall speak presently. I had always held that the man who could tell us in the early stages of any case of adolescent insanity the symptoms which indicated incurability, would add greatly to our exact knowledge of psychiatry, and I welcomed Kraepelin's induction accordingly.

There is an undoubted liability to a recurrence of mental disturbance in those who have had an attack at adolescence and have recovered. Tracing them through their whole lives, I find that nearly 20 per cent are liable to a recurrence in some form or other.

The gravest aspect of adolescent insanity is that, in about one-third of the cases, instead of recovering, they pass slowly into dementia. Nature has not been able to bear the strain of the period of complete development, and the young man or woman virtually dies as regards all the highest qualities of mind. I believe that, in most of these, dementia is inevitable from the beginning. No methods of prophylaxis or treatment would have had much effect in saving their mental life. It is this fact that makes me look on them as having some analogy to the cases of congenital imbecility, in which a mental death has taken place in the earliest periods of life. The brain of the imbecile has been 'infit' from the beginning; the brain of the adolescent was fit up to twenty, and then became unfit from some deeply-seated hereditary cause.

In addition to imbecility and adolescent insanity, we notice during brain development a series of lesser mental and moral changes, states of perverse conduct and peculiarities, which are due to the same

hereditary defects, and are, in many ways, of the same essential nature as technical mental disease. These frequently occur at other ages than adolescent insanity, sometimes even before puberty. They consist, in some cases, of stupidity and lethargy, in others of perversions of the social instincts, in others of causeless aversion to father, mother or other near relations. Some show their peculiarities in an abnormal intolerance of control, incompatibility of temper, and, in some, in immoralities and criminal acts. It is a striking fact that one-half of all convicts for crime are found in offenders under the age of twenty-five. There are many cases of the morbid impulsiveness, the losses of control, and the tendencies to drink which I have described, but occur at that age. Most of such cases are ascribed simply to bad nurture, which the parent and the schoolmaster usually treat by punishments. A few of such cases recover from these mental and moral peculiarities towards the end of adolescence, but unfortunately the outlook is bad in most of them, and they remain, so long as they live, the bad citizens, the skeletons in families, and the criminals of society.

**Dementia Præcox.** Since I first segregated those forms of insanity just described and called them 'adolescent insanity,' Kraepelin, of Munich, has segregated a group of mental cases occurring about the same age which he has called 'dementia præcox,' and holds they form a distinct variety of mental disease, with distinctive symptoms and history. That term covers the unfavourable region of adolescent insanity. Those who recover, Kraepelin would include in his 'manic-depressive insanity.' The chief features of dementia præcox are that it begins slowly over a period of years, and the patient shows his disorder more by what he does than by what he says and thinks. He shows odd or bizarre conduct. The emotional tone is blunted and changed. There is a peculiar loss of consistency between ideation, emotion, and will. The will power is perverted or lost, the conduct is automatic, there are what is called negativism, 'stereotypism,' apathy, mannerisms, and indifference to personal appearance. The patient often has hallucinations, and is completely changed in character. Kraepelin divides the cases into three forms: (1) 'Katatonic,' (2) 'Hebephrenic,' and (3) 'Paranoid.' All three varieties are unfavourable as to prognosis, but the first and second are better in this respect than the third. Many of the katatonic are those which I have described under 'stupor,' and we have seen that the chances of recovery are on the whole favourable in this form. But all forms tend to be deteriorating psychoses. If rightly diagnosed, all cases of dementia præcox should be curable.

**The Mental Disturbances of Decadence—The Climacteric and Senility.** When we come to that period at which men and women turn the corner of life, when they pass into the first stage of decadence and involution, and particularly when they arrive at its later stages, at old age, some of them are liable to certain forms of mental disturbance, the symptoms of which are markedly different from those in the

earlier periods of life. The pathological in them has a close relationship and resemblance to the physiological characteristics of those days of life. The passions of life have lost their intensity, its ideals and emotions are less keen, the driving power of sex and all that it implies in life is fading away or is past, the general result being that when the mind becomes unsound it tends towards melancholy, to a want of interest in life, to a *tedium vite*, and a general diminution in originating and energizing power. There are bodily changes pointing to the same general result. The red corpuscles of the blood markedly diminish in number, certain glands lessen in bulk, the countenance and eye are less mobile and expressive; poetry, fiction, and love tales cease to have the power to set the brain on fire. The general social instincts remain, but they assume different forms from those of youth. The subtle interest of the society of the other sex is less overmastering. Friendship and comradeship take the place of love of the fervid sort. The climacteric period begins in the woman earlier than in the man, and its signs are more marked; but it also occurs in man at a later period of life and in a less marked form. The "grand climactere" of the Romans may be put down in man as occurring at about the age of sixty-three. In some of the lowest animals reproduction is at once followed by death; in man the loss of the power of reproduction is followed by a lessened mental and bodily intensity. The symptoms of climacteric unsoundness of mind in five cases out of six take a melancholic character. The sleep becomes broken, the appetite for food is less intense, the skin gets muddily, the patient has fears and fancies, sometimes of an intense character. She is often terrified that she will lose control over herself or even commit suicide. She blames herself for all these feelings, and this is a cause of distress. Work is difficult. In some cases there are hallucinations of hearing. In action, initiative, courage, and mental aggressiveness are lessened. There is often a tincture of hypochondria in the mental symptoms, and a feeling that life is no longer worth having.

The prognosis in these conditions is not so unfavourable as is commonly supposed. It must be kept in mind that the epoch is not a sudden one. It begins slowly, and it takes several years, at least five in most cases, to get completed. In women 57 per cent recover, but in men only 31 per cent. I do not give up hope of recovery in climacteric cases for at least five years. The signs of recovery are a return to a reasonable enjoyment of life, but with less intensity in it. Weight should be gained, fat should be put on, the sleep should become normal. The post-climacteric happiness and power of work are not as great as in the former life, but there are many women of the nervous temperament who experience a quiet comfort and happiness which they have never enjoyed before. The storms of life are, as it were, past; the patients have sailed into smooth water. During the climacteric, whether normal or abnormal in its character, I have a profound belief in changes of environment, and especially in living in the fresh air. Suicidal feelings must be carefully looked for in both sexes.

insanity, though these are not usually intense, yet there are exceptions in old age. There are a few cases of characteric unsoundness in both sexes that assume the excited form: agitated melancholia also occurs. My experience is that the more acute and decided the mental symptoms are, the less chance there is of recovery. When these acute symptoms abate, the patients are apt to pass into a senile condition before the usual age of dotage.

**Old Age.** The normal psychology of old age has been frequently excoriated, from Shakespeare's King Lear onwards, but an exact scientific record which takes into account, not only the heredity of mental breakdown, but the heredity in regard to long life, has not been made as yet—especially the brain point of view; its vascular and its cellular elements have not been taken into account as they should have been. Many cases of breakdown in old age are primarily due to vascular conditions and consequently insufficient blood supply to the nerve cells. Atheroma and arteriosclerosis are both very common in all degrees in old people. Sometimes they are general, sometimes localized. The blood-pressure is always increased in old age on account of the loss of elasticity in the arteries. The brain at that time, neither its vessels nor its cells, can stand too much alcohol, though the immediate effect of that substance is often cheering and comforting. Heredity comes in as a predisposing cause of senile changes in an apparently less degree than in any other forms of mental unsoundness—except general paralysis; but the facts about heredity are further back and more apt to be forgotten. Senile insanity is apt to assume one of three forms: either a melancholia like the climacteric form, or a maniacal period of excitement, or a condition of senile dementia which may be the termination of the other two forms. My experience, from the study of hundreds of cases of senile insanity, is that about one-third of them were of the depressed type, and of these 30 per cent recovered, some of them completely, and in others all the acute symptoms passed away, so that they could return to their homes. This form of the disease does not necessarily end in either dementia or death. One-tenth of the cases had acute attacks of excitement, in fact in many cases acute mania. Some of these were short sharp brain storms preceding death, or outbursts of delirious excitement accompanying the break-up of the organism. They are exceedingly apt to precede attacks of paralysis, and most of them are accompanied, if not caused, by vascular disease. While few of these recover, yet this sometimes happens, but in an imperfect degree.

In regard to cases of simple senile dementia or aggravated dotage, these are not commonly sent to institutions, and, if possible, should not be so sent. As might be expected, the cases of senile mental depression that occur in the earlier senile stages, that is, from seventy to seventy-five, are apt to show less arterial disease, and therefore recovery takes place in a real and complete form. The risk of speedy death in most of them is considerable. Thirty per cent die as the result of their attacks, half of them within the first six months

of a residence in institutions. The milder class of cases is extremely difficult to manage on account of the sleeplessness and restlessness. It needs the very best nursing arrangements to cope with them, and if these are not provided, the risk of death is very great. Exhaustion, delirium, gangrene, paralysis, are all common.

I have commonly found that the milder degrees of senile excitement may in the beginning be effectually treated by small doses of the bromide of potassium and sulphonal, beginning with not more than five grains of the sulphonal and ten grains of the bromide twice a day at the most, and as an occasional night sedative.

If a case responds to this, and the acute restlessness subsides, with a reasonable amount of sleep at night, the patient is manifestly much the better for it. It gives him the brain rest that is so much needed in these cases, and it should not interfere with the appetite. After a week or two the medicines should frequently be omitted experimentally to see if the patient can do without them. Insomnia notoriously in many cases becomes a brain habit, and by breaking the habit and reforming the habit of sleeping, the patient may often go on without sedatives or hypnotics. It is always desirable, if there are means and proper nursing, and arrangements can be provided, that an old man or woman should stay at home and not be sent to an institution. This seems somehow to be the natural right of any citizen, and is almost always greatly appreciated by near relations. There are some senile cases, however, even at the advanced ages, whose symptoms are so acute, so troublesome, and so exhausting to all who have to do with them, that institution treatment is necessary; but all good institutions now have hospital wards where the arrangements are specially adapted to treat such cases.

#### RARE ETIOLOGICAL AND CLINICAL FORMS OF MENTAL DISEASE.

In addition to these etiological and clinical forms of mental disease, of a somewhat definite type, there are many others of a less common kind:

**Mental Symptoms from Influenza.** Since the year 1890, when the first great wave of influenza swept over the country, there have been a large number of cases where the primary disease was complicated by nervous and mental symptoms. In fact, it may be said that every attack of influenza in some way or in some degree lowers the nervous tone, either during the attack or afterwards. These results often assume the form of depression of spirits, and a lessening of the nervous energy, which lasts for weeks and sometimes for months after the actual disease has passed away. Many of us who have had severe attacks of influenza feel that we have been the worse for it permanently. I have been in the habit of saying that influenza has left the nervous and mental tone of Europe and America lower by many degrees than it found it. Some of the cases of melancholia were very marked in both their bodily and mental symptoms. They had depression of mind, lethargy, a feeling that life was scarcely worth having, anæmia,

ment of appetite, digestive troubles, or loss of weight. I do not say that there is any post-influenzal insanity of a special type. I have seen the motor energy of the body affected so that it stimulated early general paralysis. I have seen the memory markedly affected for many months. I have seen cases where a drunk craving was established for the first time. The treatment of all these conditions is very well known—rest, mostly in bed, tonics, change of air, careful attention to diet, and freedom from business anxiety. Most of the influenzal cases recover after a few weeks and respond to treatment readily. The good thing is to keep up the treatment and the regime for a considerable time after the symptoms seem to have passed away. I observed a curious fact, which may be a coincidence, that after the great epidemic of influenza of 1890, which affected almost everyone, the general type of mental disease sent to the Royal Edinburgh Asylum, which admits all classes of society, became more of a melancholic type than it had previously been. Before that, states of morbid elevation prevailed largely over those of depression. Since that time the melancholics have almost equalled in number the maniacal cases, and in no years have exceeded them.

**Diabetic Mental Symptoms.** A very large number of the cases of diabetes have some mental or nervous symptom in addition to the liability to diabetic coma. It usually takes the form of depression, irritability, and incapacity to do the usual amount of work, mental or bodily. I have seen acute cases of melancholia arising in diabetes, most of them dying of the attack. The treatment of these nervous and mental affections is that of diabetes, and the prognosis is certainly very unfavorable.

**Bright's Disease with Mental Symptoms.** A few cases of Bright's disease show marked mental symptoms, usually of the toxic character. They begin with irritability and nervousness, passing into acutely maniacal symptoms with periods of delirium. This condition I look upon as an equivalent of the convulsions that are common in the disease, probably determined by the fact that the patients had a bad neurotic heredity which rendered them more than normally liable to be affected by any toxin in their higher cortical regions.

**Phthisical Insanity.** The early, and what used to be called the prodromal, stage of phthisis is, in a certain number of cases, accompanied by somewhat distinctive mental symptoms: suspicion, slight mental enfeeblement, unsociableness, mild attacks of excitement, incapacity to follow regular employment, with digestive and nutritional weakness, which I called 'phthisical insanity.' My study of this condition led me to believe that about 3 per cent of the cases sent to mental hospitals were of this character. I used to think that it was a very measurable form of mental affection, but the modern treatment of phthisis, when applied to these cases, results in a larger number of cures than I used to see. I now believe that the cause of such mental disturbances is due to the toxic influence of the tubercle bacillus on the brain in persons specially predisposed to mental disease. The



recovery rate of this psychosis under the present treatment of phthisis may be put down as about 50 per cent.

**Mental Symptoms in Acute Rheumatism and Chorea.** In a few cases of the typical acute rheumatism which we used to see before the salicylic treatment was introduced, the patients would suddenly become very acutely maniacal, this being accompanied with an extremely active form of chorea. The rheumatic temperature would keep up during this state, while the joint affections would cease. Most of the cases recovered, but in a few death took place during such acute attacks. I have no doubt whatever that these resulted from a metastasis of the rheumatic toxin or micro-organism from the joints to the spinal cord and brain cortex. It was very relapsing in character, in this way following the lines of uncomplicated rheumatism. Its treatment is that of the acute rheumatism, by salicylates, etc. Too few cases have been put on record to give reliable statistics of curability. My impression is that such cases are far less frequently seen now under the modern treatment of acute rheumatic fever than formerly.

The ordinary chorea of early adolescence is complicated in a few cases by a delirium accompanying the inco-ordinated muscular movements. The patients first show depression, and then this delirious mania, which may be accompanied by acts of violence and suicide. Most of such cases recover, but there are a few who die of exhaustion. The treatment is that of chorea, plus the employment of hypnotics and nerve sedatives. We may have to resort to hyoscin in some of the cases, and its effects, by diminishing the motor symptoms, often give extreme relief, for the time being at least. Most of the cases recover soon and have no relapses.

**Masturbational Mental Symptoms.** The habit of masturbation is a frequent accompaniment of many forms of mental disease, and in that case it always aggravates the mental symptoms, tending to produce mental irritability and confusion. On the whole it worsens the prognosis if persistent. There is in addition a distinct form of insanity associated with and caused by masturbation. This is not, however, nearly so common as is popularly and even medically supposed. It is far more frequently a symptom than a cause, and when present it is not nearly so incurable a malady as is imagined. My experience is that 35 per cent of my cases of the disease made good and mostly permanent recoveries under right bodily, mental, and moral treatment. Some of these cases had a tinge of congenital mental weakness, which was, of course, mendable.

**Myxedema and Exophthalmic Goitre.** The mental symptoms which are liable to accompany these two conditions are fairly well known. In both cases they often become so severe that patients have to be sent for treatment to mental hospitals; at least that was so in the case of myxedema before its treatment by thyroid extract was discovered. The symptoms are in some cases depression, and in some exaltation of mind, but they all have tendencies to hallucinations of hearing. They all have a lowered vasomotor tone, it shows by

the reaction time, and a general lethargy of voluntary movement. In the cases I have had since the thyroid treatment was discovered I have recovered.

The mental symptoms in exophthalmic goitre are irritability, a tendency to delusions of suspicion, and, in the worst cases, acute mania of an extremely fatal character. Accompanying such mental symptoms are the usual bodily signs of the disease. We are yet awaiting a entirely satisfactory treatment for the disease. A surgical removal of part of the thyroid gland has lately been reported by several surgeons to have good results.

**The Delirium of Young Children.** The delirium to which all children are liable from high temperatures and toxic causes is, in some cases, so intense and prolonged as to become a cause of anxiety. Such delirious conditions mean that the children affected by them are of an extremely neurotic temperament, this complicating almost every form of disease to which they are liable. It means also that such children should be specially cared for in after life with the object of recognizing the effects of their temperament. The fact should be taken into consideration in many cases in education, selecting employments, etc.

**The Mental Symptoms of Lead and Arsenical Poisoning.** The use of these two metals when slowly absorbed into the system by painters and those who have drunk much beer adulterated with arsenic, are liable to cause mental symptoms, which may go on to coma. Hallucinations, morbid elevation, maniacal attacks, and delusions of persecution are the chief symptoms. There have been cases of coma and death following such symptoms, but most of the cases will recover if proper treatment is applied in time.

#### THE GENERAL PROGNOSIS IN PERSONS WITH A MENTAL AND NEUROTIC HEREDITY BUT NO ACTUAL MENTAL SYMPTOMS.

The change from a potentiality and tendency into an actual mental disease is always an uncertain matter, on account of the absence of reliable statistics and of scientific prognostic indications, as well as from the fact that the tendencies to actual disease through hereditary defects vary so infinitely in their strength in different cases.

The risks of the occurrence of mental disease in many persons are constantly referred to doctors nowadays, but it is rare that a certain prognosis can be given in any individual case. So much depends on the circumstances and environment of the person, on his employment, on his innate vitality and general health, and on his habits of life, as well as on his heredity, that our conclusions are made uncertain in most cases. On the one hand a certain amount of hereditary defect exists in so many families that we must not draw too fine a line, and on the other the evil consequences to the individual, to the family, and the race may be so great that we must not shirk from pointing out the obvious risks. There are in fact prognostic risks

that may be taken by any man or woman in choosing a profession, in choosing a residence, or in getting married, but on the other hand there are risks that no prudent and conscientious man or woman should take. The chief consideration which should guide the medical adviser are the strength and directness of the evil heredity, and the constitution of the person about whom our advice is sought. In every case I would say to the applicant for advice that our present knowledge of heredity is defective and uncertain, so that we may be mistaken in our conclusions.

The following, I would say, are the most relevant facts, so far as our present knowledge goes:

1. Mental disease in the father or mother implies a considerable and necessary risk in the offspring.
2. The risk is greater from the father to the daughter or from the mother to the son, especially if there are also bodily or mental likenesses.
3. On the whole there is more risk from the maternal side.
4. If mental disease has been common in the family, the risks are the greater.
5. If the person about whom our advice is asked is obviously 'neurotic' in constitution, and has 'stigmata of degeneration,' bodily or mental, the risks are thereby accentuated.
6. If the general health has been much below par, especially during the period of development, the risks are greater.
7. If any developmental diseases have occurred, such as convulsions, asthma, chorea, severe hysteria, tuberculous affections, etc., even though they may have been recovered from, the risk is greater.
8. If mental affections have appeared in near relations in the early periods of life, the risks are far greater than if they have appeared later on.
9. Many of the neuroses, notably epilepsy, occurring in ancestry, are liable to be 'transformed' into mental attacks in descendants; mental attacks are, in fact, their 'equivalents,' looked at from the hereditary point of view.
10. Alcoholic, syphilitic (including general paralysis), traumatic, and toxic mental attacks may not necessarily imply any mental hereditary element.
11. In some cases mental attacks will appear in members of a family with an entirely clear bill of health so far as the facts are ascertainable.

*T. S. Clouston.*

**MERCURIALISM.** Patients who are affected with tremor as the result of inhaling mercury vapour may not suffer from any other manifestation. Removal from the influence of the poison may be followed by rapid recovery, though in some cases the tremor never entirely passes away, and may remain with undiminished intensity. Nervous symptoms rarely follow the medicinal use of mercurial salts, but arise most frequently in those who work with the metal. Weakly people suffer much more severely than the robust, and there is a very

of individual susceptibility. The symptoms may arise for the first time when an interval has elapsed since the last exposure.

With regard to oral administration, it is stated that the taking of 20 grs of perchloride of mercury has been followed by death. On the other hand, a case has been recorded in which extensive alveolar necrosis and parenchymatous nephritis followed the ingestion of 7 grs of perchloride of mercury, and in spite of this the patient eventually recovered.

In the more acute manifestations, the following justify a very grave prognosis: oedema of the glottis may rapidly follow a large concentrated dose, leading to speedy death from asphyxia; severe gastro-intestinal disturbance with frequent vomiting of blood-tinged material; diarrhoea with bloody evacuations; extensive stomatitis, followed by sloughing of the gums and the inside of the cheeks; renal collapse; and, in somewhat less acute cases, marked cachexia and oedema round the ankles. The prognosis is much worse if there is any coincident nephritis.

Some patients die with acute cerebral symptoms, beginning perhaps with delirium, passing on to a stage with epileptiform convulsions, acute mania.

Chronic mercurialism in women favours miscarriage and the birth of still-born children. In both sexes it undermines the resistance of the body, and paves the way for phthisis, or some acute infection.

*J. R. Clark.*

**MIGRAINE.** Migraine, with its characteristic paroxysmal headache, generally unilateral, frequently preceded by the well-known vasomotor phenomena, and usually culminating in vomiting, does not constitute any direct danger to life. Migraine is a family disease, which generally appears in childhood, and subsequently recurs, often with remarkable periodicity, at intervals of about three or four weeks throughout adult life, ultimately tending to disappear in old age. In women, the attacks are specially liable to occur towards the end of the menstrual period. In addition to the natural tendency to spontaneous recurrence, there are frequently sources of periodic irritation which precipitate or aggravate an attack at the end of a particular period of time in each patient's case. Sometimes recognition and correction of such accessory factors as errors of refraction (these should always be looked for), nasal or dental abnormalities, gouty diathesis, etc., may produce a remarkable diminution both in the frequency and in the severity of the attacks; but the disease is essentially a hereditary and constitutional one, and therefore entire cessation of the attacks is not to be expected. Gowers thinks that cases in which the face becomes cold and pinched during the attack have a more favourable prognosis, as regards mitigation of the attacks, than when the face is flushed at the onset of the paroxysm; but it is difficult to be sure of this.

*Parker Sargent.*

**MIGRAINE DISEASE.** — See HEART, CHRONIC VALVULAR DISEASE OF.

**MOLLS Simple.** These tumours are congenital local defects of development in the skin. They are characterized by warty overgrowth of the papillae, and often by the presence of hair, but always all by the presence in the area of groups of chromatophores or pigment-forming connective tissue cells, which give to the mole its characteristic dark colour. In certain mole-pigment is absent.

The prognosis is good. There are few individuals who do not possess them. But in two contingencies their potential malignancy may awake. If the mole is subjected to any injury, and especially to chronic irritation, such as chafing, medicinal streams may supervene, heretofore increase in size and elevation, and by repeated bleeding, followed by enlargement of clots. The second contingency is rapid necrotic treatment. Caustics and partial excision are most dangerous. Either a mole must be severely let alone, or it must be treated, like the despotic relatives of an Oriental despot, by complete extirpation. When excision with the knife should always be performed when the mole displays signs of activity, and in any case if it is subject to chronic irritation, as on the sole of the foot, the inner side of the thigh, the neighbourhood of the anus, or in the region of the collar.

W. Simpson Harbottle.

**MOLLS, VESICULAR.** The dangers of a vesicular mole are: (1) *Excessive haemorrhage due to partial separation of the mole*; (2) *Perforation or rupture of the uterus by the mole*; (3) *The coincident or subsequent development of chorio-epithelioma.*

**1. Excessive Haemorrhage.** Great bleeding may be caused by a vesicular mole, but it is rare. A patient to die from this cause alone. Even after apparently complete spontaneous extrusion, it is usual for bleeding to go on and necessitate uterine exploration.

All vesicular moles should of course be removed surgically. More than this: even after apparently complete natural expulsion, it is safest to explore the uterus, so as to be sure that no fragments remain capable of giving rise to chorio-epithelioma subsequently.

The removal of a vesicular mole is accompanied by a great deal of bleeding, but not as a rule sufficient to give rise to anxiety, because the haemorrhage provokes surgical interference before the patient's condition has become alarming.

External haemorrhage is most marked in the non-malignant variety of these moles, and indicates an attempt on the part of the uterus to expel the mass. In some cases this is successfully accomplished; but more commonly only a portion of the growth is extruded, because the adhesion of the villi to the uterine wall is generally far firmer than obtains in normal pregnancy.

**2. Perforation or Rupture of the Uterus.** Instances have been recorded many times, but the event is relatively rare. In a certain proportion of cases the chorionic villi penetrate deeply into the wall, even to the peritoneal surface, and in such cases the risk of perforation during exploration or curettage is evident; while it is in such cases that spontaneous rupture occurs during the contractions of the

of the attempt to expel the mole. The internal hemorrhage in such cases has often proved fatal.

**The Coincident Development of Chorion-epithelioma.** This is a possibility for which one must always be on the look out. Lindberg, in an analysis of 240 cases of hydatid mole, found that 16 per cent. had become malignant. It has occurred much more commonly in a vesicular mole than after normal pregnancy or ordinary abortion. The earlier writers found that vesicular mole preceded chorion-epithelioma in 50 per cent. of the cases; but in later researches the percentage is somewhat lower.

These growths are known as malignant moles, and the prognosis is correspondingly grave. It follows that every case of vesicular mole should be watched for at least a month or two after treatment, in order to adopt energetic measures in the presence of untoward symptoms. Unfortunately, it happens that no great reliance can be placed upon the histological features of the chorionic villi in vesicular degeneration as indications of malignancy.

**Complications.** Finally, a few of the rarer complications of vesicular degeneration are vomiting, albuminuria, and even eclampsia may supervene. In these cases a condition of lowered resistance causes such a haemorrhage may be attended by a rapidly fatal result, or even a septic infection is prone to develop.

There are some theories relating to the effect of molar pregnancies upon fertility, but there exist numerous observations in which pregnancy was experienced not once, but on several occasions. It is even asserted that fertility is rare after a molar pregnancy.

Even if a hydatid mole has been successfully cleared out, there are some growth effects to be feared beyond the possibility of subsequent chorion-epithelioma development.

**Mortality.** From all causes Brindley states that the mortality in a molar mole is about 15 per cent. of the cases.

In the figures of Lindley, representing 240 cases collected from the literature, there were 49 deaths, a mortality of about 25 per cent. Of these 32 died from malignant degeneration, or 16 per cent; 7 died from haemorrhage, or 4 per cent; 4 from septic peritonitis, or 2 per cent; 1 from general sepsis, 1 from uraemia, 1 from endocarditis, 1 from meningitis, and 2 from unknown causes.

*See also Diseases of Women, 1911, 174; La Pratique de l'Art de*  
*1913.*

*Boydell G. Cunningham,*

**MORPHIA HABIT.** — (See DRUG HABITS.)

**MOUTH, CANCER OF.** — (See TONGUE, CANCER OF.)

**MOVABLE KIDNEY.** — (See KIDNEY, MOVABLE.)

**MUMPS.** — Mumps is only exceptionally fatal. Amongst 58,331 occurring in Denmark during the years 1870 to 1891 and reported by R. Berg, there were only 7 deaths, of which 3 were in children.

Comby states that there was 1 fatality amongst 406 cases in the French army during the years 1862 to 1865; but Demme, at Bern, reported 2 deaths in 117 cases. There were no deaths amongst 249 cases in soldiers admitted to the North-Western Hospital, Hampstead, from November, 1916, to September, 1917. It is rarely fatal except from complications.

**Complications.** *Ochritis* is the most serious complication; not because it is at all frequently associated with a fatal result, for that is not the case, but because it often terminates in atrophy of the testis. *Ochritis* usually sets in about the seventh or eighth day of the illness, but may occur at any time within six weeks; it may follow a mild attack of mumps. It is most frequently met with in young men, and is rare in little boys and old men. Its frequency appears to vary considerably in different epidemics. Catrin states that it occurs in 46 per cent of males of all ages; but Laveran and Comby put the incidence much higher, from 30 to 33 per cent. Comby, however, refers only to epidemics in the French army. There were 58 cases (26.1 per cent) amongst the 249 soldiers admitted to the North-Western Hospital. Catrin's estimate is probably nearest the truth as regards males of all ages.

A large proportion of the cases of *ochritis* end in atrophy, 60 per cent according to Catrin, 50 per cent according to Laveran.

*Very severe cerebral symptoms* occasionally arise during an attack of mumps, either during the parotitis or after the testis has become affected. But as a rule such symptoms do not last long, and the patient recovers without any cerebral or mental after-effect.

*Painful colitis* is another complication which is accompanied by alarming symptoms. It usually arises within a week of the onset of the attack of mumps. It has been known to occur in as many as 5 out of 333 cases in an outbreak reported by Lidzcomber. There were no cases amongst the 249 soldiers at the North-Western Hospital. There may be severe abdominal pain, vomiting, and collapse. But in spite of the apparent severity, the prognosis is nearly always favourable.

*Permanent deafness* is rarely the result of an attack of mumps. The cause is usually inflammation of the cochlear ear. There was 1 case of cathectic with temporary deafness, and 1 of otitis media, amongst the 249 North-Western Hospital cases. There were also 3 cases of *myelitis*, 2 of *myelitis*, and 1 of *brachitis*, amongst these patients.

L. W. Gossard

#### MUSCULAR ATROPHIES.

**Arthritic Muscular Atrophy.** In this form, which accompanies any acute or chronic joint affection, and which is limited to the muscles around the affected joint or joints, being usually more marked in the extensors than in the flexors, the prognosis depends upon the recovery of normal mobility in the affected joint. The absence of fibrillary movements, and the presence of electrical reactions which are normal or, at the most, merely quantitatively diminished, are here

of corroborative value. Suitable massage and movements of the affected muscles and joints rapidly produce improvement, the ultimate result being proportional to the degree of mobility attained at the particular joint.

**Ischemic Muscular Atrophy (v. Volkmann's paralysis).** The result of muscular compression by splints or bandages which have been too tightly applied, is met with only in the forearm, and is confined to the muscles on the flexor aspect of the hand. Within a few hours, the forearm muscles become tender, and the fingers and hand swollen, and unless the splints are removed and properly adjusted accordingly, the affected muscles are gradually infiltrated by fibrous tissue, causing them to become hard and leathery in consistence, with impossibility both of active contraction and of passive stretching. In this variety of muscular atrophy, due to interstitial myositis, the structure of the wrist and fingers, once established, is almost entirely resistant to the most energetic massage and electrical treatment; and the best prospect of regaining a useful limb is offered by the excision of a portion of the radius and ulna, thereby shortening the forearm to be repaired with the shortened flexor muscles.

**Neuritic Muscular Atrophy** follows lesions of motor or mixed nerves, whether in isolated affection of individual nerve trunks (such as the facial, ulnar, or musculospiral), or in multiple neurites from any cause (alcohol, lead, arsenic, diabetes, beriberi, nephritis, diphtheria, and other infective diseases, etc.). The prognosis varies according to the underlying cause, and according to the degree of degeneration which has occurred in the affected motor nerve. Sometimes the cause cannot be removed, as in diabetic neuritis. In other cases, as in alcoholic neuritis, it is removable with considerable difficulty. In diseases such as in cerebellar and neural neuritis, and in ordinary compressive facial palsy, there is a tendency to spontaneous recovery. A correct diagnosis of the cause is therefore of supreme importance. The degree of degeneration that has occurred in the nerve and muscle, in any particular case, is determined by the examination of the electrical reactions.

**Myopathic Muscular Atrophy.** In this form, whether of the pseudo-hypertrophic type, or of the primary atrophic type (where the disease, congenital in origin, consists in a primary decay of the muscle, with a reversion first to an embryonic structure, and ultimately to the disappearance of the contractile sarcoplasm), the prognosis is usually unfavorable as regards recovery. The rate of progress of the disease, however, varies with a wide limit. Some patients become disabled and helpless within a few years, and die from some intercurrent disease before attaining adult age. In others, the disease progresses with extraordinary slowness, and the patient may be able to labor about for thirty or forty years after the onset of his symptoms. Some cases, again, seem to come to a standstill and remain at the advanced stage of muscular atrophy for an apparently indefinite period. Patients with myopathy, however, rarely live to an advanced age.



The pseudo-hypertrophic form has a relatively worse prognosis as regards life than the primary atrophic type.

**Progressive Muscular Atrophy (peroneal or Charcot-Marie-Tooth type)**, which usually begins in childhood and adolescence, and is characterized by wasting of the peripheral muscles of the limbs which leads to early claw hand and to talipes, bilaterally symmetrical, has a prognosis very similar to that of the myopathies; i. e., it progresses with extreme slowness, and may even come to a standstill. Here the prognosis as to life depends upon preventing the patient from becoming bedridden. The orthopedic surgeon can often prolong life, either by providing suitable supports for the feet and knees, or by various operations upon the contracted feet, enabling the patient to get about, even when all the muscles below the knees are completely paralyzed.

**Progressive Muscular Atrophy (chronic anterior poliomyelitis)**, from degeneration of the anterior cornual cells, may affect the spinal cord alone, or it may also attack the medullary motor nuclei, producing *bulbar paralysis* (see *BULBAR PARALYSIS*). In numerous of the cases the muscles of the upper limbs are attacked earliest, especially the intrinsic muscles of the hand. Sclerosis of the pyramidal tracts, which frequently accompanies the anterior cornual lesions, is evidenced by increase of the deep reflexes, especially in the lower limbs, and by the development of an extensor type of plantar reflex. The malady is usually progressive, but sometimes it becomes arrested. The chief dangers to life arise when the respiratory muscles are affected, or when, from bulbar palsy, deglutition is rendered difficult; in such cases, not only does malnutrition result, but there is a risk of inhalation-pneumonia. In cases which become arrested as a result of treatment, the atrophied muscles do not recover; there is simply a halt in the advance of the symptoms. The prospects of such arrest are improved by systematic hypodermic administration of strychnine, beginning with .2 gr. daily, and quickly increasing to 1 gr. and 2 gr. according to the response and down by Gowers, which should be persevered with for many months. Electrolytic treatment does not appear to affect the progress of the disease materially, but sometimes x-ray treatment over the medulla, in cases of bulbar palsy, has apparently brought the degenerative process to a standstill.

The muscular atrophy of acute anterior poliomyelitis is referred to in the article on *INFANTILE PARALYSIS*. *Paras Sycant*

**MYASTHENIA GRAVIS.** There are few diseases in which it is more difficult to form an accurate prognosis in an individual case than in myasthenia gravis. Once the disease has been recognized by the presence of the characteristic and transient fatigue of certain groups of muscles, especially the ocular, facial, masticatory, palatal, laryngeal, pharyngeal, and tongue muscles, the large proximal muscles of the limbs, and, most dangerous of all, the respiratory muscles—once these phenomena have become established, the outlook is grave. Some

cases have been known to end fatally within a few weeks; others, even, with symptoms apparently no less severe, have survived for five or ten years, or even longer. Spontaneous remissions not infrequently occur if the patient leads a quiet life, free from physical exertion. Hard manual labour, or physical effort of any sort, aggravates the symptoms. The immediate cause of death is generally an attack of fatigue of the respiratory muscles. Sometimes individual attacks of this sort may, for the time, be tided over by means of artificial ventilation, combined with oxygen inhalations. Every myasthenic patient ought to have a cylinder of oxygen at hand with the necessary apparatus attached, ready for such an emergency. Fatigue of the muscles of respiration may cause attacks of choking, and is another sign of great significance.

*Pat. Sect.*

**MYCOSIS FUNGOIDES.** This rare, but dangerous, skin disease runs a two-stage course: there is first an itching erythematous rash, which may last for years; then fungating tumours form in the skin and become numerous and widespread. There is always great pruritus. The tumours have been compared to a tomato in appearance.

After a long course the disease ends fatally, the patient being carried off at last by sepsis and exhaustion. Occasionally metastases appear elsewhere. A few cases have been reported as having been cured by treatment.

*Review Sect.*—Squire and others, *Proc. Roy. Soc. Med. Dermatol. Sect.*, 1914.

*A. Reed, Short*

**MYELOID SARCOMA.** (See BONE TUMOURS.)

**MYOCARDIUM, PRIMARY DISEASE OF.**—To say that the outlook in any case of valvular disease depends ultimately on the state of the cardiac muscle is to utter an obvious platitude. Yet there are reasons in the paramount importance of the myocardium. In the typical case that is usually described as one of chronic valvular disease, the two factors to be assessed are the amount of extra work imposed on the myocardium by the valvular lesions, and the fitness or unfitness of the myocardium to meet that extra demand. On the other hand, there is a group of cardiac lesions that attack the musculature of the heart directly and immediately, either with or without a simultaneous attack to the valves and other accessories of the cardiac mechanism. In such cases the prognosis will have to be calculated in respect of two factors: (1) *The course usually followed by the morbid process at each of the particular cases*; and (2) *The nature and extent of the injury to the heart at the time of examination.*

#### 1. PROGNOSIS ACCORDING TO THE PARTICULAR MORBID PROCESS PRESENT.

The primary diseases of the cardiac muscle may be (1) *acute*, or (2) *chronic*. Those which constitute the former group are for the most part infective.

1. **Acute Infections of the Cardiac Muscle.** There are four acute infections in which myocardial lesions play a predominant part—diphtheria, rheumatic infection, typhoid fever, and influenza. Of these the rheumatic infection is the only one in which the valves and pericardium are also attacked—and even here these lesions do not attain to such a pitch of intensity during the active phase of the rheumatic process as to share prognostic importance equally with the damage which has been inflicted directly upon the myocardium by the infection.

In *diphtheria*, it would appear that about 25 per cent of all the deaths are due chiefly or solely to cardiac failure. In other words, if the average mortality of this disease be reckoned at 40 per cent, there is a chance that one person out of every 10 attacked by diphtheria will die of cardiac failure. Sudden syncope is fairly frequent in cases carelessly treated. It is quite impossible to assess in figures the effect of antitoxin treatment in reducing these risks, but it is tolerably certain that the risk of cardiac failure is directly proportional to the intensity of the infection itself, and since no drug is so potent as antitoxin in combating the virulence of the infective process, it follows that one of the chief benefits of the treatment lies in the fact that it interposes a kind of barrier between the infected mucosa and the susceptible tissue—of the cardiac wall. This is borne out by the fact that serious and fatal cardiac complications are much more common with necroses of diphtheria when antitoxin treatment has been delayed than in those treated early. One other point that is of the highest import in the prevention of cardiac failure is the absolute necessity for care in treatment to convalescence. A very large fraction of the fatal attacks of syncope occur during convalescence, after the severity of the infective process has died down, and the patient is allowed to sit up too soon, and falls back dead. By continuing some of the most distressing experiences for the medical attendant as well as for the relations, can be averted by ordinary precautions: convalescence must be prolonged, and the patient should be allowed to sit up by degrees only, one pillow at a time. It is especially important to realize that the condition of the patient immediately before such catastrophes have occurred has tended to give away, forewarning of approaching danger, so that these precautions must be observed even in cases that are following a relatively favourable course.

*Acute rheumatic carditis* is dealt with under a separate heading (*see RHEUMATIC PROCESS, MYO-, AND ENDOCARDITIS*).

In *typhoid fever* the cardiac factor is probably of more importance than appears on the surface. It is, however, obscured by the nervous and other evidences of toxæmia, and it is so unusual to encounter cases in which the chief clinical features are cardiac that these may be dismissed with the remark that sudden death occurs in a few cases of typhoid fever, but that the cardiac origin of such fatalities is not definitely proved. Persistent cardiac disability following typhoid fever is a negligible quantity.

*Tricuspid flutter* is a rare disease in this country at the present time. Cardiac complications are very important, both in relation to the possibilities of a fatal termination, and also to the duration of the course of disability which is so apt to follow this disease. Sudden death has been known to occur, but it is excessively rare. On the other hand, persons whose cardiac musculature was damaged by previous febrile or other lesions before the attack, are apt to find that convalescence leaves them more conscious of cardiac disability than they were before the illness. Even those whose hearts were sound before the attack are often left with minor evidences of cardiac incompetence. The symptoms usually pass off in the course of a few weeks, provided ordinary care, as to work and rest is exercised.

In other infections, such as lobular pneumonia, scarlet fever, and scarlet fever, and signs of myocarditis are often manifested, but it is only a part of the general picture; the phenomena are mild as a rule, and recover never or almost never due to cardiac complications alone.

**2. Progressive Degenerations of the Myocardium.** Here there is an overlapping of etiological factors. For instance, you are presented by a man with thick, contracted arteries, with a history of pronounced signs of alcoholism. His cardiac incompetence is probably due to some measure to all three factors, but in what measure to all, is difficult to say. So far as prognosis is concerned, the difficulty is to be somewhat mitigated by the fact that, whatever the cause may be, it is always possible to discover the state of the cardiac functions, and this is after all more important than previous knowledge as to the nature of the morbid process which are playing havoc with those functions. You are seeking a forecast in disease, it is necessary to know not only where you stand at the time of examination, but also what further changes along the downward path is to be expected. It is therefore necessary to make full inquiry into the causes in any given case of chronic myocardial degeneration.

Of all the various factors, none is more serious than *chronic alcoholism*. The writer has found that it is always wise to treat with the utmost care every case of chronic myocardial disease in which there is reason to suppose that the tissues have been long subjected to the deleterious effects of alcoholism. As in many of these cases the serious nature of the myocardial disorder is plain to see, for the symptoms afford the most possible indications of failing contractility, but even were these not so, and the functions are not deeply deranged, the fact that the patient has been in the habit of alcoholic excess holds all for his recovery, in chance of surmounting the tissues that he ahead of it. Not only so, but there is this further disadvantage about the effect of long-continued alcoholic intemperance on the heart, that it persists after the cause has been removed. Or perhaps one can express it better in another way, that a man who has been alcoholic up to forty, and abstemious afterwards, tend to run a quicker downward course, than the age and the sex begins to manifest evidences of atherosclerosis. It is never to be forgotten that withdrawal of alcohol in any such case will affect

the outlook favorably, the more definitely so if the cardiac symptoms are as yet trivial.

Another fact of enormous significance in a case of progressive myocardial degeneration is a history or other evidence of *splithis infectiva*. This matter is more fully discussed under a separate heading (see CARDIAC SYMPTOMS); here it is enough to say that in any case of myocardial cordis it is the practitioner's duty to seek by every possible means for evidence of a latent factor. This is particularly to be suspected in cases where the symptoms are febrile and the physical signs disproportionately slight. Whenever there is reason to believe that the myocardial disease is in part due to syphilis, the prognosis is much graver than in an ordinary straight forward case of simple heart. This is true even of those cases in which there are none of the aortic lesions that constitute so characteristic a feature of cardiac syphilis. About 50 per cent of cardiac syphilitics die suddenly.

The other factors which should be looked for in a case of the kind are those which injure the myocardium through the arterial lesions that they initiate.

Of these, mere *senility* is the least grave. Many an elderly man shows signs of cardiac decay which have developed so slowly that the corresponding symptoms are scarcely perceived by the patient himself. He has to take his pills a little more deliberately than he used to do, but this gives no anxiety, since he regards it as one of the penalties of a advancing years. Such a man should be told no more than this, that his heart is not so young as it was, and that he must be content to accept his breathlessness as an automatic index of the line separating what he may from what he may not mind. Yet that same growing old which is responsible for the signs at the time of examination is not likely to accelerate unless there be some definite force, over and above that of mere senescence, at work upon his arteries.

Of the various types of overstress to which the heart is exposed, continuous *emotional strain* appears to be the most universally deleterious. The exact manner of its action is not understood, but no one who has seen many cases of aortic sclerosis will fail to recall examples of business or family worry accelerating the final *déjà lè*.

The importance of *physical strain* as a factor in the causation of myocardial degeneration is a debatable point. One thing at least is clear, that overstress of a simple heart is liable to dire consequences much more often than an even greater hardening of the adolescent or youthful heart. Mitchell Bruce's Linnæan Lectures, delivered in 1911, contain a great deal of very useful information as to prognosis in cardiovascular degeneration. In the cases which supply the fundamentals of his discourse, he found that cardiac overstrain in the young and healthy did not shorten life much, if at all, for the average duration of life after the strain was 31 years, and the average age at death 66 years.

Of other factors, *high arterial tension* is one of the most serious. A majority of such cases end in cardiac failure. There are three points

to be in mind in constructing a prognosis here. (1) If the hypotension can be attributed to some provocative factor that can be checked, so much the better for the patient—where it is due to something such as a recent renal disease, that we can do little to mitigate, the outlook is bad. (2) The actual height of the pressure matters less than its course. Other things being equal, a rising tension is bad—it means an increase of the cardiac burden. A fall in pressure is also a bad sign if it is accompanied by evidences of increasing cardiac inadequacy—that the heart is failing in its prime duty, that of maintaining an ample supply of blood to the peripheral organs and tissue. (3) And, consequently, another way of saying that a high pressure is not necessarily a sign of violence, is the fact that treatment fails to bring down the tension is not in itself to be deprecated in every case. All the results, including the myocardium itself, depend on the maintenance of a steady blood pressure for their operation—and it is probable that in every case a high pressure is essential to the sustenance of the myocardium and its functions.

Hence, in the lectures already referred to, separate a *myocardial* group of cardiovascular subjects—obese, stiff-minded persons, with aorta and normally albumin in the urine. The cardiac phenomena of these patients tend to run a benign course, particularly if the bad ways of living be not inconvertible. The average period elapsing between the onset of cardiac symptoms and the patient's death was 12 years (O'Brien's cases), one patient lived for 32 years after the onset of symptoms. Of course it is necessary to recollect in this, as in every case, the possibilities of death from some non-cardiac cause, such as pneumonia or acid intoxication.

A *goodly* element in the case is not in the patient's distemper.

On the other hand, a strong *family history of cardiovascular degeneration* must be reckoned as an unhappy feature of the case.

In the very *obese* it is common to encounter symptoms and signs indicative of myocardial inadequacy, and these are not to be underestimated. They point to an overloading of the subpericardial interstices with fat, which often infiltrates the muscle itself along its connective-tissue planes, crushing and starving the muscular fibres. Patients in this state are therefore ill prepared to cope with the emergencies of life—they fail with undue ease in the presence of acute disease, particularly bronchitis and pneumonia.

Two other factors remain for consideration. The patient's temperament and his circumstances. The worried, splenic individual makes a bad cardiac patient, and so does the man whose affairs are hard to escape from; and the combination of the two sometimes considered in successful, pushing business or professional men is particularly deadly. To such persons the inevitable advice—"Eat, drink, and smoke sparingly, work moderately, and worry not at all"—too often appears so impossible of accomplishment that it is disregarded, and downfall ensues.

So much for the price of etiology in the prognosis of myocardial

## II. INCIDENCE OF THE NATURE AND AVOIDANCE OF FUNCTIONAL INDICES SHOWN AT EXAMINATION

We must next consider the *relative importance of symptoms and physical signs*, and in order to arrive at a proper understanding of their significance it is essential to realize they are merely means to an end—the assessment of the capacity of the cardiac muscle to do its work. Now, the chief end of the myocardial tissues lies in the ventricular contractions—it is to perform this task that the heart exists. Therefore the gravest features of myocardial disease are those which point to impairment of the contractility of the ventricles. Whatever the cause of the trouble this holds good.

**Impairment of Contractility of Ventricles.** We come here to a fact that has not yet received all the attention which it deserves despite all the teachings of the past twenty years: the fact that symptoms afford a more reliable basis for the estimation of ventricular contractility than physical signs.

First among these symptoms is *breathlessness*. Often it is the first to be noticed, and the ease with which it is evoked constitutes an excellent gauge of the state of the ventricular wall. At first it is only noticed when the patient puts himself to some unusual exertion such as climbing a hill or hurrying to catch a train. By degrees his field of cardiac response, to borrow Mackenzie's phrase, becomes more and more limited till walking on the flat becomes a difficult task. Other things being equal, the more readily the patient's breath fails, the worse the prognosis.

There are also various forms and degrees of *paroxysmal dyspnoea*, the significance of which is important in respect of prognosis. When a person with myocardial disease develops Cheyne Stokes breathing, it does not of necessity forebode evil. For example, an elderly man with elderly arteries and some cardiac enlargement is found to exhibit Cheyne Stokes breathing during sleep; here it is of little significance unless other signs of contractile failure begin to be manifest or the respiratory periodicity itself becomes rapidly more and more definite. Grouping of the respiratory movements is of importance only when it is one of a group of symptoms suggesting gradual shrinkage of ventricular contractility. When we come to an aggravated degree of the same kind of phenomenon, however, be the various forms of periodic dyspnoea with subjective distress which are grouped together within the term "cardiac asthma," a graver condition is encountered. If a patient with chronic myocardial disease begins to be afflicted with attacks of respiratory distress, coming on chiefly at night, this is in itself a sign of impairment of the contractile power of the ventricle. It appears from recent work by Lewis and others that the actual cause of this type of dyspnoea is an acidosis dependent on deficient oxygenation of the blood. To accept this explanation affords a basis for the indubitable fact that the more extreme the dyspnoea the worse the prognosis. The writer has observed cases of chronic myocardial

condition which the approach of the end has been foreshadowed by the development of a periodic dyspnea more or less continuous, and according in its intensity to a veritable angor, in association with other evidences of a disease—either a stench in the breath, vomiting, or diarrhoea, delirium, and other nervous symptoms. As part of a congestive syndrome, the periodic breathlessness is as grave a feature as the angor. Where heart block is present, various degrees of grouped irregularities of the respiratory rhythm may occur. These are usually proportional to the degree of block present, and do not therefore furnish an index of the amount of impairment of contractility.

The significance of *angor pectoris* as a sign of defective contractility has been fully considered under the heading of ANGINA PECTORIS, so that little time need be devoted to it here. Suffice it to say that the appearance of cardiac pain in any case of myocardial disease, whether the lesion be acute or chronic, is always a serious warning because it portends inadequacy of the ventricle's power to contract. The actual importance of pain as a quantitative index of contractile failure is conditioned on several considerations. First, how easily is it provoked? Second, how easily is it relieved? Third, how easily is it aggravated by case-laters? Fourth, what other evidence is there of associated disease? Fifth, how severe is the pain? The order of these questions is roughly that of their relative importance. Angina pectoris may be regarded as a symptom and not a disease, significant because of its prognostic standpoint not for its own sake but by virtue of associated conditions.

A symptom which is held in great awe by the public as evidence of a great danger is the *ability to faint*. Now this view is certainly not supported by clinical experience, which shows that this particular symptom, so far from being an important sign of myocardial disease, is rarely associated with cardiac disease at all. It is true that a man afflicted with an anginal attack will often faint as a result of the pain which he endures, and that the myocardial patient may die suddenly, as a result from these two catastrophic types of faint, which are seldom accompanied by less than very degrees of syncope. The cardiac patient faints more readily than the ordinary individual, and certain attacks of children, which have so often led to an unfavorable statement about a weak heart, are nearly always attacks of epilepsies, and have nothing whatever to do with heart disease.

*Dyspnea* is an accurate index of impairment of contractility in disease of the myocardium, but it takes a little time to develop, so that it is a poor evidence in acute myocarditis. But in the chronic degenerative disease of the cardiac muscle it is an almost constant feature, in the early stages if not before. Its value as an indicator of failing contractility seems to be found by a consideration of the extent and depth of the disease, its rate of development, and its behaviour under the influence of rest and other therapeutic measures. In this connection it is well to remember two things. First, nothing but actual personal examination of the patient's ankles should suffice to convince one of the



presence or absence of oedema—and second, the word 'dropsy' is very alarming to many patients, and should therefore be avoided as far as possible. There are also two fairly obvious precautions to observe before attributing oedema of the legs to cardiac disease. First, every means must be used to assure oneself that it is not a renal dropsy, and this should comprehend thorough examination of the urine, including microscopic examination of the centrifuged deposit. Second, the possibility of some associated cause of oedema, such as varicose veins or fibrads of the uterus, should not be forgotten. Even after all precautions has been exercised, however, it is sometimes impossible to determine whether oedema is partly urinary, or wholly cardiac, or whether it does perhaps owe its origin to coincident renal or other disease. When such difficulties arise, the importance of oedema as a quantitative index of loss of contractility is to some extent discounted, and we must be content to assess our patient's future fortune by such other means as are at our disposal.

The *daily output of urine* shrinks with failure of contractility, and increases again under successful treatment. Whenever possible this must be accurately measured and charted. There are few symptoms of more definite prognostic value than this in cases of myocardial disease that have reached the stage at which rest in bed and continuous observation are necessary.

A symptom which may appear near the end, especially in cases of acute myocardial damage, is *vomiting*: it is not uncommon in the severe forms of cardiac rheumatism and diphtheria. In such cases it is nearly always associated with other evidences of approaching cardiac failure, and is a sign of the very gravest significance. In diphtheria, the children who vomit usually suffer from epigastric pain, and display a *quiet death*, the majority dying within two or three weeks of the onset.

The *pulse* furnishes two useful indications of contractile failure. The *alternating pulse* and its prognostic import are discussed in the article on Pulse Arrangements, but here its paramount importance as a sign of failing contractility must be insisted on. Although it is true that people may live for years after this type of variation has been first noticed, yet it is always a mark of grave myocardial degeneration. The other pulse change which argues the same thing in a person whose heart muscle is diseased is *progressive quickening*. If there is no extrinsic factor, such as pyrexia, to explain this away, it is an ominous proof of increasing incompetence of the ventricular wall to perform those vital duties that are expected of it. In an adult with myocardial disease, a pulse running persistently at over 120 per minute is a signal of immediate danger.

Among the *physical signs* indicative of contractile failure, there are two that are of some prognostic value. The first of these is perhaps seldom appreciated at its true value—*weakening of the cardiac sounds*. In acute rheumatic heart disease, for example, it is almost possible to measure the unhappy progress of the myocardial embolment by the

hearing of the first sound at the apex: in the great majority of the cases of this description where a pericardial rub is or has been heard, the absence of the first sound at the apex is a sign of severe myocarditis, and not of pericardial effusion. In the other acute infections, such as typhoid fever, it may be almost the only indication of approaching ventricular failure. Of course, the intensity of the first sound varies widely according to the thickness of the chest-wall and other factors, in which different individuals differ widely from each other: so that it is not safe merely to compare the heart sounds of any one person with another, or with a general standard. The comparison should rather be between the first sound at the apex and the second sound at the base, or between the sounds as heard on one day as compared with their intensity a day or two later. At the same time it is legitimate, and indeed highly necessary, to recognize the prime importance of feeble heart sounds in a person with average thoracic walls, in a case of pericardial disease.

The appearance of the *gallop rhythm* points in the same direction. In saying this one does not of course include the cases, common in childhood, in which a close imitation of the true *bruit de galop* is produced by a combination of reduplication of the second sound with rapid rotation of the heart. True gallop rhythm is always a sign of ventricular failure, one of those valuable hints which must be interpreted as serious even when there is little collateral evidence to support such an interpretation. To exemplify this point: a short time ago a woman came into the writer's out-patient room complaining only that she could not run down. Examination of the chest disclosed the presence of a *bruit de galop*, and the urine was found to be that of subacute nephritis. On the strength of the gallop rhythm, the woman was strongly urged to come into the hospital, but she postponed her decision: within a week she died suddenly. And this sign is ominous when it appears in cases of acute infective disease. One does, it is true, come across cases in which recovery ensues even though there has been a gallop rhythm: but such are the exceptions.

Finally, certain *changes in the lungs* portend a speedy dissolution, unless they are also evidence of waning contractility. Of these, the two most pre-eminent are *acute pulmonary oedema* and *infarction of the lung*. The former is an almost constant feature of the last phase in cases of acute rheumatic carditis doomed to early death. Infarction is more often recovered from than acute oedema. *Hydrothorax* is also a bad feature of a case of chronic myocardial disease, partly because it proves a weak muscle, and partly because it adds a new embarrassment to the act of respiration. A sign of approaching cardiac failure which Mackenzie has drawn attention to is the development of *fine crepitations at the bases*. This, if looked for, is a valuable forewarning of difficulties, which may be averted by timely insistence on a period of rest. As Morison points out, these crepitations appear and disappear according to the patient's changes of posture, always appearing in the most dependent part of the lung.

All the symptoms now owe their serious import to the fact that they arise from impairment of the contractile force of the ventricles. We verify this for which the heart has been evolved and on which life depends. *The greatest generalization that can be made about any case of primary myocardial disease is that there is evidence of failing of the contractile force of the ventricle.*

**Impairment of Tonus.** As to the other myocardial functions, it may seem a splendid opportunity to differentiate between contractility and tonus, but when a prognosis is concerned there is certainly a difference, if we recall the signs of loss of tone, the appearance of a systolic murmur of mitral incompetence, and ventricular dilatation. Many a case of cardiosclerosis in which there are most definite and threatening signs of exhausted contractility comes on to the end with little or no dilatation. Indeed, in such cases the appearance of a mitral systolic murmur denoting failure of tone in the muscular tissue of the auriculo-ventricular ring, may be attended by actual relief of the symptoms, possibly because the overtaxed ventricle is thus freed of some of the mass of blood to be lifted by each systole. Each of these phenomena—ventricular dilatation and mitral incompetence—demands separate and detailed consideration.

The important aspect of *dilatation* so far as prognosis is concerned, is its course rather than its extent. Rapid stretching of the ventricle in acute disease is an untoward feature, because it proves that the muscle is thoroughly saturated with poison, but it carries no immediate threat of dissolution unless there are simultaneous signs of impaired contractility. In acute rheumatic carditis, for instance, it is remarkable how large the heart may become without remaining so permanently or killing the patient. Even in so insidious a disease as cardiosclerosis, acute dilatation may prove temporary, though of course this is exceptional. Generally speaking, the more rapid the enlargement of the heart, the worse the prognosis. Again, it will go worse with the patient if dilatation persists in spite of treatment, for two reasons, because it argues profound injury to the cells of the cardiac wall, and because it permits increase in the cubic content of the ventricle means a correspondingly increased burden of blood for the ventricle to lift at each systole.

As to the *mitral systolic murmur* that so often makes itself heard in primarily muscular cases of heart disease, there can be no question that in such it owes its origin to a fall in the tonicity of the muscle which forms part of the mitral ring. What, then, is its prognostic significance? It is remarkable to find how close an agreement there is as to its unimportance—whether in the chronic or in the infective lesions of the myocardium—among those who have made a systematic study of the point. The only weight it can be said to carry is that it sometimes serves to confirm a diagnosis of heart disease that would otherwise rest on suspicion only. In diphtheria, White and Smith, of Boston, U.S.A., who made a statistical study of nearly a thousand cases, found that the presence of a systolic bruit at the apex added

judging of the gravity of the prognosis, even when the murmur persisted into convalescence. Over and over again Mackenzie and other able writers on myocardial decay have of recent years insisted on the same fact, that a mitral systolic murmur adds nothing to the gravity of the case. Indeed the sense of many of these writings is that the effect that patients with syphilitic, atheromatous, and other diseases of the cardiac muscle do better at the evidences of diminished contractile power there be added signs of ventricular dilatation, or a mitral systolic murmur, or both, than if the case be judged only by evidences of lessened contractility. It follows from this that the loudness of an apical bruit is no criterion of the seriousness of the case: except, perhaps, in the direction opposite to that which might at first seem obvious, for it is certainly reassuring to find even in what looks otherwise like a very severe case, say, of cardiac sclerosis, a loud murmur at the apex. In such a case we accept it as a strong proof that the heart still possesses some contractile force. If, on the other hand, it is a mistake in treatment to keep patients in bed after the illness until the murmur which it has caused has disappeared, they may persist for weeks or months, and such long confinement to bed does the patient far more harm than good.

#### Disturbances of the Other Functions of the Cardiac Muscle.

The rhythmic production of stimuli, the capacity for excitation by these stimuli, and the function of conductivity are all considered fully in the article on PERIODIC ARRHYTHMIA.

There are two types of irregularity that do not matter *scarcely at all* and *extrasystoles* the latter being so common in cardiac sclerosis as to be almost the rule. It is well worth while to realize the relative insignificance of the extrasystolic type of arrhythmia: an elderly man is needlessly and indeed hurtfully "convinced, and confined" in his activities by a medical attendant who is misled by discovering that the pulse is irregular, without perceiving that the irregularity is of the unimportant kind.

*Paroxysmal tachycardia* has rather more significance, for on the one hand it proves the existence of an abnormally irritable focus in the myocardial wall, while on the other it adds the burden of excessively increased work to that which the imperfect ventricular muscle can barely undertake. This extra stress reveals itself during the attacks in several ways: the heart becomes rapidly dilated, the legs may swell, the patient is cyanosed and distressed, and the pulse may even become irregular. The gravity of the outlook is obviously enhanced in any case of myocardial disease when there occur paroxysms of tachycardia with such dire effects: and their serious import is to be measured by means of the readiness with which each attack exhausts the heart. Information as to this is yielded by observation of the behaviour of the heart during the paroxysm, and also by its condition after the paroxysm is over.

The condition of *auricular flutter* is transitional both in nature and importance, between that of paroxysmal tachycardia and that of

auricular fibrillation; probably its worst possibility is that it may pass over into the latter. Fortunately it seems often to yield to digitalis.

The *totally irregular pulse* of *auricular fibrillation* is always an unwelcome feature of myocardial disease, whether acute or chronic. It means that the cardiac muscle has reached a certain point in its downward career, from which it can never recover permanently. Patient with primary muscle disease of the heart who develop this type of arrhythmia fare worse than those in whom it constitutes a late phase of chronic mitral disease; in the former, the ventricle is less able to cope with the rapid irregular stimuli handed down to it by the auricle than in the latter, for the cells of its wall are already barely fit to carry on their systolic task. Much depends in this, as in auricular flutter, on the response of the heart to digitalis treatment, which should receive a proper trial before a bad prognosis is arrived at; if a course of full doses of this drug, given under suitable conditions, fails to relieve the dyspnoea and slow the pulse, then the prognosis is indeed gloomy. Hay points out that the reaction of the heart to the new rhythm (or want of it) should be observed — by this means some gauge of the ventricle's capacity to stand the strain will be forthcoming. He also remarks that those cases in which the irregularity and its attendant disabilities come on suddenly and without pronouncement do worse than those in which the onset is more gradual. The majority of myocardial decedents do not survive the onset of this irregularity for more than three years.

The presence of signs of *interference with the conduction of impulses from auricle to ventricle* (lengthening of the *a-c* interval, heart-block of various grades) adds to the severity of the prognosis — and the greater the degree of interference the more is this the case. The presence of heart-block in any case of cardiac disease proves that there is a gross lesion of the deep myocardium. In acute infective disease this block nearly always turns out to be transient, so that it does not warrant a gloomy view of the case on its own account; but in the chronic myocardial degenerations it is otherwise, for here the lesion of conductivity is nearly always progressive or at least permanent, and, except in some syphilitic cases, it is not influenced by treatment. Even so, however, an absolutely bad prognosis is not warranted; for on the one hand the heart-block may interfere but little with the efficient emptying of the ventricles in systole, while on the other there is always just a chance that it may pass off after an undeterminable interval and reappear no more. It is always important not to allow the heart-block to make one forget the other features of the case; for the prognosis depends on a reasonable consideration of the state of all the cardiac functions, and the influence of all the disturbances encountered on the power of the heart to carry on the circulation in an efficient manner.

The **Likelihood of Sudden Death** in primary disease of the myocardium depends on two things. It may occur as a result of

structure of the cardiac wall or gross interference with a part of the myocardium due to thrombosis or embolism; or it may much more commonly result from an exhaustion of the contractile power of the muscular muscle. We are forewarned of the former type of possibility by *pericardial friction* or rapid enfeeblement of the heart's action, especially if it follow close on the heels of an anginal attack. Attacks of this kind (anginal pain, rapid weakening of the cardiac sounds, and pericardial friction) occurring in cases of chronic myocardial disease, warrant the gravest prognosis. The majority of such cases terminate fatally within a few days; and even if he survive, the patient's future career must be guarded with the utmost care. The symptoms of failing contractile power have been fully described above, and it need only be repeated that the chief end of the heart is to contract efficiently, so that anything which suggests an encroachment on this function is a grave feature of the case. The whole art of prognosis in heart disease lies in the ability of the physician to discover whether this power is threatened or not.

The **Influence of Treatment** on prognosis is unduly small, apart from those points that have already been mentioned by the author. It is no use flogging a tired horse, and not much good can be gained from the saturation of a diseased myocardium with toxic and violent drugs. The lines along which most preservation of life is to be effected in these cases are (1) Grappling with the cause; and (2) Saving the heart from over-stress, especially of the sudden type.

*Carey F. Coombs*

#### MYOPATHIES. (See MUSCULAR ATROPHIES.)

#### MYOSITIS OSSIFICANS. Two conditions pass under this title,

one a generalized slow ossification of muscles all over the body, conferring a so-called 'brittle man,' and the other a newly described disease in which, after a fracture, a mass of bone forms in the neighbourhood of the muscles owing to dissemination of osteoblasts.

**Generalized Myositis Ossificans** is rare, lasts about ten or twelve years, and shows alternate periods of advance and arrest. It always is fatal, the termination being usually due to pulmonary troubles or fixation of the chest.

**Traumatic Myositis Ossificans** has only come into prominence since the introduction of massage and movements in the treatment of fractures, and the use of skiagraphy for diagnosis. The commonest site for the mass of bone is in the substance of the brachialis anticus after an injury of the lower end of the humerus or dislocation of the elbow. The writer has seen it in the gastrocnemius in association with fracture of the condyle of the femur, and in the erucius after fracture of the shaft. The hard mass in the muscle can be moved upon the underlying bone. It usually appears some weeks or months after the traumatic injury, and may cause severe limitation of movement.

The prognosis depends to a considerable degree on the treatment. Early removal by operation usually leads to recurrence, and no benefit

is obtained. During the first few weeks or months absolute fixation with a plaster case or splint appears to give the best results. After the ossification is complete and the bony mass has settled down, it may be removed, but not until several months have elapsed.

Schulz gives the German Army figures for the years 1897-1907. Ninety nine were operated on, of whom 26 per cent were invalided out of the army; 313 were treated by splints, etc., of whom 15.6 per cent were invalided out. It must be remembered, of course, in comparing these figures, that naturally the worst cases were treated by operation.

When the original injury affects the joint, the outlook is much graver than when the bone was broken. Thus, of cases operated on for this form of myositis ossificans by Chabrol, there were 95 bone injury cases, of which 77 were cured, 15 better, 3 no better; and 25 following dislocation, of which 8 were cured, 8 better, and 9 no better. It will be wise, therefore, to trust to rigid fixation in the dislocation cases.

The time occupied by the treatment varies, but is seldom less than three months, and may be much longer.

REFERENCE: *Lapointe, Rev. Chirurg.*, 1912, 677. *J. Rendle Short*

**NASAL ACCESSORY SINUSITIS.** The risk to life in suppuration of the accessory sinuses, whether acute or chronic, is only slight. In more than 25,000 post-mortems, such suppuration was the cause of 18 deaths, while in the same series antral suppuration was responsible for ten times that number.

Acute cases usually resolve, either without any treatment, or with minor operative measures. Such resolution may be delayed for weeks or months, and then take place without operation.

Measures applicable to all sinuses, both with and without operation, are the injection of vaccines and the local injection of *bismuth paste*.

*Vaccine Treatment.* In acute cases, vaccines are usually contraindicated. The following results were obtained in chronic cases; in the majority, however, some operative measure was also employed.

#### RESULTS OF VACCINE TREATMENT IN CHRONIC NASAL ACCESSORY SINUSITIS.

Author	Number of Cases	Number Cured	Number Improved	Number Failed
Hammer	41	14	0	0
Lozon-Tarnet	5	2	0	0
Allen <sup>1</sup>	30	20	0	0
Baker <sup>2</sup>	4	0	0	0
Levy <sup>3</sup>	15	6	6	0
Patterson <sup>4</sup>	11	1	4	0
Brawley <sup>5</sup>	10	4	3	0
Total	116	47	13	0

All of the cases reported as cured had been recently operated upon, that it is impossible to say how much credit should be given to vaccine.

Vaccines are useless as a substitute for operation. They may be of a slight help afterwards, but even this is not certain.

*Bismuth Paste.* Injections of this paste into the diseased sinuses, as advocated by Beck, may hasten cure after operation, but, like vaccines, they are not a substitute for it.

We shall now proceed to consider the results of the operative treatment of each sinus in detail.

**Maxillary Sinus.** The majority of acute cases resolve, even without treatment. Complications are rare, and fatalities are almost unknown. Treatment consists in washing out of the cavity through the inferior meatus with trocar and cannula, combined with the application of vasoconstrictors to the nasal mucosa to promote drainage. Recovery, in a really acute case, is almost certain under treatment.

Chronic cases seldom, if ever, recover spontaneously. The treatment, operative and alternative methods are: (1) Nasal puncture and lavage through trocar and cannula; (2) Alveolar drainage; (3) Intranasal operation (Crome); (4) Radical operation through the canine fossa (Caldwell-Luc).

1. *Nasal puncture and lavage through trocar and cannula* is an unsatisfactory method in chronic cases. A cure can sometimes be obtained, but only if the puncture is repeated a large number of times. Ellis, Koehn, and Madril record cases cured by twenty seven and 30, forty punctures respectively. The majority of patients, however, are object to so many applications of any operation, even if very simple.

2. *Alveolar drainage*, by the insertion of a tube through a perforated alveolar socket, with subsequent washing out, was formerly the accepted method. A fair proportion of cases can be cured by this means. Fisher<sup>1</sup> out of 27 cases, obtained a cure in only 5, whilst Logan Turner<sup>2</sup> reports records cure in 62 out of 113 cases, a total percentage of 47.

3. *The intranasal operation* consists in making a large opening into the antrum through the inferior meatus of the nose. The results are better than those of the alveolar operation. Logan Turner<sup>2</sup> records 44 cures in 55 cases treated, Coning<sup>3</sup> 24 in 23, Rethy<sup>4</sup> 30 in 36 and Parker<sup>5</sup> 12 in 15, altogether over 80 per cent of cures. Rethy<sup>4</sup>, the originator of this operation, claims that it will cure 80 per cent of cases.

4. *The radical canine operation* consists in making a free opening into the cavity through the canine fossa, curting the lining membrane if necessary, and then making a free opening from the antrum into the nose. This operation is the most certain in its results. Tilley<sup>6</sup> reports 24 cures out of 37 cases, and Logan Turner<sup>2</sup> 12 out of 12. Cure could be obtained from this operation in something over 90 per cent



of cases. Objections to it are the fact of its being a more severe operation than any of the others, the occasional post-operative neuralgia or anaesthesia from injury to the infra-orbital nerve, and the anaesthesia of teeth from the division of the nerves supplying them.

To sum up: Repeated nasal puncture and alveolar drainage are unsatisfactory, the former because of its uncertainty and necessity for repetition, the latter because a cure is not obtained in more than half the cases. In favour of the intranasal operation is the fact that it is a slight one, and can, if desired, be performed under local anaesthesia. The external operation gives a better chance of cure (65-90 instead of 80 per cent), but it is more severe, and more likely to give rise to troublesome sequelae.

Loosan Turner<sup>1</sup> has shown that cases with an excess of lymphocytes in the discharge are more resistant to treatment, and should therefore have the more radical operation.

**Frontal Sinus.** Although fatalities are rare, they occur more often in affections of this sinus than of any other. The risks are either an intracranial infection (abscess or meningitis), or infective osteomyelitis of the cranial bones. Acute cases, in the absence of complications, are readily cured by intranasal treatment. Conley<sup>1</sup> in a total of 58 cases, obtained a cure by intranasal methods in 54, or 93 per cent; 2 cases died, or 3.4 per cent. This is probably a higher rate of mortality than the normal, only the more severe cases getting to the specialist for treatment.

Chronic cases are very much more difficult to cure; but the mortality, apart from operation, is very slight. Treatment is operative, and the alternatives are: (1) Intranasal methods to improve drainage and allow of washing out; (2) One of the many varieties of external radical operation.

1. *The intranasal method* consists in a partial or complete removal of the middle turbinal bone, and opening of the portion of the ethmoidal labyrinth which is in relation to the nasal opening of the sinus. The operation has only recently been used to any large extent. Conley,<sup>1</sup> from an experience of 79 cases, records 44 per cent cured, and 51 per cent improved. Gruner<sup>2</sup> gives 46 cures out of 48 cases. Ingals,<sup>3</sup> from an experience of 39 cases, concludes that a cure can be obtained in 95 per cent. Watson Williams<sup>4</sup> has operated on 48 cases, with cures in about 50 per cent, and 1 death. Tilley,<sup>5</sup> in an experience of 30 cases, has obtained cure or relief in "a majority of them." Thus, the operative mortality in these 216 cases is only 0.16 per cent. If by cure is meant freedom from all discharge, as well as relief from symptoms, it is only obtained in a minority of cases. Probably from 50 to 75 per cent are relieved from all troublesome symptoms.

2. *The external radical operation*, as exemplified by the Killian method, aims at obliteration of the sinus. It was performed much more frequently a few years ago than at present.

TABLE OF RESULTS: RADICAL OPERATION FOR FRONTAL SINUSITIS

Case	21	11	8	1
H...	28	22	6	0
H...	74	72		2
W... W...	28	11	15	0
H...	1			2
A... Co.	100			3
Total	265			9

In a total of 265 cases, the mortality from the operation was 3.4 per cent. In 144 of them in which the result is recorded, a cure was secured in 67 per cent, and improvement in 20 per cent. In addition to the risk to life, the external operation always gives rise to more or less deformity, and may be followed by complications. Skillein,<sup>2</sup> in a review of his 20 cases, has found some unpleasant after results, such as, ranging from paralysis of the upper lid and anaesthesia of the forehead, to blindness on the operated side from injury to the optic nerve.

To sum up: In the presence of such complications as orbital abscess, the external operation is essential. In other cases, the intracranial operation, with a mortality of about 0.5 per cent, will relieve about 98 in some 50 to 75 per cent, and has no unpleasant sequelae. The radical external operation has a mortality six times as great, due to deformity and other complications, but will ensure relief in 80 to 90 per cent of cases.

**Ethmoidal and Sphenoidal Sinuses.** Suppuration of either may cause death by meningeal involvement; or, in the case of the sphenoidal sinus, by a septic thrombosis of the cavernous sinus. This event is rare, but St Clair Thomson<sup>3</sup> has collected 40 deaths as a result of sphenoidal sinusitis. Both conditions usually occur together and associated with suppuration in the frontal sinus and antrum.

A cure will usually result when the cavities are freely opened intracranially; but, in the case of the ethmoidal cells, anatomical conditions sometimes prevent this being satisfactorily performed without undue

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L. J. W. 22.

### NEPHRITIS.

**Acute Nephritis** is always a serious disease which demands a guarded prognosis. Yet there is a natural tendency to recovery, and in many cases recovery does take place, with apparent return to normal kidney function. Some authorities hold, however, that complete recovery is more apparent than real, and that a kidney, once attacked with acute inflammation, is fit permanently, were and liable to recurrence of inflammatory disease. This is particularly well illustrated in the case of scarlatinal nephritis. In considering prognosis in a given case, the first essential is to establish the duration of acute nephritis, and to eliminate the existence of an acute exacerbation in the course of a subacute or chronic nephritis. Diagnosticians may be easy in private practice if the physician is familiar with the patient before the onset of his illness, but when seen for the first time during the attack diagnosis may present difficulties. An acute onset, with possibly some fever, a urine in all in amount (of high specific gravity, containing copious albumin, blood, and mucous tube casts) in absence of definite cardiovascular changes, these point to an acute nephritis. If cardiovascular changes are recognized, the physician is bound to suspect the existence of an acute exacerbation in the course of a chronic nephritis. An estimation of the quantity and specific gravity of the *Castellani's* urine will, at times give assistance. If the amount be about the normal, and the specific gravity a little low, in underlying chronic condition should be suspected and a guarded prognosis given. Unfortunately for diagnosis, acute nephritis does not always show the frank onset as given in the text books, but may begin insidiously, and be only discovered when its existence for some time has led to feelings of ill health, and on examination of the urine the presence of albumin and blood is discovered. In such cases, the diagnosis is often difficult, and the ultimate prognosis does not seem to be so favourable as when the onset is sudden and frank. The patient's history may and by putting the physician on his guard; pyrexia, headache, polyuria, frequency of micturition at night, point to a chronic lesion. In health, as is well recognized, the amount of urine secreted during the twelve hours of day is three to four times the amount of that secreted during the twelve hours of night. In certain disease conditions, and especially in chronic nephritis, this ratio is altered, and the quantity of night urine may equal, or even exceed, the quantity secreted during the day. This leads to a complaint of frequency of micturition at night, a complaint which may be one of the first symptoms for which advice is sought in chronic interstitial nephritis.

If the diagnosis of acute nephritis be established, what are the

chances of complete recovery, and what of the duration of the disease? The statistics of the Royal Infirmary, Edinburgh, show that during the years 1904 to 1912, 400 cases of nephritis, diagnosed as acute, came under treatment. Of these 185 were cured, giving a percentage of cure as 46, while 215 could be regarded as "relieved," i. e., had passed into a subacute or chronic condition, with relief of symptoms, but liable at any time to a relapse, with an acute exacerbation of their chronic disease. The mortality in the 400 cases was 51, or 12 per cent. Such statistics, though they cannot be strictly applicable to nephritis in private practice, are nevertheless far from reassuring, and show how guarded the prognosis must be. In giving a prognosis, the practitioner is guided by the severity of the attack and the cause of the affection. Thus, the acute nephritis of scarlet fever and the true acute nephritis—*goldthorn*—may be, and often are, very rapidly fatal. On the other hand, in a considerable number of cases of nephritis—*not* consequent upon specific infection—the acute symptoms subside, the albuminuria disappears, and the patient may be discharged as cured after an average stay in hospital of six weeks. Even then prognosis must be guarded, for subsequent attacks are common, and the inflammatory reaction does not clear up with the same facility on the second occasion. The principal factors which influence prognosis during the acute stage are: the amount of urine which the kidneys are capable of secreting; the condition of the cardiovascular system; the presence or absence of uræmic symptoms and secondary inflammatory conditions.

When the *quantity of urine* is reduced to a few ounces of a highly albuminous, blood-stained fluid, or when there is complete anuria, prognosis is very grave. Complete anuria is said by some to be invariably fatal; but, while this is commonly true, it is not universally so, as cases are recorded, and it is the writer's experience, that recovery may take place after from twelve to fourteen hours, or even more, of complete suppression.

*The condition of the cardiovascular system* merits careful consideration. A frequent, irregular pulse, with evidence of loss of myocardial activity, is always of grave import. The gravity of the condition may be accentuated if hæmaturia, or possibly hæmorrhage from the coronary canal, has led to any considerable anemia; in fact, the occurrence of marked anemia may turn the scale against recovery. Hæmaturia is usually a terminal phenomenon, and is commonly of a profuse character.

*Edema* is a common cause of death, especially, according to Dickenson, in patients over sixteen years of age; in younger patients, inflammations of the respiratory tract are even more fatal than œdema. Edema of the lungs and of the glottis are very grave phenomena, which may appear with great suddenness, and prove fatal in a few hours.

The question of prognosis in acute nephritis is always difficult and uncertain. Most surprising recoveries may take place. Equally

surprising and disappointing fatalities may occur, say, from a uræmic convulsion in a patient who, casually examined, does not appear to be in a critical condition. As with treatment, so with prognosis: every case must be carefully studied, considered on its own merits, and due weight given to the more important factors. Amongst other factors, consideration must be given to *response to treatment*. Favourable signs in the early stages are an increase in the quantity of urine and a diminution in the œdema; in the later periods, diminution in the albumin, blood, and formed elements in the urine, and a definite diuresis. When improvement is taking place, not only is there an increase in the quantity of urine and a diminution in the amount of albumin, but a change takes place in the character of the deposit: epithelial cells and free blood corpuscles become less numerous, and epithelial and blood casts are gradually replaced by the hyaline and granular varieties. It has been suggested that some prognostic value can be attached to the size, and especially to the breadth, of the tube casts found in the deposit—large broad epithelial casts showing a profound desquamation of the tubules, but it seems very doubtful if reliance can be placed on this factor. At times, in the course of an acute nephritis, improvement seems to take place—albumin diminishes, the urinary quantity returns to about the normal—but the patient remains somewhat uræmic, a little œdema may be found about the eyes and ankles, the centrifuge shows the presence of granular and fatty casts, and, after a time, the radial artery becomes faintly palpable. Such a patient is passing into a condition of subacute diffusèd nephritis, and ultimate recovery seems doubtful. Particularly disappointing are cases where improvement is, at first, apparently rapid, the urinary amount returns to the normal, with only a trace of albumin, and casts are difficult to find, even with the centrifuge; yet, whenever the diet is altered from the minimum of protein and the maximum of carbohydrate and fat, a fresh exacerbation takes place, accompanied by hæmaturia. In such cases, the kidneys have been so damaged that they cannot undertake a reasonable amount of work, and the chance of ultimate recovery is not good. Yet, in acute nephritis, even when apparently of a hopeless character, there is always a chance of recovery, which encourages the physician to persevere in therapeutic measures. The writer well remembers the case of a young man who had been ill for two months. The urine was greatly reduced in quantity, and contained copious albumin, blood, and tube casts of all varieties. There was universal anasarca, so marked as to require draining: Southey's tubes were introduced into the legs, and a trocar into the abdomen. For five days the patient lived on a nitrogen- and chloride-poor diet, and passed most of his time seated on the edge of his bed with the feet dependent, draining continuously, the tubes being changed from time to time. With the disappearance of the œdema there was relief of the circulation, the rested kidneys regained their functional activity, and within a few months the patient passed an Army Board for a commission in India.

One may sum up experience, then, by saying that in acute nephritis prognosis must always be guarded; recovery may take place even in apparently hopeless cases; but a considerable proportion of the sufferers pass into a subacute or chronic condition, with interstitial and cardiovascular changes, from which complete recovery never takes place. (See also SCARLETT FEVER.)

**Chronic Diffused Nephritis** is very justly looked upon as a grave condition, the prognosis in which is bad. Cases are recorded where recovery has taken place; but there always remains the doubt if the line had been sufficiently drawn between a somewhat persistent form of acute nephritis and a true chronic diffused nephritis. The fatal issue may occur in from six months to two years, and may result from general exhaustion, with pronounced anæmia. These patients frequently exhibit profound aboratory disturbance, and can neither take nor assimilate sufficient nourishment. Frequently there is failure of the myocardial tonicity, with dilatation and pronounced anasarca. Œdema, in its protean manifestations, or pneumonia, may prove the terminal feature; or an infective process, resulting in an inflammation of serous membrane.

Prognosis will always be grave, but certain features will help in assessing the gravity. When there is marked diminution in the quantity of urine, and anasarca is universal and extreme, and the phenol-sulphone-phthalein and other tests show a marked loss of functional activity, the patient will seldom survive more than a few months. When the urinary quantity is not much reduced below the normal, and the urine, though containing a large amount of albumin, shows only a limited number of tube casts and leucocytes, and the functional activity is not pronouncedly reduced, the condition may run a much more chronic course, and pass ultimately into the 'small white kidney.' The patient may have periods of fair health; but a small upset, such as a mild tonsillitis, may precipitate grave symptoms, with a recurrence of œdema; and during one of these exacerbations the patient dies. Help in prognosis may be obtained by considering the functional activity of the kidneys, the condition of the circulatory system, and the results of treatment. When there is marked delay in the excretion of iodide of potash, or of phenol-sulphone-phthalein, the prognosis is grave. Yet at times the excretion of the phthalein may be as low as 16 per cent in two hours, months before the fatal issue. Cardiac dilatation and arterial degeneration are of grave import. Œdema may be due to salt retention; but salt retention may be combined with degenerative changes in the smaller vessels, and with cardiac failure. When œdema is due to salt retention, there will be diminished chloride excretion in the urine, and a salt-free diet will usually give considerable amelioration of symptoms. When salt-free diet is instrumental in producing a diuresis with diminished œdema, prognosis is less grave than when vascular degeneration and cardiac failure are causal factors which are unaltered by a salt-free diet. In those cases the mere mechanical presence of the fluid in the cavities and

tissues has a deleterious influence on the functional activity of the organs, and increases malnutrition. Neither the alimentary canal nor the heart can carry on its work efficiently; anaemia and malnutrition increase; and defective coronary circulation adds to the difficulties of the already congested heart. Again, it may be found that, at times, a period of protein-free diet will give considerable relief of symptoms. Speaking generally, then, it may be concluded that response to treatment makes the immediate prognosis less serious, while want of proper response renders it very grave.

**Chronic Interstitial Nephritis.** Pathologists are gradually returning to the view that the underlying and primary factor in chronic interstitial nephritis is a disease of the smaller blood-vessels, a widely diffused disease of the arterioles of the internal organs, in which the vessels of the kidney participate. The disease, in its fully developed form, involves the kidney, producing the primary contracted or small red granular kidney. This being so, it may at once be granted that the condition is incurable. True it is that Senator has stated that recovery is possible if the disease is taken early; but this, if correct, is exceptional, and is outside the hell of practical politics. Yet cases as seen in private practice must not be assessed at the same degree of gravity as the fully developed picture obtaining in the hospital ward. The established diagnosis of chronic interstitial nephritis does not by any means condemn the sufferer to a life of invalidism. In the writer's experience, the existence of chronic interstitial nephritis has been compatible with an active business career for fifteen years after the diagnosis was definitely established. Other observers have recorded cases where the condition has lasted twenty, and even thirty years. Prognosis depends, not so much on anatomical changes, as upon the functional activity of the kidney and of the heart. This being granted, it is obvious that the patient has a right to a full knowledge of his condition and the factors which should regulate his life. For much of the outlook will depend upon his ability to lead a simple life. It is fortunate when the disease is discovered early, and when the physician can obtain the hearty co-operation of the patient in regulating diet and working hours, with a view to maintaining reasonable health and prolonging life. As Duneway points out, cases of chronic interstitial nephritis fall into two groups. In one group the clinical picture is that of some degree of cardiac insufficiency, and death is a cardiac death. In the second the predominant symptoms are cerebral headache, vertigo, and apoplectic attacks, and there is evidence of severe renal insufficiency. In forming an estimate of the gravity of the prognosis, consideration must be given to the condition of the circulation, to the kidney function, and to the occurrence of complications of a uraemic type. Every case will require individual study, and too much importance must not be given to a single factor.

Cardiac hypertrophy of the concentric type, with high blood pressure, will be present; yet if the functional activity of the organ be maintained, immediate prognosis may be favourable, but unfavourable

phenomena are those suggestive of loss of compensation—palpitation, dyspnoea on mild exertion, and marked increase in the area of cardiac dullness, with some oedema about the ankles. These factors show a loss of tonicity. No doubt they may disappear under therapeutic measures, but they show that the heart has been working beyond its reserve, and that a breakdown is imminent. In this respect, consideration of the *blood-pressure* is important. It may be accepted that, within reasonable limits, high blood-pressure is necessary in these cases to maintain the functional activity of the kidney; but excessive blood-pressure throws extra work on the heart, and it may break down under the strain. A blood-pressure of 180 to 200 mm. Hg. or over, must tax the powers of the heart considerably, and must lead in the end either to cardiac insufficiency or to a cerebral hemorrhage. A systematic estimation of the blood-pressure will greatly help the practitioner in forming a prognosis. Given that it is moderately high, constant from month to month, with no signs of failing tonicity, and with fair general health, prognosis may be regarded as comparatively favourable. If, however, notwithstanding treatment, the pressure is persistently rising, prognosis becomes grave: either the heart will fail, or a cerebral hemorrhage will close the scene. (See *ARTHRITIS TENSIONIS, HIGHER*.)

A factor which must be taken into consideration in prognosis is the patient's ability and willingness to carry out treatment. The patient who can spend the winter months in an equable and mild climate, pay occasional visits to a spa, and carefully carry out directions as regards the avoidance of chills, over-work, and dietetic errors, has obviously a far better chance of prolonged life than the working man exposed to all weathers, or the harassed professional or business man living a life of strain.

The manner of death in chronic interstitial nephritis must always be uncertain: most commonly, however, it is a cardiac death, a death from failing compensation, at times combined with distressing uramic symptoms. Cases of sudden death from cerebral hemorrhage are not uncommon.

*Albuminuric Retinitis.*—The practitioner will find the systematic use of the ophthalmoscope a most valuable aid to prognosis in chronic nephritis. The retinal changes which may be present have been enumerated by Gowers as: diffused opacity from oedema, white patches, hemorrhages, optic papillitis, diffused retinitis, and optic atrophy consecutive to inflammation. Of these changes, the first three are comparatively common, the second three are of less frequent occurrence. The most characteristic and striking are the white or grayish glistening spots about the macula and optic disc and, in more advanced cases, scattered through the retina. At first small and attended, they may coalesce and form larger spots which, situated in the proximity of the disc, may be as large as the disc itself. At the periphery, they occur as numerous small glistening points; or they may be white or interrupted lines, or fan-like streaks, in all directions,



These changes are degenerative in character, and may be accompanied by hemorrhagic extravasations; or extravasations may occur alone, and may vary, according to age, from the bright red of the recent, to the dark red and finally atrophic patch marking the site of absorption of a former, extravasation. The vessels of the retina will often show sclerosis, and as Gunn pointed out, they have an exceptionally bright reflex; the central light streak is very distinct and sharp, while the whole surface of the vessel is of a somewhat lighter shade than usual. These changes in the retina are degenerative in character, and are collectively described as albuminuric retinitis. They occur most frequently in chronic interstitial nephritis, and are of very grave import. A patient with definite albuminuric retinitis seldom survives more than two years; a few cases are recorded where the patient has lived for longer, but these are the exception, not the rule. The gravity of albuminuric retinitis in its bearing on prognosis cannot be over-estimated. (Such a statement does not, of course, apply to the retinal changes which may occur in the kidney of pregnancy; there, complete recovery of kidney health may occur, but the patient may be left with permanently damaged vision).

*Estimation of Renal Function.* To the physician, anatomical changes are only important in so far as they interfere with the functional activity of an organ. By investigation of the activity of the kidney, valuable data will be obtained for the estimation of prognosis in nephritis. Of the different functional tests, the most valuable is the phenol-sulphone-phthalein test described by Row, Tree and Garrigly; the simplest for the practitioner is the iodide of potash test.

The phenol-sulphone-phthalein test depends upon the capacity of the kidney for the excretion of the pigment. The apparatus required consists of a one-litre flask and a colorimeter. Before making the observation, the patient is given a drink of water. The injection, which can be obtained in an ampoule, 1 c.c. of which contains 6 mgrms. of the phthalein, is injected into the muscles of the lumbar region. The patient empties the bladder at the end of one hour after the injection, and again at the end of the second hour. The urine voided at the end of one hour is poured into a litre flask, and rendered strongly alkaline with caustic soda solution to give the maximum red colour; water is now added to the litre mark, and the mixture shaken and, if necessary, filtered to remove phosphates. The standard colour for comparison is obtained by the dilution of 1 c.c. of phthalein solution in a litre of water. This is placed in the standard tube of the instrument, while the urinary mixture is placed in the observation tube; the colours are adjusted, the scale is read off, and the percentage of excreted pigment obtained. Unless the excretion of phthalein is very much retarded, the ordinary urinary pigment does not interfere with accurate estimation. In health, 43 to 70 per cent (usually about 50 per cent) of the pigment is excreted during the first hour, 70 to 90 per cent during the first two hours; excretion is practically complete after two hours. A diseased kidney shows a very marked decrease in excre-

tion during the first two hours. No pigment may appear by the end of the second hour in very grave cases of renal inadequacy. Excretion is noticeably decreased in acute nephritis, but it is especially in acute and chronic conditions that the test is of value in estimating prognosis. Phthalein is excreted mainly, if not entirely, by the tubules. Efficient excretion points to a deficient functional activity of the tubules.

No absolute figures can be given as a guide to prognosis from the fractional test; but, speaking generally, an excretion of 50 per cent and under shows serious renal inadequacy. In many cases of parenchymatous nephritis, excretion falls to 30 per cent or lower; the lower the percentage, the graver the prognosis. In chronic interstitial nephritis, when the kidney function is being fairly well maintained, excretion will be from 50 to 60 per cent. When uramic phenomena are present, the percentage will fall very low, in some cases even to zero. In these cases there is pronounced inadequacy, with nitrogen retention. In chronic nephritis, a pronouncedly low excretion points to an unfavourable prognosis, even though no apparent uramic phenomena are present.

The iodide of potash test is simple, but not of the same value as the phthalein test. If  $7\frac{1}{2}$  gr. of iodide of potash be given to a healthy individual, it will be recognizable in the urine in a very few minutes; and the total quantity will be excreted within about sixty hours, when the urine will no longer give the tests for iodine. Iodide of potash is excreted by the tubules, and when there is disease of the tubules the excretion of iodide is greatly delayed, the time being doubled or even tripled in some cases.

*The Non-protein Nitrogen of the Blood.* The non-protein nitrogen of the blood is made up for the most part of urea, uric acid, and amino-nitrogenous bodies, and credit is due to the French school for strongly insisting on the importance of their estimation in considering the question of prognosis in nephritis. To Folin we owe a method of estimating non-protein nitrogen which is simple and accurate. The non-protein nitrogen of the blood stands in health at from 22 to 26 mgms. per cent. It can be influenced by diet, increasing after a full meal containing considerable protein, and diminishing on fasting. When kidney function is interfered with, there may be diminished excretion of nitrogenous waste products, and the blood-nitrogen will then rise. This phenomenon is not, however, present in every case of nephritis, and a normal or only slightly raised blood-nitrogen is a favourable factor in prognosis. When blood-nitrogen rises to 100 mgms. or over in nephritis, the patient is suffering from serious nitrogen retention, there is grave renal inadequacy, and the prognosis is serious. At times the blood-nitrogen may rise to a high figure. Speaking generally, it may be stated that when the non-protein nitrogen of the blood rises above 100 mgms., the duration of the illness may be reckoned in days, seldom in weeks. (See also UREMIA.)

Francis D. Boyd.

**NERVE INJURIES.** These differ from those of other structures by reason of their function. Not only does the nerve itself suffer, but the parts supplied by it are affected, and it is with regard to these as well as and more often than, to the nerve itself, that the treatment is directed and the prognosis depends.

Injury may affect a nerve in its course (in continuity) or at its termination, one of its branches of distribution being involved.

#### INJURY IN CONTINUITY.

Two groups are recognized:

1. Those in which the naked-eye continuity of the nerve is interrupted *partially* or *completely*, which I am accustomed to term anatomical division.

2. Those in which the injury produces partial or complete interruption of conduction without naked-eye solution of continuity. To this I give the name physiological division. This classification, which was introduced by the writer in 1903,<sup>1</sup> is now generally accepted.

**Prognosis in General.** Prognosis depends not only upon prompt treatment at the time of the accident, but to a large extent on efficient supervision for many months. The treatment of injury to a nerve in its continuity consists in keeping up the nutrition of the parts supplied by it and preventing the occurrence of contractures in muscles opposed to those affected, until conduction is restored by natural means alone or aided by operation. In comparatively few cases, apart from accidental wounds in which it is essential, is operation necessary; it should always be avoided if possible, and sufficient time given to be certain that recovery will not ensue unaided.

The large number of peripheral nerve injuries that have come under observation during the course of the War have revealed no new facts with regard to prognosis. They have, however, amply confirmed our previous experience.

Relaxation of paralyzed muscles must be maintained until voluntary power is restored; unless this is done recovery may be indefinitely delayed. This muscular relaxation is the most important point in treatment, but it is the one most often neglected. It is quite useless to undertake the treatment of a case of nerve injury unless this can be carried out. While formerly it was a common experience to find patients with nerve injuries, particularly those of the musculospiral, under treatment with no attempt being made to relax the paralyzed muscles, it is fortunately now a rarity. During the last two years I have admired the ingenuity displayed, often unnecessarily, in the construction of splints to prevent it. The simplest apparatus suffices, and, as long as the muscles are kept relaxed, is all that is needed.

In cases needing operation it is too often assumed that when once the ends of the nerve have been united the surgeon's work has ceased; it has only just begun. The careful supervision of the patient and

the direction of the treatment, it may be for two or three years, is most important.

*Complete Anatomical Division.*

In complete anatomical division, immediate primary suture is the correct procedure, the nerve being united by absorbable suture and wrapped to prevent the formation of adhesions.

**Prognosis after Primary Suture.**—Primary union, by which was understood union of the divided ends of a nerve without the occurrence of complete degeneration in its peripheral end, is not possible. This subject excited considerable controversy between the years 1860 and 1880. 'De Latievaux' is due the principal credit of explaining by his clinical observations the fallacies upon which the assumption was based.

Before recovery can take place, degeneration must occur in the peripheral end of the nerve, followed by regeneration and reunion with the central nervous system.

Many papers have been written concerning the time of recovery after primary suture, but in the majority of instances they consist of collections of isolated cases recorded by others. The fallacies are so numerous, the question of the exact details of the operation and after-treatment is so impossible to define in collections of this type, that the conclusions are of little value.

One of the earliest tables of collected cases occurs in Howell and Huber's masterly paper on the regeneration of nerves. They concluded that 66 to 80 per cent of the cases recovered.

Sir Anthony Bowley<sup>1</sup> appears to have been the first to attempt to settle the question by personal observation of a series of cases. He observed the results of 28 cases of primary suture, in many of which, however, the first note was made several years after suture. He considered 16 were successful and 4 failures.

Dr. Henry Head and the writer<sup>2</sup> published a series of cases investigated at short periods from suture to recovery. The question was fully considered by the latter in his Erasmus Wilson Lectures in the following year.<sup>3</sup>

Perfect recovery is possible after primary suture: perfect function may be restored to the affected muscles and no difference noticed to the patient in the sensation of the part as compared with the corresponding sound one. Although possible and I have seen it follow primary suture even of the ulnar nerve—it is unusual. For it to occur, the operation of suture must have been carried out with great care, the wound must heal by first intention, and the after-treatment be efficient.

The prognosis will depend to a certain extent upon the nerve injured: for example, the musculospiral nerve in the lower third of the arm carries no exclusive supply to any portion of skin, and the muscles it innervates are not so intimately associated with delicate movements of the fingers as are those supplied by the ulnar. Complete

recovery is reached more frequently and more rapidly than in other nerves.

The further the seat of injury from the periphery, the longer the time necessary to full recovery, and the less likely is it to occur.

I have personally observed over seventy cases of primary suture. In all, motor power was regained and the second stage of sensory recovery completed. It is unusual, however, for complete recovery to ensue. In a recent paper, Spisharny<sup>7</sup> states, from investigation of 18 cases of suture, that perfect recovery did not occur in a single case, but 65 per cent of the patients were able to resume work.

If the nerve injured is the median or ulnar, it is improbable that recovery, either motor or sensory, will be sufficient to enable delicate movements to be skilfully performed. Thus, while the hand might be perfectly useful to an unskilled labourer, it would be a useless member to an artist or executive musician.

The time after suture at which recovery occurs varies with the distance of the point of suture from the periphery and the method of healing of the wound: suppuration prolongs it very considerably. In division of one of the nerves of the forearm, muscular recovery commences about nine months after suture, but perfect sensory recovery cannot be expected under three years.

**Secondary Suture.** Recovery is much slower and prognosis less hopeful than after primary suture (except in the case of the musculospiral nerve): in none of my 53 personal cases of suture of other nerves or in many in whom the operation was carried out by others, which have been seen at varying times after suture, did perfect recovery ensue. While this is possible after primary suture, it is improbable after secondary.

Secondary suture of the musculospiral nerve, if the operation is correctly performed and the after-treatment carefully carried out, should be followed by perfect recovery. During the present war this has become a common operation. When sutured in the middle of the arm, recovery of the supinator longus and extensors of the wrist commences about the sixth month, and all the muscles are acting voluntarily by the twelfth.

The first question to be considered is the relation of the interval between division and suture to recovery. Howell and Huber,<sup>8</sup> and Kennedy,<sup>9</sup> among others, considered that the prognosis was better, and the time of recovery shorter, the sooner after injury the nerve was sutured. I stated in my *Trismus Wilson Lectures* that there was no *direct* relation between the length of time which has elapsed since the injury in cases in which operation was performed before the lapse of two to three years. This is in agreement with Bowlby's<sup>10</sup> experience. Although I believe that the time after injury at which suture is performed has no direct relationship to the length of time necessary for recovery, it has an important indirect one, in that most of the factors hindering complete recovery develop as time advances.

Although instances of 'successful' operation have been recorded nine (Jlessop<sup>11</sup>) and fourteen (Chaput<sup>2</sup>) years after division, muscular recovery is unlikely after about three years.

There are many factors to take into consideration in estimating the chances of recovery: If the nerve was divided in an open wound, its method of healing—nothing hinders recovery to so great an extent as suppuration; the condition of the muscles as regards wasting and the retention of irritability to the constant current; the presence of contractures in opposing muscles, and the condition of ligamentous structures surrounding joints. The condition of the hand of a patient, for example, who has suffered division of the ulnar nerve below its dorsal branch, in whom a marked claw-hand has developed, is little likely to be improved by suture although the muscles may regain their irritability to the interrupted current.

The time after the injury at which the operation should be performed is of great importance at the present time. The majority of operations necessary as the result of war injuries of nerves have to be carried out through tissues which have been infected and in which suppuration has often been prolonged. *At least* six weeks should elapse between the *sound* healing of the wound and any operation on a nerve. Unless sufficient interval has elapsed, infection occurs, preventing complete success.

It is extremely important to attempt to estimate the probable extent of recovery. From the motor standpoint, if great wasting with contracture has occurred, as is so common after ulnar injuries, operation is not worth undertaking; if there is no contraction on stimulation with the constant current on several examinations, suture is useless. The length of time irritability persists varies, but I have obtained response twenty years after division. But if trophic ulceration is present, operation will cure it and prevent recurrence, for protopathic recovery is almost certain, and ulceration, as Head and the writer have shown, ceases on the restoration of protopathic sensibility.

Considerable interest attaches to the commencement of the first stage of restoration of sensibility. From time to time instances of 'rapid' return of sensibility after secondary suture have been recorded by many observers, among the more recent being Ballance<sup>6</sup> and Kennedy.<sup>12</sup> I have examined for it after operation in fifty-three personal cases, but have not yet observed it. My attention has more than once been drawn by hospital residents to the 'rapid return of sensibility to prick,' after secondary suture, which, on careful testing in the usual manner, proved to be deep sensibility. In one patient upon whom I had performed secondary suture of the median nerve, it was said that sensibility to prick had returned on the day following operation. On testing, I found that he complained of pain on pressure, but could not distinguish the sharpness of the point of a pin: it was equally painful, and produced the same sensation, as pressure with the blunt end of a pencil; moreover, he was entirely insensitive to

the painful interrupted current, and all temperature appreciation was absent. There was no doubt that the pain was that caused by deep pressure, which could be readily evoked before operation.

The time of commencement of the first stage of sensory recovery may be shorter than after primary suture, the changes of the peripheral end necessary to regeneration of the nerve being advanced at the time of suture. I have seen it as early as the thirtieth day, but much variability obtains, and, speaking generally, the time necessary for the completion of the first stage is always long, and the interval between the second and third nearly double as long. I have never yet seen perfect sensory recovery after secondary suture (except in the case of the mauseiospiral), although I have watched patients for over seven years, and examined them up to fifteen years after suture. In all, some difference could be appreciated between the two limbs, an area of changed sensibility remaining, with imperfect appreciation of the compass test. Much less variation occurs with regard to motor recovery, but the time required is invariably longer.

**Prognosis after Nerve Bridging.** Under the 'nerve bridging' are included all those procedures which are undertaken to restore anatomical continuity when the ends of a divided nerve cannot be brought into apposition. We have a choice of methods that have been used more or less successfully from time to time. Those of proved value may be put into four groups.

1. Transference of a portion of nerve from another source (nerve transplantation).
2. Provision of a path along which the nerve may regenerate (tubular suture, flap operations, etc.).
3. Utilization of neighbouring nerve (anastomosis or crossing).
4. Shortening the limb by resection of bone.

Nerve transplantation is the operation of choice. In 1903 I investigated the recorded cases of nerve transplantation, added fresh cases, and brought others up to date. Among the 30 cases, 8 were examples of transplantation of human nerve (homotransplantation); of these only 3 were reported at a sufficient interval after operation to admit of recovery. This was complete in 2. Out of 22 instances of transplantation of nerve taken from one of the lower animals (heterotransplantation), 16 were reported at a period after operation that would have admitted of some recovery; of these only 4, or at the most 2, recovered completely.

Tubular suture aims at providing a path for the new axis-cylinders, free from fibrous tissue. Many substances have been used for this purpose, among them decalcified bone, collodion, preserved animal's artery. I prefer a tube composed of a portion of one of the patient's superficial veins. In performing this operation the nerve is prepared and both ends are freshened; a portion of superficial vein of appropriate size is then excised and slipped over one end of the nerve. The ends are loosely united with catgut, the vein is drawn over the junction, and the whole surrounded with Cargile membrane. The

results given by this operation are superior to those obtained from hetero-transplantation.

The results of flap operations have been uniformly unfavourable.

The possibility of utilizing neighbouring nerves attracted the attention of investigators at an early date. Two distinct operations are included: nerve crossing and nerve anastomosis. In nerve anastomosis, an attempt is made to bring the axis-cylinders of the affected nerve into end-to-end contact with some of those of the sound nerve; in nerve crossing, the peripheral end of the affected nerve is united end to end with the central portion of a divided sound nerve.

Excluding the cases in which the operation was performed on the facial nerve, I collected 25 examples; of these, 12 were reported at a sufficient time after operation to enable an opinion to be given as to the result. Two were undoubtedly perfectly successful. Four were certainly improved by the operation and were probably successes, but the records are too scanty to enable a definite opinion to be given. Thus, out of the 12 cases reported sufficiently long after the operation, only 2 were failures; some improvement took place in all the others. This is a better result than that given by Powers,<sup>16</sup> who considered that 50 per cent were successful.

The prognosis in cases of bone shortening is that of secondary suture.

#### *Incomplete Anatomical Division.*

In order to understand the prognosis of these injuries, their nature must first be considered.

In wounds of nerves which do not completely interrupt continuity, it is found that at least a third of their diameter may be destroyed without producing any change, or one of a transient nature only, unless the injury is near the point at which a branch is given off, when the symptoms resemble those of division of that branch.

This is confirmed by the experiments of Briandet and Humbert,<sup>17</sup> who found that the fibres in a peripheral nerve which go to make up any branch do not become grouped until just before it leaves the parent trunk. In certain situations also—for example, in the anterior primary division of the fifth cervical nerve, the nerve fibres are arranged in a well-defined order, and incomplete division of this nerve may entail complete division of those motor fibres which supply the spina and deltoid muscles. Again, in the trunk of the great sciatic nerve the external and internal popliteal nerves remain separate; hence incomplete division of the great sciatic may cause complete division of the external or internal popliteal nerve.

In accidental wounds of nerves, in addition to the incomplete anatomical division, there is usually physiological division, the result of the transient compression of the intact nerve fibres by the cutting instrument or effused blood.

Absence of symptoms in many cases is due to the fact that more



nerve fibres are present in the trunk of a nerve than are necessary to the supply of the part. When symptoms are present the recovery of function is due to restoration of conduction in the fibres which have suffered an incomplete physiological division. Those fibres which are separated from their nerve centres must of course degenerate and regenerate before they can again carry on their functions. It must, however, be remembered that the injury to the anatomically intact nerve fibres may be so great that complete physiological division is produced; this may also arise at a later period as the result of compression by fibrous tissue.

If efficient treatment at the time of the accident, or later, is carried out, recovery is usually perfect, both motor and sensory. In some cases, however, in which the treatment at the time of the injury was not operative, complications ensue. After a period of improvement, deterioration of function sets in, due to involvement in fibrous tissue. Recovery in these cases does not usually occur apart from operation.

In other instances pain arises in the full distribution of the injured nerves, sometimes accompanied by hyperaesthesia, in rare instances by glossy skin. In these cases the damaged portion of the nerve should be removed and continuity re-established; the prognosis is then that of secondary suture. It has been my experience during the present war, however, that in many of these cases this ideal treatment is impossible on account of the extent of nerve involved. In such circumstances I have resorted to injection of the nerve above the seat of the injury with 90 per cent alcohol. This has proved completely successful in my hands, resulting in the immediate relief from the agonizing pain from which these patients suffer. Sensation begins to be restored, and nerve recovery ensues, at about the same time as after primary suture at the site of injection. Pain very rarely recurs.

**Subcutaneous Injuries.** Taken generally, prognosis is much more favourable than after nerve section, except in the case of traction injuries of the brachial plexus.

As the result of pressure, long-continued or sudden, all the immediate symptoms of complete division may develop. When the injury is incomplete and physiological, recovery rapidly ensues. All forms of sensibility recover together and the power of localization, so seldom restored after suture, is rapidly regained. With regard to motor symptoms, unless the reaction of degeneration develop, voluntary movement is quickly regained by the affected muscles. Restoration of sensibility to all forms of stimulation is usually perfect within six to twelve months.

At the end of a fortnight, if the affected muscles are still paralyzed, their electrical reactions should be taken. If at this date the muscles react to the interrupted current, or give the reactions of incomplete division, non-operative treatment should be continued. Recovery can be confidently expected in the former case in a few weeks, in the latter in a few months. If true reaction of degeneration develop, the prognosis is unfavourable; operation becomes necessary, with all the

drawback of secondary suture. After neurolysis has been carried out, recovery is usually rapid.

#### INJURY TO TERMINAL BRANCHES.

The principal symptom of the involvement of the terminal branches of a nerve in scar tissue or callus is pain referred to the distribution of the roots from which the affected nerve arises, with in some cases paresthesia or paralysis. In civil life these symptoms are seen most often after finger amputations.

The prognosis is good if the condition causing the symptom is removed by operation, when the pain and tenderness are still confined to the scar or stump; when they have spread to other nerves, or are associated with hysteria or muscular atrophies, it is by no means favourable.

If the pain is not relieved, or recurs, no further local operation should be done if the first was thorough. Before proceeding to the only remaining operative treatment in these cases—division of posterior roots—Weir Mitchell treatment must be tried after removal of all cause for worry. It is useless treating advanced cases while compensation proceedings are pending. Weir Mitchell treatment must also be adopted after operation in the cases complicated by hysteria. When muscular symptoms are present, the affected muscles must be kept relaxed by suitable apparatus, and daily massage given until voluntary power returns. It is often twelve months before muscular recovery is complete.

At the present time we are all familiar with these symptoms after amputation of the limbs for war emergencies. In many of these cases no attempt can be made to cut the nerves short, so that the frequency of painful stumps is not to be wondered at. Both free excision and the injection of the nerve well above the seat of the mischief give good immediate results. The prognosis of the former is, however, better, as in the latter the cause of the pain usually remains to re-establish it after the effects of nerve blocking have passed off.

#### SPECIAL NERVES.

**Facial.** The nerve may be injured as the result of fracture of the base of the skull primarily or from involvement in callus, and during the course of mastoid operations, during operations in the parotid or submaxillary regions, or from forceps pressure during childbirth.

When injured as the result of fracture, whether involved primarily or secondarily, the division is usually incomplete, and perfect recovery ensues in about three months. Facial paralysis following operation on the middle ear is, as a rule, due to incomplete division. Spontaneous recovery is usual in the majority of cases, but may take twelve months. The incomplete facial paralysis, which may occur as the result of operations in the submaxillary region, is rarely permanent if the wound heals by first intention.

Careful electrical testing is necessary in order to enable an opinion to be given with regard to the necessity of operative treatment. If true retraction of degeneration develops, no time should be lost, but operation carried out.

In but few cases is it possible directly to unite the divided ends of the nerve: nerve anastomosis is necessary.

The best results are given when, as first suggested by Korte,<sup>15</sup> the hypoglossal is used and the anastomosis is of the partial peripheral type. The prognosis varies with the cause of the paralysis, being better when the division results from injury than when it is the result of neuritis. Suppuration of the operation wound renders success doubtful.

The first sign of recovery usually appears about the third or fourth month, the face while at rest becoming more symmetrical, although there is no return of voluntary power. A few weeks later it is noticed that the angle of the mouth can be moved, at first only with movements of the tongue; then the muscles of the upper lip, and finally those of the forehead. With exercise, the movements become dissociated, and finally emotional movement may return.

For a few weeks after operation, the side of the tongue is paralyzed, causing difficulty in speech and deglutition: this passes off, but the affected side may remain smaller for a considerable time.

In forty cases collected by the writer improvement occurred in all reported at a sufficiently late date; but in comparatively few did emotional movement return, the face on the side of the injury remaining immobile in smiling. It is safe to say that in the majority of cases the appearance of the face at rest will become normal.

**Recurrent Laryngeal Nerve.** This nerve is not infrequently injured in operations upon the thyroid gland. The paralysis is usually temporary, and disappears within three months. At the end of that time recovery has not taken place, operation offers a good chance for recovery. In the first case of secondary suture recorded (Shelton Horsley<sup>16</sup>) recovery was almost perfect fifteen months later.

**Brachial Plexus.** It is now well established that the prognosis of injuries to the brachial plexus, taken as a whole, is worse than those elsewhere, although, as noted by Bardenheuer,<sup>17</sup> and more recently by Winnen,<sup>18</sup> the seriousness has been exaggerated.

Von Bruns<sup>19</sup> found that while spontaneous recovery ensued in 66 per cent. of substance injuries of peripheral nerves, only 26 per cent. of similar plexus injuries got well spontaneously. Warrington and Jones,<sup>20</sup> from the examination of cases under their care, found spontaneous recovery in 30 to 40 per cent. Winnen 30 per cent. with 70 per cent. improvement. These unfavourable figures are due in part to the nature of the injury. In a large proportion of cases the nerves are overstretched, and this results in hemorrhage into the sheath and consequent fibrosis: in addition, if it leads to rupture, the fibres give way at different levels: hence spontaneous recovery

is neutral when the signs of complete division are present, and is apt to be imperfect in cases of incomplete division. Again, it is possible that the injury in some cases tears the roots away from the cord. Even after operation, the prognosis is not so good as, for example, after secondary suture of the median at the wrist or the musculospiral. This has to do to a great extent with the length of time necessary to complete recovery: in many cases the patient ceases to attend for efficient after-treatment, and when recovery of the nerve has finally become complete, the muscles are atrophic, and contractures of the opponent muscle render the regeneration of the nerve futile.

*Brachial Birth Paralysis.* The prognosis is favourable if efficient treatment is adopted from the time of birth. Perfect recovery has taken place in 70 per cent of the cases under my care: but in these lesions particular care is necessary in order to prevent overstretching of the paralyzed muscles and over-action of their opponents. Unless this is carefully attended to, although the nerve recovers completely, the child is left with a damaged limb. This point has recently been emphasized by Fairbank<sup>21</sup> who has devised an efficient splint for the purpose.

With regard to operation: this is necessary only in a minority of the cases. If at the end of three months from birth the reaction of degeneration is present, operation should be carried out as soon as convenient. If it is possible to excise the damaged portion of nerve and perform end-to-end suture, the outlook is favourable: but when this is impossible and nerve anastomosis becomes necessary, perfect recovery is unlikely to take place.

*Post-anæsthetic Brachial Paralysis.* These injuries of the plexus are by no means uncommon, although published cases are few. Cotton and Allen<sup>22</sup> in 1903, were only able to collect thirty from the literature. It occurs in patients in whom, during the course of operation, the arms are abducted and externally rotated or raised above the head. The right arm is usually affected. Stretching over the head of the humerus with the arms elevated above the head is the probable cause of the intraclavicular injuries. In all cases the lesion is incomplete, corresponding to the slight violence which produced it.

The prognosis is good: all the cases that I have had under observation have recovered completely without surgical intervention, and all except one of those collected by Cotton and Allen.

*Injury due to Presence of a Cervical Rib.* A cervical rib is by no means an unusual cause of injury to the brachial plexus as the result of long-standing pressure. In cases in which the nervous symptoms are marked, removal of the rib is the only treatment. The result of this is on the whole good. As in other cases in which muscles are affected as the result of prolonged nerve-pressure, the question of perfect recovery will depend upon the extent of the wasting and deformity produced. When this is well marked, some atrophy and deformity of fingers always remain.

The nervous symptoms fall into two groups, paralytic and neuralgic. As a rule these co-exist. The subject has been fully discussed at the Royal Society of Medicine.<sup>25</sup> Thorburn reported 20 cases (14 personal), and came to the conclusion that pain was relieved in four-fifths; paralysis cured in certainly one-half. Sargent, as the result of operation on 29 cases, speaks of "the most gratifying immediate results obtained in those cases in which pain had been the prominent feature." Hinds Howell collected the after-results in 25 cases and came to the conclusion that "in the majority of cases pain will be relieved or cured. With regard to muscular weakness and atrophy, the expectation is that the operation, if it is not too long delayed, will greatly improve the condition." (See CURVET RŪ.)

It was pointed out that a paralysis of the brachial plexus may occasionally occur as the result of operation, but if performed by those skilled in the procedure is unusual and transient.

Operative treatment undoubtedly removes the most distressing symptom of this condition.

**Circumflex Nerve.** Injury to this nerve is unusual and is usually subcutaneous, the result of pressure of the dislocated head of the humerus or a crutch, and results in an incomplete physiological division. Treated on the usual lines, recovery ensues as a rule, but is generally slow. Even if the paralysis persists, operation is not often necessary, for the supinator and clavicular fibres of the pectoralis major acting with the trapezius may compensate for its loss.

**Ulnar Nerve.** The prognosis in cases of injury to the ulnar nerve depends upon the care taken to prevent the development of claw-hand. If in cases of incomplete division or after primary suture a suitable splint is worn, perfect recovery may take place, although it is unusual in the latter.

Perfect recovery never ensues after secondary suture, or releasing the nerve from pressure in case of injury the result of old deformity of the elbow or long-standing dislocation. Some weakness of the intrinsic muscles of the hand always remains.

**Musculospiral Nerve.** The prognosis is more favourable than after injury of any other nerve. It supplies no important area with sensibility, its muscles are none of them intrinsic. Most of its injuries are subcutaneous, resulting in incomplete physiological division. If treated by relaxation of the paralyzed muscles, recovery is rapid, and usually perfect within three months. When operative treatment is necessary to free the nerve from injurious pressure, restoration of function usually commences in a few weeks. After secondary suture, motor power usually returns in nine to twelve months, and perfect use is regained within eighteen.

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James Sherrin.

**NEURALGIA, TRIGEMINAL.** We shall only consider here the prognosis of the severest form of neuralgia, *tic douloureux*, and shall assume that ordinary medical treatment, and the examination of the teeth, nasal accessory sinuses, etc., has proved abortive. The neuralgia is severe in character, comes on in occasional paroxysms, and shows no tendency to spontaneous cure.

The methods of treatment, then, with which we have to do, are (1) *The peripheral neurectomies*; (2) *Alcohol injection*; and (3) *The removal of the Gasserian ganglion* by the Hartley-Krause method.

1. **The Peripheral Neurectomies** such as removal of a piece of the lingual and inferior dental nerves, excision of the intra-orbital nerve, or the Braun-Lossen operation on the second division of the trigeminal nerve, are all comparatively safe, so far as the immediate risk to life is concerned; they have the very serious drawback that permanent cure by their means is most exceptional; and when it does occur, it is always open to suspicion that some peripheral dental or other cause, capable of simple treatment, has been overlooked. Out of 43 cases treated by neurectomy, the average duration of relief from pain was ten months (Putnam and Waterman).

2. **Alcohol Injection** into the Gasserian ganglion is somewhat difficult of technique, and it may not be possible to reach the desired spot; but it appears to be perfectly safe, so far as risk to life is concerned. Even if the injection is made by mistake into the subdural space, nothing worse than a headache results. The relief given, if the alcohol can be correctly placed, is very marked, and lasts for a long time, even if it is not permanent; there is usually complete freedom from pain for many months or years. Harris was able to give this relief in 80 out of 86 cases. The test of success is the production of immediate anesthesia in the whole distribution of the fifth nerve. The injection can be repeated, if recurrence takes place, with equally good results.

Hartel followed up 25 cases, 15 for more than six months; of these 15, 9 were free from pain and 6 relapsed. A serious trouble is that keratitis may result; this took place in 6 out of the 25 patients, and one eye had to be enucleated. Possibly covering the eye may give better success.

I have had several very successful cases. In one of them there was some temporary facial palsy.

**Removal of the Gasserian Ganglion** is, no doubt, a serious operation, but the mortality, in skilful hands, is not as high as is commonly supposed. Horsley, Hutchinson, and Krause together report a death-rate of 4 per cent. Some years ago, Horsley had operated on 120

patients with 6 deaths. Rawling puts the mortality at 5 per cent. Very possibly it may be higher in the practice of those who have seldom or never performed the operation.

The relief appears to be certain, complete, and permanent.

Hence again there may be trouble with the eye. Hartel shows that keratitis has followed in 30 out of 207 successful removals of the ganglion, that is, about 15 per cent.

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A. B. Noble, Short,

**NEURITIS.** There are two great groups into which cases of neuritis are classified: (1) *Multiple or peripheral neuritis*, when many or all of the peripheral nerves are involved; (2) *Local neuritis*, where only a single nerve, or portion of a nerve, is affected.

**1. Multiple Neuritis or Polyneuritis.**—In most cases this is due to some poison. This poison may be introduced from without, as in the cases of alcohol, arsenic, lead, or (less commonly), mercury, phosphorus, or copper; or it may be the result of micro-organisms producing specific diseases, or of their toxins, as in diphtheria, influenza, malaria, septicæmia, gonorrhœa, beri-beri, leprosy, syphilis. Multiple neuritis may also be produced by poisons arising within the body, as in diabetes, pregnancy, etc.

Of these varieties, the commonest of all is alcoholic polyneuritis. It is unnecessary to describe the clinical features of this disease. Its onset is insidious, and the symptoms may take weeks or months to attain their maximum intensity. If the alcoholic habit continues, the neuritis persists indefinitely, until the patient becomes bedridden; contractures of the limbs develop, especially in the feet; and the patient dies, sooner or later, from some intercurrent malady, usually of pulmonary origin. If however, the poison be withdrawn, and if massage and electrical treatment are then assiduously carried out, the symptoms may even continue to increase for two or three weeks, before coming to a standstill. There is then usually a stationary period of one or two months before signs of improvement begin to appear. Then the pains and the hyperæsthesia gradually diminish, the cutaneous anaesthesia clears up, and the motor paralysis recovers in from four to six months from the time of onset of improvement: the proximal muscles recover before the distal. Last of all, the deep reflexes return: a patient may have complete sensory and motor recovery for weeks or months before the deep reflexes reappear.

The *prognosis as to life*, in a case of multiple neuritis from any cause, depends on various factors. The motor, rather than the sensory, symptoms are of significance in this respect. The more rapid the onset of paralytic symptoms, the more dangerous is the case. When the symptoms have attained a considerable severity within a few days, there is a grave risk of extension to the respiratory muscles. Implication of the diaphragm and intercostals greatly increases the seriousness of the case, more especially if the cardiac muscle be encircled, as is so

often the case. Patients with multiple neuritis have a particularly feeble power of resistance to pulmonary infections, whether by the tubercle bacillus, the pneumococcus, or other organisms; and the presence of lung complications, even a simple bronchitis, is always a serious matter in such patients.

A characteristic form of mental affection, known as *Korsakow's psychosis*, occurs in some cases of polyn neuritis. Its symptoms are those of mild mental confusion, especially with regard to times and places, together with impairment of memory for recent events; so that a patient who is bedridden from polyn neuritis may give descriptions of recent long walks which she has taken (the patient is usually a woman), and of the various people and places whom she has thus visited.

The nature of the poison which produces the multiple neuritis has little or no influence *per se* upon the prognosis as to recovery. The different forms of polyn neuritis run a similar course. A great deal, however, depends on whether the source of the underlying poison, once it is recognized, has already been removed, as in diphtheria or septicaemia; whether it can be cut off with ease, as in lead or arsenic; whether there is a tendency to relapse, as in alcohol; or finally, whether it cannot be removed, as in diabetes, cancer, leprosy, etc.

**2. Local Neuritis.**—Recognition of the underlying cause, and its removal, if possible, are the first essentials in every case of local neuritis. Thus, in a neuritis due to local pressure (e.g., by crutches, callus from an old fracture, cervical ribs, tumours, etc.) the underlying cause can sometimes be removed. In other cases, the exciting cause has already produced its effect on the nerve trunk, and we have to deal with the result (e.g., in local neuritis due to bruising or inflammation of the nerve, or to exposure to cold). In other cases still, we have to do with a disease which produces a primary degeneration of the nerve fibres (e.g., in diabetes, malaria, enteric fever). In a still further class, the fibrous tissues of the nerve trunk, its sheath or perineurium, are primarily attacked, and the degenerative changes are secondary (e.g., in gouty, syphilitic, and leprosy neuritis). The prognosis, then, of any individual case of localized neuritis is that of its underlying cause.

**Electrical Reactions.**—In cases of local neuritis of a mixed nerve, where sensory and motor phenomena are present, sensory functions generally recover before motor, although this rule is not without its exceptions.

With regard to motor paralysis, the prospects of recovery are best estimated by a careful study of the electrical reactions. To make an accurate prognosis, however, the motor paralysis must have lasted at least ten days, to allow time for degenerative changes, if any, to have developed. If, after ten days or a fortnight of motor paralysis, we find the typical 'reactions of degeneration'—i.e., total loss of fibrillar excitability, with reversed polar reactions and a slow, sluggish



response to galvanism, the degeneration of the nerve fibres is complete, and recovery will not commence for three months at least, possibly not for a year; and even then, if recovery ultimately sets in, it will probably be imperfect and associated with a certain amount of contracture. If on the other hand, the electrical reactions are normal to faradism and galvanism, or if there be merely a quantitative diminution, without polar changes, recovery may be expected to begin in from three to six weeks from the onset of the paralysis. Sometimes we meet with partial or incomplete reactions of degeneration, consisting in a sluggish contraction to galvanism, with reversed polar reactions, but with preservation of a certain amount of faradic response. In such cases, we may expect improvement in from six to eight weeks from the onset of the paralysis. Examination of the reaction of the muscles to *condenser discharges* is a valuable addition to faradic and galvanic stimulation as a means of electro-diagnosis and prognosis. A healthy striated muscle-fibre reacts to condenser shocks of the smallest condensers (e.g., 0.04 to 0.12 microfarad), with the shortest and fastest wave lengths; whereas a degenerated muscle requires larger condensers (e.g., 0.50, 1.00, 2.00, or even 3.00 microfarads), with longer and slower wave lengths.

Purves Stewart.

#### ORCHITIS, TUBERCULOUS. (See EPIDIDYMITIS, TUBERCULOUS.)

**ESOPHAGUS, STRICTURE OF.** Stricture of the oesophagus may be (1) *Functional (cardiospasm)*; (2) *Simple*, usually due to scar contraction after swallowing a corrosive; (3) *Malignant*.

1. **Cardiospasm**, a condition in which the entrance into the stomach is tightly contracted, whilst the oesophagus above may be hugely distended, is rare. It may be recognized by the oesophagoscope, and by a skiagram after a bismuth meal. It persists for years, apart from treatment, and shows no tendency to spontaneous cure. Dilatation, by various complicated means, usually gives a good result.

2. **Simple Stricture**, due to scarring, may be recognized by the history, by skiagram, by the failure to admit a bougie, and by the glistening white appearance without ulceration seen with the oesophagoscope. At least 9 out of 10 of the cases can be dilated up by bougies, passed, if necessary, by the aid of the oesophagoscope. If this fails, a temporary gastrostomy will often allow of successful retrograde catheterism; or, in a week or two, the rest to the oesophagus allows of a bougie being passed. Dilatation of the stricture has to be kept up for many years at regular intervals. Osler reports on the cases treated at Vienna during ten years. Out of 47 patients, 27 were treated by dilatation, with 24 cures and 4 death; 14 by gastrostomy and retrograde catheterism, with 10 cures and 4 death; 6 by gastrojejunostomy, etc. (for burns of stomach), with 5 cures and no deaths; the other patients were improved, or lost sight of.

3. **Malignant Stricture**, of course, has a hopeless outlook. Apart from gastrostomy, the duration of life is usually not more than six

months from the onset of dysphagia; that operation prolongs life a few months. A good many deaths, and one success, have followed excision of the growth.

REFERENCES.—*Surg., Gyn., and Obst. Abstract*, 1913, xvi, 17.

*A. Rendle Short*

**OSTEITIS DEFORMANS (PAGET'S DISEASE).** Of this rare disease there are not many more than a hundred cases recorded, but most surgeons of experience can recollect one or two others which have not found their way into print. It is a chronic incurable affection which may not shorten life.

The strange feature of the prognosis is the considerable probability that a malignant bony growth will eventually appear. Of 34 cases followed to their termination, this was the cause of death in 12.

REFERENCES.—*Edushie, St. Bart's, Hosp. Rep.* 1908, 121. *A. Rendle Short.*

**OSTEO-ARTHRITIS (See ARTHRITIS DEFORMANS.)**

**OSTEOMALACIA.** This disease appears to be more commonly met with on the Continent and in some parts of India than in England or America. It affects young women for the most part, though a few cases are recorded in males and in children. The outlook is very grave. According to the older authorities, it goes on in most cases to a fatal termination in from two to ten years, the patient being bedridden most of the time. Durham records 22 out of 145 cases in which natural recovery, more or less complete, was observed. It is most unfavourably influenced by pregnancy, and is often first recognized at that time. As is well known, the pelvis becomes very contracted, and Cesarean section will probably be required. The child is normal. Many of the mothers have died in childbirth.

In a small number of cases, double oophorectomy has been performed, and there is some evidence that this improves the outlook. Fehling reports 14 cases; 6 of these were cured for three years or more; 2 were better for a time and then relapsed; the rest died or were lost sight of. Other observers have recorded temporary benefit with relapse following.

There are a few cases known in which great benefit followed adrenalin injections.

REFERENCES.—Durham, *Guy's Hosp. Rep.*, x., 1064; Knapp, *Amer. Jour. of Obstet.*, 1912, lxxv, 582.

*A. Rendle Short.*

**OSTEOMYELITIS.** It is not easy to estimate the prognosis of such a disease as this in formal terms, for any bone may be affected, and with every degree of severity.

**Prognosis as to Life.**—In many cases there is very considerable danger to life. The rare infections of the skull and vertebral column are very fatal, and the majority of young children with perforation into the joint (Sir T. Smith's *Acute Arthritis of Infants*) also die.

Even with the commoner affections of the long bones there is grave risk. During the years 1904 to 1910, at the London Hospital, 34 per cent of the patients died; the usual causes of death were endo- or pericarditis, empyema, or abscess of the lung. Others die of cachexia at a later date.

Signs of danger are—extension of the infection over the whole length of a large bone such as the femur or tibia, involvement of the hips, knees, or ankle-joint, multiple bone involvement, rigors, and signs of trouble in the chest. In chronic cases, great wasting and cachexia, apart from efficient treatment, point to a probably fatal termination.

The younger the patient the graver the outlook. Early and thorough surgical intervention is of the utmost importance in the acuter types of the disease.

**Prognosis as to Limb.**—Very early operation, laying open the whole infected area, will avert the long illness which necrosis necessarily involves. Unfortunately the surgeon is generally too late, and part of the bone will die. In the worst cases, the periosteum is rapidly stripped up and the osteoblasts are killed, so that no regeneration of bone will take place. This is the rule in necrosis of the lower jaw. Usually, however, an efficient new bone is formed in time; but it takes months for the sequestrum to separate, and again, after that is removed, for the sinuses to close. It is likely to be from six months to a year or more before the patient is well.

Necrosis of the popliteal plate of the femur is a very trying condition for all concerned, as the separation of the sequestrum may take an interminable time. Many of the cases are cut short, at last, by an amputation, on account of failure of the general health. If the knee-joint is involved it is usually necessary to amputate, but I have seen one such case, infected from the femur, in a fair way to recovery.

Sometimes an attempt is made to avoid amputation by excising the tibia, leaving only the epiphyses. New bone is regenerated, but in my experience the limb is useless, and in one of my cases a pyæmic infection of the other hip took place.

REMARKS.—Kennedy, *Brit. Med. Jour.*, 1912, ii, 114. —A. Rouille Short.

**OVARIAN TUMOURS.** The prognosis in ovarian tumours is very largely dependent upon the nature of the growth. With the exception of certain adventitious accidental phenomena which we shall consider later, the outlook is good, doubtful, or bad according to the histological characters. At the outset, it cannot be too definitely asserted that naked-eye characters alone are an insufficient guide; and in no region of pathology are the services of an expert histologist, experienced in the study of ovarian tumours, more valuable than in expressing an opinion upon such a growth; even under the microscope, there are certain cystic-solid tumours on which it is difficult to express a decided opinion.

The relative proportion of benign to malignant tumours varies considerably; thus Macnaughton-Jones<sup>1</sup> collected the figures from

German climes, and in a series of 2893 cases only 41 per cent were reported as malignant; while Mrs. Scharlieb<sup>2</sup> found 16.6 per cent malignant out of 150 cases, and Glendinning<sup>3</sup> found 17 per cent carcinomatous out of 106 cases occurring in the Chelsea Hospital for Women in the years 1908 and 1909.

From the point of view of prognosis, we have always been in the habit of dividing ovarian tumours into three groups: (1) *The simple* (forming the largest section); (2) *The semi-malignant*; and (3) *The malignant*.

1. **The Simple.**—In the simple unilocular ovarian cysts, the results of operation are good: probably there is no more uniformly successful operation in surgery. A small proportion of cases have to be opened up again owing to slipping of the ligature round the pedicle, and occasionally such a case is lost. This accident usually results from ligaturing a large pedicle together with a piece of the broad ligament, so that when the uterus is pulled on or displaced, a portion of the ligated tissues tends to be withdrawn. A more remote accident occasionally follows failure to bury the stump of the pedicle: in such a case the sequence of events is the formation of a band, the passing of gut under the band as in hernia, and eventual strangulation.

2. **The Semi-malignant.** This variety comprises those ovarian tumours known as proligerous cystadenomata and papilliferous ovarian cysts. In these cases, the chief difficulty arises in excluding malignancy, as many of them simulate edimmar-cell carcinoma very closely. They are here distinguished from the properly malignant cysts because they do not show true metastases; secondary masses are the result of contact implantation; they are practically never found outside the abdominal cavity unless they occur in the scar of an abdominal incision; and they do not invade the lymphatic glands.

The presence of secondary nodules on the peritoneum, omentum, or intestine is not to be taken as indicating hopeless malignancy. Thoulm<sup>4</sup> has recorded cases in one of which there were vegetations all over the peritoneum, and yet at the end of four years the patient was apparently well and cured; while in another case, having to leave a tumour the size of a hazel nut in the pouch of Douglas, he was able to assert three and a half years later that this mass had not increased in size. Pozzi<sup>5</sup> says that he has himself observed that vegetations present on the intestines at the first operation were absent at a second operation.

The presence of ascites, although obviously a grave complication, is not to be regarded as hopeless, as numerous observations have been made in which the ascites was not necessarily fatal. The gelatinous fluid often encountered in some cases in this group must be taken as grave, but is indicative of the semi-malignant character. The ordinary rules as to recurrence in malignant growths scarcely apply to the cases belonging to this group. Thus, Pozzi<sup>5</sup> operated on a young girl with enormous ascites, and removed double papillomatous ovarian cysts; after twenty years the growth took on malignant characters, and the

patient did not survive the second operation more than eighteen months. Such an observation, although extreme, is typical of many cases, and leads to the conclusion that in some instances the growths take on a more malignant nature.

The clinical characters of the more malignant tumours in this group are rapid and sudden enlargement, rapid loss of weight with cachexia, extensive fixation to neighbouring viscera and structures, considerable oedema of the limbs and abdominal walls when the volume of the tumour and the amount of ascites is taken into consideration, and, finally, the presence of pleurisy.

The operative results in these cases are not good. Thus, in Mrs. Scharlieb's<sup>2</sup> series, the immediate mortality—within a month of operation—was about 15 per cent, and at least 50 per cent were known to have died within three years. There seems to be no doubt that many cases in this group, if caught early before dissemination has occurred, are comparatively successful; when ascites and secondary vegetations are observed, it is still advisable to remove both ovaries if possible, as although the condition is ultimately almost certainly fatal, yet in some cases life is prolonged for years.

Many cases will require tapping from time to time, in order to relieve the intra-abdominal tension. This simple operation has been performed a considerable number of times—over a period of years in some cases.

**3. The Malignant.**—The third group includes malignant tumours, whether cystic or solid. In these cases the outlook is not promising. If at the time of operation there is no evidence of secondary spread—as shown by vegetations on the peritoneum, and the presence of free fluid—the prognosis is generally regarded as better; but it is surprising how often such cases return with metastases within the year; the original diagnosis was that of an endothelioma or cystadenoma, but in the light of subsequent history it has often to be changed to one of adenocarcinoma.

Kachel<sup>5</sup> reports that of all malignant ovarian tumours upon which operation is performed, only 20 per cent are alive after two years, and that a considerable proportion of these cases have extensive recurrences of growth.

**Secondary Changes.** *Axial rotation* occurs in about 2 per cent of cases of ovarian cysts, but generally is much more common in dermoid tumours and in cysts of medium size and ovoid form. The operative results are uniformly good, provided infection and necrosis have not occurred.

**Infection** most commonly occurs following an axial rotation. Provided the case is seen before extensive peritonitis has occurred, the results are good, if drainage is employed for a few days in all cases showing any rise of temperature.

Later results following mild infection of the ovarian tumour are seen in dense peritoneal adhesions, rendering operation tedious and difficult, and greatly increasing the risk.

*Rupture* was found by Spencer Wells, in a series of 1000 cases, to take place in 2.4 per cent, but this figure appears abnormally high. In the majority of cases rupture is caused by rough examination, occurs in broad-ligament cysts, and is attended by no ill effects. In a few cases, however, papillary cysts and dermoids rupture, causing dissemination of vegetations or dermoid structures.

**Ovarian Tumours and Irradiation.**—Ovarian tumours have been treated by  $x$  rays on the assumption that fibroids were under treatment, with the result that shrinkage has been described in one or two instances, but no record of complete disappearance exists. Kelly and Burian<sup>7</sup> record a case of an ovarian cyst which, one year after 60 mgrms. of radium had been applied for forty-seven hours, showed a reduction in volume from 8 to  $4\frac{1}{2}$  inches in diameter.

**Ovarian Tumours and Pregnancy.** The questions of operative interference and the result to be expected therefrom have special importance when pregnancy is complicated by the presence of an ovarian swelling. The inclination both of the medical attendant and of the patient is to postpone any operative interference; but the following figures, taken from a statistical article by Barrett,<sup>8</sup> point unmistakably to the conclusion that the operative line of treatment is much the better course. He gives the results in 114 cases. Of these, 76 were operated upon before term; the maternal mortality is given as 1.3 per cent, and abortion or premature delivery occurred in 12 per cent; in 8 cases double ovariectomy was performed, and in six of these cases pregnancy continued to term. The other 38 cases were treated expectantly, and were not operated upon before term; the maternal mortality was 18.4 per cent; of the total 38 cases, 7 escaped operation, but 4 of these died, and the remaining 3 still have their cysts.

**Prognosis of Ovarian Cysts apart from Operation.**—In the absence of operative treatment the question of the prognosis is more difficult. It is necessary to refer to older writers, such as Spencer Wells,<sup>9</sup> who had occasion to see numerous patients who refused operation. He asserted that when the cyst had attained such a volume that the general health was affected, the duration of life would not exceed two years, and that these two years were full of misery, pain, and despondency.

On the other hand, T. P. Franck records a case of cyst known to exist at the age of 13, and still present at 88 years of age. Also cysts have been known to exist for twenty-five and even fifty years, but were generally of dermoid nature.

REFERENCES.—<sup>1</sup>*Proc. Roy. Soc. Med. (Obst. and Gyn. Sect.)*, 1910, i, 97; *Ibid.*, 85 et seq.; <sup>2</sup>*Ibid.*, 96; <sup>3</sup>*Med. Times*, 1881, i, 243 and 275; <sup>4</sup>*Traité de Gyn.*, ii, 933; <sup>5</sup>*Centr. f. Gyn.*, 1907, h, 1603; <sup>6</sup>*Jour. Amer. Med. Assoc.*, 1914, ii, 622; <sup>7</sup>*Surg., Gyn. and Obst.*, 1913, Jan.; <sup>8</sup>*Ovarian and Uterine Tumours*, 1882.

*Bryden Glendinning.*

PAGET'S DISEASE.—(See OSTEITIS DEFORMANS.)

**PANCREATIC CYSTS.**—Cysts of the pancreas, excluding hydatids and blood cysts, are usually due to pressure upon the pancreatic duct, either by chronic inflammation of the head of the gland, or scarring after an injury. Thus being so, they almost invariably show a steady increase in size which necessitates interference, though they may not at the time be causing any great inconvenience. The usual procedure is to open the cyst, perhaps apply carbolic acid to its interior, plug it with gauze, and drain. To attempt to dissect it out is ordinarily too dangerous to be worth the trouble.

The simple operation for drainage is not very serious. Of 160 cases in the literature collected by Mayo Robson, 20 died and 140 recovered, though 1 died later of diabetes. Of 138 cases cases treated by incision and drainage, 16 died; of 22 treated by partial or complete excision, 4 died. Mayo Robson himself had 11 patients, of whom 10 recovered. There is, however, a good deal of trouble occasionally from persistence of the sinus, and the discharge may contain active trypsin which leads to self-digestion and a raw painful condition of the skin about the orifice of the drain. On the other hand, if the sinus closes, in a few cases the cyst has reformed.

A. Rendle Short.

**PANCREATITIS.** We shall have to consider the prognosis of (1) *Acute pancreatitis*, including the suppurative, hemorrhagic, and gangrenous varieties; (2) *Abscess of the pancreas*; and (3) *Chronic pancreatitis*.

1. **Acute Pancreatitis.**—By this we mean an acute attack of violent pain in the upper abdomen, with some fever and vomiting and it may be diarrhoea, which is of such severity that an exploratory operation is performed and reveals extensive areas of fat necrosis, and a swollen, inflamed, suppurating, hemorrhagic, or gangrenous pancreas. It is almost impossible to make a diagnosis during life with any certainty apart from the operation findings. It is therefore not feasible to give any account of the prognosis in non-operated cases.

DEATH RATE AFTER OPERATION FOR ACUTE PANCREATITIS.

	Cases	Recovered	Died
Moynihan	11	7	4
St. Thomas's Hospital	16	7	9
Middlesex Hospital	8	2	6
Bristol	7	0	7
Norwich	7	0	7
Korte (literature)	103	41	62
Korte (personal)	34	18	16

Although very grave, the condition is by no means hopeless. Thus Moynihan records 7 recoveries out of 11 operations. At St. Thomas's Hospital, 1907-1911, there were 16 cases with 7 recoveries and 9

deaths: at the Middlesex Hospital 8 cases with 2 recoveries and 6 deaths. On the other hand, at three Bristol hospitals, of 7 cases all died, and Blackland and Claridge have reported a series of 7 cases, all fatal, at Norwich. Korte finds in the literature 161 cases operated on by fifteen surgeons: 41 recovered and 62 died. In his own clinic, 34 patients were treated by drainage of the pancreas: of these, 18 were cured and 16 died. The death-rate is therefore probably about 60 per cent.

The prognosis varies with the following conditions:

*a. The Time of Operation.* Thus Korte relates: Operation in first week, 12 cases, 8 cured, 4 died: in second week, 4 cases, 3 cured, 1 died: operation in 3rd and 4th weeks, 11 cases, 7 cured, 7 died: operation later, all died. It would appear, however, that Korte's series must include a number of mild cases, because in English practice the patient is frequently dead in a week, whether operated on or not.

*b. The Nature of the Operative Interference.* Mikulicz quotes from a series of cases in the literature, where on 36 occasions the pancreas was actively attacked (by blind puncture, etc.) and drained, 25 recovering and 11 dying: in 11 instances it was left alone, and only 4 recovered. Too much importance must not be attached to these figures, because it is probable that the first group contains less acute cases where a definite abscess was found, and that the latter group would include the gangrenous and hemorrhagic cases where there is little to be done except put a drain down to the pancreas. In Korte's series, 7 cases were drained posteriorly: of these, 5 died.

*c. The Operative Findings.* The gangrenous and hemorrhagic cases are very grave indeed, and seldom recover (2 out of 13 in Korte's clinic).

When there was acute pancreatitis without necrosis or pus, Korte saved 11 out of 11.

It is difficult to mention a time of average survival, because the patients differ so. In many cases they are all for less than a week before death terminates their sufferings. Others drag on for a month or more: they are very liable to suffer from self-digestion of the wound, subphrenic abscess, or pneumonia. Korte had 7 cases of severe post-operative hemorrhage, all but 1 proving fatal.

The writer has published a case of acute pancreatitis of the necessary pancreas in the wall of the jejunum, which proved fatal in spite of operation.

**2. Abscess of the Pancreas.** Although grave, the outlook in this group is by no means so serious as in the acute class just discussed. Abscess of the pancreas is generally the late result of a relatively mild attack of acute suppurative pancreatitis. Korte had 7 cases with 5 recoveries. Villar has abstracted from the literature 53 cases of abscess of the pancreas, whereof 33 recovered and 20 died. Some of those who recovered from their immediate trouble were by no means perfectly cured, but eventually developed symptoms of diabetes, phthisis, or extreme wasting.



**3. Chronic Pancreatitis.** We include here those cases in which there is chronic jaundice and perhaps also pain, the diagnosis from gall-stones on the one hand and cancer of pancreas on the other being difficult if not impossible. We do not, in this section, include those cases in which the classical symptoms of diabetes supervene, but there is always the possibility to be borne in mind, in giving a prognosis, that this disease may eventually declare its presence when there is known to be cirrhosis of the pancreas already present.

It is not probable that chronic pancreatitis will get well, apart from operation, when it has advanced so far as to produce persistent jaundice.

Two methods of treatment are possible, cholecystenterostomy and drainage of the gall-bladder. The operation mortality is given by Mayo Robson as 8 deaths in 113 cases from the literature, so that the true mortality may be about 10 per cent. Higher, no doubt, after cholecystenterostomy than after simple drainage. Neither operation can be relied upon to give first-class results; the fistula may fail to close, and if the gall-bladder and duodenum have been short-circuited, sepsis may invade the bile-passages from the bowel. Accurate figures are lacking, but probably the majority of the patients are cured by a cholecystenterostomy.

RELIABLE CASES.—Mikolich, *Ann. Surg.*, 1903, *ii*, 1; Sampson Handley, *Archiv. Mullhuser Hosp.*, 1912, Feb., 20; Korte, *Ann. Surg.*, 1912, *iv*, 23.

*A. Beattie Short.*

**PAPILLOMA OF THE LARYNX.**—(See LARYNX, PAPILLOMA OF.)

**PARALYSIS AGITANS.** This is a progressive, but not a fatal malady. Beginning unilaterally in most cases, it may remain confined to the face and limbs of one side for years; but sooner or later the other side also becomes affected with the characteristic rigidity and tremor. Worry, excitement, business anxiety, and strenuous mental exertion all aggravate its symptoms. The rigid, mask-like face, with its expressive, of unutterable sadness, not infrequently disguises a cheerful, and even a humorous, frame of mind; although, in other cases, the patient becomes depressed by the consciousness of the inveterate nature of his malady.

The intellectual faculties, however, are usually preserved unimpaired, even in the most advanced stages of the disease. By the judicious administration of hyoscyne, we can usually mitigate not only the rigidity and tremor, but the characteristic restlessness which is so trying to the patient.

*Parves Stewart.*

**PARALYSIS, BULBAR.**—(See BULBAR PARALYSIS.)

**PARALYSIS, INFANTILE.**—(See INFANTILE PARALYSIS.)

**PARANOIA.**—(See MENTAL DISEASES.)

**PARATYPHOID FEVER.** There are two varieties of this disease, one due to the *Bacillus paratyphosus A*, the other to the *Bacillus paratyphosus B*. Before the great war the former was met with in Asia, especially India, and not in Europe; the latter, on the other hand, occurred in Europe and was rare in Asia, and even in Europe was not common compared with typhoid. When, however, the epidemics of 'enteric' fever broke out in 1915 amongst the armies in Belgium and France and the Near East, not only did cases of paratyphoid appear in larger numbers than before, but paratyphoid A was met with as frequently as paratyphoid B.

The fatality of paratyphoid A for all ages before the war was estimated by Bainbridge (1912) to be about 2 per cent, and that of paratyphoid B about 3 per cent. Speaking generally, amongst the military cases the fatality of paratyphoid (A and B together) has been about 3 per cent, certainly not higher than 4 per cent, but it has varied in different groups of cases from below 1 to over 11 per cent. Still, even the highest rate is much lower than that of typhoid amongst males of military age (about 22 per cent), so there can be no question that at the worst paratyphoid is a much less severe disease than typhoid.

There is a difference of experience concerning the relative fatality of the two forms of paratyphoid in the military cases; the English observers appear to have found paratyphoid A, the French paratyphoid B, the more severe.

Death is usually due to some complication, and complications are, on the whole, not so frequent as in typhoid. Hemorrhage, rarely severe, occurs in not more than 5 per cent of the cases of both varieties, perforation in less than 1 per cent, nephritis in 4 per cent, rheumatism in 8 per cent, and phlebitis in 4 to 5 per cent. Pulmonary complications are not very infrequent, and boils and abscesses are common. Relapses take place fairly often—in 7 to 10 per cent.

In paratyphoid the febrile stage may be of several weeks' duration, and, as in typhoid, recovery is slow. It has not been shown that vaccine treatment makes the prognosis more favourable.

It must be remembered that the statistics from which these figures have been taken relate to military cases occurring during the war, and that other factors connected with the conditions of military service may well have had an influence on the character of these diseases.

Paratyphoid can only very rarely be distinguished from typhoid fever, except by bacteriological examination of the blood, stools, and urine, or by careful agglutination tests.

E. H. Coulball.

#### PELLIOSIS RHEUMATICA. (See PURPURA.)

**PELLAGRA.** Pellagra varies greatly in its type, the prognosis being grave in acute cases, but fair in the more chronic forms. According to Lombroso, the mortality among 13,000 cases in Italian hospitals in 1883-4 was 13 per cent, but in 1895 among 55,029 cases collected by Wollenburg it was but 4 per cent, while Sandwith recorded

a similar figure in non-insane pellagrins in Egypt. In America the disease is more severe, the death-rate having been about 15 per cent among 636 insane pellagrins, although according to Bass it is becoming milder in New Orleans. Roberts gives the mortality in the United States as 50 per cent in asylums and about 25 per cent in general practice, but thinks it will become less in time.

In individual cases, bad indications are acute dermatitis with vesicles, a pulse over 120 while in bed, a temperature over 100°, especially with delirium, continued diarrhoea with rapid loss of flesh, and prostration. Steady gain in weight is the most favourable sign, although it is impossible to say in a given case whether a relapse will occur in the ensuing spring. Recent work in America indicating that the disease is due to the deficiency of certain elements in the diet called vitamins, by supplying which it can be cured, will, if confirmed, materially improve the prognosis. Transfusions of blood have also been reported as having proved curative in America.

*Leonard Rogers*

**PEMPHIGUS AND PEMPHIGOID AFFECTIONS.** It is important to make clear exactly what diseases are included under the term pemphigus before endeavouring to estimate prognosis. The description 'pemphigus' has been applied to many eruptions characterized by the formation of bullae or blisters, but the use of the word is now more limited. Recently the convenient term 'pemphigoid' has been coined to cover certain allied conditions which will be considered here.

**Pemphigus Neonatorum** is a bullous variety of impetigo occurring in newly-born infants. The eruption is chiefly on the trunk, and is often associated with a septic condition of the umbilicus. The mortality is about 30 per cent. The cause of death is generally septicaemia or pyaemia, the infection becoming generalized through the umbilical stump. Provided the lesions are confined to the skin, and that they are properly dressed with antiseptic ointments, the outlook is not unfavourable.

**Pemphigus Contagiosus** is the name given to a bullous impetigo which is most commonly seen in the tropics, but is occasionally met with in this country. The eruption consists of large blebs filled with a serous fluid at first, but subsequently the contents may become purulent. To this eruption the name pemphigus is often given, and many of the so-called mild cases of the disease are of this type. The eruption usually yields rapidly to antiseptic treatment.

**Epidermolysis Bullosa** (so-called **Hereditary Traumatic Pemphigus**) is a rare affection, characterized by the formation of blebs containing serum or blood, caused by slight friction or pressure which, in the normal subject, would be unattended with any reaction whatever. It varies very much in its severity, and various degrees are often seen in several members of the same family and through several generations. If severe, it may incapacitate the sufferer from doing ordinary labour throughout life. In the less severe cases, it is a constant source

of annoyance and a hindrance to work. Moreover, the abraded surfaces are liable to infection. Though the disease must be looked upon as incurable, there are cases in which the development of the blibs becomes less marked with the approach of puberty.

**Dermatitis Herpetiformis.** This affection is one of the most troublesome in the domain of dermatology. It is characterized by the development of a polymorphic eruption, consisting of erythematous areas with groups of herpetiform vesicles or bullae of variable size. The eruption is attended with great irritation, and sometimes with pain. It tends to develop in early life, and may persist for many years. The attacks occur at intervals, and vary greatly in their severity. In some cases the periods of intermission are very short, so that the sufferer is rarely free from the eruption; in others, there are long intervals between the attacks. An attack can usually be controlled by arsenic, pushed to the capacity of the patient, and by ointments containing sulphur. In some instances the patient is able to carry on his avocations owing to the limited area affected; in others an almost complete incapacity is produced. We are ignorant of the cause of the affection, and are, therefore, unable to do more than temporarily relieve the condition.

**Hydroa Gravidarum or Hydroa Gestationis** is dermatitis herpetiformis occurring in pregnant women. It commonly appears between the third and sixth month, and often recurs with successive pregnancies; as a rule, the severity of the disease increases with each succeeding attack. In many cases the eruption clears up soon after the delivery of the child; but in some instances the disease may start after parturition. It is rare to find the condition so severe as to determine the pregnancy, and recovery is the rule.

**Paronychia Acuta.** This is a rare affection occurring in butchers and others who handle dead carcases. It is believed to be due to a diplococcus, which has been isolated by Bulloch and others. The prognosis is extremely grave. The symptoms are those of a grave septicæmia, and death occurs in 75 per cent of the cases, in from one to three weeks after the onset of the disease. In the minority of the cases, convalescence begins in from three to four weeks.

**Pemphigus Chronicus.** This disease, which is somewhat rare, is of grave prognosis. Of 30 cases admitted with this diagnosis into the wards of the London Hospital, 19 died, but this does not represent the entire mortality, because several cases running a very chronic course were removed to the infirmary and died there. It is exceedingly difficult to state at the onset what course the affection is likely to run, for many cases begin with a limited eruption, which gradually extends in spite of treatment. As a rule, the younger subjects are most likely to recover. The fatal issue usually occurs in from three to eighteen months, but in some cases a longer course is seen, the disease passing on to pemphigus foliaceus.

**Pemphigus Foliaceus.** This variety of pemphigus is characterized by the formation of flaccid bullæ, followed by a condition of general

exfoliation of the skin. It may be primary, or the sequel of the chronic form of pemphigus, or rarely of dermatitis herpetiformis.

The course is chronic, and the affection may persist, with exacerbations and remissions, for two or three years or longer. A fatal issue is brought about by gradual asthenia, diarrhoea, or some intercurrent disease.

**Pemphigus Vegetans.** This is an exceedingly rare disease, characterized by the formation of bullæ on the base of which vegetations rapidly develop. The fatal issue usually occurs in from two to six months. Though nearly always fatal, a few cases occur in which the eruption is limited to the limbs and trunk, and runs a benign course.

*J. H. Sequerra*

**PENIS, CARCINOMA OF.** Prognosis always depends upon accurate diagnosis, and therefore it will be necessary, before giving an opinion as to the outlook, to make certain that the condition is not a tertiary syphilitic ulcer, primary chancre, or mass of hard warts, all of which are, of course, curable conditions.

Epithelioma of the penis is not a particularly malignant variety of cancer. Apart from operation, it always leads to a fatal termination, usually in two or three years, but cases lasting five or even ten years are on record. The cauliflower type of growth is not so rapid as the deeply ulcerating.

Various methods of operative treatment are in use, such as: Amputation of the penis; extirpation of the penis (Pearce Gould's method); one of the above with bilateral removal of inguinal glands, either at the same time or subsequently.

Mere amputation of the penis, except in a broken-down subject, is a trifling operation. At St. Bartholomew's Hospital, prior to 1900, there was 1 death in 53 cases. The mortality of Gould's operation at that time was said to be 6 per cent. Clearance of the groin glands would, no doubt, add to the risk to some extent, but the immediate danger to life depends far more on the general health of the individual than on the exact nature of the operation.

The end-results were worked out by Butlin<sup>1</sup> in a series of 65 cases treated, prior to 1900, by simple amputation of the penis, usually without clearance of the inguinal glands. Of 65 cases followed three years, 23 were still free from recurrence, or 35 per cent. There were no difficulties with micturition, and coitus was still possible for some of them. The principal factors in prognosis are the rate of growth up to the time seen and, especially, whether the groin glands are palpably enlarged; if they are, the outlook is much more serious than in cases where they cannot be felt.

Of 9 recurrent cases, in 3 the growth returned in the penis, and in 6 in the groin glands only. This is, of course, a strong argument for clearance of the inguinal region. It also demonstrates that total extirpation of the penis by Gould's method need only be adopted for extensive growths, because there is no great tendency to spread back in the corpora cavernosa. It would no doubt be wise, and it is quite

possible, to remove the lymphatics of the deep fascial plane in a continuous sheet, from the growth to the inguinal glands, by a dorsal incision along the penis.

Even if the patient is not permanently cured, amputation of the penis is nearly always a great relief to him.

A study of 100 cases operated on between 1872 and 1905 at the Massachusetts General Hospital has been published by Barney.<sup>2</sup> He points out that recurrence after operation may be quite late; 39 per cent of the relapses are in the first year, but 12 per cent are over five years. Pearce Gould's operation gives no better results than simple amputation. Only one patient out of the 100 died in hospital. Very few patients (2) were cured when the groin glands already showed cancer microscopically.

End-results were known in 90 cases. Of these, 27 were "cured" (that is, alive and well for many years after—or else died of old age over five years later)—and 15 more died, not of cancer, within five years. One of these died in hospital of sepsis. One patient refused operation and was alive eleven years after. Twenty-two died of cancer without another operation, the average period being twenty-four months after removal of the growth. Twenty-six recurred, and 21 of them had a further operation, out of which 11 were "cured" (alive and well, average period twenty-four years after), 4 died of other causes, and 10 died of cancer, the average time from first onset to death being over eight years. Nearly all the recurrences were local, not in the groin glands.

#### RESULTS OF OPERATION FOR CARCINOMA OF PENIS.

Author	Cases	Cured	Died, or of cancer	Survived	Survived over 10 years
Bullie	65	23	—	—	—
Barney	90	27	15	33	15*
			100	100	

We may, therefore, conclude, on the whole, that the mortality of operation is about 1 per cent, and that nearly half the patients have been cured even by the inadequate methods of many years ago. A second operation for recurrence seems to save another third. Probably quite two-thirds would be saved by present-day surgery.

REFERENCES. <sup>1</sup>Bullie, *Operative Surgery of Malignant Disease*, 2nd ed.; <sup>2</sup>Barney, *Ann. Surg.*, 1907, *xlvi*, 890.

L. Rendle Short.

**PERICARDITIS.** (See also RHEUMATIC PERI-, MYO- AND ENDO-CARDITIS.) Nowhere is a knowledge of etiology and pathology more essential to clinical accuracy than in pericarditis. It is quite futile to attempt a forecast of the probabilities in a case of pericarditis without

knowing how it began. There are two reasons for this. First, the lesions underlying or associated with pericardial inflammation may have far more bearing on the course of the case than the pericarditis itself. Second, inflammation of the pericardium runs a very different course according to the cause.

The commonest of all the forms of pericardial inflammation is that which is associated with *rheumatic carditis*. As this is discussed under a separate heading, no more need be said here than will serve to bring it into line with the other types. First, it is scarcely accurate to speak of rheumatic pericarditis as if it were of itself a disease. It is never more than one feature of that which includes it—namely, rheumatic pericarditis.

When the rheumatic infection attacks the heart, the muscle and the mitral valve are always injured, the pericardium nearly always, and the other valves sometimes. When the pericardial inflammation is sufficiently intense, it gives rise to an audible rub. This is so striking a feature of the case that it is labelled 'pericarditis,' and the fundamental fact that the whole heart, and not the pericardium only, is damaged, is lost sight of. Second, the fact that there are signs of pericarditis is nevertheless of considerable prognostic importance, for it is a proof that the dose of infective agent that has been cast into the heart by its coronary blood-supply is a large one. The mortality of cases in which a rub is heard is much higher than in cases of rheumatic carditis without friction (20 per cent, as compared with a mortality certainly under 10 per cent even if only severe cases be included). Third, the permanent disabling of the heart is greater in cases of rheumatic carditis with implication of the pericardium than it is in those that show no signs of pericarditis, for a certain amount of adhesion is an inevitable result of rheumatic pericarditis. The extent to which these adhesions inflict real disability on the heart is doubtful; some allusion to this matter will be made below. Finally (and this also will be discussed below), effusion into the pericardial sac is a very rare complication of rheumatic carditis. Most of the cases in which this used to be diagnosed were in reality cases of acute dilatation due to myocarditis. The whole import of rheumatic pericarditis therefore, is that it is a sign that the attack of carditis of which it is one feature is a severe one. In general, the more definite and intense the signs of pericarditis, the worse is the outlook; but the state of the myocardium is far more important than that of the pericardium, and it is in this direction that one should look for guidance in prognosis.

A second type of pericarditis is that provoked by the *pneumococcus*. This may occur as a complication of lobar pneumonia in adults, or in small children in connection with empyema. In the latter group it is difficult to detect and equally difficult to treat; the results are therefore very bad. The examples of accurate diagnosis and early operation are very few; whereas suppurative pericarditis is a fairly common complication of pneumococcal empyema in infants and young children.

Of the 102 cases complicating lobar pneumonia collected by various writers, 70 or 68 per cent. ended fatally. This of course excludes cases in which the diagnosis was only made post mortem. In both types of case it is possible that operation facilitated by early diagnosis might not have saved many lives; for when pericarditis occurs in small children, the patient is nearly always very ill as a result of an empyema, of which the pericardial lesion is only a complication; and the adults who show signs of pericarditis with their pneumonia are often of the type that resists the original disease badly. Moreover, the pneumococcal effusions are seldom large, so that even if operation were more often possible it might not add a great deal to the patient's chance of recovery. Still, the fact remains that if there is an effusion of any bulk, nothing but operation can save the patient's life. The choice of operation will be considered below.

Cases of *tuberculous pericarditis* do better so far as the immediate results of operative procedure are concerned. It is true that of 12 cases so treated, only 11 are regarded by those who report them as being cured; but this is because in many instances temporary consolidation was followed by aggravation of the lesions in other organs. Tuberculosis of the pericardium is nearly always part of a more general infection, and it is on this fact that the prognosis largely turns. There are two kinds of cases, the chronic adhesive and the acute exudative; the former complicates the more chronic form of pulmonary tuberculosis, the latter arises as the result of generalized infection. The patient's chances of survival turn in part only on the course of his pericardial infection, if there be tuberculosis of other tissues. If it be merely one event in a generalized industry tuberculosis, it is obvious that the only prognostic importance of signs of tuberculosis of the pericardium is that they reveal something of the intensity of the infection, and by that much add to the gravity of the prospect.

Much the same is true of the pericarditis which may complicate the various forms of *septicæmia and pyæmia*. In many cases, no doubt, it is only at the post-mortem that these lesions are found. This fact was borne in upon the writer some years ago, in the course of an investigation into the cardiac lesions of pyæmia. The number of cases of pyæmia recorded in the autopsy books of the old pre-antiseptic days of surgery was in itself a revelation; and in a very large percentage of these the pericardium contained pus. Nowadays this type of pericarditis is happily less familiar, but we encounter it sometimes as a feature of pyopericardium, acute osteomyelitis, and the like. When it occurs under these circumstances, pericarditis is of necessity a grave factor in an already unpromising situation, since it furnishes evidence that the circulating blood is saturated with micro-organisms. But this does not carry with it an immediate sentence of death, for the literature contains several instances of recovery after surgical treatment of pyopericardium due to this type of infection. It is true that in most of these cases death has not been long delayed. Some other lesion of a vital organ, arising from the same infective



process, kills the patient, even though the pericardium has been successfully drained.

Pericarditis is an occasional complication of *typoid fever*. It is not invariably fatal; two of the three cases observed by Thayer recovered.

The same is true of pericardial lesions provoked by *gonococcal* infection; in the case recorded by Robin and Fressinger recovery followed paracentesis.

In the pericarditis of *scarlet fever* the prognosis depends on the nature of the organism provoking it. If the pericardial inflammation be but one member in the course of a severe septic scarlatina, its importance is that it adds to the gravity of the prognosis. If it arise during or after convalescence, it is most probably rheumatic, and the prognosis is that of acute rheumatic carditis.

Four other forms of pericarditis remain to be considered. The so-called *terminal* cases, due to streptococcal and staphylococcal infection, and complicating chronic diseases, especially renal disease, are not always fatal. It is impossible to set this statement on a statistical basis, because there are two facts which vitiate any calculations—the difficulty of discerning between true pericarditis and mere hydropericardium, and the very small percentage of pericardial lesions of this type which are diagnosed during life. In general it may be said that the appearance of pericarditis in any chronic disease such as diabetes, Bright's disease, or cancer, adds substantially to the immediate risks, the chance of survival depending almost entirely on the general condition of the patient at the onset of the pericarditis.

In *traumatic pericarditis* the outlook naturally depends on a variety of factors, apart from the state of the pericardium itself. Limiting our consideration to the pericardial lesions as far as possible, we find that, if all cases be included, the mortality is about 30 per cent. If only those cases be counted in which the injury has failed to penetrate the chest wall, it seems that about three-quarters get well. In the open cases the occurrence of air in the pericardium is not necessarily fatal.

When the pericardium becomes implicated in *malignant disease* arising within the thorax, signs of pericarditis may become manifest. In such, a prognosis of immediacy is added to an already fatal prognosis. This is particularly true of perforation of the cancerous oesophagus into the pericardial cavity.

Last of all, there is the pericardial rub which, appearing suddenly in a case of *chronic myocardial disease*, furnishes proof of some gross lesion of the cardiac wall—thrombosis, embolism, or rupture. This is always a sign of the utmost gravity, for even if the patient be not immediately destroyed, his survival cannot be more than brief.

But it is not only as a revelation of sinister forces that pericarditis carries a threat of death. The rapid collection of fluid within the pericardial sac may kill the patient. There is also the formation of adhesions, and their influence on the cardiac efficiency, to be thought of. Acute sero-fibrinous pericarditis cannot of itself kill the patient;

but it does on the one hand prove the existence of certain collateral dangers, such as rheumatic myocarditis; while on the other hand it threatens more or less directly to hamper and possibly overcome the heart by leading to pericardial effusion or adhesion.

*Effusion into the pericardium*, in amounts sufficient to endanger the life of the patient, is a very rare result of rheumatic infection. Some eminent observers declare that it never amounts to enough to call for paracentesis. There are, however, a number of cases of the kind in which it has been thought necessary to puncture the sac. In these the results were roughly as follows: the course of the case was not materially altered in about 50 per cent; in 25 per cent there was some transient improvement; while in the remaining 25 per cent paracentesis appeared to give material and lasting relief from a condition of urgent peril. The writer has never seen a case of rheumatic pericarditis in which the operation would have been justified, either by the signs during life or by the post-mortem findings. In the series of cases of effusion into the pericardium brought forward at the Royal Society of Medicine discussion in 1910, there were only 9 rheumatic cases in which it had been thought advisable to empty the sac, and in only 3 of these was life prolonged by the proceeding. Clear effusions are perhaps more characteristic of tuberculosis than of any other infective process, but they are often semi-purulent in this disease. As has been already remarked, the immediate outlook in these cases of tuberculous effusion that are diagnosed during life (about 6 per cent of all cases) is fairly good; the choice between paracentesis and pericardiotomy seems to depend on the character of the fluid, the former procedure sufficing for the clear cases, while the more elaborate operation is called for if the exudate be puriform. At any rate, the results in the published cases, in which this rule seems to have been roughly followed, work out about equal. It should be added that if the exudate be hemorrhagic, this is no contra-indication to paracentesis, as cure has followed the operation in several such cases. This is true of pericarditis due to other infections beside tuberculosis. The dangers of simple hydropericardium are as a rule overshadowed by the more direct risks implied by the underlying lesions, and the outlook is therefore that of the cause.

*Purpericardium* is a desperately dangerous disease, whatever the infection that is responsible for it. The risks are, first, those due to such other lesions as the causal infection may have provoked; second, those that arise from the fact that purulent pericarditis is very difficult to detect (in only 6 of Poynton's 100 cases in children was it diagnosed during life); third, those that are due to the risks of surgical treatment, the only form of treatment that can hold out any hope of cure; and finally, those that are included within the possibility of increase of the effusion to the point at which the cardiac movements become fatally hampered.

Suppose the condition has been detected in a patient who is fit to be operated on: what plan of treatment promises the best results? The

figures published by various writers, and tabulated in Blechmann's excellent monograph, show that mere paracentesis has never saved life; that the percentage of survivals after incision of the pericardial sac is about 46 in a total of nearly 400 recorded cases; that the recovery rate following simple incision is 28 per cent; after pericardiectomy with costal resection, 55 per cent; after operation through the epigastric incision recommended by Ogle, 66 per cent. These figures demonstrate clearly the superiority of the methods in which free drainage is secured. Such figures as are available are not very convincing as to the advisability or otherwise of drainage in pericardial tuberculosis; but the general opinion of surgeons and physicians, expressed at recent discussions, is to the effect that if incision be practised at all, it should be sewn up and not left to drain.

In *pneumopericardium* the outlook is of necessity dependent to a large extent on the antecedent conditions; and as it often forms a late incident in a morbid process that would be sufficiently desperate even if there were no rupture into the pericardium, it is not to be wondered at that the death rate is high—28 out of 43 cases (Cowan, Harrington, and Riddell). The more abrupt the invasion of the pericardial sac, the worse the prognosis.

There remains to be considered the vexed question of *chronic adhesive pericarditis*. This is met with under several sets of circumstances. In the cardiac rheumatism of childhood, some adhesion is very common (in three-quarters of Pownton's autopsy cases, and nearly half of the writer's). In the various forms of chronic indurative mediastino-pericarditis the sac is more or less obliterated. A third group of cases is that embraced within the term 'polysclerosis.' These may be due to tuberculosis or to no obvious cause.

It would at first sight appear to be a simple matter to accept the position that adherent pericardium is always a serious condition, but there are two considerations that complicate the issue. In the first place, all the diseases named inflict other disabilities on the heart or other vital organs, and it is difficult to separate these from the direct effects of pericardial adhesion. In the second place, the fact that the pericardium is adherent is by no means always discoverable clinically. The rheumatic type of case is by far the commonest, and here there is, in the writer's opinion, no reliable sign of pericardial adhesion. Of all the phenomena that have been described as pointing in this direction, here is not one that may not be present in the absence of adhesion; and it would seem that all of them are due rather to the great cardiac enlargement that is so constant a feature of just those cases in which post-rheumatic adhesion of the pericardial sac is likely to occur—in the adolescent or young adult who has just managed to survive repeated attacks of acute rheumatic carditis, though with a heart much enlarged and otherwise crippled. Be this as it may, the fact no doubt remains that in those cases of post-rheumatic disease in which there are adhesions not only obliterating the pericardial sac but also binding the epicardium to the neighbouring tissues, the heart

carries on its work far less efficiently than in cases when there are only valvular disabilities to be overcome. If, therefore, the clinician feels himself in a position to diagnose this condition in a case of post-rheumatic heart disease, the prognosis he must form will be much graver; patients in this class of case rarely attain the age of thirty. In the non-rheumatic type of case the prognosis is to be reached along the same lines; if there be signs of adhesion uniting both pericardial layers into one membrane, and that again into inseparable fusion with the surrounding tissues (and nobody claims to be able to diagnose mere intrapericardial adhesions), then the prospect of cardiac failure, within a few years at the outside, is added to such other portents as the disease in its attack on other organs may furnish.

The main interest of the question as to the influence of treatment on prognosis centres around the effect on the patient's outlook of the operation described by some as cardiodysis, but more accurately by others as thorastomy. Of 30 cases of which the writer has been able to collect the reports, only 1 died as the immediate result of the operation; of the remainder, 7 are described as receiving little or no benefit, while in the remaining 22, various degrees of improvement were observed. In reading these records, one is struck by the fact that the disappointments occurred principally in the rheumatic cases, and operations of this kind are not likely to be practised in the future for such cases, except perhaps as giving space to an enlarged heart. The cases most likely to benefit from this operation belong to the polyserositis group.

Curry P. Combs.

**PERITONITIS, PNEUMOCOCCIC.** There are two very definite types of this rather uncommon disease, the prognosis in the one being extremely grave, and in the other remarkably favourable. These are (1) *The diffuse or acute type*, and (2) *The circumscribed or chronic*. Either of these may or may not have been preceded by an attack of pneumonia. The diagnosis can only be regarded as certain when the pneumococcus is found either at operation or autopsy, or, in a few cases, when the pus leaks away at the umbilicus.

**1. Acute Diffuse Pneumococcal Peritonitis.** Of the 30 cases from the literature reported by Amund and Bowen, 46 belonged to this variety. Of 17 cases at the Bristol Royal Infirmary and General Hospital, 12 were acute.

The patients are almost all little girls. They present the clinical picture of an acute general peritonitis of rapid onset, often accompanied by a marked tendency to diarrhoea. In about half the cases there is evidence of pneumonia beginning a day or two previously. The diagnosis of appendicitis with general peritonitis is usually made, but there is no special localization of pain or tenderness in the right iliac fossa.

The prognosis is very grave indeed. Rischbieth quotes 45 cases, 31 of which died. Of the Bristol cases, 11 out of 12 died. Of 6 cases at St. Bartholomew's Hospital, all died. In Amund and Bowen's



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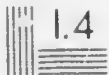
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series, 6 recovered and 10 died. All the Bristol cases except 2, both fatal, were operated on; in Anand and Bowen's list, 18 were operated on and 6 recovered. Cameron's series of 20 cases from Guy's Hospital shows 12 operated on, of whom 3 recovered; 8 others died without operation. The three recoveries each had a second operation to evacuate a residual abscess. The prognosis is not greatly affected by the question as to whether there has been a previous pneumonia or not. If death is going to occur, it is usually within a few days.

In practice, it might be very difficult to give a prognosis because of the uncertainty of the diagnosis before operation; but when there is generalized tenderness of the abdomen with marked rigidity, pain, fever, and diarrhoea, the only diagnoses reasonably probable in a little girl are perforative appendicitis and this disease, and in both the outlook is very grave with immediate operation, and almost hopeless without. One should make certain that there is not a gonorrhoeal vulvo-vaginitis present, because gonorrhoeal peritonitis is decidedly more favourable.

#### PNEUMOCOCCIC PERITONITIS.

	Age	Case	Result	Age	Case	Result
<i>Acute diffuse form</i>	Anand and Bowen, operated	18	6	33.3	12	66.6
	.. not operated	28	0	0	28	100
	Bristol	12	4	8.33	11	91.66
	St. Bartholomew's Hosp.	6	0	0	6	100
	Rischbieth	45	0	0	15	100
	Cameron	12	3	25	9	75
<i>All cases</i>	St. Thomas's Hosp. 1907-11	16	9	56.25	7	43.75
	Gammichael	20	13	65	7	35
<i>Chronic encysted form</i>	Anand and Bowen	43	37	86	6	14
	Bristol	5	4	80	1	20

**2. Chronic Encysted Pneumococcic Peritonitis.** In this very interesting and remarkable disease, one is confronted with the strange sight of a large cavity in the abdomen containing, it may be, parts of pus, surrounded by intestines, liver, and stomach all matted together, and yet the patient is singularly little affected. In one of four cases seen by the writer, the abscess quietly burst at the umbilicus before the girl was sent to hospital; in two others, sisters, the temperature was but little raised, and the patient did not look ill. They came under observation about a week after the onset of the abdominal pain and swelling, and both had had pneumonia. The pus has not an offensive odour, and is thick and creamy.

The great majority of the cases are operated on and recover. In Anand and Bowen's series of 45, the result was known in 43, and of these 37 recovered. Only one of these was not operated on; in this patient the pus burst forth at the umbilicus, and recovery took place. Four out of five Bristol cases of this encysted variety recovered; one

of them has subsequently developed abdominal pain, presumably due to adhesions.

Probably the majority of the cases of pneumococcal peritonitis at St. Thomas's Hospital, 1907-1911, were of this type, inasmuch as 9 out of 16 were cured. The same applies to the Edinburgh Children's Hospital series described by Carmichael.

REFERENCES: Anand and Bowen, *Lancet*, 1906, i, 1591; Rischlaeth, *Quart. Jour. Med.*, 1911; Noon and Morison, *St. Bart's Hosp. Rep.*, 1912, 137; *St. Thomas's Hosp. Rep.*, 1907-11.

A. Ruddle Short.

**PERITONITIS, SEPTIC.** The prognosis of local and diffuse peritonitis is considered under its causative headings (*see* APPENDICITIS; STOMACH, SURGICAL DISEASES OR (Gastric Ulcer, Perforated); PERITONITIS, PNEUMOCOCCIC; PERITONITIS, TUBERCULOUS); but there are some general considerations which may be found useful.

It is well known that the prognosis of peritonitis in the lower abdomen (e.g., of pelvic origin) is much more favourable than when the upper abdomen is involved.

A very important prognostic factor is the degree of intestinal paralysis. Incessant vomiting is grave; on the other hand, if the bowels are opened, the outlook is immensely improved. These are the most important symptoms in judging of the patient's chances. There is a type of case—one variety of which Mr. Sampson Handley has described under the name of *ileus duplex*—often following operation, in which, after a local peritonitis, usually pelvic or appendicular, the coils of small intestine, and sometimes colon also, become matted in the pelvis, producing what is virtually an intestinal obstruction, partial at first, and becoming absolute in the course of a few days, with immense distention of the abdomen. The outlook is always grave, unless there is a definite residual abscess which can be evacuated. If aperients, physostigmine, and enemata do not soon relieve, the patient's best chance will be to have another operation, which may be a short-circuiting, a temporary colostomy, or merely a freeing of the coils of small gut. About half the cases can be saved by one of these means.

Assistance may be given in the prognosis of an acute peritonitis by a bacteriological and cytological examination of the exudate. A *Staphylococcus albus* infection is very favourable; *B. coli* and *Staphylococcus aureus* give average results; *Streptococcus* and *B. pyocyaneus* are nearly always fatal (Dudgeon and Sargent). Quicker, and therefore of more clinical value, is a cytological examination. Some surgeons use this to help them to decide whether to close the abdomen or to drain. The normal sequence is that bacteria are extravasated and multiply; at first in the free state; then leucocytes appear on the scene and ingest the bacteria more or less successfully; and, thirdly, macrophages are found to effect processes of repair. The presence of many free germs, therefore, except within an hour or two of the catastrophe, is nearly always a sign of a fatal issue; if macrophages are present, and all the germs are intracellular, the patient will recover.

A. Ruddle Short.



**PERITONITIS, TUBERCULOUS.**— It is very difficult to appraise correctly the relative value of medical and surgical treatment in this disease.

**Results of Medical Treatment.**— We will first collect the evidence as to the outlook when cases are treated by medical means only. There is no lack of statistics of a sort, but many of them are vitiated by ill-arrangement, inadequate details, or too early reporting. Thus Faludi, by adding up a mass of German reports, quotes 156 cases treated without operation, of which about a third got well; but we do not know for how long a time they were watched. The writer has obtained details of 14 cases treated in various institutions in Bristol by fresh air, iodoforn, mercurial ointment, cod-liver oil, etc. All of these were followed for at least two years, and most of them for four years or more. Of the 14, 10 were cured, 1 relapsed, and 3 died; one of these last three had an immediate operation just at the end, when death was already imminent. Ochsner, by the analysis of a mass of figures, concludes that half of the cases treated medically get well; but that half of these relapse later, so that only a quarter are finally cured. Borchgrevink followed up 17 cases treated medically; 3 of these died, and 14 were well for two years or more.

It is quite useless to set these figures up as an alternative to those obtained by surgical intervention; for the great majority of the patients treated medically are handed over to a surgeon as soon as it becomes evident that they are not doing well; and it is quite certain, therefore, that the Bristol cases and Borchgrevink's, for instance, are much too favourable, representing, as they do, only those patients who are not bad enough to be operated on.

In an orphan asylum in Bristol, where the physician preferred to treat all cases medically, 6 were cured and 3 died; they were all well cured for from the first, and obtained plenty of fresh air, good food, and skilled nursing; so that these results are probably too favourable. In dealing with this disease, the worst statistical reports are more likely to be correct than the best. It is probably fair to accept Faludi's view, that about one-third will recover, and two-thirds will eventually die, apart from surgical intervention. The illness is likely to be prolonged; it is generally a year or two before they can return to normal life.

**Results of Operation.**— These are much easier to obtain with some degree of reliability, though here also there is a tendency to report too soon. Most of the figures are taken from hospital records, and may therefore be trusted. In Caird's and Borchgrevink's and in the Bristol series, the patients were followed for more than two years; in Czerny's, the majority were followed over three years, but others for a lesser period; Ochsner's and Bottomley's were traced for one year only.

It will be observed that the immediate mortality varies a good deal: the Bristol cases included two deaths from intestinal obstruction, one from ileosigmoidostomy, and one from perforative peritonitis,

and are therefore too high. The true mortality of the operation, in properly selected cases, is not more than 1 or 2 per cent.

With the exception of Ochsner's series, which is reported too soon, the end-results are much the same everywhere; it will be seen that rather more than half are well for two years or more; 40 per cent, approximately, die of some form of tuberculosis; and a certain small number relapse, or are little improved. This agrees with the conclusions of Fenger, but is less favourable than those of Faludi, who claims that of 125 operation cases, 70 per cent were 'cured'; but we do not know for how long.

RESULTS OF OPERATION FOR TUBERCULOUS PERITONITIS.

Author	Cases operated	Healed (or cured)	Cases followed	Alive	Dead (or not cured)	Survived 1 year
Bottomley -			24	11	2	11
Borchgrevink			22	13	0	9
Czeruv	41	3	38	18	9	11
Ochsner	32	1	20	15	0	5
Matteson -	53	0	37	17	0	20
Card	31	3	17	8	0	9
Bristol hospitals	33	7*	20	11	2	7
Total	190	14	178	93 (52 per cent)	13 (7 per cent)	72 (40 per cent)

\* See text.

The Mayos claim excellent results by removing tuberculous tubes in adult females.

We may sum up, therefore, by saying that, on an average, about a third of the patients will be cured by medical means; and of those that come to operation, about half will be permanently freed from their trouble. Inasmuch, however, as the first of these figures is little better than a guess, the value of operation is not very securely established.

**Prognosis in Individual Cases.** There does not appear to be much difference between the results in adults and children. Febrile cases are said to do better than afebrile (Borchgrevink). The more acute the onset, the worse the prognosis (Rolleston).

The type of the disease is of very great importance in this respect. *The ascitic type*, with abundant free fluid, but no adhesions, does best. *The ulcerous type*, with great wasting, a huge abdomen, irregular temperature, and tendency to diarrhoea, only recovers in quite exceptional cases. A faecal fistula is practically a death warrant. *The fibrous or adhesive type* is intermediate. Most of the operation figures given refer to the ascitic type.

Bottomley and Matteson both distinguish between the results of operation on the different kinds, as shown in the following table.

## MORTALITY ACCORDING TO TYPE OF PERITONITIS.

DISEASE	ACUTE TYPE		CHRONIC TYPE	
	CASES	DEATHS	CASES	DEATHS
Bottomley	16	7	7	3
Matteson	29	10	24	18

Grave signs, in any particular case, are marked wasting in spite of treatment, uncontrollable diarrhoea, and evidence of pulmonary tuberculosis.

In fatal cases, death usually takes place in six months to two years; those surviving the latter period are likely to recover. It is remarkable how it occasionally happens that even a badly matted abdomen may eventually get well.

Death results from intestinal obstruction, perforative peritonitis, exhaustion from diarrhoea, fecal fistula, and generalized tuberculosis.

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A. Boodle Short.

**PERNICIOUS ANÆMIA.** There are few conditions in which the practitioner of medicine finds more scope for the exercise of his prognostic powers than in pernicious anæmia. Death may occur within a fortnight after the patient comes under observation, and, on the other hand, a fatal issue may be delayed for twenty years; but in spite of this very wide range of possibilities, the skilled observer may be able to assign nearly every case to a place in the acute, the subacute, or the chronic group, the characters and course of which are fairly definite. Even after cases have been assigned to their appropriate class, a careful review of general symptoms, together with a thorough examination of the blood, will enable the practitioner to make further refinements, and he can often predict the course of the individual case with very considerable accuracy. One of the remarkable features of the disease is the occurrence of remissions. They sometimes begin quite abruptly, even although severe symptoms may be present, and their occurrence is often attributed to the exhibition of medicines which had no part in bringing about the improvement.

Remissions may last for months or even years. A patient may undergo as many as half a dozen remissions and relapses. During the remissions, the chief abnormal characteristics of the blood may disappear; but in many cases a rather high colour-index, or some other special feature, may persist; the remission may be complete as regards disappearance of symptoms. This is particularly likely in

the case of remission following a first attack; after subsequent attacks, remissions are less likely to be complete, and the patient is most likely to remain, at the best, in a condition approaching or exemplifying semi-invalidism.

**History.**—It is of prime importance to take into account the cause of the disease. If the cause can be discovered and removed, the outlook is good. If not, the disease will sooner or later prove fatal.

The cases due to *Babriocephalus latus* can practically all be cured.

Cases which begin during pregnancy and the puerperium are likely to recover if the very dangerous period during which the symptoms are acute can be safely tided over. Some cases appear to be due to cancer of the stomach. Little hope can be held out in these, as there is no likelihood of a remission, and without a remission of the anaemia, operation would be out of the question. When no cause can be discovered, we must judge of the case on the lines laid down in connection with the blood changes.

Another important point in connection with the history is the question of whether or not we are dealing with a first attack. Not only is the chance of a remission greater after a first than after a subsequent attack, but after a first one there is a much greater likelihood that, if a remission occurs, it will be more complete and more prolonged than after a second or subsequent relapse. Due regard, however, must be paid to the kind of attack. A patient suffering from pernicious anaemia of a definitely chronic type, although he never reaches a high standard of health, has a better expectation of life than the patient who has had more than one acute attack with an intervening period of apparent health. Most cases have their type stamped upon them early. In all, there is a history of very insidious onset. In cases of chronic type, the disease gradually advances till an extreme degree of weakness is reached. In acute cases, the more urgent symptoms come on rapidly, but are usually a sequel to a slowly progressive departure from health.

**Blood Changes.**—In a case doing badly, the behaviour of the blood will vary a good deal according to the acuteness or chronicity of the disease.

In the acute cases, the tendency is for the corpuscles to diminish steadily in number, and for the colour-index to rise or remain high. More and more megaloblasts may appear, and these are often at their maximum just before death.

It is impossible to make any statement as to the lowest red-cell count compatible with life. Many cases die before the count has fallen below 1,000,000 per c.mm. In these it is hardly likely that the anaemia, *per se*, is the cause of death. Renal inadequacy, a pneumonic patch, and a variety of other complications whose existence may give rise to no obvious symptoms, often play an important part in determining the fatal issue. We have seen a case recover where the red cells had fallen to 400,000. The patient in question was practically comatose for nearly a fortnight, and then had a remission

which lasted eighteen months. Quincke's count of 143,000 has never been equalled: the patient in that case recovered. Our own lowest count was 200,000, but it was made only a few hours before death.

In cases which are going to recover, the red corpuscles sometimes increase with startling rapidity. There may be a rise of a million a week, although that is exceptional. The colour-index, if it has been high, gradually drops. The corpuscles improve in quality: they become smaller, basophilia and polychromasia lessen, and megaloblasts disappear. A recent case in point was a lady, age 49, whose first count was 800,000, hemoglobin 25 per cent, colour-index 1.5. Three successive counts at intervals of a week read: 1,050,000, 30 per cent, 1.3: 2,300,000, 55 per cent, 1.19: 3,280,000, 58 per cent, 0.9.

Some of these cases reach a perfectly normal count in every way, and often pass through a stage during which the colour-index is low. It may drop to 0.7 and remain below unity for weeks. This is to be interpreted as a return to the normoblastic type of blood-formation in the marrow, and is an excellent prognostic sign. If the leucocytes at the same time show a tendency to rise to the normal level of 7000 per c.mm., so much the better.

A certain number of cases never reach normal figures for either red or white cells. Many of them have a short period of comparative health and soon drop back again to a condition of serious illness. Others become chronic cases and may last a very long time, with blood-counts far from satisfactory, but with a wonderful degree of freedom from subjective symptoms or active discomfort.

We have been accustomed to group cases of pernicious anemia as follows, mainly in respect of the blood condition.

1. *Acute Favourable Cases.* The symptoms are marked. Red corpuscles are diminished, but repeated counts indicate a tendency to rise. Megaloblasts are not very numerous, and are mostly of pyknotic type. Normoblasts are present. The colour-index, on repeated examination, shows a tendency to fall. Polychromasia is not marked. The percentage of polymorphonuclear cells is fairly high, and the white-cell count is not greatly diminished. Myelocytes are absent or few.

In these cases a remission to a fairly normal condition may be expected, and the remission may last for years or months.

2. *Acute Unfavourable Cases.* Symptoms are very marked. Red cells number about a million, and repeated counts reveal a tendency to fall. Megaloblasts are typical, large, and numerous. Normoblasts are very few or absent. The colour-index is high. Polychromasia is marked. The percentage of lymphocytes is high, and the total leucocyte count is low. Myelocytes are numerous.

In these cases a fatal termination is to be expected in less than three months, and it may occur in less than three weeks.

3. *Subacute Cases.* Symptoms are fairly well marked. Red cells are usually just over a million, showing considerable variations in

number in successive counts. Megaloblasts are fairly numerous. Normoblasts are scanty. The colour-index is high. Polychromasia is present. The percentage of lymphocytes is high, but polymorphs may show an increase during a febrile attack. Myelocytes are fairly numerous.

The average duration of these cases is about two years. Inter-current disease or acute exacerbations usually terminate the case.

*C. Chronic Cases.* Symptoms are not well marked. Red cells tend to remain about one and a half or two millions. Megaloblasts are scanty or absent. Normoblasts are rarely seen. The colour-index is about unity. Polychromatophilia is slight. Basophilic stippling is seldom seen. The percentage of lymphocytes is high. Myelocytes are scanty or absent.

Such cases are often fit to work for perhaps six months in the year. Their chief trouble is weakness. Febrile attacks may occur, but seem to have little effect. Nerve symptoms are fairly common, but their incidence does not affect prognosis. Improvement is rare, but the patient may live for many years.

Not infrequently we are unable to make this classification as the result of a single blood examination. In some of the acute cases it may be impossible to say whether the outlook is favourable or otherwise. In these, a second examination in a week's time will often clear up the difficulty.

Thus, a case where the red corpuscles are under one million per c.mm. rarely continues long at that stage; if at the end of a week they have shown a tendency to fall, we may predict a fairly early termination; on the other hand, if the tendency of the corpuscles is to rise, we generally find that our case will undergo a remission. Further, we may expect that if the symptoms have been severe, with fever, yellow colour, etc., the remission will be very satisfactory, especially if the attack should be the first one. A case of more chronic type, and especially a case in a second or later relapse, is more likely to make less rapid progress, and the improvement will be from invalidism to semi-invalidism rather than to an appearance of complete health.

When a case is at its worst, a very slight alteration in the blood-count may have a very important significance. A rise of 300,000 red cells per c.mm. in a week would almost be sufficient to justify the hope of a remission, and a preponderance of the type of megaloblast with small, deeply-staining (pyknotic) nucleus, rather than the type with large nucleus and open chromatin network, would also be a very favourable sign.

**Symptoms.** The incidence of such symptoms as sickness or diarrhoea, increase of the yellow tint, or oedema, does not necessarily affect the ultimate course of the disease, though any of these would add to the gravity of a case in an acute attack. Conversely, the disappearance of gastro-intestinal symptoms is of good omen. The clearing up of the lemon-yellow tint, when it has been present, is always

good, as indicating that the toxic affection of the liver is passing off. This clearing up is not necessarily attended by an improvement of the blood.

It is important to keep a record of the patient's weight, if possible, because of the tendency to generalized oedema of the subcutaneous tissue, which does not necessarily show itself specially in the usual sites affected by heart or kidney disease. Thus, a loss of weight associated with a diminution of oedema is a good sign, a gain of weight with increase of oedema is a bad sign, a gain of weight without oedema and with improvement in the blood is a good sign. Oedema of cardiac type is always very bad, and is usually associated with other evidence of heart failure, which requires appropriate treatment, but is rarely recovered from.

Febile attacks add to the gravity of the condition while they last. The patient may be none the worse, and is sometimes better, after they are over.

Hæmorrhages are a serious sign, but are not nearly so common, even in the worst cases, as text-book statements would lead one to expect. It has been suggested that retinal hæmorrhages are not so serious prognostically as others.

We recently saw a case where pernicious anemia was complicated by bleeding fibroids. Each hæmorrhage was definitely lowering the blood-count. There were megaloblasts, polychromasia, and basophilic stippling of the red corpuscles. The counts were red corpuscles 1,370,000, hæmoglobin 56 per cent, leucocytes 1100, colour-index 1.3. We advocated operation, and hysterectomy was successfully performed. A week after operation the red corpuscles numbered 1,600,000, hæmoglobin 43 per cent.

The onset of jaundice is a somewhat serious symptom.

It is probable that all cases suffer from some renal inadequacy. The evidence of this is based on our post-mortem experience: when there is clinical evidence of kidney disease, the prognosis becomes much more serious, except occasionally in the puerperal cases.

Any complication of an inflammatory nature nearly always determines a fatal issue. Patches of catarrhal pneumonia may be present without clinical symptoms, owing to the failure of the patient to react. When they are discovered, they are to be regarded as likely to shorten the patient's life.

Other complications do not greatly disturb the course of the disease. Three cases of ours, all with a red-cell count of 3,000,000 to 3,500,000, and hæmoglobin 65 to 72 per cent, underwent operation for gall-stones with no ill effect.

**Treatment.** There is little doubt that cases placed in favourable surroundings have a better chance of a remission or recovery than those not so fortunately placed. Hospital treatment for the poor, and skilled nursing for the well-to-do, may make all the difference between a favourable and an unfavourable result.

The patient who can take life easily after a first attack is in an

infinitely better position as regards expectation of life than one who has to return to either mental or physical work.

As regards medicine, no drug can yet be said to compete seriously with arsenic, and an important element in prognosis is the way the patient responds to it, and the manner in which it is tolerated. Patients who can take such doses as 15 minims of Fowler's or a similar solution three daily, are almost certain to do well.

The various organic preparations of arsenic—cacodylate of soda, atoxyl, soamin, arsacetin, etc.—give no better results than Fowler's solution or the liq. arsenicæ hydrochlor., and in our experience they cause more frequent and more severe toxic results than the pharmaceutical preparations.

Many observers have published the results of treatment by salvarsan and its substitutes. Among those who have been favourably impressed with this drug is Byron Bramwell,<sup>1</sup> who has published the result of 11 cases. In 4 there was a return to health, in 2 there was marked improvement, and in 1 slight improvement; 2 showed no improvement and 2 died. The salvarsan was injected into the buttock, and there was a slight febrile reaction in most of the cases. Boggs<sup>2</sup> has also reported the result of salvarsan treatment in 11 cases. Of these, 2 were practically moribund before treatment, and died. The remaining 9 cases improved. A large number of cases have been reported by other observers; in many instances the results are not nearly so favourable as the foregoing. Our own experience is not encouraging; we have treated 13 cases with intravenous injections of salvarsan, and 7 cases with intramuscular injections of neosalvarsan; the intravenous injections were always followed by a febrile reaction, and often by gastro-intestinal disturbance. Of the salvarsan cases, 7 died, 3 improved, and 3 remained *in statu quo*; of the neosalvarsan cases, 4 died, 1 improved, and 2 seemed to be unaffected. We do not think it can be maintained that the introduction of these drugs has in any way improved the prognosis. Further cases have been treated since the above series was recorded. On several occasions we have 'raced' two similar cases, treating one by salvarsan or galyl intravenously or intramuscularly, the other by arsenic given by the mouth. In nearly every instance the cases treated by the latter method have won. Some of the salvarsan cases showed no improvement, and only began to improve when arsenic was given by the mouth. It is never justifiable to give salvarsan or its substitutes intravenously in severe or febrile cases. In several that we have heard of, death has directly followed this procedure.

An alternative method of giving arsenic is by the intravenous channel, as liq. sod. arsen., well diluted, the dose beginning with 4 min., and being increased as indicated. This is almost always well borne, and is sometimes successful when arsenic by the mouth fails, or causes digestive disturbance.

Iron does harm rather than good in most cases of pernicious anemia; sometimes it does good when the colour-index is low during the course of recovery.



Washing out the bowel with normal saline solution is a measure which may be said to improve the patient's prospects of recovery. The administration of intestinal antiseptics is not of such proved benefit.

Among other measures which have been suggested are the administration of bone-marrow, the injection of antistreptococcus serum, and transfusion of blood. We have never been able to satisfy ourselves that bone-marrow does any good. In the published successful cases it has generally been given along with arsenic or other medicines, and the mere transference of a patient from an unfavourable environment to hospital might be enough to determine a remission, especially in the case of a first attack. This explanation probably partly accounts for the successes which have been attributed to antistreptococcus serum, the other factor being a possible benefit from the serum itself, not from its antistreptococcus element. We have never seen a case in which benefit could be attributed to its use apart from these considerations, and we have certainly seen cases in which it did harm.

We have had cases which improved after a course of injections of normal horse serum. We have never seen anaphylactic symptoms in these cases, and if arsenic fails completely, it is worth trying.

Transfusion of blood is a measure which is usually reserved for desperate cases. We have had several apparently brilliant successes, and many failures. Where there are urgent reasons for attempting to prolong the life of a hopeless case for a month or so, it is a measure which may justifiably be tried. It is much more satisfactory to do direct transfusion from a healthy and preferably young subject by the artery-to-vein method, than to use any of the indirect forms. During the last few years we have done about eighteen such transfusions. Only one patient broke down the corpuscles injected, as evidenced by haemoglobinuria, and was in no way benefited. All the others retained the corpuscles, and improved for a longer or shorter time; in several cases a remission followed, though the subsequent history of the disease was not influenced.

In a few cases, which were all febrile, we have tried enol intravenously. The temperature generally falls after the injections, but the course of the disease has not been affected.

As we have indicated earlier on in this article, cases of pernicious anaemia seem to stand surgical operations surprisingly well, but the reasons for sanctioning any operation must always be eloquent.

Splenectomy has often been performed as a treatment for pernicious anaemia; but, while the initial risk is great, the subsequent history of the cases which have been followed up is not such as to encourage us to adopt the procedure.

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PERTUSSIS.—(See WHOOPING-COUGH.)

**PHTHISIS.** (See PULMONARY TUBERCULOSIS.)

**PHLEGS.** (See HÆMORRHOIDS.)

**PLACENTA PRÆVIA.** The progress of placenta prævia varies with several factors, of which the more important are: the period of gestation at which the bleeding incidental to the vicious situation of the placenta takes place; the degree of dilatation of the cervical os; and the type of placenta prævia. In general it may be said that cases occurring before labour are of more serious import than those occurring coincidently with the onset of labour pains. Also, the more central the placenta, the sooner its separation occurs in the period in which the expansion of the lower uterine segment proceeds. Thus, in cases in which the bleeding begins before the onset of labour, there is more likelihood that the practitioner has to deal with a placenta entirely covering the external os. This in itself is serious; but the outlook is rendered more grave by the fact that the obstetrician, in his efforts to arrest the bleeding, is confronted with an undilated cervix.

In estimating the prognosis of any individual case, the state of the patient when she first came under treatment, and the correct selection of the proper method of treatment suitable to that case, have both to be taken into account.

There are three principal methods, each of which is warmly championed by certain authorities, but each of which, to be successful, has its own sphere. These are (1) *Cæsarean section*; (2) *De Ribes' bag*; (3) *Podalic version*.

1. **Cæsarean Section.** This is undoubtedly the best method under certain definite circumstances—namely, when (a) The hæmorrhage has not been excessive; (b) The cervix is not dilated; (c) The placenta is central; and (d) The child is alive.

With regard to the first of these, it is important to bear in mind that where a woman is already *in extremis* from loss of blood, rapid emptying of the uterus gives rise to a degree of shock that may be fatal. In regard to the second, it is obvious that by extracting the child through an abdominal incision, the difficulties that attend measures applied through an undilated os are avoided: in fact, bleeding is absolutely controlled from the moment of opening the abdomen. Further, the undilated condition of the cervix probably means that the uterus is free from infection, which is the chief source of danger in Cæsarean section.

Some figures of the more recent results may be given. The number of cases in which Cæsarean section has been performed makes a comparatively small total. Routh<sup>1</sup> has collected the following figures. In 43 cases by American surgeons there were 7 deaths, or 16·3 per cent; in 26 cases by Kröning and Sellheim there were no deaths. The wide variation in the results is to be attributed to the number of operators in the first series. Bumm has performed vaginal Cæsarean section in 15 cases, with 1 death.

It is in the saving of the life of the offspring that Caesarean section shows so much better results. Thus, in the 26 cases performed by Kroeng and Sciliena, all the children survived.

**2. De Ribes' Hydrostatic Bag.** The use of de Ribes' bag is eminently successful in suitable cases, such as a patulous os, early in or before labour, and in those cases in which it can be ascertained that the placenta does not cover the internal os completely. It is therefore applicable to a large majority of cases of placenta praevia: it is inferior to Caesarean section in the results of the latter under certain specified conditions; but in emergency it supplies a means of treating even these cases, when the conditions and the requirements for Caesarean section are lacking.

The results of treatment by the bag vary considerably in different hands. In a group of cases undertaken under the ordinary conditions of life, it will be found that the mortality ranges between 6 and 8 per cent of all cases. If, on the other hand, figures are taken from special obstetrical hospitals, where there is a routine carefully followed and where the chief personally directs, the mortality is found to be as low as 2.18 per cent in Pinard's clinic and 2.1 per cent in the clinic of Kroeng. The total mortality varies widely, but ranges between 10 and 70 per cent, the average figure being 60 per cent.

**3. Podalic Version.** Turning the child is strongly recommended by certain authors as giving better results, and being more constantly effective, than the use of de Ribes' bag. It is perhaps specially indicated in those cases in which by the time the case is seen dilatation of the os is advanced. Further, in the absence of a de Ribes' bag there is no doubt that this procedure forms a good substitute.

When the results are compared with those of the bag, it is seen that the *average* is nearly as good; but the best figures of skilled obstetricians do not come up to the best with de Ribes' bag. Thus the Rotunda statistics quoted by Tweedy show a mortality of 5.3 per cent in 110 cases during the years 1903-1910; but of the 41 delivered in hospital, there was only 1 death, or 2.5 per cent, which compares very favourably with the results of the use of the hydrostatic bag. There is no doubt that the fetal mortality is higher in this method

60 to 80 per cent; but of course it depends to a certain extent upon the advancement of gestation and the time of commencement of treatment.

In comparing the three methods of treatment, it should be remembered that in the majority of cases the champion of podalic version as against de Ribes' bag, or vice versa, has become expert in that form of treatment; there ought, however, to be a special field for each method when its proper application will lead to a successful result. Caesarean section will become more extensively used in the future; at present many obstetricians would limit its application to about 5 per cent of cases.

The morbidity rate of all cases is given by Ellice MacDonald as 26 per cent. The most important complication is sepsis, which is

responsible for a fatal termination in at least 60 per cent of the deaths. Next is thrombosis of uterine veins and swelling of the leg. It is found that septic complications occur in 44 per cent of cases.

The more immediate cause of death is the shock of rapid or rough delivery, superimposed on great loss of blood during labour.

The fetal deaths, in cases where the child is viable, are due partly to premature separation of the placenta and partly to asphyxia during a breech delivery.

In conclusion, the following figures may be taken as indicating the results of all cases of placenta previa, irrespective of the treatment adopted:—In 10,640 cases collected by Ellice MacDonald,<sup>2</sup> the maternal mortality was 7·7 per cent and the fetal mortality 55 per cent (the maternal mortality in the year 1877 was 23 per cent).<sup>3</sup> Edgar<sup>4</sup> records 40 cases, with a maternal mortality of 7·5 per cent and a fetal mortality of 32 per cent.

REFERENCES.—<sup>1</sup>*Jour. Obst. and Gyn.*, 1911, Jan.; <sup>2</sup>*Ibid.*, 1913, Aug.; <sup>3</sup>*Surg. Gyn. and Obst.*, 1911, June; <sup>4</sup>*Amer. Jour. of Obst.*, 1911, July.

Byrden Glendinning.

**PLAGUE.**—Plague is one of the most deadly diseases known, and it carried off about a million people yearly in India during the height of the recent pandemic. The mortality varies in the different clinical varieties of the disease. The pneumonic form is extremely fatal, it being doubtful if recovery ever takes place. In Calcutta every case showing plague bacilli in the sputum died. This form is also extremely infectious by bacilli being disseminated during coughing, but not by ordinary breathing (Strong). The septicemic form as seen clinically is also almost invariably fatal, numerous plague bacilli being found in the blood. On the other hand, in the much more common bubonic form, recovery takes place in a fair proportion of cases, the death-rate having been 30 per cent among 444 hospital cases examined by the India Plague Commission in Bombay, and it has been about the same in Calcutta.

The essential point in the prognosis is the presence or absence of plague bacilli in the blood-stream, in which they may be found by culture in the majority of cases of bubonic plague, as well as in the clinically septicemic and pneumonic cases. Thus the India Plague Commission classified their 444 cases in accordance with the number of plague bacilli in  $\frac{1}{4}$  c.c. of blood as follows:

Number of bacilli of blood	Cases	Per cent	Dead	Dead per cent	Recovered per cent
Nil	155	34·9	46	29·7	70·3
1 to 10	94	21·1	70	74·5	25·5
11 to 100	39	8·8	39	100·0	0·0
Over 100	156	35·2	156	100·0	0·0

Thus 70 per cent of the cases showing no bacilli in the blood recovered, but only 25.5 per cent of those showing from one to ten bacilli in  $\frac{1}{2}$  c.c. of blood survived, while all of those with higher numbers died. In alternate cases plague serum was used, chiefly intravenously and in large doses up to 500 c.c., but the mortality was 73.7 per cent in the controls and 66.2 per cent in the serum cases: a difference which was considered to be too small to indicate any definite effect of the serum. Yersin's serum gave no decrease in the mortality, while antitoxic serum, prepared in the Lister Institute by means of nucleoprotein extracted from the plague bacilli by Rowland, gave a reduction of 20 per cent in the death-rate, which was confined to the cases showing not more than ten bacilli in  $\frac{1}{2}$  c.c. of blood.

Clinically it is usually impossible to judge in the earlier stages what the prognosis will be. Later in its course the general condition of the patient may give some clue. Delirium, high and prolonged fever, and very rapid soft pulse are bad signs. A fall of temperature late in the disease, especially if sudden, is often only the prelude to fatal collapse. Cases showing primary vesicles at the seat of inoculation of the virus more frequently recover than others, in the writer's experience. Patients who live long enough for the buboes to suppurate, not infrequently recover.

No treatment is known to have any effect on the mortality of the disease, even the specific serum having failed in all but the mildest cases. It has been claimed that early incision of the bubo may lessen the toxic absorption, but this can hardly influence the common cases with numerous plague bacilli in the blood. Good nursing is more effective than drugs.

Leonard Rogers.

**PLEURITIS.** The immediate prognosis of pleuritis is good; the remote prospects are not so satisfactory. An investigation of the examples of this disease admitted to St. Bartholomew's Hospital from 1899 to 1903 showed that the average length of treatment amounted to a little over three weeks in cases without effusion, and to rather less than five weeks in cases with effusion.

**THE IMMEDIATE PROGNOSIS.** This varies with (1) *The nature of the organism*; (2) *The age of the patient*; (3) *The amount of fluid present*; and (4) *The associated conditions*.

**1. Nature of the Organism.** Out of 47 cases of pleural effusion examined from a bacteriological standpoint at St. Bartholomew's Hospital, 40 were found to be sterile and therefore presumably tubercular, 7 were associated with the *pneumococcus*, and 2 with the *streptococcus*. Other organisms which have been found in this condition are the *Bacillus typhosus*, *Pfeiffer's bacillus*, and the *gonococcus*. There is a greater tendency to the formation of pus in the case of the *pneumococcus* and *streptococcus*.

**2. Age of the Patient.** In children and young adults the immediate dangers of pleuritis, whether with or without effusion, are small, and the mortality is probably less than 2 per cent.

3. **Amount of Fluid Present**—The amount of fluid present when the case comes under observation has a definite bearing on the mortality. The danger of death from a small effusion is practically nil; but fluid which is present to such an extent that it reaches above the second rib causes positive pressure upon the heart and lungs, and so may cause death. Other causes of death in pleural effusion are thrombosis of the right heart and pericardial effusion. The presence of fine rales on the unaffected side is associated with a graver prognosis. Gee and Horder state that 651 cases of pleuritis between the years 1884 and 1893 gave a mortality of 10.3 per cent; whilst 783 cases between the years 1894 and 1903 gave a mortality of 4.4 per cent. Thus, 1434 cases were associated with a mortality of 4.1 per cent. The great difference between the mortality of the two series is attributed to improved methods of treatment, and especially to the earlier adoption of aspiration in the latter series.

4. **Associated Conditions.** Pleuritis as a complication of existing disease is of graver significance than pleuritis occurring in a previously healthy person. Thus, pleuritis in pulmonary tuberculosis denotes an extension of the original disease; whilst in chronic diseases such as Bright's disease it is of grave significance, and is not infrequently caused by the onset of tuberculosis. Extension of the inflammation to the pericardium tends to prolong the duration of the illness, but does not add greatly to the immediate mortality.

**ESD-RUSTIANS.**—The remote prospects of pleuritis, whether dry or with effusion, are chiefly concerned with the question whether the cause of the original inflammation is the tubercle bacillus or not. The proportion of cases of pleuritis which are due to the tubercle bacillus is considerable. Some French observers put the percentage as high as 75; few physicians put it lower than 30. Lord followed up 55 out of 82 patients he had observed, and found that 7 had died from pulmonary tuberculosis, 8 were suffering from this disease, and 10 were well. He further found that 25 per cent continued to complain of occasional pleuritic pains.

Fiedler found that of 92 cases of acute pleuritis with effusion, there had been 28 deaths from pulmonary tuberculosis at the end of two years, and that only 21 of the remaining patients appeared to be healthy. Barr found that in six years 22 patients out of 132 had died from pulmonary tuberculosis. Cabot had 117 deaths in five years out of 300 cases; whilst Hedges found that out of 130 cases, tuberculosis developed in 40 per cent in seven years. These figures are supported by two other lines of observation: (1) A positive tuberculin reaction is stated to be present in 75 per cent of cases of pleuritis with effusion; (2) At least 18 per cent of the cases of pulmonary tuberculosis admitted to the chest hospitals in London have a history of pleuritis two or more years before.

The practical deduction is that a large number of cases of pleuritis can be demonstrated to have a tuberculous origin, and that an even greater proportion are due to this cause. In view of the great

frequency, subsequently, of pulmonary tuberculosis in these cases, it is not too much to say that every primary case of pleuritis, whether with or without effusion, should be regarded as tuberculous, unless the contrary can be proved. If this were done, and all such cases were treated for some time on sanatorium lines, together with tuberculin, a great step would be taken in diminishing the incidence of pulmonary tuberculosis. My own experience in this direction is most satisfactory; and I am tempted to express the opinion that primary pleuritis, when regarded as a comparatively trivial affection, is associated in later years with a high mortality from pulmonary tuberculosis; whereas, when it is adequately treated from the commencement as being tuberculous, the after-results are almost as good as the immediate ones.

*Arthur Latham.*

**PNEUMOCOCCIC PERITONITIS.**—(See PERITONITIS, PNEUMOCOCCIC.)

**PNEUMONIA.** The mortality from pneumonia when taken over a considerable number of years amounts to about 1 in 5, or 20 per cent. Thus, Wells collected 465,400 cases with a mortality of 91,826, or 20.1 per cent; Osler and McRae collected 43,557 cases with a mortality of 21 per cent; in the 7868 cases which occurred in the London general hospitals during ten years, there was a mortality of 21 per cent; in 1065 cases of the Collective Investigation Committee of London, the mortality was 1 in 5.5. Even when the causes which are associated with a high mortality in this disease—such as intemperance, mental and physical deformities, infectious cases, old age—are allowed for, the mortality appears to be 1 in 8.

*The character of the epidemic*, that is to say, the violence of the causal organism, affects the mortality, as it may effect the character of the complications. Thus, the 673 cases observed in the Middlesex Hospital from 1880 to 1889 showed a mortality of 17 per cent; but when the different years were compared, the mortality varied from 12 to 24 per cent. This explains why such widely different results are given when the effects of different treatments are compared over a comparatively small number of cases. For example, some authors claim a mortality of as little as 2 per cent, whilst others confess to a mortality of over 30 per cent. As bearing on this point, I would mention that I have known five people die from pneumonia in one house within a fortnight. Tyson quotes an epidemic in a ship's crew, in which 298 cases out of 720 ended fatally.

In a similar way the character of the epidemic may affect the complications: thus, in three months I saw pneumonia followed by abscess of the lung in no less than seven cases.

It has been shown by Dr. Rufus Cole and others that in pneumonia we may have *four types of pneumococci*. *Types I and II* are specific organisms in the same category as typhoid bacilli; they appear to account for 60 to 65 per cent of cases. *Type III* organisms are widely distributed in healthy mouths, and account for 10 to 15 per cent of

cases. Those of *Type IV* are the most commonly found varieties in healthy months, and appear to account for about 25 per cent of cases, the infection here being probably autogenous. The different types have a different virulence, and consequently the prognosis in a given case will be affected by the type of organism present. In the prognosis of a case of pneumonia, therefore, we require to know the type of pneumococcus present, and we may hope that as observations on this point accumulate, we shall be in a much better position to estimate the probable course of a given case. For example, it has been found possible to manufacture immune horse serum for *Type I*, with the result that in a limited number (78) of cases treated in the Hospital of the Rockefeller Institute the mortality was 8 per cent, as compared with 25 per cent in similar cases untreated by the serum.

As regards age, it would appear that pneumonia is especially fatal to children under two years of age, and to old people. With regard to children, Gossage, in observing 986 cases under ten years of age, found a mortality of 13.8 per cent. Of these, cases under two years of age gave a mortality of 26.4 per cent, whilst above this age it was only 6.2 per cent. These figures are borne out by most observers; and in most epidemics of pneumonia, children of from five to ten years of age have the disease in a mild form, which often aborts on the fourth day. I have seen recovery in one case at the age of fourteen from a typical attack where it was stated that the child had had fifteen or more similar attacks.

Various factors influence the prognosis. The mortality in hospital cases is greater than in private practice; in drunkards it is probably at least double. Although women are less frequently attacked than men, it is stated that their mortality is greater. Again, the mortality is greater in negroes than in white people, in debilitated persons than in those previously robust, and is much increased when there is associated disease such as arteriosclerosis, severe cardiac affections, chronic nephritis, or diabetes.

With regard to the position and extent, it is stated that right-sided lesions are more fatal than those on the left, and it is generally held that apical lesions are more dangerous than basal ones, more especially in attacks during old age. The extent of lung involved affects the result, but appears to exert rather less influence than might be expected, as may be seen in the following tables of Osler and McCrae:—

MORTALITY AS AFFECTED BY EXTENT OF LUNG INVOLVED.

Osler's		Newell's Case	
1 lobe involved in	21 per cent	1 lobe involved in	40 per cent
2 lobes .. ..	38 ..	2 lobes .. ..	33 ..
3 .. .. ..	34 ..	3 .. .. ..	29 ..
4 .. .. ..	9 ..	4 .. .. ..	1 ..



The effect of complications has no great bearing on the total mortality from pneumonia, as they are, comparatively speaking, uncommon. Their effect on the cases in which they occur is greater. Thus, of the 7868 cases observed in the London hospitals, there were only 290 cases of empyema, or 3.7 per cent, of which 88 were fatal, or about 30 per cent; 125 cases of pleural effusion, or 1.6 per cent, of which 13 were fatal, or about 10 per cent. Pericarditis only occurred in 1 per cent of these cases, but of the fatalities 10 per cent were associated with this complication. In children, convulsions in the early stages have little significance, but in the later stages they are associated with a higher death-rate. Herpes is held to be a favourable sign; thus, Gissler noted the presence of herpes in 182 out of 421 cases, and found the mortality less when this complication occurred.

The degree of toxæmia and the reaction to it are really the most important factors in estimating the outlook in a particular case of pneumonia. For practical purposes these must usually be estimated from a consideration of the temperature, pulse, and respiration. The following tables of Probes on the relation of the temperature, pulse, and respiration rate to the mortality, are therefore of interest.

It will be seen that when the temperature is low—i.e., below 100°—or above 105°, the mortality is greater than the average; that when the pulse is above 130 the mortality is more than doubled; and that when the respirations are more than 50 the mortality is 50 per cent or more.

## TEMPERATURE AND MORTALITY.

Temperature	Cases	Fatal	Per cent
Under 100	17	6	35.2
102	220	52	23.6
103	302	83	27.4
104	408	109	26.7
105	386	99	26
106	148	45	30.5
Over 106	34	23	68

## PULSE-RATE AND MORTALITY.

Pulse	Cases	Fatal	Per cent
Under 100	57	2	3.5
110	123	7	5.7
120	142	18	12.6
130	288	62	21.5
140	143	68	47
150	125	74	59
Over 150	83	64	77

## RESPIRATION RATE AND MORTALITY.

Age	Temp.	Pulse	Respiration
Under 30	77	6	7.7
40	247	36	14
50	384	116	30.2
60	123	62	50.4
70	98	61	62.2
Over 70	23	14	65.6

If the infection causes little response, as is often the case in old people, and the temperature remains low, the outlook is grave; if the infection is severe and causes marked toxæmia, as shown by temperature, pulse, and respiration, the mortality is greatly increased; but when the infection is met with an adequate response, and the temperature is below 105°, the pulse-rate below 130, and the respiration rate below 40, the mortality is about 1 in 5.

*The action of the heart*, and especially of the right ventricle, is always significant. When the right heart becomes distended, and the pulse in addition to being rapid becomes irregular, the outlook is grave. When auricular fibrillation occurs during the attack, even though the crisis may appear to have been safely passed, the case always ends fatally.

Although the outlook may appear hopeless, treatment—especially with cardiac and respiratory stimulants such as alcohol, digitalis, and strychnine—should be continued and pushed until a definite effect is obtained, for in no disease are there so many recoveries from an apparently inevitable death.

*Different forms of treatment*, such as the use of vaccines, the systematic employment of digitalis, or the use of various other methods, have not been shown to have any markedly different results in a sufficiently large number of cases. In a limited number of cases of *Type I*, the use of immune horse serum, as mentioned above, appeared to have a marked effect upon the mortality. Patients moved to hospital on the first day of the disease appear to have a better prognosis than those moved on the third or fourth. This is probably explained by the effect of movement in inducing excessive auto-moultations, as in other cases of bacterial infection, and emphasizes the necessity of limiting the movements and examination of the patient as much as possible during the acute stage of the disease.

Those who suffer from an attack of pneumonia not infrequently have another attack later in life. Some authors put this tendency to a second attack at as high a figure as 50 per cent.

Arthur Latham.

**PNEUMOTHORAX.**—The prognosis differs greatly according to the cause and to the condition of the patient in whom it occurs.

*In the spontaneous form*, which is chiefly dependent on the presence

of emphysema, infective agencies are absent, and consequently one of the most serious complications is absent also. Further, in this form, effusion is rarely found. In 58 cases studied by Fussell and Rissman, effusion only occurred in one instance. Adams, however, reported a case in which effusion lasted for four years. The outlook in this form of pneumothorax is good, and recovery is the rule, provided the general condition of the patient is good. It may occur in a week, or it may be delayed for several months. In Fussell and Rissman's series only one death resulted. On the other hand, when pneumothorax is a complication of advanced emphysema, with severe overtaxing of the heart, it is a grave complication and usually fatal.

*In the traumatic form*, the prognosis depends chiefly on the character of the wound, and more especially on the question whether septic complications occur. In the absence of sepsis the outlook is good. Cases which occur as the result of thoracentesis usually do well.

*Cases in which pneumothorax is due to the perforation of the lung by an empyema*, often do well after the necessary surgical measures have been taken.

*Cases associated with gangrene, rupture of septic infarcts, or bronchiectasis* are, practically speaking, always fatal.

*Pneumothorax occurring in a case of pulmonary tuberculosis* is usually attended with a grave outlook, as it is most commonly met with when the disease is advanced and both lungs are extensively affected. Samuel West, as the result of observations on 101 cases, gives the mortality as being about 70 per cent; Saussier recorded a fatal result in 131 out of 147 cases, that is to say, a percentage of 90. Of 58 cases of pneumothorax collected from the post-mortem records of the Brompton Hospital, the greatest duration of life was twelve years, the least duration ten minutes. On the other hand, cases with a much longer duration are on record. Dr. Williams reported a case, occurring in his private practice, in which life was prolonged for twenty-one years.

It would appear that recovery may take place in from 50 to 25 per cent of cases; and further, that in a small number of instances the occurrence of pneumothorax may be beneficial to the patient, leading to arrest of the disease, in the same way as the artificial compression of the lung by nitrogen is sometimes followed by great improvement or complete recovery. I have personally seen recovery after pneumothorax with arrest of the tuberculous disease in two cases.

The prognosis in pneumothorax is therefore bad, when viewed as a whole. Whether it is immediately associated with fatal results depends on the extent of the primary disease and the general condition of the patient, that is, his capacity to withstand the great shock which is caused by the production of this complication. The practice of removing the air from the distended pleura at an early stage has certainly decreased the immediate mortality. If the pneumothorax is sharply limited by adhesions, and small in extent, it may be without effect on the duration of life, and even escape notice at the time of

its production, but in the case of a general pneumothorax the chief consideration at the time it is produced is the effect of the immediate shock.

If the stage of shock is survived, the chief considerations in estimating prognosis are the general condition of the patient, the extent of disease in the other lung, and the occurrence of septic complications. When a hydro-pneumothorax has become established, the condition remains unchanged usually for months, or exceptionally for years. It is rare, however, for complete recovery to take place under these conditions, as the primary disease usually continues to extend. Even if pneumothorax supervene, the patient may live for several years.

*Arthur Latham.*

**POISONING, ARSENIC.**—(See ARSENIC POISONING.)

**POISONING, LEAD.**—(See LEAD POISONING.)

**POISONING, MERCURIAL.**—(See MERCURIALISM.)

**POLIOMYELITIS, ACUTE ANTERIOR.**—(See INFANTILE PARALYSIS.)

**POLYCYTHÆMIA (SPLENOMEGALIC POLYCYTHÆMIA, ERYTHRÆMIA).** This disease is rare, and few observers have had sufficient experience to lay down any very definite statements regarding its probable course.

Many cases show little change, either for better or worse, for prolonged periods.

Temporary exacerbations of the cyanosis may occur, and, on the other hand, periods of remission of symptoms have been recorded.

Complications are not very common. Erythromelalgia has been noted in several cases. Hemorrhages are not infrequent, but as a rule their effect is beneficial to the patient.

Many intercurrent affections may arise. Among those which have been recorded are jaundice and cirrhosis of the liver, valvular disease of the heart, arteriosclerosis, thrombosis and cerebral hemorrhage, bronchitis and emphysema, kidney disease, and affections of the central nervous system. Other complications which have been reported have no apparent connection with the polycythæmia.

A fatal outcome is usually associated with an exacerbation of the cyanosis, a vascular complication, or an inflammatory intercurrent affection.

No special line of treatment appears to influence the course of the disease, though symptoms may be alleviated.

Venesection has been followed by benefit, especially when the blood-pressure is high. The results of application of *x* rays have been inconstant. A diet poor in iron has been tried with some degree of success. No benefit is to be expected from splenectomy.

*G. L. Galland,  
A. Goodall.*

**PREGNANCY, ALBUMINURIA OF.** (*See* ALBUMINURIA OF PREGNANCY.)

**PREGNANCY, ECTOPIC.** (*See* ECTOPIC PREGNANCY.)

**PREGNANCY, VOMITING OF.** (*See* VOMITING OF PREGNANCY.)

**PROGRESSIVE MUSCULAR ATROPHY.** (*See* MUSCULAR ATROPHIES.)

**PROLAPSUS RECTI.** (*See* RECTAL PROLAPSE.)

**PROSTATE, CANCER OF.** About one-fifth of the cases of enlargement of the prostate are due to cancer. An excellent study of 111 cases was published a few years ago by Young.<sup>1</sup>

The course is very variable. A few die within a year, the majority in from two to three years; but a remarkably large number live for three or four years, and a few live more than five. Some patients have had bladder trouble for twenty years, so it is probable that the cancer may start in a prostate which is the subject of a simple hypertrophy. There is, therefore, frequently plenty of time in which to undertake diagnosis and treatment before the growth becomes irremovable.

**Treatment.** So far, the results are not very decisive. The cases are wholly unsuitable for suprapubic enucleations; 4 out of 11 such patients at St. Thomas's Hospital died.

Young's perineal route gives better results. His radical operation, with wide removal, has apparently cured 2 patients out of 6, these being well four and six years respectively; another lived three years. Out of 49 patients treated by his ordinary method, as used for simple cases, all but 4 obtained some relief; 2 lived in comfort for two and three years respectively, and 2 others were apparently cured, 1 being well so long as six years afterwards.

In 39 cases, catheter life was instituted, with no operation. It often became very difficult, and out of 23 cases followed, only 3 lived two years.

Auld found evidence that 75 out of 177 cases arose in a hypertrophied prostate. Of 82 cases followed up after operation, 24 died within six months, and 5 others after an unknown interval; 11 were well three years after operation (1 one year after), 16 two years, and 20 one year after. Apparently 3 were living, with recurrence.

REFERENCES.—<sup>1</sup>Young, *Ann. Surg.*, 1900, 1, 1111; Auld, *Internat. Jour. Surg.*, 1915, xxvii, 17.

A. Rendle Short.

**PROSTATE, HYPERTROPHY OF.**—We shall here speak only of cases of simple overgrowth of the prostate, reserving malignant affection of the gland for a separate article.

**PROGNOSIS APART FROM OPERATION.** It must be borne in mind that enlargement of the prostate is a progressive disease. Acute exacerbations due to inflammation may subside under treatment, but we have no means of checking the steady growth. When symptoms

have once appeared, then, therefore, there is a tendency for them to get worse instead of better. In a fair proportion of cases seen, however, a fortunate man may live for years with or without the regular use of a catheter, any advance in the size of the prostate being very slow indeed. Much depends on the person's age: in an old man, severe decay may intervene before the prostatic trouble proves fatal, whereas, in a patient in the fifties, and in good general health, difficulties with micturition and uræmia are likely to shorten life very considerably. The most favourable cases are those in which, owing to some definite cause, such as lack of opportunity to pass water on a long journey, an attack of acute retention is precipitated. After a few days of rest and catheterism, voluntary power of micturition may be regained for years. Much more commonly the retention is permanent.

Ordinarily, there are five successive stages: (1) Difficulty in micturition, with straining; (2) Frequency of micturition, seriously interfering with sleep; (3) Acute or chronic retention of urine, necessitating the occasional or regular use of the catheter; (4) Chronic cystitis: the discomfort and frequency now get much worse; (5) Septic infection of the kidneys, leading to uræmia.

The total course varies so much that one can only form a prognosis by judging each patient's prospects separately. Unintelligent old men often present themselves, obviously but a few weeks before the inevitable fatal termination, and give a history of bladder troubles only within the past month or so. On the other hand, a patient may have symptoms of an enlarged prostate for eight or ten years, but this is unusually favourable.

Many patients pass into an extremely miserable condition. Their morale may become unhinged, and offences against decency may ruin their reputation. Later, great frequency of micturition, pain, hæmaturia, loss of sleep, and calculus formation due to ammoniacal fermentation of the urine wear out their strength. When marked cystitis and frequency are present, the patient has, in the majority of cases, not many months to live, apart from surgical intervention. Loss of appetite, thirst, sweating, drowsiness, twitchings or convulsions, emaciation, urinous breath, tendency to catheter fever, and polyuria with urea output below 15 grms. a day, show that uræmia has already begun, and death is not far off. Retention is a sign of some gravity unless most carefully treated: it leads frequently to cystitis; and if all the urine is drawn off at once from a patient with chronic retention, fatal suppression of urine is not at all uncommon, owing to the dilated ureters allowing a sudden fall of pressure in the renal pelvis.

In estimating the prognosis apart from operation, therefore, one has to take into account: (1) *The patient's age*, bearing in mind that the younger the man is, the more will his natural expectation of life be shortened; (2) *The apparent rate of progress*; (3) *His intelligence and skill in using a catheter, and keeping it clean*; and (4) *The question of cystitis, or of signs of uræmia*. The question of *malignancy* really

enters into the prognosis also, because it is impossible to make a certain diagnosis at first, and one case in five of prostatic enlargement is cancerous. It is all but certain that cancer may supervene on a simple hypertrophy.

**PROGNOSIS AS REGARDS OPERATION.** Of operations for enlarged prostate, we may mention *suprapubic caeculation*, *perineal prostatectomy*, *Balfour's operation*, the *bar-punch operation*, *castration*, and *vasectomy*. We may say at once that the two last named are almost extinct.

**Vasectomy** was simple and harmless, but seldom produced a lasting cure.

**Castration** was more successful, perhaps, in reducing the size of the prostate, but it often failed, and was frequently very repugnant to the patient, had a decided mortality, and led to mental disturbance in a distressingly large number of cases. No doubt it was too often resorted to in old men who were already marked for death.

**Suprapubic Prostatectomy.** Largely owing to the teaching of Freyer, this is the customary operation in England, the perineal route being the favourite on the Continent and in some American clinics.

*The mortality rate* is bound to vary much, according to the condition of the patient at the time the operation is undertaken, and there is a great difference between the figures which could be quoted. Freyer, in 1912, reported a series of 1000 cases with only 55 deaths, but at the same meeting Hey Groves stated that the death-rate in English hospitals, for the year 1907, was 40 per cent! This latter figure is undoubtedly too high at the present day, because hospital surgeons are not now so ready to operate in one stage upon patients whose kidneys are already affected, and general practitioners are beginning to send in cases that are not yet *in extremis*. The English hospital statistics at the present time show a death-rate of about 20 per cent. At two Bristol hospitals, during the years 1906 to 1912, it was decidedly higher than this, early cases being few. Out of 68 patients, 24 died, a mortality of 35 per cent. At "one of the largest hospitals," according to Wade, out of 164 operation cases in ten years 54 died, that is, 35 per cent. At St. Thomas's Hospital, 1906 to 1910, of 69 cases, 14 died, a mortality of 20.3 per cent; and at four other London hospitals during the same period, 46 died out of 76. It must be remembered that many of the patients who succumbed in hospital were already desperately ill; and the genuinely favourable cases are not very well represented, because many surgeons do not recommend operation to patients who could be treated by catheterization.

During the past five years there has been a great improvement in hospital statistics. At the Bristol Royal Infirmary the present death rate is about 10 per cent.

The increased safety is due to better selection of cases, and to the use of a two-stage operation when necessary.

In the hands of individual surgeons who prefer operation to the catheter, and whose material includes a large proportion of cases

derived from private practice, the mortality is lower. Freyer, as already mentioned, lost 55 out of 1000 cases. Thomson Walker, in a series of over 100, had a death-rate of 5 per cent. Yet both these surgeons claim to have accepted bad cases: Thomson Walker declares that he exercised practically no selection, except in cases where any sort of operation would obviously be foolhardy, and Freyer remarks that many of his patients were desperately ill, usually more or less dependent on the catheter, few were free from cystitis, 181 had vesical calculi (of these, 8.5 per cent died), and 62 were octogenarians.

We may conclude, therefore, that the mortality of suprapubic prostatectomy would, in capable hands, be well below 5 per cent in patients with sound kidneys and little or no cystitis.

The causes of death in Freyer's 55 fatalities, shock or heart failure, and chest complications.

*The end results* of suprapubic prostatectomy are no doubt remarkably good. Freyer claims that every case of his surviving the operation has a perfect result, except one patient with atony of the bladder; he has never seen retention, incontinence, fistula, or loss of sex power. He does not, however, give data showing how many patients were seen or heard from at any considerable period after the operation. He claims, and all surgeons will corroborate the statement, that atony of the bladder, even when it appears to have already come on, recovers wonderfully after removal of the prostate.

Thomson Walker has carefully studied 112 cases of his own, followed for at least eighteen months. The results were as follows: Incontinence of urine, 0; atony of bladder, 2; loss of sexual functions, 11; cystitis, occasionally persists; development of vesical calculus, 6; suprapubic fistula, 2; suprapubic hernia, 2; recurrent hemorrhage, 1. All the rest were restored to perfect health; and it must be remarked that in the atony cases, in most of those with loss of sexual functions, and in three out of the six cases of stone, the trouble was but a persistence or recurrence of the pre-operative condition. One of the fistula patients was cured by a second operation. It will be observed that, omitting the patients with impotence, cystitis, or calculus, 105 out of 112 were cured.

Of 26 patients at St. Thomas's Hospital and followed up, 20 did excellently, 2 developed a stone, 3 had incomplete control (two of these were possibly cancerous) and 1 had a suprapubic fistula.

Of 32 cases operated on in two Bristol hospitals, 24 were perfectly well, and 2 were only troubled by some degree of frequency. Of the others, 2 patients developed a stone, and in 1 of these the suprapubic opening failed to close; 2 had some incontinence; and in 3 patients there was little or no relief, straining and difficulty persisting; one or two of these were possibly cancerous. All these were followed at least a year.

The sexual functions were completely lost in only 12.5 per cent of Thomson Walker's cases: many of these were aged men, and in some there was impotence or loss of desire before operation. Occasionally



a troublesome degree of stricture of the commencement of the urethra may follow.

**Perineal Prostatectomy.** This operation is performed in several different ways, some of which do not conserve the membranous urethra as well as others: we have material for studying the end-results of Young's method, which is probably the best. The special points are the use of his tractor, and the preservation of the ejaculatory ducts and mucous membrane of the base of the bladder.

## MORTALITY OF PROSTATECTOMY.

Operation	Cases	Deaths	Mortality
Fever	1000	55	5.5
Thomson-Walker	over 100	—	5
<i>Suprapubic</i> St. Thomas's Hospital, 1906	10	69	20.3
Four London hospitals, 1906	10	76	21
Two Bristol hospitals, 1906	12	68	35.3
A hospital (Wade)		164	35.4
<i>Perineal</i> Young	150	17	3.8

The mortality rate in 150 cases was 17, that is, 3.8 per cent: there were 128 consecutive operations without a fatality. Some of the deaths might have been prevented by more careful washing out of the bladder beforehand.

The patients get about sooner than after the suprapubic operation, more than half going home in a month.

## END-RESULTS OF PROSTATECTOMY.

Operation	Number of Cases	Survived	Deceased	Recurrent Stricture	Urethral Stricture	Bladder Neck Stricture	Bladder Neck Contracture	Bladder Neck Stenosis	Bladder Neck Obstruction
Thomson-Walker	112	99	80	1	0	2	6	2	2
<i>Supra-</i> St. Thomas's	26	20	77	0	3	0	2	1	0
<i>pubic</i> Two Bristol hospi-	32	24	75	0	2	3	2	1	0
<i>tals</i> -									
<i>Perineal</i> Young	403	361?	89	0	3	12	?	27*	0

The end results were followed up by Young in 403 cases—for at least six months in all but 26. Of these, 79 died of various intercurrent affections, and 324 survived until the report.

All but 12 can hold water for three hours or more by day: about a quarter can go all night, but must have to rise once or twice. Although

70 per cent required the catheter before operation, only 4 patients were still wholly dependent on it, and 8 more had some partial obstruction. In all the rest there was a perfect result with regard to micturition. None had incontinence night and day; 3 only by day. All the 79 patients who died did well as far as urinary troubles were concerned, except 2 who are included in this summary. The principal drawback of the perineal route is persistence of the fistula; in 27 of Young's cases it was open three months after operation, but it is not stated in how many of these it remained open permanently. Some other advocates of the perineal operation report 3 to 6 per cent of cases of persistent fistula, and 2 to 4 per cent of cases of recto-vesical or recto-urethral fistula.

SEXUAL POWER (ERECTIIONS) LOST AFTER PROSTATECTOMY.

Operation	Cases	Per cent
Suprapubic—Thomson Walker	—	12.5
Perineal—Young	133	25

The sex-functions were retained in 59 per cent of 133 cases in which they were normal before operation, and 75 per cent still obtained erections.

In Young's hands the perineal operation certainly gives better results, both immediately and remotely, than suprapubic enucleation, but it is doubtful if this would be the universal experience. It is better perhaps for small hard prostates, but Freyer's method will still hold a place for large glands that shell out easily.

**Bottini's Operation and Young's Bar-punch Operation.**—These are indicated in cases where the prostate is not enlarged, but a median lobe obstructs the urethra. Young reports 67 cases treated by his punch without a death; 4 of these were failures, and 63 gave good or perfect results.

REFERENCES.—Freyer, *Brit. Med. Jour.*, 1912, n, 868; Thomson Walker, *Can. Jour.*, 1912, xl, 261; Page, *St. Thomas's Hosp. Rep.*, 1910, 135; Young, *Surg., Gyn., and Obst.*, 1911, xii, 269; Young, *Keen's Surgery*, vol. vi, 679; Wilde, *Ann. Surg.*, 1914, lx, 321.

A. Bendle Short.

**PROSTATIC CALCULI.**—These are not very often met with, and, of course, require removal. Incontinence of urine is apt to follow the operation. In a case under Mr. Morton's care, seen by the writer, it returned again and again after repeated removals.

A. Bendle Short.

**PSOAS ABSCESS.** We shall confine our remarks under this heading to tuberculous abscesses arising, in the great majority of cases, in the cavities of the spine.

The material available for coming to a sound conclusion as to the

prognosis of this disease is very scanty. The condition is rather uncommon, so that no one surgeon is able to present a record of a long series of personally-observed cases. We shall here base our study upon the not very recent figures of Lovett, relating to 54 patients under fourteen years of age treated at the Boston Children's Hospital, and upon the notes of 56 cases treated at the Royal Infirmary and General Hospital, Bristol.

The great majority of the cases were, of course, operated on. Nevertheless, recovery apart from operation is not impossible, given rest and favourable conditions. Of 5 children not operated on at Boston, 2 were healed; and 2 probable psoas abscess cases at one of the Bristol hospitals, treated by rest, have made an excellent recovery. Such a happy issue must be regarded as exceptional: usually the abscess will burst and become infected with the organisms of suppuration, which of course makes the outlook much less hopeful.

At the Boston Children's Hospital, the routine treatment was opening and draining by a tube or gauze. More modern practice would prefer, in favourable cases, to evacuate the pus and sew up again; and the results might have been better. This course had been adopted. Of the 49 patients operated on, none died within a month; 6 were lost sight of. Of the 43 followed up for periods from one to ten years, 17 died, and 26 were still alive. The fatal result usually occurred more than a year after the operation. Of the 26 survivors, 12 were cured, 10 much improved, but still suffering from sinuses or pain in the back, and 4 were little or no better. These results, and those of the Bristol cases, are set out in the table subjoined.

## RESULTS OF OPERATION FOR PSOAS ABSCESS.

	Cases operated on	Cases not operated on	Cases followed up	Cases cured	Much improved	Little improved	Dead
Boston Children's Hosp.	49	0	43	12	10	4	17
Two hospitals, Bristol	54	2	37*	17	3	4	13
Total	103	2	80	29 (or 36 per cent)	13 (or 16 per cent)	8 (or 10 per cent)	30 (or 37.5 per cent)

\* 11 cases under sixteen years of age; 26 over sixteen.

The Bristol cases were followed for periods from eighteen months to twelve years (very few under two years). The infected cases were usually drained, and the purely tuberculous abscesses evacuated, scraped, and closed. The results are about the same as the American ones. It will be seen, combining the figures, that the immediate mortality is low, about 2 per cent: that, of 80 cases, about a third

are cured or show only a trifling sinus, a third have died since, and the remaining third are either improved or *in statu quo*, the wounds remaining open and the back still painful. Contrary to expectation, the results in patients over sixteen were very decidedly better than in children: of the former group, 13 out of 23 did well. The figures are, however, too small to be reliable on this point.

In fatal cases, death usually takes place after many months or years of myelitis; albuminoid disease, chronic suppuration and exhaustion, and tuberculous meningitis figuring largely in the final issue. The average time in 11 Bristol cases was between two and three years.

With reference to the prognosis in individual cases, the outlook is much graver if secondary infection with cocci takes place. Lovett shows that fever is of bad omen: thus, of 10 febrile cases, 3 lived, 7 died, mortality 70 per cent; of 30 afebrile cases, 20 lived, 10 died, mortality 33 per cent.

The development of a fecal fistula is extremely grave.

With reference to the mode of operation, Lovett gives evidence which tells against the practice of opening both in the groin and the lumbar region; but it must be borne in mind that the double incision was probably adopted for the larger abscesses. His table is as follows:

RESULTS OF DIFFERENT OPERATIONS (LOVETT).

Operation	Cases followed	Lived	Died
Iliac opening	11	8	3
Lumbar opening	13	9	4
Iliac and lumbar opening	13	4	9
Gluteal opening	5	4	1

He believes that a better result is obtained if the patient is kept sitting or standing after operation, to promote drainage.

We may conclude, therefore, that of cases of psoas abscess, about a third recover more or less completely, a third die, and, of the remainder, some improve, and some go on for years in a wretched state. The average duration of life in fatal cases is two to three years. According to the figures given here (too small to generalize from), it would appear that adults do better than children: this is doubtful.

REFERENCE.—Lovett, *Boston Med. and Surg. Jour.*, 1901, cxlv, 463.

A. Rendle Short.

**PSORIASIS.**—We have to consider (1) *The immediate prognosis*; and (2) *The liability to recurrence*.

1. **Immediate Prognosis.** This will depend upon whether the patient can or cannot give himself up entirely to treatment. The ambulatory treatment of an extensive psoriasis is most unsatisfactory,

and the patient may not be free from the eruption for years; but in a long-standing case, the patient may, perhaps not unwisely, object to lying up for the removal of an eruption which does not trouble him, and which he knows by experience will certainly recur. If the sufferer from psoriasis can give himself up to treatment, and will submit to chrysarobin, the eruption can in many cases be removed in three or four weeks. A longer time will usually be necessary if the scalp is badly involved, as chrysarobin cannot be used in this region. No other remedy is so rapid in its action; if the drug be objected to—and it has many drawbacks—a longer time must be allowed for treatment. The drugs next in efficiency are the tars, oil of cade, pyrogallol, and the derivative of the latter, eugallol.

An extended experience has shown the value of the *x* rays in the treatment of psoriasis when the areas are limited. The periods of intermission are certainly lengthened in many instances, and the patient is enabled to continue at work without the constant application of ointments.

As regards the value of internal treatment, the writer cannot say that he has been greatly impressed by any measure. Arsenic, given either by the mouth or, probably more effectively, by injection, is certainly of some value. Hutchinson stated that he had cured cases by arsenic alone, and the writer knows cases in which its timely use, together with sulphur alkaline baths, cuts short an attack.

**2. Liability to Recurrence.** It is impossible to give a hopeful prognosis as regards recurrences in psoriasis. In some cases, the patient may be free for several months, or a year or so; in others, the intervals last for a few weeks only. Recurrence sooner or later is the rule, and nothing that we know at present can prevent it. The patients are often in the best of health, and in some instances they only lose their eruption when they are out of condition. Relapses are less common where the scalp can be kept free from disease, and the eruption is less liable to recur if completely removed by treatment; but it is at present impossible to speak more favourably.

*J. H. Squerra.*

#### PUERPERAL MANIA. (See MENTAL DISEASES.)

**PUERPERAL SEPSIS.** In puerperal infections, the clinical manifestations are of immense importance in coming to a decision as to the prognosis in individual cases. With regard to the results of treatment, so much variety exists in the classification of cases, that it is difficult to compare the results of different reporters. Thus, while for some American and English authors the mortality is lowered by half when vaccines are used, other writers, especially Continental authorities, absolutely ignoring vaccine therapy, can show very similar results. The truth would appear to be that there is an average mortality figure for each group of puerperal sepsis, and a lower figure where appropriate treatment is applied in each case.

The last few years have seen an interest aroused in the question

of thrombophlebitis and its surgical treatment with results which are not at first sight encouraging, but may readily be improved upon.

We give some figures relating to puerperal infections in general, compiled in large measure from those quoted by Deamund.<sup>1</sup> The death-rate from puerperal infection in all labours is given as 0.25 to 0.3 per cent, and the mortality of puerperal sepsis represents about 10 per cent of all cases, including, of course, very many mild cases. If only the more serious cases of puerperal infection are considered, the death-rate is at least 30 per cent.

The following table shows the relative proportion of the different forms of fatal infections, with the respective death-rate.

TABLE SHOWING THE RELATIVE PROPORTION OF THE DIFFERENT FORMS OF FATAL INFECTIONS, WITH THE RESPECTIVE DEATH-RATE.

Form of Infection	Number of Cases	Mortality per cent.
True septicaemia	40	95
General peritonitis	20	85
Pyæmia	17	72
Stomach endometritis (sapraemia) and abscess	15	75
Pneumonia and pleurisy	7	

A rough indication of the prognosis is also to be gained by a knowledge of the infecting organism: streptococcal organisms are obtained from the uterus in 50 to 75 per cent of all cases; they are the most to be feared—streptococcal cases are much more generally fatal than those due to any other organism. Staphylococcal infections seldom give rise to a septicaemia, but commonly enter into local lesions. *B. coli* infections are comparatively rare, but are said to be dangerous on account of their action on the liver. Gonococcal infections most frequently end in tubal disease and adhesions, which engender sterility; it is seldom that they prove directly fatal.

It has been noted that infections which have taken on an epidemic form are as a rule much more virulent than the average run of sporadic cases. The explanation is to be found in an acquired virulence during the passage through the human body.

**Prognosis from the Clinical Standpoint.**—It is a good thing to have the following rule before one when investigating a case of puerperal sepsis: The gravity of an infection is in inverse ratio to the intensity of the local reaction; that is to say, where there is nothing found to account for the symptoms, the clinician will be guarded in his statements. The following factors are of varying importance:

*The condition of the patient*, especially as to preceding obstetrical operations which have resulted in extensive bruising or the production of necrotic wounds, may indicate a lowered power of resistance,

Cases of albuminuria, of eclampsia, and of severe hemorrhage come under the same category, and provide a large proportion of cases of puerperal infection ending fatally.

*In comparing post-abortion with post-partum cases,* it is found that the latter are, generally speaking, much less favourable. An exception is to be made respecting the cases subsequent to efforts at criminal abortion, in which the mortality easily reaches 5 per cent.

As a general rule, the death-rate is higher in cases (with declared puerperal sepsis) *transferred to institutions* than in cases occurring within an institution.

*The date of onset* of the fever has an important significance. An infection which is evident within 24 to 36 hours after labour will cause anxiety from the outset, while cases occurring after the sixth day will almost certainly show only local lesions of a suppurative character.

*The severity of the general symptoms* bears a direct relation to the gravity of the septic infection. Thus, a temperature maintained at about 100°, a pulse of 110 to 120 per minute and remaining fast in spite of oscillations in the temperature reading, with a dry tongue and loss of sleep, are bad signs.

The correspondence between the pulse and temperature curves should be noted, as in bad cases the pulse is constantly higher than the temperature curve, and does not fall when the temperature is lowered. A slow pulse, irrespective of the temperature, may be taken as a good sign. In the worst cases there is incontinence and dyspnoea, and the extremities become cold. In the absence of vomiting or diarrhoea, and while the appetite remains and the patient receives nutrition, there is always hope that the resistance to disease will be effective.

*Albumin in the urine and a diminution in quantity of the latter* must be taken as unfavourable.

*Jaundice* is seen in cases of general peritonitis, and indicates wide extension of the latter. It is rare in such cases for recovery to take place. The condition must not be mistaken for the icteric tinge not infrequently seen in cases of severe septic infection with high temperature; such a tinge occurs in nearly all fevers, and does not imply a serious lesion of the liver tissues.

*The blood* furnishes information—in the first place bacteriologically, as indicating the presence or absence of micro-organisms. It is of some significance to try to distinguish the true septiciemias from the occasional bacteriæmias. Thus, a culture from the blood within an hour or two of a rigor will almost certainly contain bacteria; but the same patient's blood a few hours later may or may not reveal the presence of organisms. Such a discontinuous bacteræmia has a much better prognosis than the continuous. Again, cultures taken when death is approaching are frequently found to reveal a *B. coli* infection, which is probably not the true causal agent. The presence of microbes does not necessarily indicate a bad prognosis, as Western,<sup>1</sup> in 96 cases of puerperal fever, found definite evidence of organisms

in the blood, continuously or discontinuously, in 40 per cent. The mortality in these cases was: in the group treated by vaccines, 32 per cent; in the group treated by ordinary methods, 55 per cent. The absence of microbes in the blood is, of course, a good sign; but pneumonia, peritonitis, or some other complication, may cause a fatal issue.

In the second place, the blood has been examined from the point of view of leucocytosis. In the milder forms the white cells should range round 20,000, and the polymorphs should not exceed 90 per cent of the whole; while in the severe forms the leucocytosis reaches 50,000, the polymorphs represent 95 per cent of the whole, and there may be complete disappearance of the cosmophiles.

Such complications as endocarditis, pericarditis, suppurative arthritis, and pneumonia are very serious indeed; while with the development of thrombosis of the leg, the infection often subsides.

The conditions prevailing in the pelvis help materially; when the lochia are normal and inoffensive, the uterus small and firm, while the general symptoms are marked, the case is almost certainly one of septicæmic nature; on the other hand, cases with a large bulky uterus and offensive discharge, or a local swelling, are much more hopeful.

**The Results of Treatment.** These would appear to be more a matter of recognizing the type of infection and applying thereto the appropriate treatment. The difficulties of diagnosis are immense. For instance, there is no doubt that operative procedures offer the best chances in cases of thrombophlebitis, yet clinically it is nearly impossible to distinguish these cases from the true septicæmias—in fact, the two frequently co-exist.

We shall, however, consider the figures given by different authorities for the various forms of treatment.

The conservative treatment, where douching, drugs, and local applications are used according to the clinical manifestations, show a wide variation in mortality, depending on the observer.

MORTALITY IN CASES TREATED BY ORDINARY METHODS.

Author	Mortality
Notified cases	58
Western <sup>1</sup> (44 cases)	55
Western (bacteræmias)	87.5
Jolinstone <sup>2</sup> (Belvedere Hospital)	42
Jeanmu <sup>3</sup>	30
Stokes <sup>4</sup> (Mossall Hospital in 1910—75 cases)	19.7

<sup>1</sup>Stokes<sup>4</sup> included all cases admitted, and it is not stated whether vaccines were used or not. Great variation exists in deciding what



constitutes a puerperal infection: thus, Jeannin<sup>1</sup> places the figure at 10 per cent if all puerperal infections are included.

Vaccines have recently been extensively used in this country and in America. The largest series was treated at the Landon Hospital, and published by Western.<sup>2</sup> He claims that it is possible to reduce the mortality by half by using autogenous vaccines. Thus, in 56 cases treated with vaccines, the mortality was 32 per cent; in 44 treated without vaccines, it was 55 per cent. Still more striking are his figures in those cases where there were organisms present in the blood at the time of culture: in bacteriemiae treated without vaccines, the mortality was 87.5 per cent; in those treated with vaccines, it was 52 per cent. Western, however, was of opinion that vaccines were not so useful in the severe type of cases in which death usually ensued within ten days of the onset. He also found stock vaccines unsatisfactory. Podak,<sup>3</sup> using polyvalent vaccines, had only 6 death in 28 cases of streptococcal bacteriemia, i.e., 21.4 per cent; and in 12 staphylococcal infections only 4 died, a mortality of 83 per cent.

*Antistreptococcal or anti-putrid sera* have now received an extensive trial. They do not appear to have been very successful. Johnstone<sup>4</sup> says he has seen no benefit from their use. Jardine<sup>5</sup> used polyvalent sera in 25 cases, with benefit in only 2. Bonstedt,<sup>6</sup> however, believes they have been of much service in a series of 26 cases in which he employed them.

*Injections of a 2 per cent sterile solution of magnesium sulphate* have recently been used. In this way James A. Harrar<sup>7</sup> treated 11 cases of severe septicæmia—in 5 cases streptococci were isolated from the blood, with 1 death; while in the other 6 cases streptococci were cultured from the uterus, and again 1 died. He finds this method useless in thrombophlebitis, pus collections, and chronic pyæmia. To obtain good results the treatment must be undertaken early.

*The operative treatment* of thrombophlebitis still shows a very high mortality. Jeannin, Vanverts, and Ponceot<sup>8</sup> collected 82 cases up to 1912, with a mortality of 59.8 per cent. But it must be remembered that this list includes some of the first operations, and also many hopeless cases. Thus, in some cases there was thrombosis of pelvic and uterine veins of both sides, of ovarian, and even of the hypogastric veins. The cases operated upon within the last year or two would show more favourable results. On the other hand, it appears that thrombosis of the veins is found in the majority of puerperal infections, and in less than one-third it constitutes the only lesion: of these latter, it appears that the thrombosed vessel is capable of satisfactory surgical treatment in 70 per cent.

REFERENCES. <sup>1</sup>*Lancet*, 1912, Feb. 10; <sup>2</sup>*Jour. Obst. and Gyn.*, 1912, June, 367; <sup>3</sup>*Pratique de l'Art de l'Accouchement*, 1911, 3rd edition, vol. 1, 640 (1 seq.); <sup>4</sup>*Jour. Obst. and Gyn.*, 1913, March, 178; <sup>5</sup>*Jour. Amer. Med. Assoc.*, 1911, Nov., 25; <sup>6</sup>*Jour. Obst. and Gyn.*, 1912, June, 378; <sup>7</sup>*Monats. f. Geb. u. Gyn.*, xxiv, Heft 1, 46; <sup>8</sup>*Amer. Jour. Obst.*, 1913, Nov.; <sup>9</sup>*Arch. Mens. d'Obst. et de Gyn.*, 1912, Nov.

Brylen Glendinning.

**PULMONARY TUBERCULOSIS.** — The prognosis in pulmonary tuberculosis in an individual case is extremely difficult, so much so that it has been said that he who attempts it can be sure of one thing only, and that is that he will be mistaken. Patients who appear to be doing well, and in whom the disease seems to be almost arrested, may, and often do, suffer a relapse brought about by fatigue, inter-current illness, or other cause, or may die from hæmoptysis, meningitis, or pneumothorax. For example, a doctor who had recovered from an acute attack of the disease, who had doubled his weight, and was capable of walking fifteen miles with no rise of temperature, as the result of sanatorium treatment, suffered a severe relapse owing to an afternoon's enthusiastic tobogganing. This laid him up in bed for five months, and rendered him a more or less permanent invalid during the remainder of his life.

On the other hand, every physician of wide experience in this disease comes across numerous instances of patients whose life at some time or other has not appeared likely to be prolonged for more than a few months, and who nevertheless make a surprisingly good recovery. Three examples from my own experience may be given.

A Frenchman living in New York, who was apparently dying, was anxious to go to Paris to take farewell of his family, and consulted a number of physicians on the subject. All except one thought he would die on the voyage, and advised him not to undertake it. He, however, went to Paris, taking a coffin with him on the voyage. He improved somewhat, and then went to a well-known sanatorium, where he became so much better that he was able to take up his work again. He lived an adventurous life in all climates, and often faced conditions which would have tried a strong, healthy man. When he consulted me some fifteen years later, there was no active disease, but much fibrosis, some dry excavation, together with shortness of breath. He died two years afterwards from profuse hæmoptysis.

A working man came to my out-patient room at the Brompton Hospital, apparently in the last stages of the disease. Both lungs were extensively infiltrated, with signs of excavation in three lobes, a large laryngeal ulcer was present, and the temperature was 103°. The man refused to go to an infirmary, and it was impossible to get a bed for him in a home for the dying. A philanthropic lady gave the necessary funds for him to be boarded out in the country. He had practically no medical treatment, but when I saw him a year later, all signs of active disease had gone, satisfactory fibrosis had taken place, the laryngeal ulcer was completely healed, and his general condition was so satisfactory that he was sent to the Fimley Sanatorium, where he reached the highest grade of labour. He continued to do well for some years, although he never returned to his occupation, preferring to live on the charity of the lady who had befriended him when he was thought to be dying.

A doctor who had just qualified was found to be in an early stage of the disease, and led an open-air life for two or more years. When

I saw him, some thirty years afterwards, he was capable of very hard work; and he told me that apart from an occasional attack of fever lasting a week or two, he had been able to cope single-handed all this time with a practice which was so arduous that although he kept four horses he was never able to drive a pair. The whole of the left lung was infiltrated, and there was an unusually large cavity in the lower lobe. This patient died, when over seventy, from cerebral hemorrhage.

These cases are sufficient to show the folly of making too dogmatic statements about the future of anyone suffering from pulmonary tuberculosis. Nevertheless, certain wide general statements may be made on the subject of prognosis. In the first place, pathological investigations show that the defensive forces of the body are capable of defeating the invading tubercle bacillus with extraordinary frequency, and that many persons suffer from slight degrees of pulmonary tuberculosis and recover completely. In fact, pathological evidence is the strongest we have to demonstrate the curability of the disease. It shows us that many persons contract consumption, and yet recover without their condition being diagnosed. Clinical evidence, similarly, shows that a number of persons have the disease in such a slight form that a short holiday, or a few months' rest under open-air conditions, brings about a complete restoration to health. In fact, it is probably true that at least 20 per cent of the cases of pulmonary tuberculosis in which a clinical diagnosis can be made, end in recovery whatever the treatment, and sometimes in spite of treatment. In other instances the disease has obtained a firmer hold, and more prolonged and rigid treatment is required to enable the defensive forces of the body to gain the victory; and in yet other cases, some of them diagnosed in the early stages, no form of treatment appears to have much, if any, effect in arresting the activity or the progress of the disease.

These differences are due to the fact that in this, as in every form of infective disease, we have a constant war between the invading micro-organisms and what may be termed comprehensively the defensive forces of the body. The latter are complicated things, and upon their response to the invading organisms or their products depends the question of recovery or of extension of the disease and eventual death. The questions of recovery, partial recovery, and arrest, or gradual extension of the tuberculous process, depend upon the ratio of the virulence of the bacilli and the specific resistance of the defensive forces of the body under the particular conditions of the individual case. If there is no response on the part of the defensive forces, or if the response is such that the toxic effect of the bacilli or their products is not neutralized, the inflammatory process continues, and the disease extends.

In prognosis, therefore, we are faced with the problem: How will the defensive forces respond to the attack? If the bacilli are virulent and the patient's strength is undermined, the outlook, even with opportunities for satisfactory methods of treatment, commenced at

an early stage of the disease, is bad. If the bacilli and their products elicit an effective response and the conditions for treatment are satisfactory, the outlook is far more favourable.

**Factors influencing the Prognosis.** From the above it will be clear that in the prognosis of this disease the most important factor to be taken into account is *the response of the defensive forces*. If the patient suffers from toxic effects such as malaise, loss of appetite and of weight, fever to 99° or more when at rest, we know that the response is ineffective, and that the disease, being active, is extending. On the other hand, if the patient loses his sense of fatigue, gains weight, has an afebrile temperature, and has less signs of local irritation, such as diminution in the amount of expectoration, we know that the response is effective.

The above reasoning helps us to understand how *different types of the disease* are associated with a varying prognosis, and how the prognosis depends upon the varying conditions of life, environment, and constitution of the individual patients. In established military tuberculosis the outlook is hopeless; in acute casuous tuberculosis, associated with fever and other signs of toxæmia for several months, it is always grave, as it is in the comparatively rare form of pneumonic tuberculosis in adults. In the pneumonic form in children, the portion of lung affected not infrequently breaks down, a cavity is rapidly formed, the casuous matter is expectorated, the disease ceases to extend, and the patient recovers.

Again, *the state of the patient's previous health* has a marked effect upon his capacity to respond. Thus, when pulmonary tuberculosis is grafted on such diseases as chronic Bright's disease, diabetes, or cancer, it is incapable of cure, and only accelerates the end. Similarly, the development of such complications as chronic albuminuria or glycosuria in a case of pulmonary tuberculosis is of the gravest significance. As a further example of this point, it may be mentioned that the death-rate from pulmonary tuberculosis in lunatics approaches 25 per cent. A chronic alcoholic rarely recovers from consumption. Syphilis often leads to the subsequent development of tuberculosis, and is a grave complication of the disease; in many instances in which it is difficult to explain the unsatisfactory progress of a case, it will be found that there is a history of previous syphilis, with the persistence of a positive Wassermann test. Further, a consumptive who is also an alcoholic and a syphilitic may be regarded as having practically no chance of recovery.

*The earlier the disease is diagnosed and the patient brought under efficient treatment, the better is the outlook*; but even if the diagnosis is made in the earliest stages, and efficient treatment is immediately undertaken, at least 10 to 15 per cent of the cases fail to make an efficient response, and a fatal ending is brought about in from one to three years. On the other hand, the mere fact that the disease is in an advanced stage when discovered does not preclude recovery. In a number of instances in which the disease is advanced there has been

very good resistance, and but little is required to make the defensive forces victorious. Thus, a working man who has continued his work under bad conditions whilst the disease has made slow but considerable progress, and until he is forced to seek advice will often do well when placed under more helpful conditions.

*The character of the onset*, apart from the forms of the disease already discussed, has an effect on the prognosis. When the first symptom is haemoptysis, patients often do very well. This is largely accounted for by the fact that this symptom alarms the patient and impresses him with the necessity for treatment at a time when there is only a slight amount of infiltration. When the onset is pleuritic, and efficient treatment is commenced at once, the outlook is usually favourable.

*Family characteristics* have some bearing on this question. If two or more members have died from the disease without any real response having been made to the infection, it is a fair deduction that the resistance of the family is poor; and if another member of the family contracts the disease, the outlook as a rule is not satisfactory.

Apart from the above considerations, the most important factors are: the character of the patient; his facilities for treatment; and the conditions he has to face after the disease has become arrested.

Everything depends on *the character of the patient*. This has been expressed more forcibly by the statement that in this disease it is "impossible to cure a fool." The patient must depend on himself; his doctor can direct him, but unless he is prepared to devote himself whole heartedly to the details of treatment until the arrest of the disease has continued for at least two years after the resumption of work, his chance of permanent recovery is small.

The question of *facilities for treatment* speaks for itself: the value of different forms of treatment is discussed later.

*The after-conditions* are important. It is often said that treatment of this disease is a failure, because so many relapses take place when it appears to have been arrested. If a man breaks his leg by tripping over orange peel, has it truly united by proper treatment, and subsequently fractures it again by once more slipping on orange peel, it is no reflection on the treatment given. If a man owing to bad conditions has his defence so undermined that he contracts tuberculosis, it is no reflection on sanatorium treatment if, after the disease has undergone arrest, he suffers from a relapse as the direct result of returning to precisely the same conditions as those under which the disease originated. The essential things in the after-conditions are the avoidance of fatigue, the avoidance of impure air (rather than the necessity of making a fetish of open-air conditions), and the opportunity of having a rest at once if slight illness, such as a feverish cold, or symptoms of renewed activity of the disease, occur. Fatigue is the usual cause of relapse, and in many instances it is fatigue produced in the excitement of sport.

In concluding this part of the subject, we may say that if the disease is acute and no response is made, death may take place in three months,

and is seldom delayed much beyond two years. If we consider the cases which end fatally in the consumption hospitals—and most of these cases are presumably of the more acute type—the majority (to the extent of 80 per cent) have a duration of less than three years, and only about 6 per cent have a duration of over four years.

This type of the disease may be recognized by certain clinical signs, as these are an index to the activity of the disease. So long as fever continues, the disease is active. If fever is not reduced by absolute rest, and continues for some months, the outlook is always extremely grave. Again, if slight degrees of exercise always produce fever, which persists in spite of rest, the case is an unfavourable one. In such instances the production of rest to the affected lung by means of a pneumothorax induced by nitrogen gas, more especially when this method is adopted at an earlier stage than is usually the case at present, may do much to prolong life and, in a certain number of cases, to bring about permanent arrest.

The pulse, like the temperature, is an index to the activity of the disease, and a persistently rapid pulse rate, or one which is readily increased by exertion, is associated with an unsatisfactory prognosis. A sense of malaise or easy fatigue is similarly indicative of a poor response on the part of the patient's defensive forces; and its persistence in spite of treatment, like the persistence of other signs of toxæmia, such as loss of weight, sweating, etc., is associated with a bad prognosis.

The extent or character of physical signs are of little assistance in determining the activity of the disease; the important things are the degree of toxæmia and the response of the individual. Increase of expectoration and repeated hemorrhage usually signify that the patient's chances are diminishing. The persistent presence of tubercle bacilli in his expectoration is often associated with failure to arrest the process, but bacilli continue to be present in the sputum of many patients who retain their health and capacity to work for years. In fact, we have tubercle carriers just as we have typhoid carriers. The presence of secondary organisms in the sputum is not necessarily indicative of secondary infection, and many patients who suffer from pulmonary tuberculosis associated with bronchitis live long and useful lives. When secondary organisms have invaded the tuberculous tissue, the hope of recovery is greatly diminished. A further point is that a persistent diazo-reaction of the urine is usually associated with an unfavourable prognosis.

When the response of the patient is more satisfactory than in the acute cases, but still inadequate, or when the response is adequate but the conditions of life after arrest has been brought about are unsatisfactory, the mean duration of life probably does not exceed seven to eight years. Stadler showed that of 670 male and female patients in the first and second stages of the disease who were not treated in a sanatorium, 51 per cent were alive at the end of six years, and 41 per cent at the end of seven. Of these 670 patients, only 40 per

ent were capable of full work at the end of four years: whereas, of 746 patients treated at the Prussian and Hessian Railway Sanatorium, 60 per cent were capable of full work at the end of five years.

When the response is adequate and the after-conditions are satisfactory, the prognosis is good, and many patients are capable of leading very active lives for a number of years.

Finally, it may be said that when a patient who has suffered from pulmonary tuberculosis feels well (probably, in sensible patients, the most reliable guide of all), has a normal temperature, maintains a satisfactory weight, and has no return or increase of expectoration, he may be satisfied as to his condition, no matter what physical signs may be present. Conversely, a feeling of malaise, a raised temperature, continued loss of weight, and a return or increase of expectoration, apart from a temporary cold, indicates the presence of toxæmia and a return of the activity of the disease.

*Efficient treatment* has much effect on the future of the large proportion of consumptives. As they rely on their defensive forces they require good hygienic conditions—i.e., pure air, sufficient food. The most important thing in their treatment is the regulation of the amount of exercise in such a way that the auto-inoculations produced stimulate the defensive forces of the body, but never paralyze them. This is the principle underlying sanatorium treatment. The figures given below suggest that climatic necessities have been overrated in the past: that good results are obtained from sanatorium treatment; and that these are somewhat improved by the careful use of tuberculin. In a certain number of carefully selected cases partial or complete compression of a lung by nitrogen gas (artificial pneumothorax) gives good results.

**Effects of Climate.** We have conclusive evidence that pulmonary tuberculosis is capable of undergoing complete arrest in practically any kind of climate. Thus, good results have been obtained in Russia below sea-level, and in low-lying Holland. Conversely, the death-rate from this disease among Red Indians in the Rocky Mountains—one of the coldest climates in the world—is stated to be 25 per cent of the total mortality. This is doubtless due to the conditions under which the Indians live, and emphasizes the importance of the immediate environment. The theory that treatment at high altitudes is far superior to all other climatic or hygienic forms of treatment is not supported by modern observations. Perhaps the most important evidence in this respect is that of Professor Saenger, who has contrasted the results obtained by him at the Vejlebjerg sanatorium in Denmark with those obtained by Turban at Davos. The Vejlebjerg sanatorium is a few feet above the sea; Davos has an altitude of 5000 feet. At the Danish sanatorium the average stay of patients was 176 days, whereas at Davos it was 222 days. Again, Turban's patients were drawn from a richer class, who would be in a better position to look after themselves when they had left the sanatorium. In spite of these disadvantages, the results obtained by Professor

Sargmann, given below, compare favourably with those obtained by Turban, and show conclusively that a high altitude is not essential to the successful treatment of consumption.

Climate, naturally, cannot be ignored. Much better results are obtained in cold or temperate climates than in hot or tropical ones. Again, results are not so good in situations which are damp, or wind-swept and exposed, as in dry or more protected situations. A change of climate is as beneficial to the consumptive as to others, but not essential. In suitable cases, an after-cure at an altitude is of service in expanding the lungs.

PERCENTAGE OF PATIENTS FROM WHOSE EXPECTORATION TUBERCLE BACILLI DISAPPEARED DURING TREATMENT.

Stage	Percentage of Patients	Percentage of Bacilli
I	74	79
II	41	65
III	11	17

PERCENTAGE OF PATIENTS WHO SUFFERED FROM FEVER ON ADMISSION BUT BECAME AFEBRILE DURING TREATMENT.

Stage	Percentage of Patients	Percentage of Cases
I	85	83
II	80	96
III	41	69

PARTICULARS OF AFTER-HISTORY OF PATIENTS IN WHOSE EXPECTORATION TUBERCLE BACILLI WERE PRESENT DURING STAY AT SANATORIUM.

After-history	STAGE I		STAGE II		STAGE III	
	Percentage of Patients (over 1.7 years)	Percentage of Cases (over 1.7 years)	Percentage of Patients (over 1.7 years)	Percentage of Cases (over 1.7 years)	Percentage of Patients (over 1.7 years)	Percentage of Cases (over 1.7 years)
Able to work	94.7	91.4	51.0	71.3	16.8	24.7
Unable to work on account of tuberculosis	5.3		13.7	2.0	7.0	5.3
Died from tuberculosis		8.6	29.6	25.7	72.2	67.3
Unknown			2.7	1.0	3.0	1.2



## PARTICULARS OF AFTER-HISTORY OF PATIENTS WHO WERE ADMITTED TO SANATORIUM WITH PLEUR.

After-history	STAGE I		STAGE II		STAGE III	Average of all cases
	Number of cases	Percentage	Number of cases	Percentage	Number of cases	
Able to work	91	100	44.4	77.1	12.3	20.5
Unable to work on account of tuberculosis			11.1		7.1	3.9
Died from tuberculous			37.8	22.9	77.7	75.6
Unknown	5		3.3		2.5	0.5

In the later stages, life is probably prolonged if the patient is able to avoid marked climatic changes, and to reside at some place where the conditions are suitable for the particular indications of the case.

**The Results of Sanatorium Treatment.** The results obtained by treatment in a sanatorium vary, as might be anticipated, according to the condition of the patient and the character of the lesion at the time treatment is commenced. The results obtained when treatment is commenced in what is known as Turban's Stage I\* are far better and more lasting than those obtained when treatment is commenced in Stage III. Further, the results are more lasting according to the class from which the patient is drawn and according to the character of his work and surroundings. In the case of the working classes, about 50 to 60 per cent of those treated in Stage I may be expected to be capable of work five years after their discharge from the institution; whilst in those belonging to the upper classes, the percentage given by some authorities is as much as 80 to 90.

It is unwise to rely too much on statistical proof under present conditions, for it is difficult to compare data from different institutions, owing to the different methods adopted in classification and treatment. For example, in some institutions a proportion of patients receive tuberculin; in others, this remedy is not used. Certain broad conclusions, however, may be drawn, and the statistics of the results of sanatorium treatment given below are useful for that purpose. These are largely taken from the excellent chapter on this subject in Sir R. Douglas Powell and Dr. Hartley's book on *Diseases of the Lungs and Pleura*.

\* Turban's Stage I is the condition of the lung in which the disease is in its early stages.

Stage I is the condition in which the disease is in its early stages.

Stage II is the condition in which the disease is in its early stages.

Stage III is the condition in which the disease is in its early stages.

Stage IV is the condition in which the disease is in its early stages.

Stage V is the condition in which the disease is in its early stages.

Stage VI is the condition in which the disease is in its early stages.

Stage VII is the condition in which the disease is in its early stages.

I.—SHOWING RESULTS OF SANATORIUM TREATMENT IN 267 CASES OF EARLY PULMONARY TUBERCULOSIS (STAGE I, TURBAN) ADMITTED TO THE STANHOPE SANATORIUM DURING THE YEARS 1900-1908.

Year	Cases Admitted		Disposition of Tuberculous Cases					Percentage of Cured Cases
	1900	1901	Went to work	Returned to work	Returned to work	Returned to work	Returned to work	
1900-1901	14	14	7		2	5		50.0
1901-1902	26	23	8	1	10	7	1	30.8
1902-1903	20	21	7	1	5	7	1	35.0
1903-1904	33	28	18	1	6	8	1	51.5
1904-1905	35	30	16	1	11	4	2	45.7
1905-1906	37	35	17	5	7	7	1	46.0
1906-1907	51	45	26	6	4	12		56.9
1907-1908	51	43	34	15	1		1	66.7
Totals	267	236	136	33	46	50	7	50.0

II.—SHOWING RESULTS OF SANATORIUM TREATMENT IN 317 CASES OF ADVANCED PULMONARY TUBERCULOSIS (STAGE III, TURBAN) ADMITTED TO THE STANHOPE SANATORIUM DURING THE YEARS 1900-1908.

Year	Cases Admitted		Disposition of Tuberculous Cases					Percentage of Cured Cases
	1900	1901	Went to work	Returned to work	Returned to work	Returned to work	Returned to work	
1900-1901	12	3			12			0.0
1901-1902	20	8	2		17	1		10.0
1902-1903	31	17	2		26	3	1	6.5
1903-1904	29	11	3		26			10.3
1904-1905	37	19	6	1	27	3	2	16.2
1905-1906	68	25	7	8	46	7	1	10.3
1906-1907	62	23	10	9	41	2	3	16.1
1907-1908	58	24	11	32	12			24.1
Totals	317	130	44	50	207	16	7	13.9

These statistics of Dr. John Gray, which are confirmed and improved upon by other English observers such as Dr. Burton Fanning, show the capacity for work at varying intervals. They also show that of

The 257 patients treated in an early stage, 46 were known to be dead and 50 were lost sight of in 1908; whereas of the 317 patients treated in an advanced stage, 207 were known to be dead.

The statistics of the German State Sanatoria, although not strictly comparable as they refer to all classes of cases, show that 41 per cent of the male and 51 per cent of the female patients were capable of working four to five years after their discharge from the institution.

III. SHOWING THE IMMEDIATE AND AFTER-RESULTS IN MALE PATIENTS TREATED IN GERMAN SANATORIA UNDER THE PROVISIONS OF THE INVALIDITY INSURANCE LAW DURING THE YEARS 1904 TO 1908.

Year	Number of patients treated	Number of patients who were capable of working after 4 to 5 years	Average number of patients who were capable of working after 4 to 5 years				
			1904	1905	1906	1907	1908
1904	16,957	79	73	61	53	48	44
1905	19,085	81		76	63	54	49
1906	21,959	82			77	65	55
1907	22,258	81				77	65
1908	26,437	81					77

III. SHOWING THE IMMEDIATE AND AFTER-RESULTS IN FEMALE PATIENTS TREATED IN GERMAN SANATORIA UNDER THE PROVISIONS OF THE INVALIDITY INSURANCE LAW DURING THE YEARS 1904 TO 1908.

Year	Number of patients treated	Number of patients who were capable of working after 4 to 5 years	Average number of patients who were capable of working after 4 to 5 years				
			1904	1905	1906	1907	1908
1904	6,520	81	76	66	59	55	51
1905	7,536	83		78	67	60	55
1906	9,063	85			81	70	63
1907	9,816	84				80	69
1908	12,288	86					82

Slightly better results have been obtained in other German sanatoria. Thus, in the case of the Prussian and Hessian Railway Company employees, 60 per cent were capable of full work five years after leaving the sanatorium, although a considerable proportion of the cases (26 per cent in 1908) were in Turban's Stage III.

IV. — SHOWING THE IMMEDIATE AND AFTER RESULTS OF SANATORIUM TREATMENT AMONG THE EMPLOYÉS OF THE PRUSSIAN AND HESSIAN RAILWAY COMPANIES DURING THE YEARS 1904 TO 1908.

Year	No. of cases	1904	1905	1906	1907	1908
1904	716	81.7	74.6	66.6	63.0	59.6
1905	810		85.3	76.7	71.8	68.1
1906	1,180			85.8	70.0	73.0
1907	955				81.0	73.0
1908	1,152					82.5

In patients belonging to the upper classes, the results of sanatorium treatment show that in the early cases a larger percentage are capable of work than is shown by the statistics for the working classes, and confirm the observation that treatment in the later stages is seldom accompanied by satisfactory results for any length of time.

Dr. Noel Bardswell has given the results obtained in the case of patients treated by him at the Mundesley Sanatorium from 1901 to 1905, as observed to the year 1909.

V. — SHOWING RESULTS OBTAINED IN 241 MALE AND FEMALE PATIENTS BELONGING TO THE UPPER CLASSES TREATED AT THE MUNDSELEY SANATORIUM, NORFOLK, DURING THE FIVE YEARS 1901 TO 1905.

*All Cases considered together.*

Year	1901	1902	1903	1904	1905	1906	1907	1908	1909	Well	Alive	Died	Discharged	Lost sight
1901	58 (5)	49	39	33	27	26	24	22	20	99 (41.0)	17.2			
1902	53		48	39	35	32	31	30	26	15 (6.2)				
1903	57 (2)			52	43	36	35	34	32	101 (41.9)				
1904	34				33	31	29	29	28					
1905	15					13	12	9	8					
245*										19 (8.0)	49.9			
										100 (41.0)				
										7 (3.0)				
										Total 241				

\* Includes to case 215, cases 7 patients were discharged but have since returned to the sanatorium, and 11 cases were discharged but have since returned to the sanatorium, making a total treated 241.

*Incipient Cases.*

	1902	1903	1904	1905	1906	1907	1908	1909			
1901	10 (2)	10	10	9	9	8	7	6	Well	46 (74.0)	75.6
1902	15	15	14	14	14	13	13	12	Alive	4 (4.6)	
1903	18 (2)		18	16	16	15	15	15	Died (0)		
1904	11			11	11	11	11	11	m.s.m.	11 (17.6)	
1905	4				4	3	3	3	torum)		
	58+								Lost sight		
									of	4 (6.4)	
									Total	62	

1. In addition to the 7 cases of moderate advanced cases, 1 case of moderately advanced case, 1 case of far advanced case, and 1 case of incipient case, there were 15 cases of moderate advanced cases, 1 case of moderately advanced case, 1 case of far advanced case, and 1 case of incipient case.

*Moderately Advanced Cases.*

	1901	1902	1903	1904	1905	1906	1907	1908	1909		
1901	24 (3)	23	17	15	12	11	11	11	11	Well	47 (49.4)
1902	19	19	16	15	14	14	14	13	12	Alive	10 (10.5)
1903	25		24	21	16	16	16	15	15	Died (1)	
1904	16			16	16	15	15	14	14	m.s.m.	35 (36.8)
1905	7				7	7	5	5	5	torum)	1
	91;									Lost sight	
										of	3 (3.1)
										Total	95

1. In addition to the 36 cases of moderate advanced cases, 1 case of moderately advanced case, 1 case of far advanced case, and 1 case of incipient case, there were 38 cases of moderate advanced cases, 1 case of moderately advanced case, 1 case of far advanced case, and 1 case of incipient case.

*Far-advanced Cases.*

	1901	1902	1903	1904	1905	1906	1907	1908	1909		
1901	24	16	12	8	6	6	5	4	3	Well	6 (7.1)
1902	19	—	12	9	6	4	4	4	2	Alive	1 (4.7)
1903	12			10	6	1	4	3	2	Died (18)	
1904	7				6	4	3	3	3	m.s.m.	71 (88.0)
1905	4	—				2	2	1	1	torum)	
	66;									Lost sight	
										of	0
										Total	84

1. In addition to the 18 cases of moderate advanced cases, 1 case of moderately advanced case, 1 case of far advanced case, and 1 case of incipient case, there were 20 cases of moderate advanced cases, 1 case of moderately advanced case, 1 case of far advanced case, and 1 case of incipient case.

Careful observations in the same direction have been made by Dr. Lawrason Brown and the late Mr. E. G. Pope on the results obtained in 2222 patients, admitted in all stages of the disease, who were treated at the Adirondack Cottage Sanatorium in New York State. The immediate results gave a percentage of 56 apparently cured and 32 arrested out of 620 early cases.

VI. SHOWING THE CONDITION ON DISCHARGE OF 2222 PATIENTS ADMITTED TO THE ADIRONDACK COTTAGE SANATORIUM, NEW YORK STATE, U.S.A.

	CONDITIONS ON DISCHARGE				
	Number	Percentage	Number	Percentage	Number
Incipient cases	620	56	32	11	0.43
Moderately advanced	1326	32	16	40	2.10
Far advanced	273	0	16	78	6.10

The *after-results* of these cases, calculated in terms of 1000, showed :

1. That 750 patients out of 1000 discharged as apparently cured survived at the end of 15 years, as against 850 out of 1000 of the general population.
2. That the expectancy of life in those discharged with arrested disease (which includes 32 per cent of the incipient cases, 16 per cent of the moderately advanced, and 16 per cent of far advanced) was between seven and eight years.

**Results of Tuberculin Treatment.**—It is difficult to prove by any method other than the personal supervision of a large series of cases that tuberculin is of the value in pulmonary tuberculosis that most authorities on this disease consider it. Statistics are open to many fallacies when used for such a purpose; but it is recognized—much more strongly by physicians in Germany, Switzerland, and America than by most physicians in England, it is fair to add—that tuberculin is of considerable value both as regards the immediate and ultimate results of treatment. If this were not so, the great extension in the use of this remedy seen both in Germany and England would be unaccountable; for example, in 1905 tuberculin was employed in 36 out of 123 private and public sanatoria in Germany; in 1906, in 57 out of 132; and in 1907, in 77 out of 135. In three years, therefore, the figures rose from 29 to 57 per cent. To my mind, the best summing-up on this subject is that of Dr. Lawrason Brown, who says, "Tuberculin when properly given does no harm, may produce no apparent result, and may markedly benefit an individual patient who can follow at the same time the hygienic-dietetic treatment while in a health

resort, at home, at rest, or at work. Some patients, even in advanced stages, reap great benefit. The immediate and ultimate results are improved, fewer relapses occur, and more patients lose the tubercle bacilli in their sputum." My own experience is to the effect that patients suffering from consumption, and in whom there are no contra-indications against the use of tuberculin, not only lose their bacilli in greater numbers when tuberculin is *effectively administered* than patients who do not have this remedy, but suffer from relapses less frequently.

Statistics on such a subject tend to be fallacious, but a few may be given to support the above generalizations. The problem may be discussed from, amongst others, the three following points of view: (1) The disappearance of tubercle bacilli from the expectoration; (2) The immediate results of treatment from a clinical standpoint; (3) The ultimate results.

1. *The Disappearance of Tubercle Bacilli.*—Dr. Radcliff, of the King Edward VII Sanatorium, found that in patients treated by sanatorium methods and no tuberculin, the percentage of cases in which the bacilli disappeared was as follows: Stage I, 45.6 per cent; Stage II, 19 per cent; Stage III, 8.9 per cent; or taking all cases together, 23.3 per cent. Loewenstein, on the other hand, using a more searching technique, found that in patients treated by sanatorium methods *and* tuberculin, the percentage of cases in which the bacilli disappeared was as high as 52.9 per cent. Bandler, in a similar series, found the percentage to be: Stage I, 100 per cent; Stage II, 87.3 per cent; Stage III, 44.2 per cent. Curschmann gives: Stage I, 80 per cent; Stage II, 47.7 per cent; Stage III, 33.7 per cent.

We may say, then, that so far as statistics go, there is evidence of the value of tuberculin in causing the disappearance of tubercle bacilli in all stages; and that when we take all cases in one group, we find that with sanatorium methods alone less than 25 per cent of the patients lose the bacilli from their expectoration, but that when tuberculin is added to the treatment, the percentage is over 50.

2. *The Immediate Results of Treatment from a Clinical Standpoint.*—Trudeau found that in the incipient cases the results were very satisfactory with sanatorium methods alone, and that they were but slightly enhanced by the use of tuberculin. In the moderately advanced cases, 27 per cent of those in whose treatment tuberculin was given were cured, as against 6 per cent where tuberculin was not given; 55 per cent were arrested when tuberculin was given, as against 51 per cent when it was not; whilst 18 per cent remained active when tuberculin was given, as against 43 per cent when it was not.

3. *The Ultimate Results.*—Turhan found that of 86 patients whose sputum contained bacilli and who were treated with tuberculin, 52.3 per cent are capable of work from one to seven years after their discharge from the sanatorium; whereas, of 241 patients whose sputum also contained bacilli and to whom no tuberculin was given, only 39.4 per cent gave a similar result. Ritter found that the following

percentage of his patients were capable of work one to four years after their discharge from his sanatorium (50 being examined only about one year after their discharge):

PATIENTS CAPABLE OF WORK ONE TO FOUR YEARS AFTER DISCHARGE FROM SANATORIUM (REITER).

Stage	Treated with tuberculin, 95 per cent	without tuberculin, 72 per cent
I.	82	57
II.	50	22

Lawrason Brown's statistics show an advantage in favour of tuberculin, but to a slighter extent. Of his moderately advanced cases discharged with active disease, however, 41 per cent were alive of those treated with tuberculin one to fifteen years afterwards, as against 22 per cent of those not so treated.

**Results of Compressing a Lung by Nitrogen Gas (Artificial Pneumothorax).**—It has been found that in cases in which one lung is comparatively sound, but no real progress is being made towards the healing of the affected lung, compression for many months of the diseased lung gives good results. In many cases compression is either limited in extent or impossible to procure owing to the presence of adhesions. In all cases the main factor in the results obtained by this special form of treatment is the selection of the case. Various authors put the percentage of cases suitable for treatment at about 5.

Saugmann elected 100 cases for treatment, but failed to produce compression in 36 of these owing to the presence of adhesions. Both groups were given sanatorium treatment and were followed up for between one-and-three-quarter and six years. The results obtained were as follows:—

RESULTS OF TREATMENT BY ARTIFICIAL PNEUMOTHORAX (SAUGMANN).

After 1 year	1 year	Number
Alive to work	50	29.2
Free from tubercle bacilli	50	8.6
Dead from tuberculosis	18.7	38.8

Other observers give somewhat similar figures. Carpi (1914), in reporting on 36 cases, found that 6, all of which but one were bad cavity cases, were cured. Shortle (1915) had 104 cases, in 79 of which he induced compression; of the inoperable cases, only 2 (8 per cent) were working at the time of the report, and only 1 (4 per cent) was improved; of the patients in whom compression was produced, 22 (28 per cent) were working, and 19 (25 per cent) were in a good condition of health.

Arthur Latham.



**PULSE, IRREGULARITIES OF THE.** The fundamental principle underlying accuracy of prognosis in cardiac arrhythmia is the same as that which has been enunciated in regard to cardiac pain: the outlook in each case depends chiefly on the cause; for arrhythmia, like angina, is only a symptom, and not in itself a disease. There is, however, a difference between the two, for the type of irregularity that is met with gives valuable intelligence of itself as to the state of the myocardium; and in any case of heart disease it is the myocardium, and especially that of the ventricles, that counts. Each kind of irregularity must therefore be considered on its own merits, as well as in connection with the associated lesions.

**Sinus Irregularity.** This comes first in order of frequency, as well as of unimportance. This aberration, in which the whole heart, ventricle as well as auricle, participates, is always due to extracardiac causes and is therefore never indicative of a cardiac lesion. Practically, therefore, it has no prognostic significance; though perhaps, when it develops in a case of meningitis or intracranial tumour, it may be regarded as evidence of increasing pressure within the skull, and assessed accordingly. From the cardiac point of view it is of the highest importance that we should recognize the lack of significance of this type of arrhythmia; for it is extremely common in childhood and youth; so common indeed, that a child under ten with a perfectly regular pulse is a clinical curiosity. Nervous subjects are in like manner very prone to exhibit this alteration of rhythm. When the pulse, under the stress of supracardiac influences, shows an extreme degree of sinus irregularity, it is apt to alarm both patient and medical attendant, unless the latter has assured himself of its harmless origin. *The mere fact that a pulse is very irregular has no prognostic meaning;* yet there are many people crawling miserably through an invalid existence to-day because, being possessed of an exaggerated sinus irregularity in early life, they were labelled as having weak hearts, and were restricted as to exercise. Any medical officer to a public school can tell a tale of boys sent to school with certificates of unfitness for games, certificates which have no other basis than a sinus arrhythmia. A certificate of this type is tantamount to malpraxis; for in these days of graphic methods of analyzing the heart's rhythm, there is no excuse at all for such a mistake. Even when these methods are not available, much needless misery might be avoided if it could be realized that irregularity of the pulse, no matter how extreme, is of no significance in a child or adolescent who shows no other evidence of cardiac disease.

**The Extrasystolic Type of Arrhythmia.** Of this condition almost the same may be said. Premature contractions, whether arising in auricle, ventricle, or junctional tissues, are due in some cases to the development of hypersensitive foci in the myocardium, in others to extracardiac influences; but not even in the first kind of case does the extrasystole count for much. As Sir James Mackenzie puts it, even in elderly people the extrasystole is of no more importance than

the presence of tortuous temporal arteries. The writer has often seen extrasystoles develop in persons at or past middle life, without other signs of cardiac disease, and continue intermittently or persistently for years, without introducing any harmful condition other than the mild pain which is often experienced by patients who have become aware of their own extrasystoles. Even in cases where the pulse is confused by a whole medley of these premature escape beats, the outlook is no worse than in cases where the extrasystole is occasional.

When this type of irregular pulse makes its appearance for the first time in a case of organic heart disease, it is rarely of any significance. There are two exceptions to this rule. The first of these is the case of the patient with advanced post rheumatic disease of the mitral valve—cases which usually fall within the category of mitral stenosis. Here the appearance of auricular extrasystoles may sometimes foreshadow the descent of the heart into that condition of total irregularity which may be regarded as the beginning of the end (*lede infra*: 'Total Arrhythmia'). But this sequence is by no means inevitable, and it would be very bad practice to frighten the patient by any mention of its possibility. The other exception is sometimes encountered in persons whose ventricular contractility is becoming impaired by atherosclerosis or other progressive myocardial disease. In such cases the supervention of frequent extrasystoles may add to the burden of a ventricle that is already almost unable to carry on effectively. An extremely significant proof of this fact is occasionally furnished by the supervention of the alternating pulse (*lede infra*). In a few cases this alternating pulse is first, and for short periods, set in motion by an extrasystole; first comes an extrasystole, and then follows a bout of alternating beats. Even here, however, it is not so much the extrasystole as that which it 'unmasks' (to borrow Lewis's words that is of grave import). But one may at least look for improvement in the condition of such a patient if the extrasystoles leave off.

As a general rule, therefore, it is true to say that the extrasystole may be ignored so far as the prognosis is concerned. There is no form of irregularity of which the patient himself is more painfully aware than this; and his restoration to a sense of well-being is often largely dependent on the confidence with which his medical adviser is able to say that there is nothing the matter with him. The assurance that must necessarily underlie the delivery of such a statement is scarcely possible of attainment, in many cases, except by means of graphic analysis of the pulse irregularity, or apart from that familiarity with the meaning of the various kinds of arrhythmia which it is hard to acquire without the practice of graphic methods. There is no area in the whole range of medicine where accurate prognosis is more absolutely dependent on accurate diagnosis than that of cardiac arrhythmia.

**Tachycardia.** This is the next kind of irregularity to be considered. Here it is first necessary to discriminate between quickening of the pulse by cardiac causes and that due to extracardiac influences. Tachycardias of the former class, such as those of hyperthyroidism and the

beats are of course outside the purpose of this paragraph. Persistent rapidity of the pulse, other things being equal, is not a good sign in heart disease, but it scarcely comes under the heading of 'irregularity.' This practically limits the subject to a consideration of *paroxysmal tachycardia* of a disorder, that is to say, that is characterized by attacks of rapid, regular pulse. Such attacks begin and end abruptly, without any gradual transition from or into the normal rate.

Here the prognosis turns not so much on the nature of the attack itself as on the condition of the heart between and during the paroxysms. The best kind of case is that which occurs in an otherwise healthy young adult with no evidences of organic disease of the heart. The worst kind is that in which the patient is afflicted with advanced heart disease of the post-rheumatic or of the atherosclerotic type, and in which each bout of tachycardia aggravates the signs of cardiac insufficiency (oedema, dyspnoea, alternating pulse, and the like). The import of paroxysmal tachycardia is graver, the older the patient; in persons at or past middle life these attacks are apt to reveal myocardial inadequacy, even where it was not otherwise suspected, in the following manner: when the heart has been beating at its highest speed for a little time, the excessive call for ventricular work begins to induce fatigue of the myocardium, evidenced by shortness of breath, precordial distress, cyanosis, alternating pulse, and even dropsy. Such phenomena are speedily liable to occur in elderly persons, and they have a doubly ominous significance: in the first place, they discover myocardial shortcomings that were not previously known to exist; and, further, each attack throws a fresh overstrain on a ventricular wall which is already taxed to its utmost by the ordinary calls of life, and thus aggravates its inadequacy. Other things being equal, a fast tachycardia is more exhausting to the ventricular contractility than a relatively slow one; Wenckebach considers that there is a 'critical speed' of 150 per minute, at which the ventricular systole of one cardiac cycle coincides with the auricular systole of the next cycle, producing what he calls 'obstipatio sanguinis.' It should be added that patients do not die during attacks, though the foregoing remarks will suffice to impress the gravity of the overstrain thrown by a prolonged bout of tachycardia on a heart that is already seriously diseased.

To sum up what has been said as to the general outlook in paroxysmal tachycardia: it is of grave import in proportion to the amount of ventricular weakness which it reveals or induces. This answers the first question put by patients suffering from this trouble, as to its significance in regard to life prospects.

But they are also, and not unnaturally, concerned to know how far they are to expect relief from the mental discomfort of mind and body occasioned by each attack. To this question it is extremely difficult to give a satisfactory reply. Each case appears to have its own remedies, and it is impossible to prophesy success from the use of any single one of them. On the other hand, no case ought to be regarded

arrhythmia, even when it is an accompaniment of any organic lesions, this type of irregularity may disappear completely. Neither its prolonged duration to be accepted as evidence of incurability, cases of years' duration have been known to clear up entirely.

Other types of tachycardial paroxysm, those which constitute varieties of auricular flutter and fibrillation respectively, will be considered under those headings.

**Auricular Flutter.** The next form of arrhythmia which calls for notice is this newly-defined condition. This is a tachycardia, usually paroxysmal, or at least periodic, arising in the auricle, which beats regularly but at a great rate. Sometimes all these fast beats come through to the ventricle, but more often they, or rather a proportion of them, are blocked in transit, so that the ventricular rate is one-half, one-third, or one-quarter of the auricular. The writer recently had occasion to review the published reports of this condition, and summarized the prognosis by saying that "auricular flutter has no grave significance so far as is known, except where it occurs in cases of organic heart disease. Here it betrays a fairly advanced degeneration of the auricular musculature, and it adds to the burden of the heart by excessive speeding up of the ventricle." To this may be added the fact that flutter seems to pass over into fibrillation of the auricle in some cases, a possibility which is of course evidence of the fact that flutter is a sign of auricular degeneration when it is associated with organic disease of the heart.

**Totally Irregular Pulse—Auricular Fibrillation.** We come next to the consideration of the totally irregular pulse—the most consistently organic of the recognized types of arrhythmia. It is now recognized universally that this disturbance of action arises in a phenomenon known as auricular fibrillation (Lewis), consisting of replacement of the orderly auricular systole by a disordered tremulous movement of the whole auricular musculature. This latter appears to originate from many irritable foci in the auricular myocardium taking over the function of stimulus production, and the result is that an absolutely irregular stream of stimuli is rained down by the fibrillating auricle into the ventricle. Clinically this makes itself apparent in an irregular pulse—not merely an occasional disturbance of an otherwise normal rhythm, but a total absence of rhythm of any kind. Added to this, the usual evidences of auricular contraction disappear from the graphic records and from the other physical signs.

When this rhythm first makes its appearance in a case of heart disease (nearly always either post-rheumatic or cardiocerebral) it means that the wall of the auricle has reached a certain stage in its downward career. The forces that are tampering with its food-supply have carried their notorious designs to a definite point of success. The first prognostic fact in relation to the totally irregular pulse is therefore this, that it is an unmistakable mark of auricular degeneration. Even where this disorder first makes its appearance in transitory attacks between which the rhythm returns to the normal, it is sure to become

permanent sooner or later. Ninety-nine times out of a hundred, then (for it seems that there are rare exceptions), total arrhythmia spells grave organic disease.

The next question to be answered is the expectation of life after this disturbance has appeared. As to this, there is a difficulty which may be best illustrated by contrasting two cases recently under the writer's observation. At one end of the scale was the case of an elderly man with cardio-sclerotic and alcoholic degeneration of the myocardium, who died only twelve days after the pulse had become totally irregular. At the other end comes a man with mitral stenosis whose pulse was found to be quite irregular over four years ago, yet this has not prevented him from keeping on at his rather laborious work in a tan-yard, practically without intermission, since that time. The explanation of this discrepancy is to be found in the fact that the ventricle, and not the auricle, is the vital part of the heart. The danger of the totally irregular pulse is probably twofold: in the first place, the rapid, irregular stream of stimuli pouring down on the ventricle from the auricle imposes a great strain on the former; and secondly, if the auricle is out of action, this adds somewhat to that venous stasis which does so profound an injury to the nutrition of the myocardium (among other tissues), and thus assists materially in precipitating cardiac downfall. It is the first of these factors that is the more immediately dangerous; and in any case it is the condition of the ventricular wall on which depends the ultimate fate of the heart, as to whether it shall continue to work effectively or not. The two cases mentioned above bring out this point very strongly; in the first, alcohol and senility had already reduced the ventricular myocardium to the verge of bankruptcy, so that the onset of an irregular pulse proved to be the last straw. In the other, the active phase of the rheumatic infection was long past, and, as is often the case under such circumstances, the ventricle was almost well again, so that it was able to carry on the circulation, though exposed to the additional worry of a rapid and disorderly series of stimuli descending on it from above.

It is the paramount importance of the ventricle that explains the contrast between the behaviour of the cardio-sclerotic and the post-rheumatic heart respectively, after total arrhythmia has supervened. In the first of these, the arterial degeneration that has undermined the efficiency of the auricular wall has been equally active in its attack on the ventricular myocardium; so that when the stage is reached at which the auricular rhythm goes wrong and thus imposes an extra strain on the ventricle, that structure is already barely able to cope with the demands made upon it by the ordinary rate and rhythm of stimulation. In the post-rheumatic type of heart disease, on the other hand, the degenerative changes induced in the cardiac wall by overwork and chronic stasis proceed more quickly in the auricles than in the ventricles, because in every such case there is mitral obstruction, which throws the burden of over-stress upon the

auricular wall. As a result, the auricle breaks down and fibrillates, while the ventricle still has plenty of work left in it. Consequently the new burden thrown upon it, by the disorderly behaviour of the auricle fails to overwhelm it. The dominant importance of ventricular integrity explains the different way in which some cases of mitral stenosis respond to the onset of auricular fibrillation and the total arrhythmia dependent thereon. In some, the rheumatic process that established the valvular deformity, at the same time injured the ventricular myocardium and induced dilatation; for various reasons this is more persistent in some cases than in others, and it is in such that the supervention of the totally irregular rhythm produces its most definite effects so far as this type of cardiac disease is concerned.

So far, then, our conclusion is that in any given case exhibiting the total arrhythmia of auricular fibrillation, the outlook turns on the condition of the ventricle. It remains to translate this into clinical terminology. First, the prognosis is generally better if the underlying disease be post-rheumatic than if it be cardio-sclerotic, alcoholic, or syphilitic in origin. Second, bad signs are oedema, anginal pain, and grouped respirations. The more pronounced and easily provoked the dyspnoea, the worse the prognosis. Finally, the extent to which the symptoms improve under the influence of rest and digitalis, measures which meet with quite a remarkable response in some cases and none at all in others, is an important index of probabilities. The pulse should become slower, the output of urine should increase, and the subjective symptoms should be definitely mitigated, within a few days—a week at the outside—of the institution of such treatment. If this improvement is not manifest, it means that the patient is incapable of receiving benefit from any form of help; and the gravity of the prognosis is directly proportional to this insensibility to appropriate therapeutics.

To sum up: the appearance of total arrhythmia in any case of heart disease adds to the gravity of the prognosis. In any given case the future depends upon the efficiency or otherwise of the ventricle, and on the response to treatment.

**Heart-block.** Here the prognosis is necessarily grave. This is not to say that it is an irrecoverable phase of heart disease. In many cases of extreme heart-block the unexpected has happened: the normal rhythm has been restored; but the general rule is that heart-block depends on gross organic disease involving central and vital portions of the myocardium.

The risk of sudden asystole is considerable where there are the syncopal or epileptiform attacks which, when they coincide with the long pulse pauses of heart-block, constitute the Stokes-Adams syndrome. Patients who suffer in this way may go out quite abruptly, being found dead in bed or the like; or they may be quickly exhausted by a rapid series of such attacks occurring at brief intervals. In milder cases, where only every fourth, third, or even second beat drops out,

the prospect of sudden death from block and syncope is remote, provided the patient is willing and able to restrict his activities within the limits allowed him by his cardiac lesion.

In any individual case of heart-block, there are four considerations upon which the prognosis rests. The nature of the lesion causing the block is the first of these. Acute heart-block—i.e., injury to conductivity by an infective lesion of the myocardium—is usually slight and transitory; it does not appear greatly to pervert the course of the disease from that which it would have followed if no heart-block had occurred. In ulcerative endocarditis, however, the supervention of heart-block may be a serious feature; it may indicate direct extension of a burrowing ulceration into the auriculo-ventricular connections. Chronic heart-block is much more often encountered than that due to acute lesions. Its commonest causes are arteriosclerosis and syphilis. Of these two, the latter gives the best chance of recovery, since it is amenable to specific treatment. Even so, however, cure is only effected in a few cases. The arteriosclerotic cases tend to get worse, slowly as a rule, sometimes rapidly.

This introduces two other points of importance—the degree of block present, and the course which it follows under observation. It is pretty obvious that the advanced degrees of block are more to be feared than comparatively mild phases; but in estimating the bearing which the point has on the prognosis, it is essential to take into consideration the progress or otherwise of the interruption of conductivity. This is best illustrated by comparing two cases recently under the writer's care. The first patient was an old lady with pronounced arterial degeneration. Her illness began with occasional attacks of block; but within a week it was practically continuous, and in ten days from the onset she was dead. The other patient, an elderly man of placid temperament, gives a history of ten years' bradycardia and fainting attacks. He lives quietly, and though he has, for several years at least, been the subject of complete heart-block, he seems little the worse for it so long as he refrains from physical or mental stress. His cardiac symptoms have made no perceptible progress for years. This comparison affords a vivid illustration of the fact that a severe but stationary degree of block is less minatory than a mild but progressive case.

One more point will arise for consideration in any given case—the other signs of cardiac disease. So far as the likelihood of a fatal issue is concerned, a bad prognosis is of course inevitable when there are signs of impaired contractility in addition to the evidences of interrupted conduction; in such a case it is obvious that the block may be of minor importance, the outlook depending more directly on the state of the other myocardial functions. If, however, we are essaying a forecast of the course that the block itself will follow, then the general condition of the heart makes rather less difference, except that gross enfeeblement of contractile power tends to accelerate the destruction of the conducting function. As for the possibility of lessening block

by treatment, apart from the syphilitic type of case spoken of above, nothing has any direct effect as a rule.

**Alternating Pulse.** One other aberration of the pulse is generally included in descriptions of arrhythmia, the alternating pulse. This term should include nothing except the alternation of weak and strong beats of the same length. When this is encountered, it is always a sign of advanced or advancing exhaustion of contractility *par excellence* the vital function of the myocardium. It is therefore an ominous feature of any case of heart disease. It is true that in some cases its first appearances are transitory; it may be detected during a bout of paroxysmal tachycardia, or for a few beats following an extrasystole; even so, it is to be received as a forewarning of further troubles to come, and even where it is unsupported by other evidence of myocardial deterioration, it forms sufficient reason, of itself, for warning the patient that his activities must be restricted in future.

**Summary.** The aim of this article has been to show that in any case marked by irregularity of the pulse, this symptom should always be analyzed so that its exact mode of origin may be determined; and further, it should always be considered in conjunction with the other means of examining the heart. Nothing is more wildly inaccurate than prognosis founded on the degree of arrhythmia without scientific exploration of its origin.

Carey F. Coombs.

**PURPURA.** Purpura is to be regarded as a symptom rather than a disease. It appears to depend upon a defect in the small vessels, probably the veins. In many instances it is a mere incident in the course of a disease, and such cases need not be discussed here.

The following special varieties may be recognized: (1) *P. simplex*; (2) *P. hæmorrhagica*; (3) *Schönlein's purpura* (peliosis rheumatica); (4) *Hænoch's purpura*.

Statistics regarding cases of purpura give little help in regard to prognosis, since the severity of the different types varies greatly. It may be noted, however, that Mackenzie found the mortality in a series of 200 consecutive cases to be 14 per cent.

As a general statement, it may be said that the severity of purpura increases with advancing years. In purpuric subjects, attacks are liable to become more frequent, and the resulting anemia is more severe.

**1. Purpura Simplex.**—This is a mild form usually seen in children. The hæmorrhages are seldom larger than petechiæ, and in most cases are confined to the limbs. Prognosis is favourable. Successive crops of spots may appear for three or four days, but as a rule the patient is well within a fortnight, although the pigmented spots may be seen for some weeks. The associated symptoms, such as fever or diarrhœa, never give rise to serious trouble.

In a few instances an attack of purpura simplex has been followed by symptoms of purpura hæmorrhagica.

Cases have been reported in which the purpuric spots were followed



ly gangrene. Some of these are to be explained by the administration of salicylates or iodides. Apart from such causes they are extremely rare.

2. **Purpura Hemorrhagica.** This is the most formidable type of purpura. Prognosis may be the more serious from the fact that it usually affects children already in delicate health, although it also attacks adults. The purpuric spots appear and soon increase in number and in size.

Epistaxis, bleeding from the gums, hæmatemesis, hæmaturia, and, less commonly, hæmoptysis may occur. The patient becomes profoundly anæmic with great rapidity. In a week the corpuscles may have fallen to 50 per cent. Cases of *purpura fulminans*, occurring especially in children, may be fatal within twenty-four hours; in some of these the end comes before there has been any obvious bleeding from the mucous membranes.

Cerebral hæmorrhage, kidney disease, hæmorrhage into the suprarenals, and heart failure or exhaustion from repeated bleedings, may also lead to a fatal result.

In favourable cases, symptoms cease or lessen in from one to two weeks. There is always a prolonged period of convalescence. Patients are weak and emaciated, and several months may elapse before the blood regains its normal condition. While we must regard prognosis in purpura hæmorrhagica as somewhat grave, perhaps the most striking thing about it is the large proportion of very severe cases which recover.

The chief points on which we can base a prognosis are as follows: The more severe and frequent the cutaneous hæmorrhages, the more serious is the case. Hæmorrhages from the mucous membranes, if at all severe, add to the gravity of the condition: of these, epistaxis has probably the least serious significance. Hæmorrhage from many mucous membranes is more serious than from one. Marked pyrexia, albuminuria, constitutional disturbance, and mental depression are unfavourable signs. Accurate information regarding the effect and progress of the hæmorrhages is to be obtained by a frequent use of the hæmocytometer and hæmoglobinometer.

An intermediate group of cases is that in which special symptoms associated with the hæmorrhages arise. These include the occurrence of blebs, ulcers, or necrosis as the result of the cutaneous hæmorrhages: hæmorrhages into the tongue may give rise to great swelling and tension, and may even call for relief by incision: recurring epistaxis may persist after other symptoms have been arrested.

3. **Schönlein's Purpura (Peliosis Rheumatica).** This variety is associated with pain and swelling in the joints, urticarial and inflammatory lesions of the skin, and a variable degree of fever. The outcome is usually quite favourable. Fatal cases have occurred, but with great rarity. It is, however, associated with a very large number of possible complications, and recurrence of the disease is exceedingly common. The symptoms of an attack may be very persistent:

recurring crops of petechiae and attacks of fever and arthritis may persist for over a year.

A very potent factor in determining relapses is exertion, and it may be stated here that rest in bed is the one therapeutic measure of outstanding importance in all forms of purpura. Pharyngitis, sometimes so severe as to lead to gangrene of the tonsils and uvula, may occur. The other complications are those usually associated with rheumatism: endocarditis, pericarditis, pleurisy, albuminuria, chorea, and hyperpyrexia may supervene.

It should be remembered, however, that in spite of the somewhat formidable list of possible contingencies, their actual occurrence is so rare that peliosis rheumatica in the average case may be regarded as a benign affection.

**4. Henoch's Purpura.** This variety is associated with vomiting, colic, and diarrhoea. A considerable number of cases associated with intussusception are on record. There are joint swellings, and cutaneous affections such as erythema may accompany the purpura. Actual hemorrhages from mucous membranes may occur.

Prognosis is fairly good, but a fatal outcome may take place. Osler recorded 3 deaths in a series of 11 cases. In one the fatal outcome was the result of an intense hemorrhagic nephritis.

Hemorrhage from mucous membranes, nephritis, and exhaustion are the chief dangers, in the absence of any association with a grave abdominal condition. When intussusception is present, it dominates the position as regards prognosis, but it is, of course, more dangerous because of the purpura.

Relapses are a common feature, and attacks of Henoch's purpura may recur for years.

G. L. Gulland.

A. Goodall.

**PYELOCYSTITIS.** Pyelocystitis includes a number of conditions differing in gravity, and therefore varying in prognosis. The infection is most commonly due to the *B. coli communis*, which is usually present in pure culture.

*B. coli* pyelocystitis is acute or chronic; and it may be uncomplicated or complicated. In acute uncomplicated *B. coli* pyelocystitis the infection has occurred in a previously healthy urinary tract. The origin may be traced to hemorrhoids, acute or chronic colitis, appendicitis, chronic constipation, dysentery, or some other intestinal trouble, or there may be no apparent cause. The attack may be moderate or severe. It is usually possible during the first two days to form an estimate of its probable severity.

In a moderate attack the temperature may rise to 101° or 102°, and is ushered in by a slight shivering or a feeling of chilliness. The bladder symptoms may be severe and distressing. Kidney symptoms are less prominent, amounting to slight pain and tenderness, but no enlargement of the organ; they may be entirely absent.

In a severe attack the initial rigor is also severe, and may be repeated; the temperature rises to 102° or 104°, or even to 105° F.,

and the patient shows evidence of profound toxæmia. There is severe pain in the kidney, the abdominal muscles are rigid, the kidney region is tender, and the kidney, if it can be felt, is enlarged.

A mild attack such as has been sketched above may be expected to last for ten or fourteen days. There is no danger to life, and the principal points in the prognosis are: that relapses are very frequent if the patient is allowed to get up or to go out too soon; and that it is impossible to say, even in a mild attack of pyelocystitis, whether a bacilluria may not persist and give rise to future trouble.

In a severe attack there is danger to life. If the patient is old, or very stout, or bronchitic, or otherwise incapable of withstanding a severe toxæmia, he will probably succumb after a week or ten days. On the other hand, when the patient suffers from no such complication, the immediate prognosis is more favourable. The temperature remains high for about a week, but after that time should commence to fall, and at the end of ten or fourteen days from the onset of the illness will have reached normal. If the temperature remains high and the symptoms show no sign of abating at the end of a week, the outlook is less favourable, and will, if no improvement occurs in the next three or four days, become grave. After one or more of such relapses, the patient usually succumbs. Operation in such cases should not be too long delayed. If at the end of a week the acute symptoms persist, and the patient is beginning to lose ground, operation should be performed.

The results of nephrotomy are not very satisfactory. In 20 cases of nephrotomy for acute pyelonephritis there were 7 deaths (35 per cent). In surviving cases the late results are also unsatisfactory: the acute symptoms subside, but chronic pyelonephritis persists, and nephrectomy may be required at a later date.

The best results in acute cases have been obtained by nephrectomy, after ascertaining that the second kidney is healthy. In 17 cases of nephrectomy there were no deaths.

Where the acute symptoms subside without operation, the infection in some cases disappears. In a large number of cases, however, it persists in a mild form, the principal symptoms being those of slight chronic cystitis. In such cases there is a constant danger of recurrence which takes place sometimes after short intervals, and sometimes after some years. Secondary stone-formation in the renal pelvis or in the bladder is not uncommon in such cases, and there is a danger of ascending pyelonephritis of the healthy kidney, leading to suppression of urine and death. Some cases go on for many years without any change, but the patient suffers chronic ill health, and is unfit for great or prolonged efforts, either physical or mental. In some of these cases the original focus of infection, such as chronic intestinal stasis, produces a chronic toxæmia, to which that from the kidney is added. In other cases the kidney is the principal or only source of the toxæmia. Nephrectomy is the only effective treatment in the latter class, and is frequently a difficult and dangerous operation.

In some cases of chronic pyelocystitis the principal focus of infection lies in the prostate. In such cases the symptoms are principally those of cystitis: the pyelitis passes off after a slight preliminary attack, or persists in a mild form. Recovery depends upon successful treatment of the chronic prostatitis. The prognosis for ultimate recovery is somewhat better in these cases, but in some the condition persists in spite of vigorous and prolonged treatment.

Chronic pyelocystitis may be complicated by stone in the kidney or bladder, by movable kidney, diverticulum of the bladder, stricture, or enlarged prostate, or by bladder growths. Prognosis in such cases depends upon the possibility of removal of the stone or other complicating disease. Until this is done the pyelocystitis cannot be cured.

Two special forms of *B. coli* pyelocystitis may be mentioned. The pyelitis of infancy and childhood is a frequent form. It occurs in infants a few months old and in young children, and takes an acute course. The condition occasionally ends fatally, but recovery takes place in the great majority of cases, even when a very high temperature is recorded, and profound toxæmia, even coma, is present. The cases improve rapidly under treatment: the temperature falls, and the symptoms subside in a week or ten days. The pus may remain for several weeks, and the bacteria for longer, but eventually these also disappear.

Pyelonephritis is a not infrequent complication of the early months of pregnancy, arising usually in a previously healthy urinary tract, but occasionally as an exacerbation of a chronic pyelocystitis. Premature labour occurs in 25 per cent of severe cases. When the acute attack occurs early in pregnancy, and there is an interval of normal temperature before parturition takes place, the puerperium is usually apyretic. If, however, the acute attack occurs late in pregnancy, there is usually fever during the puerperium; but puerperal infection does not occur.

If the pregnancy be interrupted, the child is usually ill-nourished, and dies in one-third of the cases. If the attack occur late, and the pregnancy go on to full term, the child is usually healthy and well nourished.

The production of abortion, or the induction of premature labour, is seldom necessary, but it may be called for in a severe case. After parturition, the pyelonephritis may subside, and the urine may clear and become sterile; but more frequently bacilluria and some degree of pyelonephritis persist, and exacerbation occurs during succeeding pregnancies.

J. W. Thomson Walker.

**PYELONEPHRITIS.**—(See PYELOCYSTITIS.)

**PYLORUS, CONGENITAL STENOSIS OF** (see also STOMACH, SURGICAL AFFECTIONS OF).—Though rather new to the profession, this disease is by no means a rarity. The large proportion of cases recognized in the first-born infants of medical men makes it probable that a

number of deaths occur in other children without a diagnosis. The hall-mark of the condition is the association of vomiting with constipation, palpable pyloric tumour, and visible gastric peristalsis. The symptoms usually come on at the age of about four weeks, and apart from treatment are fatal in a few weeks.

It is still hotly debated whether the treatment ought to be purely medical or purely surgical. Scudder, for instance, denies that any cures have ever been effected by medical means, and urges operation in every case.

**Results of Medical Treatment.**—Medical treatment includes lavage, careful feeding by the best modern methods (including citrated milk, peptonized milk, albumen-water, or breast milk, all in small quantities), and perhaps a little tincture of opium. There is no doubt that many cases have recovered under such treatment. The proportion varies in different statistics from 40 to 60 per cent; it is probably less than half the total number. Monier's figures give 80 to 90 per cent of fatalities under medical treatment. In some of the alleged medical cures the diagnosis has not been indisputably established.

In any individual case, the prognosis depends upon the following factors. Children of 8 lb. do better than those of 6 lb. Diarrhœa is very ominous. Head-retraction and fever may be seen just before death. Large vomits are apt to induce fatal collapse. If the weight continues to fall and the vomiting persists after two to three weeks of careful medical treatment, it is not likely that the child will live, apart from operation.

It must be remembered that the small intestine is thin and atrophic, and any attempt to 'feed up' the child, before or after operation, will probably induce fatal diarrhœa.

In favourable cases treatment takes six to twelve weeks. The tumour is probably permanent; in cases described by Batten and many others, the persistence of the hypertrophy was verified by autopsy long after more or less perfect cure of the symptoms.

There is some tendency to relapse in later life; Scudder quotes a number of authorities to this effect.

**Results of Surgical Treatment.**—From 1898 to 1905 the results of surgical treatment were not very good, but probably better than those obtained by medical means. According to Scudder, the mortality of operation was 46.5 per cent. Paterson in 1906 collected the records of 25 cases treated by gastrojejunostomy, of which 13 died of the operation, 3 died within two months, and 9 were cured. Pyloroplasty was more successful: of 9 recorded cases, 3 died of the operation, 1 died two months later of diarrhœa, and 5 were cured.

Since 1905, three short series have been published by Scudder showing much better results. These include, first, 10 cases operated on by several surgeons on the Pacific coast, and recorded by Stillman; second, a group of 9 in the practice of Richter, of Chicago; and third, Scudder's own series of 17 operations. These combined give a record of 36 cases, with only 5 deaths—that is, a mortality of 13.8 per cent.

These American cases were treated by gastrojejunostomy. Seudder's patients have been followed for periods varying from one to eight years (all over two years with a single exception). All but three were under eight weeks old at the time of the operation.

The difference in the mortality before and since 1905 is due partly to improved technique, but no doubt principally to the fact that in the older series the surgeon was called in when the infant was already greatly reduced after the failure of medical means, whereas the American surgeons quoted above would operate as soon as the diagnosis was made, without waiting to see the results of dieting, lavage, and so forth. We consider, personally, that a fortnight is a suitable period during which to try medical means.

RESULTS OF OPERATION FOR CONGENITAL PYLORIC STENOSIS.

Author	Case	Died of operation	Died later	Cured
Paterson (literature up to 1906)	25	13	3	9
Gastrojejunostomy				
Pyloroplasty	9	3	1	5
Seudder's three series since 1905	36	5	0	31

Apparently the operation does not lead to any reduction in the mass of the pyloric muscle. A baby operated on by Murphy recovered well from the operation, but died six and a half months later from causes unconnected with the gastric trouble: the tumour of the pylorus persisted unchanged. Seudder states that in nine cases after a gastrojejunostomy in these infants, bismuth skiagraphy showed that the food passed through the stoma and not through the pylorus: it is well known that the food passes only through the normal passage and not by the stoma after a short-circuiting operation in patients or animals with no pyloric obstruction: evidently, therefore, the mechanical obstruction of the circular muscle persists.

After successful operation, the children grow up into normal individuals. A very sturdy boy, aged six, on whom gastrojejunostomy was performed in his second month, is known to the writer.

To summarize, we may conclude on the evidence before us that medical treatment will save certainly less than half the patients, perhaps so few as 10 per cent, and that the survivors may suffer from persistent symptoms of pyloric obstruction: that the operation mortality in early cases is less than 20 per cent, but may be 50 per cent if medical treatment has been persisted in before the surgeon is called; and that neither medical nor surgical treatment leads to any improvement in the pyloric hypertrophy.

REFERENCES. Miller, *Medical Diseases of Children* 1911, 230; Paterson, *Lancet*, 1906, i, 577; Seudder, *Ann. Surg.* 1914, lix, 239.

A. Rendle Short.

**PYONEPHROSIS.** There are two types of pyonephrosis, and the prognosis is different in each. The first type is pyonephrosis secondary to hydronephrosis (hydronephrosis), or uropyonephrosis; the second is pyonephrosis developing from acute pyelonephritis.

In uropyonephrosis the condition is unilateral, and the actual obstruction is situated high up in the ureter, being due to a stricture, stone, or duplication of the ureter. The superadded infection is usually hematogenous.

Pyonephrosis developing in pyelonephritis occurs especially in cases of old-standing disease of the lower urinary organs, such as stricture, chronic prostatitis, enlarged prostate, growths of the bladder, etc. There is frequently bilateral disease, but the second kidney is not necessarily pyonephrotic.

The general symptoms of uropyonephrosis are often moderate, although in some cases the character of the illness resembles that of the other form of pyonephrosis.

In pyonephrosis due to pyelonephritis the patient is seriously ill, with a high swinging temperature and other symptoms of toxemia. Unrelieved pyonephrosis may lead to a fatal result in ten or fourteen days, or the course may be more prolonged, and the pus find its way through the wall of the sac and form a perinephritic abscess, death taking place from exhaustion after some weeks.

The prognosis depends upon the patient obtaining prompt relief by operation, and upon the presence or absence of infection of the bladder and of the second kidney. In a few cases where a mild infection of a hydronephrotic sac has occurred, it is possible to do a plastic operation for removal of the obstruction, and what remains of the kidney is saved. In the majority of cases, however, the choice lies between nephrotomy and nephrectomy.

Nephrotomy can be performed in the very worst cases when the patient is weak from prolonged suppuration, and in cases where it is impossible to estimate the value of the remaining kidney, or when this organ is known to be the seat of advanced disease. The mortality of this operation is from 17 (Küster) to 23 per cent (Tullier). After the operation an improvement in the work of the second kidney is usually observed, and the general health greatly improves. In 27 per cent of cases the sac shrinks and the patient is cured.

In a certain number of cases septicæmia persists, and the work of the second kidney is still poorly performed. This is due to continued suppuration in the thick fibrous-walled cavity, to undrained pouches, to abscesses in the walls and partitions, to stones being left in the sac (16 per cent of cases), or to the persistence of the ureteric block. A fistula remains in from 45.6 per cent (calculous pyonephrosis 34.2 per cent, non-calculous pyonephrosis 57.1 per cent) to 56 per cent (Küster).

Secondary nephrectomy is indicated when septicæmia persists; when it is believed, from the inadequate secretion of the diseased kidney and the absence of disease in the second kidney, that a depressed renal function in the latter will improve after nephrectomy;

and when the patient is gradually losing ground from prolonged suppuration. The mortality of secondary nephrectomy is only 5.9 per cent. If this be added to the mortality of nephrotomy (23.3 per cent), the total mortality of nephrotomy followed by nephrectomy at a later date is 29.2 per cent.

Primary nephrectomy should be performed when it is certain, from examination of the urine of the second kidney, that the function of this organ is adequate. The mortality of this operation is 17 per cent.

The prognosis after nephrectomy, in cases where the second kidney and the bladder are healthy, is very good, and there is no reason to expect that the duration of life will be shortened. On the other hand, in cases where there is chronic cystitis which does not clear up after nephrectomy, and especially where the second kidney is already infected, the danger of acute pyelonephritis of the remaining kidney, with suppression of urine, is very considerable. Even if this take place, however, the outlook is not hopeless. The writer has performed nephrotomy on the solitary kidney in such a case, and the patient is known to be alive and in fair health several years after.

*J. H. Thomson Walker.*

**PYOSALPINX.**—(See SALPINGITIS.)

**RECTAL PROLAPSE.**—In young children, the great majority of cases of prolapse of the bowel get well in the course of a few months with simple treatment (replacement, purgatives, astringent lotions, etc.). It is not possible to quote exact statistics. It is only in a few instances that any operation is required.

In adults, on the other hand, there is little tendency to amendment, and operation will be necessary. Paraffin injection is going out of fashion; although it may be immediately successful, cases of ischio-rectal abscess have been recorded at a long interval afterwards. When only the mucous coat prolapses, searing it to the muscle with the cauter is very successful. Severe cases require excision, and this is usually satisfactory, though temporary incontinence may follow; this nearly always gets well at last. In a few rare cases colopexy is necessary; this is well spoken of; no doubt failure is very rare, but the writer has seen a case.

*A. Rendle Short.*

**RECTUM, CANCER OF.**—Prognosis in carcinoma of the rectum largely depends on the stage at which the disease is detected. In this connection it is impossible to insist too strongly upon the importance of a digital examination of the rectum in every patient, whatever his age, presenting rectal symptoms. It must be borne in mind that rectal cancer may occasionally occur as early as the second decade of life. A cylindrical-celled carcinoma of the rectum has been reported in a girl of eleven, the youngest case of carcinoma on record.

Cancer of the rectum begins upon one aspect of the bowel wall as a small ulcer, which spreads circularly along and across the bowel. As it spreads it puckers up and contracts the affected area of mucosa,



and thus strictures the bowel. Accordingly intestinal obstruction or perforation is the usual cause of death in untraced cancer of the rectum. Even when a well-defined stricture has formed, a bridge of normal mucosa can still be detected forming part of the circumference of the stricture, and the breadth of this bridge gives some idea of the stage which the cancerous ulcer has reached. Even more important is it to determine whether the growth has passed outside the walls of the rectum. If the growth is fixed to its surroundings, this is probably the case. The vertical extent of the growth in the axis of the rectum is a less important point. It used to be considered that a rectal growth was only operable if the examining finger could pass through the stricture and feel normal mucosa above. With modern methods, extension of the growth along the bowel for a considerable distance is not in itself a bar to operation.

It must be remembered that methods of estimating the operability of a growth from local examination only are open to fallacy. In certain cases, while the primary growth is still small and mobile, metastases may form in the liver, probably owing to cells carried there by the blood-stream. On the other hand, fixation of the growth may result from merely inflammatory changes. A final estimate as to the operability of a rectal carcinoma can only be given when the abdomen has been opened and its interior examined manually. This is one of the advantages which the combined abdomino-perineal operation possesses over other methods.

Since most cases of cancer of the rectum occur in advanced life, the general condition of the patient's health—and more especially the condition of the heart and kidneys—is an important element in the prognosis. Unless their vital organs are fairly sound, patients cannot be expected to tolerate an operation for the extirpation of the growth. On the other hand, apparently delicate patients, if free from organic disease, often stand severe operations well. The worst subjects apart from organic disease are, in my experience, of the stout florid type with soft tissues, especially if alcohol has been habitually indulged in.

**Prognosis as regards Recovery from Radical Operation.**—The following table by Tuttle, quoted by Swinford Edwards, gives the mortality of the different methods of operation up to the date of its publication:—

MORTALITY OF THE VARIOUS OPERATIONS  
FOR RECTAL CANCER.—(Tuttle.)

Method	Number of cases	Deaths	Mortality per cent
Sacral -	913	211	23.1
Perineal -	569	76	13.5
Abdominal -	49	18	36.7
Combined -	22	9	40.9

These figures show a high mortality for all methods except the perineal. At the present time they do not afford a correct view of the risk involved in the abdomino-perineal method, a risk which by improved technique is reducible, as I shall be able to show, to a fraction over 15 per cent. In my opinion, with rare exceptions, and possibly excluding squamous-celled growths beginning in the anal region, the only two operative procedures worth considering in cancer of the rectum are: first, abdomino-perineal excision of the rectum with the formation of a colostomy; second, simple colostomy.

This view excludes the possibility of retaining the natural fecal outlet at the anus, an end very desirable in itself. But attempts to bring down the upper colon and attach it to the sphincters are very dangerous to life. The mortality of an abdomino-perineal excision terminated by bringing down the bowel is at least double that of the same operation terminated by a colostomy. Even if the patient survives the operation, the anal sphincters may subsequently become fibrotic and useless. The danger of recurrence of the growth in the anal structures left behind is also a very real one. In most cases, too, the final result is a sacral abscess, owing to the breaking down of part of the line of union of the bowel.

But what of excisions of the rectum performed from below? While some surgeons, notably Mr. Harrison Cripps, have recorded satisfactory results in a considerable number of cases, others, especially Mr. W. Ernest Miles, have experienced recurrence in almost every case. My own experience of these operations accords with that of Mr. Miles. But it has not been my good fortune to meet with early cases, where the growth is small and well localized to one portion of the bowel wall. In such cases some competent authorities, e.g., Mr. Lockhart-Mummery, would advocate perineal excision. I agree with Mr. Lockhart-Mummery that very stout patients, those with impaired constitutions, and those over seventy, are unsuitable subjects for the abdomino-perineal operation. In such cases I should perform a simple colostomy. But even in small early growths, if the patient is a suitable subject, I should advocate the complete operation; for it is known that glandular involvement may occur when the local growth is still in an early stage, and the abdomino-perineal operation is the only procedure by which reasonable security can be attained.

As regards immediate risk, the perineal operation is undoubtedly the safer procedure at present. But as the combined operation is being rapidly improved, I anticipate that its mortality will soon fall to 10 per cent. Mr. Cripps's mortality for perineal excision is 8 per cent (3 deaths in 38 cases). Mr. Miles, among 26 cases of the abdomino-perineal operation, lost 10, a mortality of 38 per cent. The same operation, perhaps however on rather more restricted lines, shows in my own hands a mortality of 2 among 13 cases, excluding a fatal case in which a large fibroid uterus was removed at the same time. Only one death occurred in the first ten cases, a result mainly due, I believe, to the method of post-operative saline infusion which I

advocate. My present mortality thus works out at only 15 per cent, a figure which is not unsatisfactory. Since the foregoing paragraph was written I have performed the operation in 11 further cases, with 2 deaths.

My experience shows that the abdomino-perineal operation, though necessarily a severe one, is fairly safe when performed under favourable conditions. Age is not a bar to it, for my series of successful cases includes two patients over sixty years of age. It must be preceded by a careful preparation of the patient, with the object of rendering the lower bowel as aseptic as possible and of increasing his resisting power to micro-organisms. For this latter purpose the prophylactic use of vaccines is advisable. During the perineal portion of the operation, and after the rectum has been removed, it is well to mop the raw surfaces freely with a 1:1000 flavine solution, as an additional precaution against sepsis. The operation should never be done except in a fully-equipped operating theatre and in the operator's familiar surroundings. If this rule is broken, minor *contretemps* will sooner or later occur, which in such an operation may have serious consequences.

**Prognosis as regards Recurrence after Operation.**—The published results of Mr. Ernest Miles show the prognosis of different methods of operation in the hands of the same surgeon. They are a convincing testimony to the superiority of abdomino-perineal over perineal operations.

In his search for the ideal method, Mr. Miles first passed through various stages. He describes how, between 1889 and 1900, he did operations from the perineum, with section of the bowel one inch above the margin of the growth. These operations were followed by recurrence in an average period of twelve months. During 1902 to 1904 he performed fourteen operations with a wider removal of the perineal skin and the ischio-rectal fat, the operation otherwise remaining the same. Recurrence took place in every case, and was most common in the levato ani. In a third series of eleven cases, 1904-5, Kraske's method was adopted; the mesorectum and the levatores ani were extirpated, and the bowel was divided three inches above the uppermost limit of the growth. Recurrence took place in every instance, and seven of the recurring growths involved the lower margin of the bowel and the adjacent mesocolon. As Miles remarks, these recurrences probably arose either from pre-existing permeation of the apparently healthy rectal wall, or from metastases in the para-colic lymph nodes—that is to say, the disease returned in tissues situated above the field of operation. He accordingly decided to excise as much of the pelvic colon and its mesocolon as he could reach. After this operation recurrence followed in every case, and in fourteen cases it took place in the pelvic peritoneum and the pelvic mesocolon—tissues which could not be removed by an operation performed entirely from below. Miles accordingly abandoned the perineal method; he had performed it successfully in 58 patients, of whom 55 were known

to have suffered from recurrence, a percentage of return of 94.82 per cent. Since abandoning the perineal operation, Miles has developed an abdomino-perineal method, which in many details is his own. He has done this operation 12 times, with a mortality of 10 per cent. The operation would appear from his statistics to be unjustifiable after the age of sixty, since no patients who submitted to it beyond that age recovered from it. Among the 25 patients who have survived the operation, only 4 have had recurrence of their disease. At the present time 19 patients are living, and 10 of them have survived the operation more than two years without, up to now, showing any sign of recurrence. These results are a brilliant advance on any that have been hitherto published.

Among my own 11 cases who survived the operation, 1 is living five years later but has recently developed signs of recurrence, and 1 died of her disease about a year after the operation. The other 9 are alive and well, so far as I know: one is doing full work as foreman at a lead works, another as a policeman; four of them have been seen or heard from recently. Most of my cases are too recent to claim as successes, but the results to date are satisfactory. A final judgment on the abdomino-perineal operation will not be possible for some years, but its superiority over the older methods is already established.

Mr. Lockhart-Mummery, in his recent work, quotes the following percentages of three-year cures following the perineal methods of operation: Harrison Cripps 25 per cent, Hocheneegg 17.2 per cent, Tuttle 14.8 per cent. These figures were no doubt obtained by a selection of cases far more rigid than is now applied, a fact which must be borne in mind as increasing the advantage shown by the combined method.

**Influence of Radium Treatment on Prognosis.**—The value of radium in cancer of the rectum is not yet determined, but Wickham and Degrais (1913) state that inoperable cases of cancer of the rectum have certainly found in radium a palliative and useful treatment, that radiation may clear the passage by dissolving the nodules, that the hemorrhage, discharge, and pain diminish, and that the general condition of the patient consequently improves. In two cases they were able to avert a colostomy, and to prolong a tolerable existence for periods of twelve and fifteen months respectively.

It is obvious that the subject has not yet reached a stage in which general statements are possible, and in any particular case the results of treatment are uncertain. A case of my own shows that radium may convert an inoperable into an operable case. The patient, a man—sixty, was pronounced beyond the range of operation by a well-known surgeon, and was brought to me for a second opinion. I agreed that the case was inoperable, and advised a trial of radium. The treatment was carried out by Dr. N. Finzi. Within a few weeks the edges of the growth became flat and fibrotic, so that it might have been mistaken for a simple stricture: slight mobility could now be detected in it. I then advised and carried out an abdomino-perineal

radical operation. Two tubes of radium were inserted at the operation into the pelvic cavity, one from below and one from above. The peritoneum forming the floor of the rectovesical pouch was infected, and the operation was here necessarily an incomplete one. Whether as a radium effect or not, suppuration occurred in the pelvis, and during convalescence a troublesome attack of pyelitis occurred; but at present, four years later, the patient remains well and free from recurrence.

**Cases suitable for Colostomy.**—In a very large proportion of the cases unsuitable for radical operation, an immediate colostomy is the proper line of treatment. The operation should not be deferred until obstruction is imminent. As Mr. Swinford Edwards says: "That I would perform a colostomy on every patient upon whom I had decided that a radical operation was inadmissible I will not say, but rather that I would strongly advise the operation as soon as any of the symptoms of the disease became so marked as to interfere with the comfort of the patient." This statement, in my opinion, rather under-estimates the importance of colostomy. The operation is not merely a means of increasing the patient's comfort; it appears to exercise a definite influence in retarding the progress of the disease.

**Prognosis after Colostomy.** The prognosis in cases of cancer of the rectum treated by a simple colostomy is much more hopeful than is generally believed.

First, in regard to the question—Is life worth living with a colostomy wound? Upon this point most patients, and some medical men, are apt to take quite unjustifiably gloomy views. Numbers of people with a colostomy opening go about their daily work, and are to all appearance normal individuals. Thus, a well-known police magistrate with this disability sat on the bench for some years; among patients of my own, one is a foreman at a factory, another a police constable doing full duty, another a dressmaker who made frequent Continental journeys in the course of her business. There are two conditions essential to a successful colostomy: one that the opening shall be well situated (preferably in the midst of the rectus muscle) and properly made, the other that it shall be properly managed by the patient. An injection of soap and water, followed by the use of the bed-pan before rising in the morning, will usually ensure freedom from trouble during the day. Care must also be exercised by the patient in regard to diet, and laxative foods must be taken in strictly regulated quantities.

Having considered prognosis with regard to comfort, we may turn to the outlook in regard to the symptoms of the growth and its rate of advance. The diversion of the septic stream of feces from the surface of the ulcer is followed in practically all cases by a diminution or cessation of mucopurulent discharge from its surface. Accordingly, the teasing diarrhoea or rectal tenesmus produced by the irritant discharge diminishes or ceases, especially if the lower bowel is periodically washed out through the colostomy wound with a mild

antiseptic such as boracic lotion. There is a corresponding improvement in the bleeding, and, except in very advanced cases, in the sacral pain, for both of these signs are mainly of septic origin. For some years the patient may be able to forget that the growth, though quiescent, is still present. Sooner or later, however, sciatic pains will indicate infiltration around the sacral plexus, and frequency of micturition, with albuminuria and haematuria, will indicate invasion of the bladder. Compression of the ureters will be followed by ascending pyelonephritis, which is likely to end the case if in the meantime hepatic metastases do not manifest themselves.

The period of relief from symptoms which follows a colostomy varies widely. It may be estimated at from one to five, or even seven, years. In one case within my knowledge a simple colostomy was followed after some years by complete cicatrization of the growth, spontaneous closure of the colostomy, and re-establishment of the natural anal evacuations—an instance of the natural cure of cancer: it is probable, however, that in this case the disease will ultimately re-assert itself.

While a properly made and managed colostomy would need give little more trouble than a set of artificial teeth, an ill-made prolapsed one, with colitis of the bowel above and sepsis about the opening, is undoubtedly a misery to which some patients will consider death preferable.

*W. Sampson Handley.*

**RELAPSING FEVER.**—The mortality of relapsing fever varies considerably according to the type of the disease. In the European form the mortality was 4 per cent in Western Europe, but 15 per cent in Russia, while Sandwith reported a similar death-rate in Egypt. In the American form it is from 2 to 6 per cent. In India, Vandyke Carter had a mortality of 18 per cent in Bombay, but more recently Choksy gives it at 30.7 per cent in 7131 cases in the same city, while during an outbreak in the United Provinces it was 26.5 per cent.

According to V. Carter, one-half the deaths occur during the acme of the first paroxysm, and one-fourth more during the first remission. The rest take place later, commonly from complications such as pneumonia, cerebral hemorrhage, or exhaustion. Deep jaundice is a bad sign, while abortion often results.

In the African form of the disease the attacks are mild in natives, but more severe in Europeans. According to the Cooks, the death-rate in Uganda is 13.6 per cent, while in recovering cases great prostration remains.

Until recently no specific treatment for the disease was known; but now it is established that such arsenical preparations as salvarsan and galyol, in moderate doses intravenously, best given shortly before a crisis, destroy the spirilla and are likely to reduce the mortality considerably.

*Leonard Rogers.*

**RENAL CALCULUS.**—(See KIDNEY AND URETER, CALCULUS OF.)

**RHEUMATIC FEVER.**—The prognosis here must depend upon the particular organs that are most affected in the attack. If they are vital ones, such as the heart and brain, and are severely injured, the risk to life is great; but where the articulations chiefly suffer, though there may be great distress, the actual danger to life is but small.

It is a very difficult undertaking in this disease to single out a particular manifestation and lay down rules that apply to it alone, for in the course of the illness we continually find one lesion obscuring the prognosis of another. There still remains, however, a demand for the prognosis of the individual lesions, and the writer will accordingly first consider, under the general term 'rheumatic fever,' the prognosis of the articular manifestations.

There is another difficulty in the prognosis of rheumatic fever which is caused by the inadequacy of the name. If we use the term rheumatic fever, we discover that the disease may occur without fever in childhood, and that such a lesion as rheumatic pericarditis may be present with a subnormal temperature; yet in childhood also the term acute rheumatism is often inapplicable, for the onset may be most stealthy.

The condition most comparable to rheumatism in its general course is tuberculosis, for in both there occur febrile and afebrile attacks, gradual and acute onsets, and all degrees of duration.

Fulminating cases of acute rheumatic arthritis are apparently not so frequent as they used to be. In rheumatism, as in gout, we do not meet with so many of those cases from which have been drawn the pictures of the disease we read in our text-books of twenty-five years ago. As Litten observed, the type of the disease has apparently become more septic in character.

The prognosis in these acute attacks, provided the heart is not damaged, is good, and acute rheumatic arthritis tends to complete recovery.

Since the introduction of salicylates, such cases have been much easier to handle; but when we search for accurate facts upon the exact improvement they have produced in the prognosis, we are puzzled. There are several important reasons for this. On the one hand, the frequency of some degree of heart affection is more generally realized, and the knowledge of the behaviour of the disease in childhood is much more definite. On the other hand, with our increasing knowledge, we are getting milder cases under supervision more readily. We have one element, that of cardiac infection, leading us to think that the disease lasts quite as long as heretofore, and the other, the treatment of the milder cases, leading us to think that the duration of the disease is shortened.

It is some forty years since these drugs were first used in this country by Dr. T. J. MacLagan, and in the early eighties careful statistics were made to elucidate the value of such treatment as compared with the alkaline method, or the natural course of the disease. These investi-



gations showed conclusively that pain was rapidly relieved and fever lowered. Dr. Pye Smith found that in 180 out of 355 patients these symptoms were arrested in five days, but in only 3 out of 21 cases treated expectantly was there the same good result.

The influence upon relapses was much disputed: Dr. Pye Smith had 93 relapses in his 355 cases; Dr. Donald Hood found 31 relapses in 850 cases treated without these drugs (4 per cent), and 182 in 1250 cases treated with them (14.6 per cent).

To the writer, it seems that our conception of rheumatism has so changed that it is not possible at the present time to express in statistics the influence of the salicylates. This is clear, that these drugs have no lasting effect upon rheumatic processes, for fresh infections or recrudescences are very frequent in childhood; but acute articular rheumatism is greatly relieved and the pain and distress are much diminished. For these reasons the prognosis is improved.

There are, however, some cases in which the articular symptoms, though less violent, are more intractable, requiring large doses of the salicylates to keep the symptoms under control. It is a matter of opinion as to whether there are cases in which these drugs are ineffectual, but it has been the writer's experience to see some in which, while several of the joints recover completely, others drift into a rheumatoid condition, and believing as he does that there is a rheumatic form of rheumatoid arthritis, he is not prepared to accept the dictum that an arthritis which does not yield to the salicylate treatment is necessarily non-rheumatic. We are here face to face with the great problem of the present time in the treatment and prognosis of rheumatic fever—are the salicylates *specific* antidotes? This much we can assert with regard to the arthritis, that when it does not react to this method of treatment, and yet is of what we call the rheumatic type, the prognosis as to the future is uncertain.

Hyperpyrexia, although less fatal since the introduction of the cold-bath treatment, is still, despite the salicylates, of very uncertain prognosis. In late years it has been a very rare occurrence; the diminution in frequency did not occur at the time of the introduction of salicylate of soda, however, but some years later, and this may mean an alteration in the character of the disease of temporary duration, rather than the possession of any real control of the symptoms.

Mental symptoms may, in adult life, though rarely, add considerably to the gravity of the prognosis of acute rheumatism. Great depression, and even mental derangement, may occur. Unless there is a previous history of mental instability, a gradual recovery may be expected. Another troublesome group of symptoms in the adult are abdominal. These may take the form of dilatation of the stomach or troublesome vomiting and gastralgia, or again of pain located apparently in the large bowel and leading to troublesome distention or obstinate hiccough. Recovery may be much delayed by these complications. Whether rheumatism is a cause of acute appendicitis has not been



certainly established, but should this prove to be the case it is clear that the prognosis in such a complication is to be judged by the general indications that govern the prognosis of appendicitis. Where rheumatic fever attacks a patient living in an insanitary house, the character may become almost typhoidal. There is great prostration, and the tongue becomes dry and cracked; the course is long, and troublesome vomiting may prevent the use of the salicylates. Although the eventual recovery may be good, it is slow, and the illness may last for months.

There is little to guide us as to the prognosis of future attacks. Our common sense tells us that if the original attack in an adult is dependent upon some gross exposure to chill and to general carelessness, there is good hope that with proper care in the future the first attack will also be the last.

The writer believes that if there is recurrent tonsillitis with obviously diseased tonsils, their emulcation will improve the outlook.

In general terms, then, the outlook in acute articular rheumatism is good as to life and to complete recovery; but such a general statement is of little value, seeing that in a large number of cases the heart is more or less affected, and that upon the degree of this affection the prognosis in acute rheumatism mainly depends. In children the articular symptoms are of little prognostic importance.

There seems no serious difference in the prognosis dependent upon the variety of salicylate compounds used in the treatment. Those who push these drugs usually combine the sodium salt with sodium bicarbonate, but others claim that the acid aspirin is even more effectual. In the severe articular forms the writer prefers the salicylate of sodium, finding it less likely to upset the digestion; but it must be premised that only the purest drugs are used. It is important to remember that in childhood, if these drugs are pushed too heavily and without reference to the particular patient, bad and even fatal results may follow in a case of moderate severity.

As a general guide, it is useful to recognize three classes of arthritic lesions in rheumatic fever:—

1. The acute severe type, recovering rapidly and completely.
2. The relapsing subacute type, also recovering, but more slowly. Such attacks may leave some weakness in the larger joints.
3. The more pernicious type, drifting into the rheumatoid group. This latter, many authorities regard as non-existent.

There may be great muscular wasting in some of these cases of severe rheumatic arthritis; and in children in whom the hands are badly affected, the result may resemble precisely the rheumatoid arthritis of young adults. Very good recovery may, however, result, though the improvement is generally slow and such cases are not frequent.

The prognosis in the cardiac affections is discussed elsewhere (*see RHEUMATIC PERI-MYO- AND ENDOCARDITIS*).

*F. J. Poynton,*

**RHEUMATIC PERI-, MYO-, AND ENDOCARDITIS (ACUTE).** It is most essential that we realize that these three lesions are not as a rule independent entities in rheumatism, but that the cardinal lesion of severe types is a carditis affecting to a greater or lesser extent all parts of the heart. Both in the child and adult these cardiac lesions are the ones that chiefly influence the prognosis of rheumatic fever, and because of their greater frequency in the child it is generally admitted that the prognosis is the more serious at this early age.

The outlook is very grave when severe carditis occurs in a child with a family history of rheumatism on both sides, in the very young (five years and under), and in those who are surrounded by poverty and neglect.

The most virulent cases are liable to commence abruptly with somewhat unusual symptoms, such as vomiting and diarrhoea, severe shivering or sudden acute thoracic pains, and considerable fever. On the other hand, we must be prepared to find that a general carditis may gradually appear in some delicate children with remarkably few alarming signs, and though the course is more protracted than in the first group, the ultimate result may be most unfavourable.

1. **Pericarditis.**—This is the commonest cause of a fatal event in acute rheumatism. The cause of death is the general carditis, but the pericardial lesion is the most evident warning of this occurrence.

Some of the most dangerous cases show remarkably little fever, and in the last days of the illness the chart may even give a subnormal record. This is a point that should not be lost sight of by those who regard a fall of temperature at the time of the administration of salicylates as necessarily a good omen. Livid pallor, a rapid small pulse, great dilatation, and feeble cardiac sounds are signs of a deadly infection, whether nodules develop or not. Delirium is a bad sign, but it is not at all frequent in childhood. The fatal issue may be unexpectedly abrupt from syncope. Those who are acquainted with this virulent form of rheumatism will recognize at once from the general appearance and rapid development of the heart disease that the prognosis is very bad, for, should the patient rally for the time, the heart is usually irretrievably damaged, and the more speedy death is really the happier event. Fortunately, these cases are comparatively rare, and we know that pericarditis is more often an event in a recurrent attack of cardiac rheumatism. This fact is one of considerable interest, for it reminds us that with recurrent infection the resistance seems to lessen, a principle which may be also applied to the endocardial lesions.

The occurrence of nodules is much more frequent in the child than in the adult, and the lesion is one which leads us to consider with particular care the prognosis of the case. Dr. Cheadle made the general statement that these lesions were as a rule associated with grave heart disease, and that the prognosis was accordingly grave. This general rule holds good. Thus, out of 39 of the writer's cases that came to hospital showing nodules among other manifestations, 15 died.

Although, then, this lesion is a very important one in prognosis, we must not fall into the error of looking upon its occurrence as a sentence of death. The writer has seen rare cases in which the heart has been scarcely damaged, and in which excellent recovery has followed. There are other cases in which the nodules disappear, and the heart, though damaged, makes a good recovery and becomes well compensated, and the child does not suffer from another attack of rheumatism while under observation. We must guard against the error of mechanical precision in judging of these cases, and not permit ourselves, on detecting nodules, to state dogmatically that the condition is hopeless; on the contrary, though justified in fully admitting their prognostic importance, we must judge each case by the broad lines of clinical inquiry, and above all must estimate the degree of cardiac damage. This is the more necessary because it may not have occurred to some physicians that these nodules are only the visible evidence of a process which occurs elsewhere in the subcutaneous tissues without forming visible projections, as post-mortem and histological investigation has shown. This being the case, it is quite possible, though clearly difficult of proof, that in many more cases than we think, some degree of local subcutaneous infection occurs short of obvious nodule formation, and the actual appearance of the prominences will then only represent a somewhat greater severity of this same process.

In adolescents the occurrence of nodules is also as a rule associated with grave, but by no means necessarily fatal, heart disease.

Among the less virulent cases, we can recognize a group in childhood in which there is obstinate and recurrent carditis, with a subacute and recurrent pericarditis. In these there are numerous manifestations, such as nodules and erythema, endocarditis is invariable, and more than one valve may be attacked. The outlook is bad, for though these children may pass through one or more attacks, even in convalescence they never seem to be quite free from rheumatism, and the heart is irretrievably damaged. In London we see a number of these cases, of all degrees of severity, and they include some of our most favourite and our most familiar hospital in-patients. There is a third group in which only a single acute attack of pericarditis may occur, and among them are seen examples of remarkable recovery, the heart apparently throwing off the infection with very little, if any, permanent injury. In a few of these the cardiac valves seem to escape entirely, although such an event always rouses the suspicion that the illness is not rheumatic. These are not difficult cases to recognize; the child is usually a strong one, the pericarditis is evanescent, the symptoms are mild, and the cardiac dilatation is fleeting. Unfortunately, in the hospital class we do not meet with many of them, but in the well-to-do they are more frequent.

In the adult, pericarditis is much less frequent, but when it occurs the prognosis must always be cautious, for here again it is an indication of a grave infection, and the damage to the myocardium is at this age a very serious event. Nevertheless, there are all grades of severity

in the adult as in the child, and good recovery may occur even when the patient is over fifty years of age. The guiding principles lie in the estimation of the violence of the attack and the degree of cardiac failure that results.

The prognosis of carditis and pericarditis must also be influenced by the degree of care in convalescence. At all ages this is of the greatest importance, and it is very advisable to picture the pathological changes that occur in this carditis, for thus alone can we realize the time that is needed for the inflammation to subside, the exudation to be absorbed or organized, and the heart to compensate for the necessary impairment of functions. Attention must be paid not only to the physical signs in the heart, but also to the general condition of the patient, for the heart may show good evidence of recovery, but the debility of the patient may warn us not to commence to apply the test of increasing calls upon its powers until this recovery has become assured for some while. We have to be reminding the parents continually that, for the child, the problem is not one of the immediate future but of his whole career.

It is useful in considering the prognosis of rheumatic pericarditis to recognize three main types:—

1. The acute and transient.
2. The subacute and relapsing.
3. The virulent form proving rapidly fatal, or, if less severe, leading irresistibly into the second variety.

The influence of adherent pericardium upon the prognosis takes us beyond the scope of acute rheumatism. (*See PERICARDITIS.*)

Pericarditis is always a long illness, although in the most favourable cases all activity of the lesion may be over in three weeks. The quieting down of active symptoms marks, however, only the commencement of that very gradual and cautious convalescence upon which the real progress so greatly depends. The guiding principle in this stage is not to take an abstract period of time, but to study the behaviour of the heart in each cautious forward step. Some patients get forward much faster than others, and these lose rather than gain by prolonged and complete rest. Others need more rest than would have been expected. In both instances, if progress is cautious, we can alter the details without doing any real harm, even if the advance has been a little too rapid. It is the abrupt transition from invalidism to ordinary life that may alter the prognosis of this condition from good to bad. The temperature, the pulse-rate, the character and position of the cardiac impulse, and the nutrition of the patient are guiding points. Three weeks of normal temperature after a rheumatic pericarditis is, in general terms, a useful time to allow before attempting to make any forward step at all.

2. **Acute Myocarditis.**—The importance of this is well recognized, but the accurate estimation of its severity is not yet within our powers, and for this reason we must temper dogmatism with caution. The more modern methods of cardiac examination are helping us with the

study of arrhythmias that may result from rheumatic myocarditis, but we must not take the occurrence of arrhythmia as necessarily an index of the power or weakness of the cardiac muscle, and we must remember also that the kind of arrhythmia—the extra-systole or premature contraction—is one which requires much more study before its true meaning is understood. Acute dilatation from myocardial poisoning may prove fatal even in childhood, but it is a very rare occurrence. When it occurs, there are such clear signs of cardiac failure and intense illness that the danger is apparent.

A much more frequent occurrence is cardiac dilatation followed by the failure of the heart to compensate for a mitral lesion which clinically appears to be one of ordinary severity. These are the mitral cases that run such a disastrous course at all ages. The action of the heart remains feeble and rapid, and the dilatation only recovers in part. The child is short of breath, and cardiac tonics do not produce the effect that is wished. An adult if forced by circumstances to return to work, soon breaks down, with evident signs of mitral insufficiency. In such cases, the factor of an adherent pericardium always comes in for consideration, but there is no doubt that in many of them no such complication has occurred. There can be little doubt that the most important element in the prognosis is the early recognition of this myocardial weakness, and a determined attempt to cope with it by prolonged rest and care at its first appearance. When once such a heart as this has been overstrained, the outlook is bad. It need hardly be added that, if this be true of mitral cases, it is even more so of aortic or combined mitral and aortic lesions.

There is a third group of cases in which the myocardium appears to suffer almost alone, and the valves to escape: these are not the virulent acute cases mentioned above, but those in which, after an attack of rheumatism, the heart remains dilated, the action rapid and often irregular, pallor, and symptoms of breathlessness, nervousness, and palpitation, with or without syncopal attacks, are prominent, and there is a real danger, owing to the absence of a definite valvular murmur, of considering the condition as neurasthenic. Such a condition is very obstinate, but in childhood good recovery may be made after many months. In adult life much will depend upon the occupation. The mildest examples of this condition are the transient dilatations which occur so frequently in first attacks of rheumatic heart disease, and from which recovery may be rapid and complete if their true meaning is appreciated.

It will be apparent that in dealing with the prognosis of myocarditis in rheumatism we are continually driven to realize its existence, not by a clinical sign, but by evidence that we have put too great a strain upon a heart which we believed was stronger than proved to be the case. This difficulty must always be remembered as one of the most important facts in the study of rheumatic heart disease.

Once more we may usefully recognize three classes:—

a. The acute simple dilatation which with care recovers completely.

*b.* The subacute obstinate cases that require much time and caution before a good result is obtained.

*c.* The virulent cases which may actually prove fatal, but more frequently much increase the danger of concomitant pericardial and endocardial lesions.

3. **Acute Endocarditis.**—Simple rheumatic endocarditis is never fatal, for the lesions are small, and would be negligible if it were not for the functions of the structure attacked; but the bearing of these lesions upon the ultimate prognosis is of immense importance.

We can lay down some useful guiding lines upon this point from clinical experience. We recognize that the combined aortic and mitral lesion, particularly if the aortic is predominant, is a grave event. In childhood these cases, if severe, usually point to a great tendency to develop future attacks, and to a fatal termination before adult life is reached. The writer believes that if they survive to early adult life they are prone to develop malignant rheumatic endocarditis, and sometimes they develop frequent attacks of angina pectoris. The solitary aortic lesion is rare in childhood, but if severe the prognosis is bad.

Simple mitral endocarditis, if associated with grave myocardial weakness, runs a very disastrous course in the young; but when, as is more usual, it is compensated, the outlook is good. If there is no further rheumatism, many of these cases recover in a way which can hardly be realized until they have been followed for some five or six years. The murmur, which was loud and heard over a wide area, may disappear, or only be audible when the child is lying down, and even then perhaps only be recognized by the physician who has followed the case closely.

The writer believes that slight aortic lesions may also sometimes disappear.

Mitral stenosis does not, as a rule, give rise to symptoms in childhood, although its origin is frequent at this age, but if it does the outlook is bad. If, before puberty, recurrent bronchitis, embolism, or attacks of tachycardia, and cyanosis with dyspnea, have occurred, or if there has been an attack of heart failure with dropsy as the result of this lesion, we must be prepared for invalidism and early death. On the other hand, slight mitral stenosis, though always more serious than slight regurgitation, may, after childhood, never make headway, and a useful life may follow. When, however, we take a broad survey of this lesion and couple with it the greater frequency of rheumatism in the poorer classes, we are forced to the conclusion that it represents a form of rheumatism which is very prone to dog the footsteps of its victim through life, and we find that death is very usual under forty-five years from chronic heart disease, or some accident associated with the lesion.

The following statistical points may be of service in helping the reader to focus some of the facts that bear upon the prognosis of rheumatic heart disease.

Taking 150 fatal cases in children under twelve years of age, we find the mortality somewhat greater in females: 59 per cent as against 41 per cent in males.

Allowing for the great difficulty there is in establishing without doubt that any particular attack is a first one, about 30 per cent of fatal cases occur in the first attack.

The incidence of fatal cases rises to about the tenth year, thus:

Up to 3 <sup>d</sup> years	11.6 per cent
3 <sup>d</sup> to 4 <sup>th</sup> ..	3.9 ..
4 <sup>th</sup> to 5 <sup>th</sup> ..	7.4 ..
5 <sup>th</sup> to 6 <sup>th</sup> ..	9.4 ..
6 <sup>th</sup> to 7 <sup>th</sup> ..	12.7 ..
7 <sup>th</sup> to 8 <sup>th</sup> ..	12.7 ..
8 <sup>th</sup> to 9 <sup>th</sup> ..	15.3 ..
9 <sup>th</sup> to 10 <sup>th</sup> ..	20.0 ..
10 <sup>th</sup> to 11 <sup>th</sup> ..	12.0 ..

At least 86 per cent of fatal cases of rheumatic heart disease show active rheumatism in the last illness, and death from chronic heart disease alone is very unusual. The cardiac lesions found after death are very definite and often very extensive.

In at least 90 per cent the pericardium is more or less damaged.

The mitral valve was damaged in 149 out of 150 cases, the aortic valve in 34 per cent, the tricuspid in 24 per cent, and the pulmonary in 3 per cent.

The multiple valvular lesions in the severe rheumatism of childhood are well exemplified by these numbers.

When confronted with a case of acute rheumatism in a child of five years or under, the following figures will give an idea of the conditions that may be expected.

Eight out of 52 such cases proved fatal, that is, about 16 per cent.

Definite heart disease occurred in about	85 per cent
Arthritis or arthritic pains	74 ..
Chorea	35 ..
Sore throat	20 ..
Nodules	15 ..

When we turn to adolescents and adults, and look into the after-histories of a considerable number, we come upon a very suggestive and interesting fact. Putting aside as beyond the scope of this article the numerous cases of death from chronic heart disease, we find the great danger is not carditis, but malignant endocarditis.

This point has such close bearing upon the prognosis in acute rheumatism, that the writer feels that he is not trespassing upon the ground of another contributor when he gives the examples shown in the table on the opposite page.

Closely allied, and probably of the same nature, were 7 further cases in adults, the victims of repeated rheumatism in childhood, who showed many of the signs of malignant endocarditis, and eventually recovered for the time, after long and dangerous illnesses.

TABLE SHOWING THE SEQUENCE OF MALIGNANT ENDOCARDITIS FROM ATTACKS OF ACUTE RHEUMATISM.

Sex	Course of Acute Rheumatism	Interval between attacks
M	10 years	13 years
F	6, 8, and 10 years	16 "
F	23 years	37 "
F	12 and 13 years	14 "
F	7 and 20 years	21 "
F	As a child	37 "
M	11, 14, 17, and 18 years	19 "
M	12 years	50 "
F	12 years	16 "
M	As a boy and at 16 years	27 "
F	12 years	16 "
M	7 years	13 "
F	12 years	17 "
F	8, 13, and 15 years	24 "
F	38 years	48 "
M	18 years	28 "
F	13 and 17 years	27 "
F	As a child	32 "

It is evident, then, that the physician who deals with acute rheumatism in the adolescent and adult must take into account the possibility of malignant endocarditis, and this particularly in the cases in which the aortic and mitral valves have been both damaged by previous rheumatism. Whatever interpretation he may choose to put upon the occurrence of these malignant lesions, the fact of their intimate, and in the writer's opinion direct, association with the nature of the early illnesses cannot be put aside in the prognosis of acute rheumatism.

A study of 2000 post-mortem examinations upon adults brought home this fact to the writer, that more rheumatic patients die from malignant endocarditis than from an acute rheumatic carditis such as occurs in children, or indeed from any form of acute rheumatism that is generally recognized.

The influence of treatment by special drugs or by special methods upon the prognosis of rheumatic endocarditis is most difficult to estimate. The most important claim in recent years has been that the salicyl group, if used effectively, is a specific to the rheumatic process. The writer is not himself at all convinced upon this point, and would express his own view by the statement that in a case of severe rheumatic carditis he would not feel confident that pushing these drugs would not do harm rather than good. He has seen this method of treatment used on many occasions, and yet at the time of writing has still this feeling of lack of conviction. Such a method as Dr. Cotton's has much improved the prognosis of early endocarditis by



demanding a complete rest for the patient, while a definite procedure, which in itself is devoid of any danger, is being carefully carried out by the physician. In the recent literature, the most decided claims have been made by Grenet, who treated rheumatic fever with intravenous injections of colloidal gold (*Medical Press and Circular*, 1916). His results showed: (1) An analgesic effect; (2) A fall of temperature; (3) Abbreviation of the attack; (4) *Suppression of the endocarditis*. Twenty minutes after the injection a severe reaction occurs, with fever, severe rigor, and sweating; this lasts about three hours. He states that in 76 cases, 1 died in the reaction, 1 from active heart disease, and the remainder showed no heart affection. The writer is not aware of further statistics with regard to this method of treatment.

*E. J. Poguton.*

#### RHEUMATOID ARTHRITIS. (See ARTHRITIS DEFORMANS.)

**RICKETS.** Rickets is a disease which invariably gets well when the patient passes from infancy to childhood, and although the older text-books describe a condition called 'late rickets,' which is said to be a relapse, it is very doubtful if there is any real relation between them. It is customary, at the present time, to speak of the spinal curvatures, coxa vara, genu valgum, flat-foot, and similar deformities as 'static,' not rickets.

On the other hand, although the rickets passes away, the deformities of the bones, if of marked degree, will be permanent. Thus if, in a young child, the knees are two or more inches apart with the ankles touching, it is probable that the condition of bow-legs will persist throughout life, if not remedied by operation. There is, however, a not very uncommon form where a child is born with the legs slightly bent, and there is a decided separation at the knees throughout infancy, which only gets well when the art of walking has been thoroughly learned; it is important to distinguish this from genu rickets, no other signs of which are present.

The most serious consequences of rickets are due to the coincident affection of the nervous system. Tetany (carpo-pedal spasm) usually indicates grave malnutrition. Convulsions in children are usually associated with rickets, and are occasionally fatal. Laryngismus stridulus, though alarming, very seldom threatens life unless there is an actual laryngitis present. Marked rickets makes the prognosis worse if the child should develop an acute infectious fever, such as whooping-cough or measles.

*A. Reindle Short*

#### RINGWORM.

**Scalp.** The prognosis in ringworm of the scalp has been revolutionized by the introduction of the x-ray treatment. Under the old conditions repeated shaving of the scalp and the application of ointments, lotions, etc., it was common to meet with cases of two years' duration, even when every care was taken, and the ointments,

etc., were applied by skilled persons. The writer has seen cases in which the endothrix fungus has been present for five years. The average duration of the residence of children in schools specially devoted to the treatment of ringworm, in Paris (Sabouraud) and in this country, was eighteen months. Under x-ray treatment, when complete epilation has been obtained, the scalp is usually free from infection in four or five weeks. Time has to be allowed for the hair to grow, and the average period during which a child need be kept from school is about three months. Where a cap can be worn, the child may return to its usual surroundings immediately the infected hair has fallen, that is, in about five or six weeks.

Re-infection must be guarded against by the complete sterilization or destruction of all infected caps, hats, etc.

*Favus of the Scalp* does not give quite such good results, because in severe cases the true skin is sometimes involved, and prolonged treatment after epilation may be required.

**Glabrous Skin.** The prognosis is usually extremely good. With the removal of the infected epidermis by the use of iodine, or the application of ointments of chrysarobin, or of benzoic and salicylic acids in combination, as suggested by Whitfield, a cure can usually be effected in a couple of weeks. Care, of course, must be taken that there is no re-infection. The so-called *eczema marginatum* of the groin is a variety of ringworm, and this readily responds to treatment, especially to the benzoic and salicylic acid ointment. *Ringworm of the toes*, which often occurs in association with the *eczema marginatum* of the groin, is less easy to cure. The infection persists between the toes, and especially in the thickened epidermis on the plantar surface at the fourth interdigital space. Recurrences in this site are very common, and in some cases, where the nature of the condition has not been recognized, the trouble may continue for several years. The palms may be similarly affected, the eruption simulating pompholyx, and recurring every summer.

**Nails.** Ringworm of the nails may persist for years. The fungus is commonly of the endothrix type, and cure is often very difficult. The fungus involves the ungual plate and the root of the nail, and forms thick masses of scale under its distal end. Many months' treatment by scraping, and the constant application of antiseptics such as iodine or mercurials, may effect a cure. Norman Walker has had better results by soaking the nail in Felding's solution until it is softened, and then dressing the base with copper sulphate solution. Even complete avulsion of the infected nails and the application of strong antiseptics may be insufficient to bring about a cure; the writer has a case in which the infection has persisted for several years, in spite of the fact that the nails have been removed on two occasions. Where the infection exists for a long time in the nails it is common to find the glabrous skin attacked from time to time, and this point should be borne in mind in cases of recurrent attacks of tinea of the smooth skin.

**Beard.** If the affected parts are thoroughly freed from hair by the forceps, or still better by the *x* rays, and then dressed with antiseptic ointments, the results are usually satisfactory. In the writer's experience, the more suppurative the ringworm of the beard, the speedier is the cure. It must be remembered that these cases closely simulate syphilis of cocco-genic origin, which is notoriously difficult to cure.

*J. H. Sequerra.*

**RODENT ULCER.**—The prognosis in rodent ulcer depends upon early diagnosis. So long as the lesion is limited to the skin and subcutaneous tissue, there are several methods of treating it successfully. Radium therapy gives excellent results: I have cases of rodent ulcer treated by radium which have been free from recurrence for twelve years. The proper application of the *x* rays, with or without preliminary curettage of the raised edge of the ulcer, gives similar results. Cases treated thirteen and fourteen years ago are still free from recurrence.

Radium has occasionally proved successful when the *x* rays have failed to bring about a cure, and in the writer's opinion there are cases, especially where ulceration preponderates or there is deep infiltration, in which the converse holds true. In all cases treated by radium and by the *x* rays, the best results are obtained when the lesion reacts rapidly. If treatment has to be repeated again and again, the prognosis is not satisfactory.

Complete excision of a superficial rodent ulcer, with a good margin of healthy skin around and below the lesion, gives admirable results; but where the ulcer is near the orbit, and particularly at the inner canthus, the operator often errs by removing too little, and recurrences are inevitable.

[\* At the second International Surgical Congress, where the writer had the honour of presenting the *rapport* on radiotherapy, he recorded an average of 40 per cent of recurrences after treatment by the *x* rays. The statistics of operation were almost identical. A larger experience has shown that with the proper selection of cases for radiotherapy, and improvements in technique, especially in the giving of massive doses through appropriate screens, these results have been materially improved.

Where a rodent ulcer has involved cartilage or bone, or where the orbital cavity has been invaded, the prospects of complete cure are more remote. Thorough and early clearing out of the orbit will often save the patient for some years. Removal of the maxilla, when the disease has involved that bone and the accessory sinuses, may be necessary. In some cases, a judicious combination of operation with radium and radiotherapy may effect a cure, but it is difficult to remove entirely the deeper foci of the disease without producing grave mutilation.

The *prognosis as regards duration of life* is not as serious as one would imagine, for patients often live for many years with a hideous cavity

in the face. The writer has seen one such of forty years' duration. A fatal termination is brought about by septic infection of the sinuses of the skull, meningitis from extension to the cranial cavity, general sepsis, and exhaustion. Constant care in preventing septic infection, by the application of antiseptic dressings, irrigation, etc., alone can prevent these dangerous complications.

Mention should be made of the use of carbon-dioxide snow in the treatment of superficial rodent ulcer. Satisfactory results are often obtained, but relapses are more common than with radium or *x* rays. On several occasions the writer has had to apply radium after failure to cure a rodent ulcer with the solid carbon dioxide.

Gray recently showed a case of extensive disease in which an admirable result has been obtained by the revival of an old method of treatment, viz., the application of arsenical paste. — *J. H. Sequeira.*

**RUBELLA (GERMAN MEASLES).**—The prognosis in this disease is almost invariably excellent. I have met with but 1 death in between 400 and 500 cases. Corbin has reported that there was not a single death amongst 1523 consecutive cases admitted to the London Fever Hospital during the twenty-one years 1887 to 1907.

Complications are rare. I have twice observed *otitis media*. The fatal case referred to above occurred in a boy, age 3, who succumbed to *acute cardiac dilatation* following a slight attack of arthritis.

*L. W. Goodall.*

**RUPTURED VISCERA.**—(See ABDOMINAL TUMOURS.)

**SALPINGITIS.**—From the point of view of prognosis, a distinction is made between chronic non-suppurative inflammations of the tube and ovary and the ordinary pyogenic suppurative conditions which are considered under the heading pyosalpinx.

**Salpingo-oophoritis.**—There is probably no more difficult problem in gynecology than in a given case of salpingitis to form an idea as to the end-results. In the majority almost all information is to be gained from the record of the subjective symptoms, and very little from physical signs, so that errors and uncertainties of diagnosis must be common. Although the symptoms and general reaction to an inflammation of the appendages may seem comparatively trivial, yet the far-reaching results of such a condition will make it necessary that a guarded prognosis be given, not so much concerning the immediate future as the end-results. In fact, the cases showing acute initial illness requiring active treatment, for that very reason often do better in the long run than the subacute forms.

**The Infecting Organism.**—Some difference in prognosis might be expected according to the infection. In some measure this is probably true; but the difficulty of diagnosing the nature of the infecting agent, in large part due to the similarity of symptoms irrespective of the causal agent, very frequently renders such information valueless. The tuberculous lesion is usually very chronic, commonly occurs in

young unmarried or non-parous women, and is only temporarily relieved by prolonged palliative treatment. In gonococcal lesions, it is currently believed that with one tube infected the opposite tube will be likely to become inflamed. Also, in acute gonorrhoeal forms, one is rarely in fear that general peritonitis will supervene.

An inflammation following an abortion or occurring during the puerperium is usually of streptococcal nature, and produces a condition of pelvic peritonitis—a definite clinical condition known as perimetritis, ending in most cases in partial or complete recovery, or more rarely passing on to a pyosalpinx.

**Effects of Salpingitis.** The effects, more especially the remote effects, may be enumerated and considered irrespective of the casual agent. In the first place, there is no doubt that pelvic adhesions in the majority of cases owe their origin to a previous salpingitis. These adhesions may be symptomless and only discovered during the course of other operative procedures; but generally they give rise to ill-defined symptoms of pain, varying greatly in intensity, and often causing considerable distress. The inability to recognize such adhesions on examination often leads to a diagnosis of neurosis, and to lack of success in treatment. Again, conditions frequently associated with salpingitis are the retro-displacements of the uterus, especially of the fixed variety. Or the development of a hydrosalpinx may give rise to pressure symptoms, or cause displacement of the uterus or rectum.

#### **The Results of Treatment.**

*Expectant.* In the acute varieties of salpingitis the recognized form of treatment consists in absolute rest, douches, and saline purgation. Finley quotes Fraub, of Amsterdam, as reporting cures in 70 per cent of cases as a result of this mode of treatment. The cures, however, were not absolute, as in a limited number there were relapses; but he maintains that at least 50 per cent of cases of salpingitis require no operative treatment. The average duration of treatment under this expectant method was six weeks; however, in some cases it was as short as three weeks, while in others it extended to as many months. Unfortunately, it is only the better classes who are able to submit to the longer periods of rest.

Finally, there is no doubt that there is a very good chance of recovery, if the treatment is persisted in. It has not infrequently happened that patients who have been recommended to submit to operation, and who have been pronounced to be very unlikely to conceive, have yet recovered and borne children.

*Operative.* In the chronic forms of salpingitis, which do not react to medical means, and in which the symptoms indicate the necessity for further measures, the only alternative lies in surgical intervention. The immediate operative results are uniformly good, as is seen in the accompanying figures taken from the annual reports for the years 1912 and 1913 of the Chelsea Hospital for Women.<sup>2</sup> Number of cases operated on in 1912, 61—no deaths; in 1913, 55—no deaths; a total of 116, with no deaths.

The operative risks are therefore not great; but it is necessary to consider how often this treatment leads to complete recovery. It is undoubtedly true that in a few instances relief does not follow operative measures; but this is often the result of omitting to remove the uterus as well as the tubes, or due to faults in technique, which in the near future may be much improved.

**Pyosalpinx.** The operative treatment of pyosalpinx shows results very different from those in chronic salpingo-oophoritis. It is in fact one of the most serious operations in gynecology, the mortality being only exceeded by that of Wertheim's hysterectomy for carcinoma of the cervix. Thus, in the returns of the Chelsea Hospital for Women for the last two years, operations for pyosalpinx were undertaken in 31 cases, with 5 deaths, a mortality of 16.1 per cent. Such a death-rate appears exceedingly high; but many of the cases were very seriously ill. Injury to the bowel during the course of operation accounted for a certain number of deaths.

In those cases recovering, there is a strong likelihood of adhesions forming between the peritoneally denuded surfaces of the pelvis and its viscera; also when the uterus is preserved, unless the precaution of fixing it to the abdominal wall be taken, there is much likelihood of a fixed retroversion occurring during convalescence.

**Tuberculous Salpingitis.** With regard to the operative treatment of this condition, the results seem to be uniformly good, provided the tuberculous material be all removed. No other measure can offer equally good results.

REFERENCES: *Diseases of Women*, 1911, 167; Chelsea Hospital for Women, *Annual Reports*, 1912 and 1913.

*Erphen Glendinning.*

**SARCOMA OF BONE.** (See BONE TUMOURS.)

**SARCOMA, MELANOTIC.** (See MELANOTIC SARCOMA.)

**SCARLET FEVER.** It will be convenient to consider the prognosis of this disease under the following heads: (1) *Age*; (2) *Sex*; (3) *Severity of attack*; (4) *Special symptoms*; (5) *Complications*.

1. *Age.* During the years 1900 to 1909, 173,553 patients suffering from scarlet fever were admitted into the hospitals of the Metropolitan Asylums Board. The fatality at the different ages is shown in the following table:

FATILITY ACCORDING TO AGE.

0-1	11.7	0-5	0.3	25-30	1.6
1-2	11.1	5-10	1.7	30-35	1.5
2-3	8.0	10-15	0.9	35-40	2.8
3-4	5.5	15-20	1.1	40 and over	2.2
4-5	3.4	20-25	1.7	All ages	3.0

It will be seen that, under fifteen years of age, the younger the patient the greater is the chance of death. The first three years of life are the most dangerous.

2. **Sex.**—The fatality amongst males was slightly higher than amongst females: for all ages, it was 3.2 per cent for males and 2.8 for females; under five years of age, it was 6.7 for males and 5.0 for females.

3. **Severity of Attack.**—It is convenient, for the purpose of description, to divide cases of scarlet fever into three classes: the *malignant*, or toxic; the *anginous*, or septic; and the *benign*, or simple. The fatality of an epidemic or group of cases will depend, partly upon the proportion of each of these three groups, and partly upon the proportion of children of tender years. Malignant scarlet fever is extremely fatal; very occasionally an adult will recover; but I do not remember ever to have seen a case amongst children under ten years of age which was not fatal. In this form of the disease serious symptoms come on very rapidly, and, in children, death takes place within four days. A feature of malignant scarlet fever is the slowness of the faucial inflammation. But usually the temperature runs high, the rash is vivid, the pulse very frequent (150 per minute or more), the respiration sighing, and the skin and mucous membranes dusky. The patient is prostrate, delirious or comatose, and vomits frequently.

Benign scarlet fever, on the other hand, is never fatal, unless through some complication (e.g., nephritis), and then but rarely.

Most of the deaths in scarlet fever are connected with the faucial lesions of the anginous variety, and these may assume various forms. Briefly, it may be stated that the more extensive the inflammation and the more extreme the swelling, the graver is the prognosis, because sloughing or ulceration, more or less widespread, is sure to result, conditions which are very favourable to the development of septicaemia or pyaemia. There is a variety of the disease, not often met with, which holds an intermediate place between the benign and the anginous forms in respect of the prognosis. I refer to what is known as the *typhoid form*. In this, the temperature remains raised for three or four weeks, and yet the faucial lesions are moderate in severity. If death takes place, it is nearly always due to some complication.

It is a prevalent idea that an attack of scarlet fever occurring in a pregnant or recently delivered woman is more often than not of unusual severity. But my experience points in the opposite direction. During the twenty-one years 1892 to 1912, there were at the Eastern Hospital, Homerton, 40 cases of women who had been attacked by scarlet fever just before or just after delivery. In only 4 of the cases was the attack severe, and in only 4 could death be attributed to the scarlet fever. There were four other fatal cases amongst these women, but in all of these there was present, before the symptoms of scarlet fever set in, a septic condition due to retained placenta, laceration of the uterus, etc., which was quite sufficient to account for the fatal event.

4. **Symptoms of Special Seriousness.**—These are: repeated

vomiting); continuous excessive frequency of the pulse (over 150, especially in adults); sighing respiration; coma; a prolonged high temperature; prolonged delirium and restlessness; a dusky or cyanotic appearance of the skin. These symptoms are most often met with in malignant scarlet fever, but they may be observed in some cases of the anguinous form. To what has been stated above concerning the prognosis in the latter, it may be added that if, in spite of the return of the temperature to the normal and the improvement in the faucial lesion, the pulse-rate remains unduly frequent, the patient continues to waste, and there is looseness of the bowels and occasional vomiting, the prognosis is unfavourable.

**5. Complications.** These are most frequently met with during or after an attack of anguinous scarlet fever. Seldom is an attack of the malignant variety of sufficient duration to allow of their occurrence.

*Cervical Cellulitis.* This is one of the most fatal complications; the more extensive it is, the more ominous it is. These children seldom recover in whom the cellulitis involves the whole of the neck below the jaw, from one ear to the other.

*Nephritis.* Marked albuminuria and diminution in the quantity of urine, occurring during the first week or two of an attack of scarlatina nigrosa, are to be regarded with apprehension; for they are not infrequently the sole expression of a particularly severe form of nephritis. Should there also be coma or semi-coma, with muscular twitchings, the outlook is still more grave. A purpuric condition supervening at any stage of the disease is nearly always serious.

The common form of scarlatina nephritis, that which is a sequel rather than a complication of the disease, more often follows a severe than a mild attack. It may begin abruptly, with vomiting, pyrexia, hæmaturia, scantiness of urine, and occasionally a rigor. But it may also begin insidiously, with little else but albuminuria. On the whole, the more abrupt the onset, the less likely is the attack of nephritis to be prolonged; whereas the cases with an insidious beginning are usually tedious. The duration of an attack of nephritis varies from three to eight or ten weeks. The vast majority of the cases recover completely and do not become chronic.

It is not often that the renal lesion is the cause of death. When this event occurs, it is usually due to some such intercurrent affection as pneumonia or pericarditis; so that the occurrence of these complications is unfavourable. The fatality of nephritis is about 8 per cent, and is higher among children than adults. Of symptoms that are due to the nephritis itself, the most unfavourable are drowsiness, coma, a marked diminution in the amount of urine excreted, and extreme anasarca. The last symptom is seldom met with in cases that have been brought under treatment at an early stage. Convulsions, though serious, are by no means so grave as the symptoms just mentioned; they are prone to arise without the slightest warning, in cases which are by no means severe and are apparently progressing favourably.



The incidence of nephritis varies considerably. The average for the ten years 1900 to 1909 in the hospitals of the Metropolitan Asylums Board was 1.6 per cent in 153,007 cases of scarlet fever. It is highest in children, and especially in those between the ages of five and ten years, and of the male sex.

*Rheumatism.* The prognosis of the articular rheumatism which not infrequently follows an attack of scarlet fever is usually favourable. It is not often that cardiac complications occur, at any rate in those cases in which arthritis is manifest. There are reasons, however, for thinking that endo- or pericarditis arises in the course of scarlet fever more often than is supposed, and that they either are overlooked, or do not give rise to symptoms, till long after the scarlatinal attack is past.

*Pneumia.* This is an extremely unfavourable complication of scarlet fever.

*Laryngeal Affection.* Such an event is seldom met with except in the anginous form of the disease, and it makes the outlook grave. Even if the patient recovers, a more or less pronounced stenosis of the larynx remains.

*Otitis Media.* The prognosis is usually favourable, provided that the appropriate treatment has been commenced early. But this complication is apt to resist treatment, which must, therefore, be carried out with unremitting care to prevent the occurrence of any serious impairment of hearing.

*Tuberculosis.* An attack of scarlet fever will often have a most prejudicial effect on patients who are the subject of tuberculous lesions. Not only is the part affected by tubercle likely to become worse, but nephritis is prone to occur and to be prolonged. *E. W. Goodall*

**SCHISTOSOMIASIS.** This disease is caused by the *Schistosoma japonicum*, and is a chronic disease affecting chiefly abdominal organs, and producing emaciation of the liver and dysenteric symptoms. The prognosis is bad, about 40 per cent dying directly of the disease and a still larger proportion from secondary infections. *Leonard Rogers.*

**SCIATICA.**—This term is applied to pain in the region of the sciatic nerve and its branches. Sciatica includes both *sciatic neuralgia* and *sciatic neuritis*, and in every individual case we have to decide which of these two is present.

Many cases of sciatic neuralgia occur independently of any affection of the nerve: e.g., in disease of the vertebrae (whether tuberculous or arthritic), in affections of the sacro-iliac joint or the hip-joint, in diseases of the femur (tumours, osteomyelitis, etc.), in intermittent arterial claudication, etc. In other cases, especially in gouty and rheumatic subjects, we have to do with a sciatic neuritis, in which the fibrous sheath of the nerve trunk becomes thickened and inflamed.

**Sciatic Neuralgia.** The prognosis of sciatic neuralgia, secondary to disease of other structures—vertebrae, pelvis, sacro-iliac joint or

hip-joint, femur, etc.) depends upon the possibility of relieving the primary cause.

**Sciatic Neuritis.** This is a somewhat obstinate malady; it may last for months or even years, varying in its intensity from time to time, and being specially liable to relapses. The presence of muscular atrophy, and the diminution or loss of the Achilles jerk in the affected limb, indicate that definite degenerative changes have occurred in the nerve fibres. Anaesthesia in the cutaneous distribution of the nerve is not common, and is indicative of a still more severe degree of degeneration. Nevertheless, the ultimate prognosis, even in long-standing cases, is usually favourable, except in senile and debilitated patients.

Bilateral sciatica is always a more serious affair. It may be due to diabetic neuritis, or it may be symptomatic of gross disease elsewhere, e.g., in the sacral region of the spinal cord or the cauda equina, or in the bones of the vertebrae or pelvis.

In every case of sciatic neuritis, rest and avoidance of violent movement are desirable. Recent cases often subside rapidly under hot local applications (e.g., hot poultices, radiant dry heat, hot mud-baths, electric light baths, hot air, etc.), combined with anti-gouty or anti-rheumatic remedies, as the case may be. In other cases, excellent results are obtained by counter-irritation (e.g., by iodine, fly-blister, or, better still, by a Paquelin cautery) applied to the tender points along the course of the nerve. Electrotherapeutic methods, in the hands of an expert, are often useful, especially the employment of a galvanic current, with or without ionization by various drugs; or again of the static wave current; or, in chronic cases, of static sparks along the course of the nerve trunk. Sometimes obstinate cases of sciatic neuritis, which have resisted other means of treatment, are relieved by injecting directly into and around the nerve sheath large quantities of saline solution (50 to 100 c.c.), to which may be added a small proportion of an analgesic drug (e.g., 1 per cent cocaine); or the fluid may be injected, in smaller quantity, into the roots of origin within the sacral canal, by means of so-called epidural injection through the sacro-coccygeal fontanelle. Cutting down upon the sciatic trunk, dissecting it out, and forcibly stretching it, had a vogue some years ago, but is rarely prescribed nowadays; it appears to have no special advantages over saline injections.

*Purves Stewart.*

#### **SCLEROSIS, DISSEMINATED.** (See DISSEMINATED SCLEROSIS.)

**SCOLIOSIS.** The following factors govern the prognosis in scoliosis.

Apart from treatment, the deformity often gets worse in growing patients; but when growth ceases it is usually arrested. There is no remedy to natural cure. The patients are bad subjects for chest diseases later.

To find an answer to the question as to what benefit may be expected from treatment by exercises, massage, etc., the patient's

spine must first be put into the best possible position by the surgeon's hands. It will be possible to make that position habitual by treatment; but if the hands do not overcome bony deformity, the exercises will not do so. It is usually safe to promise relief of pain and prevention of further progress of the scoliosis.

For all other factors influence the outlook.

1. **The Cause.** If there is a contracted chest, unequal length of the legs, or severe muscular paralysis, not much can be done to straighten the spine.

2. **The Age and Duration.** Recent cases are better than old-standing. The younger the patient the worse the prognosis. Children under six or seven do badly.

3. **The Type of Patient.** Shy, shrinking girls, who will not try to stand up like a soldier, and are careless of their personal appearance, are unfavourable subjects.

4. **The Degree of Deformity.** The deviation of the vertebrae matters more than that of the spinous processes. Fixed bony deformity cannot be cured; but with the same initial degree of deformity there is much variation in the result of treatment. High or low curves in the spine are unfavourable.

5. **The Nature of the Treatment.** In early cases, without bony fixation in a bed position, exercises, posture, and massage give the best results. In old, fixed cases it will be necessary to supplement this by a supporting jacket to relieve aching pain.

REFERENCES.—Tubby, *Deformities, including Diseases of Bones and Joints*, 1912; Noble Smith, *Curvature of the Spine*, 1896; Roth, *Chin. Jour.*, 1914, 144.

1. *Bundlle Short.*

**SCROTUM, CARCINOMA OF.** This disease is uncommon, except in sweeps and tar-workers. It is one of the least malignant of all forms of carcinoma, but we have very little in the way of exact statistical evidence bearing on the point. Patients sometimes present themselves who have already had the growth for years. No doubt, apart from treatment, it would always be fatal at the last.

**The Operation Mortality** is small. Of 58 cases at St. Bartholomew's Hospital, 2 died, both being very bad subjects. Probably clearance of the groin glands would slightly increase the mortality.

**The End-results** have been studied by Butlin.<sup>1</sup> Excluding 2 cases which died from the operation, and 2 more in which the glands were involved but not removed, we have the following: 7 cases recurred; 5 cases, followed one to three years, are well; 8 cases, followed over three years, are well.

Even amongst the recurrences, a second operation was several times successful. It is true that recurrence is occasionally very late; probably, in some instances, it is really a new cancer.

We have no figures to show whether it is wise to remove the groin glands. This was done in some of Butlin's cases, but not in all.

REFERENCES.—Butlin, *Operative Surgery of Malignant Disease*, 2nd ed.

1. *Bundlle Short.*

**SCURVY.**—Scurvy is not nearly so common as formerly, and its more severe aspects are now practically never seen in this country. In the eighteenth century the mortality from scurvy was appalling; in Lord Anson's voyage round the world in 1740-1741, 380 out of 510 men died of the disease. Present-day mortality in this country is well under 1 per cent. Although the intimate nature of the disease is not yet understood, it is well known that certain simple measures will either prevent its onset or cure its manifestations. The prognosis depends, therefore, mainly upon the availability of the means of suitable treatment. Unless the patient when first seen is dangerously ill, recovery may almost certainly be predicted. The most important danger is sudden syncope. This must be met by keeping the patient absolutely quiet in bed for a week. After that period the danger has passed, and restoration to health may be looked for at the end of a fortnight. As the patient improves, a striking change in his aspect will be noticed. The subcutaneous and intranascular indurations clear away; this is followed by a return to normal of the gums, and finally by a disappearance of the petechiæ. The tendency for wounds to break down and ulcers to form ceases when treatment begins, and healing is rapid.

When scurvy has come under treatment, the only danger to life, apart from the possibility of syncope, arises from the existence or onset of a complication. Pneumonia is thus a source of danger. Pleurisy and pericarditis, even when the effused fluid is sanguineous, usually clear up. A complication such as dysentery may cause symptoms to persist. Hemorrhage is not usually of serious import, and apart from epistaxis, is uncommon.

G. F. Goodall,  
A. Goodall.

**SECONDARY ANEMIA.** (See ANEMIA, SECONDARY.)

**SEPTICÆMIA.** With the rarest possible exceptions, true septicæmia (septicæmia), that is, confirmed by finding bacteria of suppuration in the blood, is inevitably fatal within a few days, and the diagnosis is really the diagnosis. Here belong those cases in which the patient, sometimes a nurse or doctor, is taken acutely ill with what appears to be a severe type of influenza; where there is little or no local inflammation at the site of entry, and where the utter prostration, high fever, septic rashes, diarrhoea, or onset of peritonitis or abscesses, leads to an examination of the blood. It is always a very grave sign when effectual treatment of the primary focus of a suppuration does not produce marked improvement within two days. Occasionally one sees cases of probable septicæmia in which anti-tetoptococcus serum seems to work like a charm. — A. Rendle Short

**SINUS THROMBOSIS, LATERAL.** (See INTRACRANIAL COMPLICATIONS OF EAR DISEASE.)

**SKULL, GUNSHOT WOUNDS OF.**—(See GUNSHOT WOUNDS.)

**SLEEPING SICKNESS.**—(See TRYPANOSOMIASIS.)



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**SMALL-POX.**—The prognosis of this disease must be considered in so far as it is influenced by the following factors: (1) *The Age*; (2) *Sex*, and (3) *Race of the patient*; (4) *Nature of the attack*; (5) *Presence of special symptoms*; (6) *Occurrence of complications*; (7) *Character of the epidemic*; and, further, by the very important factor, (8) *The condition of the patient in respect of vaccination*.

1. **Age.**—Amongst the *unvaccinated*, all the evidence goes to show that small-pox is very fatal to the young. If we refer to times in which the disease was not controlled by vaccination, we find that amongst the total number of deaths from small-pox at all ages, the proportion amongst children under five was very high. Thus, at Geneva, during the years 1580 to 1760, there were 25,319 deaths from small-pox; 83 per cent of these were children under five years of age, and 48 per cent were under two. At the Hague, for fifteen years, the proportion of deaths under five was 73.4 per cent; in Sweden, during the years 1770 to 1798, 78.4 per cent; in Kilmarnock, during 1728 to 1764, 99.5 per cent; in Chester, in 1774, 89 per cent; in Manchester, during 1763 to 1774, 95 per cent; in Warrington, in 1773, 94 per cent; and in Edinburgh, during 1764 to 1783, 94 per cent. (See Dr. J. C. McVail's evidence before the Royal Commission on Vaccination.) There are no records which are extensive or accurate enough to furnish a definite statement as to the fatality at the different ages in those times; but if we argue from what has taken place amongst the unvaccinated during recent years, we may safely assert that then, as more recently, the fatality amongst young children was high. The following table has been compiled from the annual reports of the Metropolitan Asylums Board (London), for the years 1892 to 1895 and 1901 to 1903, and from the reports of small-pox epidemics in several large towns in England (Leicester, Gloucester, Manchester, Oldham, Chadderton, and Bradford) during the period from 1892 to 1896, made to the Royal Commission on Vaccination. All cases doubtful as regards vaccination are excluded from these figures.

FATALITY OF SMALL-POX AMONGST THE UNVACCINATED,  
ACCORDING TO AGE.

Age	Cases	Deaths	Fatality per cent
Under 5	1510	645	42.7
5 to 9	1253	246	19.6
10 to 14	663	115	17.3
15 to 19	393	77	19.5
20 to 29	447	131	29.2
30 to 39	152	62	40.7
40 to 49	73	43	58.9
50 to 59	26	12	46.2
60 to 69	15	7	46.6
70 and over	6	2	33.3
Total cases	4534	1340	29.5

From this table it appears that, during the epidemics from which the figures are derived, the fatality was very high amongst children under five, that it fell considerably during the next two quinquennial periods, and then quickly rose again. But even the lowest fatality, 17.3 per cent for children between the ages of ten and fifteen years, is high; and the fatality for all ages, 29.5 per cent, is very high compared with that which is found in such diseases as typhoid fever and scarlet fever.

Amongst the *vaccinated*, however, i.e., those vaccinated in infancy, the prognosis is very different. The following table has been drawn up from the same reports of the Metropolitan Asylums Board and the Royal Commission as were employed for the preparation of the table given above relating to the *unvaccinated*, so that the two tables are very rightly comparable.

FATALITY OF SMALL-POX AMONGST THE VACCINATED,  
ACCORDING TO AGE.

Age	Cases	Deaths	Fatality per cent
Under 5	39	1	2.5
5 to 9	285	2	0.7
10 to 14	870	7	0.8
15 to 19	1752	30	1.7
20 to 29	4648	219	4.7
30 to 39	3097	335	10.8
40 to 49	1571	239	15.2
50 to 59	552	89	16.1
60 to 69	221	47	21.2
70 and over	65	13	19.5
Total cases	13101	982	7.4

From this table we find that, amongst the vaccinated, the fatality rate is under 5 per cent for persons under thirty. It is especially low between the ages of five and fifteen, being less than 1 per cent. After thirty, the fatality rises, and it is about 20 per cent amongst those over sixty. But even the highest fatality rates amongst the vaccinated are only a trifle higher than the lowest amongst the unvaccinated. And it may be concluded, from a comparison of the two tables, that while infant vaccination affects most favourably the prognosis at all ages, the most beneficial effects are to be noticed in those under thirty years of age, and especially in children between the ages of five and fifteen.

Unmodified confluent small-pox is extremely fatal in children under two years of age, and very fatal in those between two and five.

2. **Sex.**—Most authorities state that sex has very little influence on the prognosis. There are, however, few statistics, bearing on the point, in which the vaccinated are distinguished from the unvaccinated



cases. During the years 1892 to 1895, 534 unvaccinated males and 537 unvaccinated females were treated in the Small-pox Hospital of the Metropolitan Asylums Board; 90 males and 112 females died, so that the fatality amongst the former was 16·8 per cent, and amongst the latter 20·8 per cent. But these figures are too small to warrant a general conclusion. During the same years, and at the same hospital, 1883 vaccinated males and 1365 vaccinated females were treated: of the former, 58, or 3 per cent, died; of the latter, 40, or 2·9 per cent; so that in these cases the fatality was the same in each sex. Welch and Schamberg state that in certain epidemics in Philadelphia the fatality amongst 1593 males was 27·4 per cent, and amongst 2606 females 25·7 per cent; and McCombie puts the male fatality at 1 per cent higher than the female. These writers are referring to vaccinated and unvaccinated cases taken together.

3. **Race.** It has been stated by more than one author that small-pox is much more fatal amongst the dark races of mankind than amongst the white. There is historic evidence to show that when the disease has been introduced into certain countries for the first time (as into Mexico when it was conquered by the Spaniards), the mortality, and apparently also the fatality, has been very high. The statement made above concerning race may have been true to a certain extent so far as the more remote past is concerned; but it is doubtful whether it is true at the present day. The following figures, given by Welch and Schamberg, refer to unvaccinated patients treated in the Philadelphia Municipal Hospital: Amongst 2036 whites there were 910 deaths, a fatality of 44·7 per cent; while amongst 637 negroes there were 315 deaths, a fatality of 49·4 per cent. The figures are scanty, and the difference in the fatality rates not very great. But the character of the epidemic is of great importance. Thus, the writers just quoted state that during the years 1898, 1899, and 1900, small-pox of an extremely mild type prevailed in certain parts of the United States, and that they treated in hospital 162 patients (of whom 138 were unvaccinated) without a single death; 150 of the patients were negroes. A very mild form of small-pox (known as Annas) has also been prevalent during recent years amongst the Kaffirs in South Africa. This evidence, therefore, goes to show that race has very little influence on the mortality.

4. **The Nature of the Attack** is of great importance. I have added together the figures presented to the Royal Commission on Vaccination, which were obtained from various authorities, from Marson (1826 to 1851, at the Highgate Hospital) to Coupland (1896, in the Gloucester epidemic).

Amongst the *unvaccinated*, I find that of 478 malignant or hemorrhagic cases, 451 died, a fatality of 94·3 per cent; of 5258 confluent cases, 2393 died, or 45·8 per cent; and of 1068 discrete (including those classed by Coupland as coherent) cases, 57 died, or 5·3 per cent. It will thus be seen that nearly all the hemorrhagic cases are fatal. In respect of the confluent and discrete cases, the age of the patient

must be taken in conjunction with the character of the attack (see table given above); most of the deaths in discrete small-pox occur amongst children under three years of age.

Amongst the *vaccinated*, I find, from the figures given by the observers just quoted, that of 529 malignant cases, 425 were fatal, or 80.3 per cent; of 5394 confluent cases, 963 died, or 17.8 per cent; while of 9603 discrete cases, 42 died, or 0.4 per cent. It will be observed that in both the vaccinated and the unvaccinated the prognosis in the case of malignant small-pox is very grave. In confluent small-pox the prognosis is grave in the unvaccinated, much less so in the vaccinated. In all forms the prognosis is much more favourable in the vaccinated than the unvaccinated.

Generally, it may be stated that the more profuse the eruption of pocks, the graver is the prognosis.

**5. Special Symptoms.**—If the symptoms of the prodromal or initial period be mild, then the attack (eruptive stage) will be mild. But if the initial symptoms be severe, the eruptive stage will not necessarily be severe. Often it will be; often, also, it will not. Even an attack which proves to be very much modified is occasionally ushered in by severe initial symptoms.

*Rashes.*—Of the initial rashes, the scarlatiniform and morbilliform erythemas, whether generalized or local, are usually favourable, especially when the patient is vaccinated. The same remark is true of the pale sepia erythema described by Thomson and Brownlee under the designation 'caputoid.' The generalized livid (dark plum-coloured) erythema is of very bad omen; so also are the crisperlatoid (astacoid) erythemas—local or generalized.

The hæmorrhagic initial or prodromal rashes are, on the whole, very unfavourable. When the hæmorrhages are small (petechial), not very numerous, and of a bright red colour, the prognosis is not so grave as when they are small, very numerous, and of a purple hue. The vaccinated person has the better chance. The occurrence of scattered, purple, blue-black, or inky cutaneous and subcutaneous hæmorrhages is very ominous. In the very worst cases there is also an crisperlatoid erythema. The presence of hæmaturia, metrorrhagia, or bleeding from other mucous surfaces aggravates the prognosis.

The symptoms last mentioned are amongst those which are to be observed in malignant or hæmorrhagic small-pox, which, as we have seen, is an extremely fatal form of the disease. Death may take place on the third to sixth day, before the eruption of pocks has made its appearance. Not only the hæmorrhagic but the crisperlatoid initial rashes are prone to occur in malignant small-pox. The lumbar pain is often unusually severe. There is some hope of recovery in that form of hæmorrhagic small-pox in which the hæmorrhages are limited to the skin immediately beneath and around the pocks.

*Pocks.*—It has already been stated in regard to the eruption of pocks, that the more profuse it is, the graver is the prognosis. The outlook is especially bad when the eruption is already confluent in

the papular stage: then the papules are often softer and less prominent than usual. In the vesicular and pustular stages, it is an unfavourable sign if the pocks are whitish, flat, and collapsed, and if there is little or no swelling of the skin. It is, on the other hand, a favourable sign if the pocks, even though very numerous, run through the stages of vesiculation and pustulation to incrustation more quickly than usual: if the pocks are superficial: if they are small or of variable size: and lastly, if, whether in the vesicular or pustular stage, they are ill-developed. These modifications of the cutaneous lesions are, at the present time, most often due to previous vaccination.

If there are many pocks on the mucous membranes of the mouth, palate, pharynx, and especially larynx (as shown by signs of laryngeal obstruction), the gravity of the prognosis is much augmented.

In hæmorrhagic small-pox, the fatal event often takes place on the third to sixth day: in confluent and severe discrete cases, the dangerous period is that of the suppuration of the pocks, that is, from the sixth to twelfth day of the eruption (eighth to fourteenth of the illness). Complications are very likely to set in during this stage.

*Other Symptoms.* Marked restlessness, insomnia and delirium, convulsions, coma, prostration, profuse diarrhoea, and, in children, grinding of the teeth, are all unfavourable symptoms.

**6. Complications.**— These are especially to be expected in the most severe cases, either during, or soon after, the period of suppuration of the pocks. Those which are both frequent and serious are œdema of the lungs, acute bronchitis, lobular pneumonia, acute dermatitis and cellulitis with suppuration, erysipelas, septicæmia, and pyæmia. More serious, but infrequent, are lobar pneumonia, empyema, gangrene of the skin (especially of the scrotum), arthritis, and acute myelitis. Ocular complications are common, especially after confluent and severe discrete attacks. Extreme inflammation and swelling of the lids is serious and leads to conjunctivitis, corneitis, corneal ulcer, and panophthalmitis, so that if the patient survives the attack of small-pox, his sight may be lost or impaired: but conjunctivitis and corneitis may occur independently of œdema of the eyelids. Otitis media is met with chiefly in children.

*Influence of Pregnancy.*— In Welch and Schamberg's book on *Acute Contagious Diseases*, a table is given in which are shown details of 113 cases of small-pox in pregnant women. From this table it appears that in 67 of the 113 cases, or 59 per cent, abortion or premature delivery took place: 7 of the patients, or 6 per cent, died undelivered: 20, or 18 per cent, recovered and went to delivery at full term: and 19, or 17 per cent, left the hospital still carrying the fetus, and no further information was to be obtained concerning them.

In 73 cases in which the woman was attacked by small-pox before the completion of the seventh month of pregnancy, 41 aborted, or 56 per cent: while of 39 attacked after the seventh month, 25 were delivered prematurely, or 64 per cent.

The fatality was much higher in those who were prematurely

delivered than in those who were not : of the 67 in the former class, 28 died, or 41·7 per cent ; while of the 46 in the latter, 7 died, or 15·2 per cent.

Miscarriage takes place most frequently during the eruptive stage ; but the earlier in the attack it occurs, the more likely is the event to prove fatal. The more severe the attack, the greater the risk of premature delivery and death. Vaccination has a great influence in prognosis. Of the cases quoted, 27 had not been vaccinated and 20 of them died, a fatality of 74 per cent ; of 85 cases in which vaccination had been performed " at some previous remote period," 14 died, a fatality of 16 per cent.

The writers point out that the death-rate of small-pox in pregnant women varied in different epidemics ; in their series, in three different epidemics, it varied from 13 to 51 per cent. The miscarriage rate varied less widely, from 55 to 61 per cent. In the very mild epidemic which prevailed in Trinidad during 1902 to 1904, Schenlt found that 27 out of 89 women miscarried, or 30 per cent ; none died.

On the whole it may be concluded that an attack of small-pox is a most serious event for a pregnant woman ; and that the vaccinal condition of the patient and the nature of the attack are of prime importance in determining the issue.

In respect of the child, the earlier in gestation the mother is attacked by small-pox, the more likely is the child to perish. In the later months, the child may be born with the eruption of small-pox out upon it, or, if it live, it may develop the rash later. A living child born of a variolous mother may not have small-pox at once, and yet is rarely immune to vaccination.

**7. Character of the Epidemic.** Allusion has already been made to this factor when the question of the influence of race was under consideration. One epidemic will differ very widely from another in respect of its case mortality, that is to say, of the virulence of the immediate cause of the disease, whatever it may be. The fatality of the London epidemic of 1902 was 16·8 per cent, and of that of 1903 3·4 per cent. The epidemic in Sydney in 1913 was characterized by extraordinary mildness. Up to the end of that year there were 1070 cases, with but 1 death. Even young children had the disease in a mitigated form. Of the persons attacked, 93 per cent had never been vaccinated. This outbreak was also characterized by its low power of infectivity.

**8. Vaccination.**—One or two more points require to be dealt with under this heading which have not been touched upon in the previous paragraphs. It will be seen from the table, given above of the fatality of small-pox in the unvaccinated, that on the whole it increases with age, that is, with the lengthening of the interval between vaccination in infancy and the attack of small-pox. We must now consider the question of the expectation of an attack of small-pox in those who have been vaccinated in infancy, when they are exposed to the infection of the disease. Very careful investigation into this point

was made in the epidemics at Sheffield, Warrington, Dewsbury, Leicester, and Gloucester, and the results were reported to the Royal Commission on Vaccination. The inhabitants of houses invaded by small-pox in those epidemics were divided into two classes, the unvaccinated and the vaccinated. The number of persons in each class was enumerated, and also the number in each who were attacked by small-pox. A further separation was made of these persons into two groups, those under ten years of age, and those of ten years and over. Adding the totals from the five towns together we get the following figures:

PROPORTION OF UNVACCINATED AND VACCINATED PERSONS EXPOSED TO ATTACK WHO WERE ATTACKED.

	Under Ten			Over Ten		
	No.	Attacked	Per Cent.	No.	Attacked	Per Cent.
Unvaccinated	2317	1133	48.8	1195	631	52.8
Vaccinated	5810	119	2.1	20822	5997	29.0

It will be noticed that the attack rate in the unvaccinated is not very different in those under or over ten. In the vaccinated, however, the attack rate is four times higher in those over than in those under ten. These figures deal almost entirely with persons vaccinated in infancy. The protective power of vaccination wanes as the length of time from the vaccination increases. But even after its power of preventing an attack of small-pox has gone, its influence in modifying the attack remains for a considerable time. It may also be stated that the incidence of the severe forms of small-pox is much less amongst the vaccinated than the unvaccinated.

The prognosis is also affected by the *efficiency of the vaccination*, as measured by the number and character of the vaccination scars. The larger the total area of the vaccination marks, the better the prognosis.

*Re-vaccination* will restore to the already vaccinated individual any loss of the immunity conferred by the primary vaccination. It is rare to meet with attacks of small-pox, and still more rare to meet with fatal cases, in persons who have been successfully re-vaccinated.

E. W. Goodall.

**SOLDIER'S HEART.** At the present time this subject has a special interest, and it is likely to demand attention for some years to come. No aspect of the matter is of more practical importance than its prognostic side. Put in a nutshell, the problem is this: What chance has the soldier with "D.A.H." (disorderly action of the heart) of complete or partial recovery? This problem is of double significance. In the first place it constitutes a portion, and by no means

an unimportant one, of the task imposed upon warring nations of maintaining an army in the field. In the second place, there is the question of probable fitness for civil life after military service is over. To the first question we are able to give a fairly definite reply based on ascertained facts; to the second nothing better than a reasoned guess.

**Likelihood of Return to Military Duty.**—Parkinson found that after seven months only one-quarter of his patients had become fit for full duty. The exhaustive interim report of the Medical Research Committee gives the following figures relative to a series of 220 cases: Three months after discharge from the special hospital, 11.8 per cent were doing duty overseas or were marked fit for it, 17 per cent were doing full duty at home, 41.8 per cent were on light and 41.3 per cent on sedentary duty at home, 37.5 per cent were still under treatment, and 11 per cent had been discharged permanently unfit. (It must of course be understood that all these figures apply strictly to men who are proved to be free from gross organic disease of the heart or other organs). In a word, only a small percentage becomes fit for general service within a few months. At the other end of the scale are almost as large a class of men found permanently unfit. Between these extremes lies a large group of men, most of whom become fit for light or sedentary duty.

In determining for each individual patient his chance of recovery, the Hampstead workers (who are responsible for the report published by the Medical Research Committee) examine him from three points of view. First and for most they apply *systematic exercises* to see how he bears them. His expression, colour, breathing, and heart-rate are the indices upon which they rely. As he improves he is given more strenuous exercise. Finally those "who progress to the highest exercises and carry them out in conjunction with route marches are boarded as fit for full duty; men who progress more slowly and those who tolerate the highest grades of exercise less perfectly are boarded for light duty," while "those who show continued symptoms on lower-grade exercises are discharged as permanently unfit" or retained for sedentary duties only. This highly practical test of functional capacity has the advantage of being not merely selective but also remedial (see below).

Second, the *etiology* of the condition must be examined to discover the main chances of quick improvement. In many of these patients there is an inherent predisposition to such cardiac disturbances as are classified as 'D.A.H.' This has often manifested itself during boyhood, and led to the gradual abandonment of severe exercise. The patient had chosen a sedentary occupation for this very reason, and was carrying on contentedly until the war came and thrust upon him strenuous exertion in the form of military training. Soon his heart begins to complain, and his is a case of 'D.A.H.' With regard to such men the Hampstead workers write: "Where the disability is of long duration it is relatively mild during the initial stages of training

and service; . . . but if the condition changes for the worse in these men, recovery is slower and more unsatisfactory than in those in whom a similar degree of disability has arisen more recently."

Among other causal factors, infective disease needs consideration. Patients much debilitated by dysentery and other forms of diarrhoea often develop 'sodder's heart,' and the prognosis is then dependent on the underlying condition. Men with a history of rheumatic fever or chorea, even if incurred in childhood and not since, are very liable to this syndrome, and they do badly. On the other hand, cases in which the symptoms follow 'gassing' do well. Tobacco in moderation is worse than none at all; the prospect is better if these men smoke nothing, apparently.

Third, there are a few *symptoms and physical signs* which deserve notice. Let it first be said that no objective signs can at all compare with subjective symptoms in furnishing an index of the man's condition, progress, and prospects. The murmurs which are nearly always heard in such cases are quite without value in this respect (be it understood that this whole discussion relates only to those cases in which the presence of definite organic heart disease has been excluded).

The same is almost equally true of the extent and force of the apex beat. Rapidity of pulse is open to so much variation of all kinds that it is not in itself of any value. What is of value, however, is the readiness with which acceleration of the pulse is provoked (e.g. by sitting up in bed), and the time in which the rate returns to normal after such acceleration. The return should not occupy more than a minute. The longer it takes, the less favourable the prognosis.

**Influence of Treatment on Prognosis.** Various methods of treatment have been put forward, but the only one that can be said to offer any certain hope is the graduated exercise method alluded to above.

According to the Hampstead workers, the period of stay in hospital amounts to no more than two months, whereas the average stay in hospital of patients treated by other means amounts to something over five months.

No drug treatment has any definite influence on the course of the disorder.

**Future Fitness for Civil Employment.**—This side of the matter is of necessity obscure at present. Probably we shall find that the majority of the 'D.A.H.' patients, especially those who showed a predisposition to the trouble before the war, will return without much difficulty to their civil employments. On the other hand, those men who have developed similar symptoms apparently as a result of some infective disease are likely to be less fortunate. It is probable that in such cases the myocardium has suffered actual damage, and the possibility of recovery will depend on the patient's age and other circumstances.

Carey F. Coombs.

**SPINA BIFIDA.**—We shall have to consider: (1) *The prospects of survival apart from treatment*; (2) *The results of injection methods*; and (3) *The prognosis after operation*.

**1. Survival apart from Treatment.** It is quite certain that the patient may, in rare cases, survive and grow up. The report of the Clinical Society,<sup>1</sup> many years ago, was able to present about a dozen such cases, several of whom were over twenty, and two over forty, years of age; one or two had obtained a spontaneous cure by shrinkage. Nevertheless, this happy event must be regarded as very exceptional. In 1882, of 649 cases of spina bifida dying in England, 612 were in their first year, and a great number of these died within the earlier months. Morton estimated that only 1 per cent grow up without treatment; this is probably too low a figure. Of 90 cases not operated on, 20 lived to the age of five.

The causes of death are rupture, leading to fatal drainage of fluid; meningitis; and hydrocephalus. The children who survive frequently suffer from cystitis, and may be paralyzed in their legs.

The only cases in which there is a reasonable prospect of survival are those of meningocele with a thick skin covering.

**2. Results of Injection of Morton's Fluid.** On paper, this is by far the best method of treatment. According to the report of the Clinical Society, of 74 cases, 35 were cured, 27 died, 5 were improved, and 5 not improved. Morton<sup>2</sup> himself had 29 patients, of whom only 6 died. But a closer examination presents the picture in a very different aspect. The operative procedure is, of course, by no means so dangerous as an excision, and therefore those dying within a month are fewer; but the great majority of the 74 cases given in Morton's book have only been followed for a very short time; and when the book appeared, 24 of those whose history had been followed up were known to be dead. The cure was often partial; many tapplings and injections were necessary in several instances, and occasionally there was no improvement even after this. It is therefore quite impossible, from such evidence, to obtain figures sufficiently reliable to compare with those obtained by operation. One can only say, in general terms, that the procedure itself is not very dangerous, even in young infants; that, if repeated, it usually causes some shrinkage of the sac; but that a great number eventually succumb to intercurrent ailments. At the Children's Hospital, Manchester, of 42 cases, 3 were cured, 8 died, and 1 was not improved.

Probably modern surgery has gone too far in abandoning the injection of Morton's fluid so completely as it has done.

**3. Prognosis after Operation.**—It is extremely difficult to obtain figures which are really comparable, because of the variations in the age at which the operation is performed. If the surgeon waits until an age when the weakly children will have died off, good figures can be obtained; if he operates in early infancy, in hopes of saving a few who would otherwise die, there will be a heavy mortality. A number of the children succumb in the next few months, even after operation.



Nicoll,<sup>2</sup> of Glasgow, reports the results of excision in 32 cases, mostly young infants, treated by himself; but unfortunately they were not usually followed up more than a month or two; of these, 7, or 21.8 per cent, died within a month.

Sachtleben,<sup>3</sup> in 1903, recorded 18 operations in Mikulicz's clinic. Of these, 4 died soon after operation; of 12 recoveries, 6 died within a year. Only 6, therefore, were alive a year after; 5 of these were completely cured, all being, in the first place, meningoceles.

Moore,<sup>4</sup> in 1905, made a study of all the cases treated by operation mentioned in the Surgeon-General's Index Catalogue for nearly a century. He estimates that the mortality at the present time, amongst children with spina bifida operated on in infancy, is about 35 per cent, and that not more than half the total number are alive at the end of a year. If operation is postponed until they are five years old or over, the mortality is only 4.7 per cent. Even after operation, infants may develop hydrocephalus, paraplegia, or incontinence; and if these conditions were already present, it is very unlikely that they will be improved.

Boettcher reports a series of 39 cases operated on by himself; 13 died, and of the 26 survivors 12 died within a few months, and 14 (that is, 36 per cent of the whole) were cured. These were all cases of meningocele.

At the Manchester Children's Hospital,<sup>5</sup> out of 8 cases treated by operation, 5 recovered and 3 died. The age is not stated.

At two Bristol hospitals, 19 infants have been operated on; 6 died, five of the deaths occurring within a few days; 1 has been lost sight of; 3 are alive, respectively three, five, and eight years after the operation. Of these three, one is quite well, another has incontinence, and the third has paralysis of the legs dating from the operation. Of 7 children not operated on, 6 died within a few months, and 1, aged three years, is still alive, paralyzed, idiotic, hydrocephalic, herniated, and always ailing.

**Summary.**—We may conclude, therefore, on the rather unsatisfactory evidence at present available:

1. That survival is quite exceptional, apart from treatment; and a surviving child will often be paralyzed and suffer from incontinence of urine or hydrocephalus.

2. That injection of Morton's fluid is comparatively safe at the time; but probably half the cases die within a few months, and in about one in seven the spina bifida is not cured.

3. That operation in early infancy has an immediate mortality of 35 per cent, and less than half the cases grow up; it cures the spina bifida, but will not improve any paralysis, incontinence, or hydrocephalus. In older children, over five, the mortality is low (about 5 per cent) and the prospect of cure excellent.

Cases of meningocele with a thick covering are favourable; syringomyelocele and meningo-myelocele, especially with a thin covering, usually threaten early death, which is scarcely a calamity in view

of the probability of helplessness and total intelligence in the case if it survives.

REFERENCES: *Trans. Clin. Soc. Lond.*, LVIII, 330; *Morton, Spinal R. P. L.*, 1887; *Neuill, Brit. Med. Jour.*, 1898, II, 1112; *Sachleben, Centr. f. Chir.*, 1901, 331; *Mason, Trans. Amer. Surg. Assoc.*, 1905; *Thorburn, Spinal R. P. L.*; *Burgard's System of Operative Surgery*. *A. Boodh Short.*

**SPINAL CARIES.**—The following points demand attention in attempting to forecast the prognosis for patients with tuberculous disease of the spine: (1) *The prognosis as to life*; (2) *The prospects of cure in ordinary cases, and length of time likely to be necessary*; (3) *The prognosis when paraplegia is present, and the value of laminectomy*; (4) *The prognosis when the disease is complicated by abscess formation, and widely by pyous abscess.* This is dealt with elsewhere (see PIOUS ABSCESS).

1. **Prognosis as to life.**—Undoubtedly patients with spinal caries run some risk of early death. According to some old authorities quoted by Tubby, about a third of the cases die within a few years of the onset. Nowadays it is quite certain that with anything like favourable circumstances and proper treatment the danger to life is much less than this. In 1903 Goldthwait published a study of the end-results of 62 cases treated in a Boston hospital and followed up till eight years afterwards, and including 20 with abscesses and 11 with paraplegia, only 11 dying (including 8 abscess cases and 2 paraplegics). Tubby followed 99 cases for two and a half years; of these, 12 died. Patients seen in private practice, or able to be treated at an open-air hospital such as Alton, do better still, and the true mortality is probably between 5 and 10 per cent. It must be admitted, however, that the patients are usually delicate all their days, and not likely to reach a great age.

Menaces to life are infected abscesses, paraplegia leading to phlegmon troubles, pulmonary tuberculosis, and of course any evidence of commencing tuberculous meningitis, such as mental change, incessant vomiting, headache, or unexplained continued fever. In cases where there is great angular curvature a good many die of cardiac lesions. In cervical caries there is some danger of sudden death by displacement.

2. **The Prospects of Cure in Ordinary Cases.**—Given favourable circumstances, country air, and good treatment, the great majority of the patients make an excellent recovery, and may indeed become hale and hearty, though there is likely to be some permanent deformity. If the treatment was instituted early, this deformity will not usually be severe; any curvature already present at the commencement of treatment will probably be permanent, but it need not increase. According to Marsh and Watson, from 80 to 90 per cent of cases treated in private practice or at Alton, and taken early in the pre-curvature stage, recover completely. The treatment will last about two years, and supervision must be exercised for still another year.

The outlook is not always so encouraging. Social position makes a great deal of difference; in towns the children of the poor do badly. Young children are more likely to suffer severely or to die than adults. Pregnancy as a rule makes matters much worse. A long length of spine affected makes a bad prognosis. Situation in the dorsal spine is less favourable than in the lumbar.

Some years ago Tubby and Jones published statistics to show the effect of forcible straightening of the curvature at one sitting; although they have now abandoned the method, it enables one to obtain some insight into the ordinary prognosis in spinal curvies. Of 99 cases followed for two and a half years, 44 recovered sufficiently to be able to walk, the curvature being improved or cured; 28 were still recumbent; 12 died; 15 were lost sight of. Further details are furnished; it is stated that 16 were no better; 17 developed abscess; 18 were, or became, paraplegic—of these, 12 recovered and 6 were still afflicted. It is declared that these figures compare well with those obtained by the usual conservative means.

It is probable that a further shortening of the time needed to effect a cure may be obtained by Albee's bone-grafting method.

Recrudescence in middle life is not very rare, but usually ends in recovery.

**3. Prognosis in Paraplegic Cases.**—All experienced observers agree that cases of paraplegia treated by prolonged rest and weight-extension, preferably in the open air, usually recover the power of walking, but this result may not be obtained for six, or even twelve, months. Probably about 80 per cent of the patients can be improved, if not cured, by this means.

There is a certain residuum in whom conservative measures do not appear to do any good, and where laminectomy may be indicated. It ought not to be resorted to until after long trial of the means already mentioned. Many years ago a few brilliant cures reported by Macewen and Horley led the profession to overrate the value of operation in these cases.

#### END-RESULTS OF LAMINECTOMY FOR PARAPLEGIA IN SPINAL CURVIES.

Operator	Cases	Failed of operation	Failed	Cured	Improved	Relieved but recurred	Not improved
Thorburn	17	2	1	4	2	5	3
Lloyd	128	21 or 16.5 per cent	36 or 28 per cent	37 or 28 per cent	16 or 12.5 per cent		18 or 14 per cent

Lloyd, in 1902, published an account of 128 cases—abstracted from the literature, and therefore possibly unduly favourable. They are

not so good, however, as Thorburn's results, drawn from his own personal cases. It will be observed that the mortality, immediate and remote is about 44 per cent in Lloyd's series, but less than 20 per cent in Thorburn's. Those cured amount to about one-quarter of the whole; with those improved, the proportion is brought up to one-third. It must be remembered that Thorburn and most other surgeons only operate on bad cases, after six months' rest has failed.

**4. Prognosis when Psoas Abscess is Present.**—As stated elsewhere (*see Psoas Abscess*), cases of psoas abscess recover, die, or become chronic invalids in about equal proportions.

**Summary.**—We may take it that good social position and proper treatment commenced early are very important; that the mortality is about 5 to 10 per cent; that about 80 to 90 per cent recover in early, well-treated cases in favourable surroundings; but that taking the average of all cases, it is probably only about half that do so; that of paraplegic cases, three out of four recover with prolonged rest and extension, but if this fails, laminectomy will relieve or cure about a third of those operated on—the mortality of the operation, immediate and remote, may be 40 per cent.

REFERENCES: Tubby, *Deformities, including Diseases of Bones and Joints*, vol. 6, 1912; Thorburn, "Spinal Cord," *Barghard's System of Operative Surgery*; Lloyd, *Philadelph. Med. Assoc.*, 1902, Feb.; Marsh and Watson, *Diseases of the Joints and Spine*, 1910. A. Rendle Short.

**SPINE, INJURIES OF.**—We shall consider the prognosis after injuries of the spine under the following headings: (1) *No evidence of fracture, dislocation, or gross injury of the spinal cord*; (2) *Fractured or dislocated spine, with or without involvement of the cord, apart from operative treatment*; (3) *The value of operative treatment*; (4) *Gunshot and other wounds of the spine*.

**1. Cases without Evidence of Fracture, Dislocation, or Gross Injury of the Spinal Cord.**—It is notoriously difficult to arrive at an accurate diagnosis and prognosis in this class of injuries, and much litigation and cross-swearing of medical witnesses is the consequence. "Say it's your back, Bill; the doctors can't never get round your back"; so runs the classical advice given by a workman to his injured mate.

In the great majority of cases, sprains, wrenches, or contusions of the spine, without evidence of bone or nerve injury, improve quickly, and the patient is well in a month or two. There are, however, three groups of symptoms which make the outlook much less favourable.

First, we have to consider the possibility of the onset of *tuberculosis*. Undoubtedly this is a very rare sequel; if a hundred cases of spinal injury were followed up, it is not likely that any would show it; but, on the other hand, patients with caries of the spine do often date it from an injury. The best evidence of the onset of tuberculosis following a trauma will be abscess formation, angular curvature, or skiagraphic evidence of excavation of the bones.

Second, it is quite common for patients, especially workmen seeking compensation, to complain of *persistent stiffness and pain* in the back, often with a tender spot, for months or years after the accident, and the physical examination may reveal nothing at all. It is usually a matter of the greatest difficulty to make a proper distinction between fraud, subconscious exaggeration, fear of being hurt, and genuine pain due to adhesions, in these cases. Sometimes it is rather by detective than medical methods that a correct opinion is arrived at, as for instance by noticing how readily the patient can stoop to pick up anything when he thinks that he is not being observed. When he is lying down on his back, he may be asked to sit up, and also to flex the thighs on the abdomen, while the surgeon observes whether by these means the normal hollow of the lumbar spine is straightened out. If it is, there cannot be any serious disease present. When a patient is holding his back stiff voluntarily, it can usually be detected by keeping him stooping several minutes with the flat hand over the painful part; there will be a sudden 'give' when the muscle tires.

When the pain and stiffness are due to adhesions, sometimes a cure can be obtained by forcible flexion under an anæsthetic, followed by movements and massage. In many cases recovery is rapid when a financial settlement has been arrived at and the patient has a strong motive to get well.

There are certain other evidences of organic disease, carrying with it of necessity the probability of long, if not permanent, disablement. By firm pressure with oiled fingers, one may be able to detect little nodular thickenings in the deep muscles if they are at fault. Firm prolonged massage helps to cure such cases. Again, there is a group of cases suffering from a shearing or compression fracture of the bodies of the lumbar vertebra, less commonly of the cervical and dorsal, shown by the skiagram, and by the development of a slight degree of angular deformity. It will be necessary for the patient to rest in bed for many months, and lead a quiet life for a long time afterwards, before he can be expected to go about his work free from pain, and some permanent disability is very probable.

Third we have to take into account the condition called *traumatic neurasthenia or hysteria, 'concussion' of the spine, or 'railway spine,'* with its protean manifestations. This is something more than the persistent pain and stiffness just described; these are usually present and well marked, but in addition there may be a condition of extreme nervous prostration, coming on a few days or weeks after the accident, not usually at once. Sleep is bad, and the patient is very feeble, and lives in terror of paralysis. This is traumatic neurasthenia.

Less commonly, one finds a remarkable simulation of organic disease. There may be areas of complete anæsthesia, having the sock or stocking distribution, and perhaps extreme hyperæsthesia just above the insensitive region. Paralysis, with exaggeration of knee-jerks, may be present, and sometimes retention of urine. This is traumatic hysteria.

The real difficulty is introduced into these cases by the fact that there are a few cases on record of genuine nervous lesions apparently due to an injury to the back, but coming on very slowly afterwards, persisting throughout life, or ending fatally. Several examples are quoted in the third edition of Osler's *Principles and Practice of Medicine*. The following case came under the writer's notice. A gentleman fell from a horse and sustained a blow on the back (not head). For several weeks he was apparently fairly well, though a good deal shaken and neurasthenic; then gradually-increasing weakness of the legs came on, and after some months he became unconscious and died. The autopsy showed a chronic cerebral hemorrhage, apparently by *contre-coup*. In other recorded cases there has been pachymeningitis, or degeneration of the tracts.

The prognosis in cases of apparent traumatic neurasthenia and hysteria must take these rare sequences into account, and a careful search must be made for the stigmata of organic disease. If any one of the following is present, the prospect of cure is very uncertain—optic atrophy, optic neuritis, *marked* muscular wasting, reaction of degeneration, absent knee-jerks, extensor plantar response, anaesthesia confined to the anatomical distribution of a nerve or spinal segment, incontinence of urine or feces. Trophic lesions, unless artificial, and ankle-clonus are suspicious of organic disease, but not conclusive.

If evidence of gross changes cannot be found, the patient will almost certainly recover, but it may be a long business. Traumatic hysteria is much more amenable than traumatic neurasthenia. Settlement of any financial or compensation claim usually leads to rapid improvement, and this must not be interpreted to mean that the patient was shamming. Given such settlement, the traumatic neuroses are usually well within a year; but it must be admitted that in a few cases, even where there is no question of compensation, the patient's courage and morale appear to be permanently impaired.

## 2. Fracture or Distocation of the Spine, apart from Operation.

In general, a fracture or dislocation of the spine leads to crushing of the spinal cord, paralysis, anaesthesia, and sphincter troubles. If the injury is high up, death results within a few hours or days, from interference with breathing; if above the fourth cervical vertebra, the patient usually dies on the spot. If the fracture is low down, the patient may linger in a pitiful condition for months, sometimes as long as two or three years, and dies at last of cystitis leading to surgical kidney, bedsores, or bronchitis. Much depends on the care with which he is looked after. Degenerative changes, sometimes called 'myelitis,' appear to take place sooner or later in a spinal cord which has been crushed severely, and these changes may spread up towards the brain.

Burrell has published a record, unfortunately not very well classified, of 244 cases of fractured spine admitted to the Boston City Hospital during forty-two years. He does not furnish separate figures for those patients, 13 per cent of the whole, who displayed no

paralysis, nor for the cases operated on. Of the 244 cases, about two-thirds died in hospital. Period when deaths took place:

Under five days	65.7	per cent
Five to ten days	8.6	..
Ten to thirty days	12.4	..
Later	13.3	..
	<hr/>	
	100.0	

Of the 'recoveries' (that is, sent out of hospital still alive), 62 per cent were 'useful,' and 38 per cent 'useless.' Therefore, of 100 cases, two-thirds die within a month or two, one-fifth recover sufficiently to get about, and the remainder linger in a helpless condition. More than half of the 'useful' recoveries had never been paralyzed. Apparently about 7 per cent of the 244 patients who were originally paralyzed obtained 'useful' recovery.

Classifying the results according to the region affected:

Cervical	85.7	per cent died in hospital
Upper dorsal	76.7	.. .. .
Lower dorsal	56.1	.. .. .
Lumbar	50	.. .. .

We turn now from the darker to the more favourable picture, and consider what are the cases that recover.

*Concussion of the Cord.* There are undoubtedly patients, of which the writer has seen one, who, with or without a bony injury to the spinal column, are completely paralyzed and anæsthetic up to the umbilicus when first seen, and yet they recover perfectly within a few hours or days. Corner relates five such: in all there was evidence of fracture or dislocation. Some recovered power and sensation within twenty minutes. In a sixth case, the patient, an old man, kicked in the back by a horse, was completely paralyzed and anæsthetic, and died in two days; but at the autopsy there was no sign of injury either to the spine or cord. The patient seen by the writer was admitted with complete loss of power and sensation, coming on instantly at the time of the blow; but he was well enough to walk home in a week! It does not appear to be possible to tell on first seeing the patient whether his paralysis is due to concussion or to gross organic destruction; but if the distributions of the anæsthesia, the paralysis, and the bony injury do not coincide, there is good hope that there is an element of concussion in the case. If recovery is going to take place, it will do so within a week, and usually there is great improvement within a day or two. Not uncommonly there is a combination of concussion and organic mischief, and recovery will only be partial in consequence.

*Fracture or Dislocation of the Cervical Spine* used to be considered a necessarily fatal injury; but since the introduction of skiagraphy, many cases have been observed, of which the writer can recollect seeing four, in which recovery took place, though some pain and

stiffness of the neck remained. Fritzsche collected from the literature up to 1912 as many as 40 cases of fracture of the odontoid process: 27 died and 13 recovered. Boeckel has furnished a monograph on fractures and dislocations of the neck, showing that the best results are to be obtained, when the cord is not pressed on, by immediate reduction under chloroform, or, better, by continuous extension; if nothing is done there is danger of sudden fatal nipping of the cord. If paralysis is already present, laminectomy is the only hope.

Unilateral dislocation of the neck is particularly favourable in that the cord often escapes involvement, and reduction can generally be effected.

*Hæmorrhage into the Spinal Cord or Membranes.*—This may come on at once or within a few hours of the accident, and is so far favourable in that some degree of recovery usually occurs, though it may not be complete. Signs suggesting hæmorrhage are: (1) The onset or spread of paralysis after a few hours; (2) The development of the syringomyelia complex—loss of pain and temperature sense whilst tactile persists—indicating a central hæmorrhage; the writer has seen a case; (3) Spasms, cramps, and hyperæsthesia, due to extradural bleeding.

*Injury of the Cauda Equina.*—Regeneration, sufficient to be of functional value, does not occur in the central nervous system, but it may take place in the cauda equina, either after operation and suturing any divided roots, or spontaneously. Recovery, apart from operation, is not likely to be complete unless the involvement of the roots was very partial. The writer has seen very considerable improvement take place in a month, but not sufficient to make walking possible.

In general terms, then, it may be stated that if recovery is going to occur spontaneously after an injury to the spine with paralysis, there will be marked improvement in a month, and usually in a fortnight. After this, there is little or no hope of further benefit. The most important sign is the degree of muscular wasting. If this is marked, the case is hopeless. Severe trophic lesions, such as bed-sores, are also a bad sign.

It must be borne in mind that, in cases of fractured or dislocated spine in which the cord has escaped, great care must be exercised for months, or the bones may slip and nip it. Burrell relates an instructive example of this.

**3. The Value of Laminectomy.**—In the great majority of cases of fractured spine, the cord is completely nipped at the moment of the accident, and nothing will ever restore it. This unfortunate fact dominates the situation. Neither in man nor in animals does functional restoration occur after suture, although Marinisco and others have demonstrated some histological regeneration of fibres. Nevertheless, realizing the hopelessness of the situation in many cases apart from operation, the surgeon is often tempted to employ it as a last chance.



The *mortality* of the operation itself is not high. Thorburn had 3 deaths in 49 cases under his own care, including, however, laminectomy for all sorts of conditions; he lost none of the 16 patients on whom he operated for injury after the lapse of some weeks. In Lloyd's series of cases from the literature up to 1901, the mortality of the immediate operation was 48 out of 82, or 57 per cent, and of the late operation 11 out of 103, or about 11 per cent. These statistics need correcting; being literature records, they may be too good; but as they go far back, they may be too bad. We may probably conclude that the mortality of the early operation is high, and of the late operation about 5 to 10 per cent. Care must be taken to avoid infection, especially if the patient has incontinence.

STATISTICS OF LAMINECTOMY FOR FRACTURED SPINE (LLOYD, 1909).

	CERVICAL		THORACIC		LUMBAR		SACRAL	
	Immediate	Late	Immediate	Late	Immediate	Late	Immediate	Late
Died early	21	2	23	5	4	4	0	0
Recovery	0	2	1	10	1	6	0	1
Improvement	2	1	9	18	1	6	0	3
No improvement	0	4	6	16	0	4	0	0
Died later	4	3	7	16	0	2	0	0
Total	27	12	40	65	6	22	0	4

SUMMARY.

	Cases	Died	Recovered	Improved	Not improved	Died later
Immediate operation	82	48	5	12	6	11
Late operation	103	11	19	28	24	21

When we inquire concerning the *end-results*, the records are not very promising. Thorburn himself operated 5 times within a day or two of the accident, but none of the patients were benefited; he collected records of 200 more cases, without finding evidence that any were improved by the operation. Some, it is true, did get better, but they might equally well have done so without interference.

Lloyd, from his study of the literature, found that out of 83 cases operated on early, only 5 could be described as more or less cured, and 12 improved; it is not possible to say how much better they would have got without operation, but the figures do not compare well with those of the non-operated series, where one-fifth obtained

'useful' recovery. Except in a few urgent cases, such as those with pressure on the cervical cord, early operation is not to be advised.

The late operation, usually a month or six weeks after the accident, gives better results in well-chosen cases. The immediate risk is much less, and as by this time it is evident how much or how little one may expect from nature, any improvement resulting is more certainly due to the operation. Thorburn has performed 16 laminectomies under these circumstances, with 4 cures, 7 improved, and 5 no better. In Lloyd's series, nearly one-fifth are described as having recovered, and one-fourth improved. Unfortunately, mere improvement is not of much use to these patients, unless they are able to stand or walk. In the majority of cases no benefit was conferred.

Nevertheless, it is evident that in a few picked cases considerable good may be done. Exactly which these cases are is shown less by the statistics than by experience and by a few isolated reports. Laminectomy may do good in the following classes:

*a.* Fracture or dislocation of the neck with pressure on the cord, where death stores the patient in the face.

*b.* Pressure on the cauda equina, because in the nerve-roots regeneration is possible. Thorburn advises delay for six weeks to see what spontaneous recovery will do, and quotes a case of Tullier's, in which complete cure followed laminectomy and suturing.

*c.* Depressed fracture of a lamina, which can be removed. Schede obtained complete recovery in such a case, although when first seen the patient was quite paralyzed and amesthetic. Other surgeons have not had such happy results.

*d.* Cases of hemorrhage into the membranes.

*e.* Cases in which retention, or exaggeration of the reflexes, shows that the functional continuity of the cord is not destroyed, but that it may be suffering injurious pressure.

4. **Gunshot and Other Wounds of the Cord** (see GUNSHOT WOUNDS, p. 291).

REFERENCES.—Lloyd, *Jour. Amer. Med. Assoc.* 1901, 1014, 1111, 1247; Thorburn, 'Injuries of the Spine,' *Burghard's System of Operative Surgery*; Fritzsche, *Deut. Zeits. f. Chir.* 1912, 7; Boeckel, *Rev. de Chir.* 1911, 285; Corner, *Lancet*, 1906, ii, 784; Birrell, *Ann. Surg.* 1905, 481; McKeendrick, *Injuries of the Back*, 1916.

J. Rendle Short.

**SPINE, TUMOURS OF.**—We shall include under this heading growths of the vertebral column, and also of the spinal cord.

**Tumours of the Vertebral Column.** Growths arising in the bony spine are almost invariably malignant, either primary sarcoma or secondary carcinoma. At first they are likely to be confused with an early case of tuberculosis of the spine, presenting only pain and localized rigidity, without abscess formation or angular deformity. The skiagram may be helpful, and especially a history of carcinoma elsewhere.

When the diagnosis is established, the prognosis is practically

hopeless. After a few months of great pain and helplessness, the patients die. The cord may eventually be pressed on.

Hydatid disease of the lumbar vertebra may simulate tumour, and in this case a successful result may follow operation. Of five cases of hydatid disease of the spine treated by operation at the Queen Square Hospital, all have done well.

**Tumours of the Spinal Cord.** The diagnosis of these cases usually rests upon progressive signs of paralysis, anaesthesia, and sphincter trouble due to pressure on the cord, associated with severe pain, and in many cases the symptoms are at first unilateral. As it is difficult or impossible to make a clinical distinction between the signs of spinal-cord tumour and those of localized or diffuse spinal serous meningitis, these are taken together.

Apart from operation, the cases are always fatal within a few years. The average duration of life is said to be sixteen months (Starr) to two years (D. Armour), but a few go on for several years. Rarely, iodides improve matters somewhat. There is generally a steady progress from root pains to pressure on the cord, then to sphincter troubles, cystitis, bedsores, etc.

*Treatment by Operation.*—Although tumours of the spinal cord are not so common as tumours of the brain, the results of treatment are much more satisfactory. All observers agree that sarcoma is the type of growth most frequently met with, but if the microscopical diagnosis is to be relied upon, sarcoma in this situation must be of a very benign type, because recurrence is the exception, not the rule.

The *operation mortality* is not very serious at the present day. The general death-rate of the operation of laminectomy for all causes is given by Thorburn, as the result of 49 cases in his own practice, as 6 per cent.

The following table gives the mortality of laminectomy for tumour:

NUMBERS OF THE SPINAL CORD. OPERATIONS MORTALITY.

Reporter	Cases	Deaths
Thorburn (personal)	6	0
Von Eiselsberg and Ronzi	17	2
Hunt and Woolsey	7	1
Harte (from the literature)	92	26
Potel and Veinshau (literature)	55	19
Total	177	48

When followed for a long period, 17 more of Harte's series died, but his figures could probably be improved upon at the present day; the true mortality may be between 10 and 20 per cent. About half

the cases seen are suitable for removal; of the remainder, some growths start in bone, others are very extensive, or the cord is already destroyed.

The *end-results* are very satisfactory. R. T. Williamson, by picking successful cases out of the literature, is able to give details of 51 patients, 17 of them having had a sarcomatous tumour, in whom practically complete recovery took place; that is, they were all able to walk, but a few still showed some spasticity or ataxia.

The following table gives the end-results in a few small series:—

TUMOURS OF THE SPINAL CORD, END-RESULTS OF OPERATION.

Author	Cases followed	Cured	Improved	Not improved	Recurred
Thorburn	6	5	1	0	0
Von Eiselsberg and Ranzi	10	3	6	1	0
Hunt and Woolsey	5	3	0	0	2
Harte (from literature)	40	20	17	3	?
Total	70	40	24	4	2

Thorburn records 6 cases from his own practice, of which 5 were well enough to go back to work.

In von Eiselsberg's series, in 3 cases no tumour was found; 2 of these were improved, and 1 was not improved.

Hunt and Woolsey relate 5 cases; 1 recurred and had a second operation four years later, but has since remained well for years; another recurred a year after operation. The other 3 were well three to five years after operation.

Harte's series, drawn from a study of the literature up to 1905, does not show how long the cases were followed, nor how many recurred, but he states that many cases, even of sarcoma, were well years afterwards. Out of 37 patients with sarcomatous tumours of the cord, 20 died, 8 were cured, 7 improved, and 2 no better. In 12 of his cases only adhesions or cysts were found.

We may conclude then, that about half the cases of tumour of the spinal cord are operable; that the operation mortality is about 10 to 20 per cent; of patients recovering from the operation, two-thirds are cured, and only about one in ten fails to benefit or relapses; and that sarcoma in this situation is remarkably benign.

REFERENCES.—R. T. Williamson, *Diseases of the Spinal Cord*, 1911; Thorburn, "Spinal Cord," *Burghard's System of Operative Surgery*; Von Eiselsberg and Ranzi, *Arch. f. Clin. Chir.*, 1913, 309; Hunt and Woolsey, *Ann. Surg.*, 1910, lii, 289; Harte, *Ann. Surg.*, 1905, xlii, 524. A. Rendle Short.

**SPLEEN, INJURIES OF.**—(See ABDOMINAL INJURIES.)

**SPLENIC ANÆMIA.**—(See ANÆMIA, SPLENIC.)

**SPLENOMEGALIC POLYCYTHAEMIA.**—(See POLYCYTHAEMIA.)**SPRAINS.**—(See JOINTS, INJURIES OF.)

**SPRUE.** Sprue is a very chronic disease as a rule, with great tendency to relapse after apparent cure, so it is difficult to obtain accurate figures regarding its mortality. An analysis of 50 cases in the Calcutta European Hospital showed only 2 discharged as 'cured,' of whom at least one relapsed. Only 6 died in hospital, 5 of whom were between the fifth and twelfth month of the disease out of 18 in that stage, which is therefore the most deadly period. Only 1 of 12 cases of over one year's duration died in hospital, so the more chronic cases have a better prognosis. None died during the first six months of the disease. On the other hand, only 3 of the 45 cases were much better when discharged, while 26, or 57·7 per cent, were no better, mostly after prolonged treatment, so had little chance of recovery, and the prognosis of the disease is therefore very grave. Many patients, who return to the tropics after having been 'cured' by santonin and other treatment during a prolonged stay in Europe, soon relapse, and some die of the disease. The most deadly complication is pernicious anaemia, which may carry off the patient within a few weeks.

Favourable signs are extreme emaciation, advanced anaemia, increased frequency of the stools maintained over a long period, and extreme soreness of the mouth interfering with feeding. Too early, and especially sudden, great changes in the diet may cause a relapse or precipitate a fatal termination.

Steady gain in weight and improvement in the consistency and colour of the stools are the most favourable signs; but extreme caution is necessary in adding to the diet. No drug has any specific action in the disease, the effect of yellow santonin being very temporary when not accompanied by change to a cool and bracing climate, which itself has the greatest curative action. Rogers has recorded recoveries in the tropics by treatment with an autogenous mouth streptococcus vaccine, but confirmation by others is lacking.

*Leonard Rogers.*

**STILL'S DISEASE.**—(See ARTHRITIS DEFORMANS.)**STOMACH, MEDICAL AFFECTIONS OF.**

**Acute Gastritis.**—The prognosis depends very greatly on the cause and intensity of the catarrh. If due to microbial causes, the gastric symptoms may only be the local manifestations of a general disease such as enteric fever.

Uncomplicated acute gastric catarrh is generally well in a few days, but may last for a week or longer.

**Toxic Gastritis,** i.e., the gastritis produced by the ingestion of various poisonous substances such as concentrated acids and alkalis, arsenic, phosphorus, perchloride of mercury, and so on.—The prognosis in each case depends on the amount taken, the concentration, and the

particular poisonous action of each substance. A fatal result may occur in two or three hours, the patient becoming cyanosed, with embarrassed respiration, and dying with convulsions, suffocation, or collapse. On the other hand, he may die in a few days' time from perforation and peritonitis, or later on from remote effects such as stenosis of the œsophagus, stomach, or pylorus. Lastly, he may die from the poisonous effects of the particular substance taken.

**Chronic Gastritis.**— Before any satisfactory prognosis can be given in chronic gastritis it is necessary that a certain diagnosis should have been made, and the possibility of indigestion or pernicious anemia excluded. *Per se* it may last for an indefinite number of years; but some cases are complicated by subsequent carcinoma of the organ. In very rare cases a tumour may be felt in simple cirrhosis of the stomach, death eventually being due to asthenia following emaciation and anemia.

**Diffuse Phlegmonous Gastritis** is almost certainly always fatal, the course of the disease being less than a week.

**Membranous Gastritis**, being almost always secondary to some other severe illness, the prognosis depends on that of the primary disease, though not infrequently this complication is a terminal lesion.

**Carcinoma.**— The prognosis depends on the type of the growth, its rate of progress, tendency to ulceration, and the rapidity with which secondary deposits arise. Unless the tumour can be removed by surgical means, death is inevitable. This in very rare cases may be delayed as long as four years, but in the great majority of cases is very much less. An average duration of life after the disease is first diagnosed is about seven or eight months. In very exceptional cases the patient may increase in weight after a preliminary wasting. In one of the writer's cases, a temporary gain in weight of eleven pounds in sixteen days occurred in an emaciated woman the subject of carcinoma. The intensity of the pain is no guide to the prognosis, since it bears no relation to the rate of extension or size of the growth.

It is unusual for hæmatemesis to be the cause of death in carcinoma of the stomach, though this may arise from deep ulceration, or even from involvement of the spleen. The onset of complications due to the invasion of other organs by secondary growths frequently hastens the end. Among the most important of these are jaundice from involvement of the liver or of the glands in the transverse fissure, and ascites from involvement of the peritoneum. Perforation may give rise to general peritonitis, according to some authors, in as many as 5 to 7 per cent of cases. If the growth is surrounded by adhesions, an abscess, sometimes subphrenic, is responsible for the fatal result.

**Congenital Hypertrophy of the Pylorus** (*see also* PYLORUS, CONGENITAL STENOSIS *or*). About 50 per cent recover without subsequent complications. With an earlier recognition of the disease, the proportion of recoveries will probably be much greater. In Still's series of 27 cases about 50 per cent recovered, 8 after operation and 6 after

medical treatment, which included daily gastric lavage with a weak alkaline solution.

**Ulcer.**—Correct statistics in connection with gastric ulcer are almost impossible to obtain, because of the difficulty of a certain diagnosis. This applies not only to observations made during life, but also to statistical records based on post-mortem investigations, because cicatrices of small ulcers which have healed are readily overlooked, and very slight ulceration may have healed without leaving any scar.

Speaking generally, the prognosis of gastric ulcer treated by thorough and prolonged medical treatment is satisfactory. Statistical figures vary, however, within somewhat wide limits. Leube gave the death-rate as 2.4 per cent in 424 cases, but eventually he brought down his mortality to 0.3 per cent. Lebert gave the mortality as 10 per cent, J. W. Russel as 6.4 per cent, Bulstrode as 18 per cent, Flower as 0 per cent in 300 cases, and Weirand as 0 per cent in 133 cases. Possibly about 6 to 7 per cent of cases perforate into the peritoneal cavity. At the present time the prognosis of this calamity has enormously improved within recent years, owing to the advance of surgical technique. Local abscess, subphrenic or elsewhere, may lead to death by exhaustion, pyæmia, or pyelphlebitis. In rare cases, the abscess bursts into the lung, pleura, or pericardium. Probably less than 3 per cent of the cases succumb from hæmorrhage, and another 5 to 6 per cent from other causes, including inanition, secondary mechanical deformities, and carcinoma. The mortality from hæmorrhage in Lenhart's series of 295 cases was 1 per cent, and in Ewald's 652 cases 1.2 per cent. Spriggs found that the prognosis with reference both to life and recurrence of hæmorrhage was more favourable in patients treated by Lenhart's method than in those treated by nutrient and saline enemata followed by a graduated milk diet. Relapse is very frequent, and probably occurs in not much less than 30 per cent. After surgical treatment, as after medical, relapse is not infrequent, but the tendency to relapse after any method of treatment is less after the age of thirty than before. Although it is unusual for a patient to die from a single attack of hæmorrhage, this occasionally occurs, sometimes so rapidly that the patient succumbs before vomiting takes place. According to Spriggs, the mortality of any large series of cases operated on for hæmorrhage is greater than it is in a similar series not operated on.

About 50 per cent of the cases are permanently cured. Anæmia from any cause retards the healing of an ulcer, and a patient with a healed ulcer is always liable to relapse as long as anæmia persists. The percentage of cases of cancer of the stomach which owe their origin to previous ulceration varies in different statistics from 2.3 per cent up to 9 per cent.

**Syphilitic of the Stomach.**—This affection may very closely simulate gastric ulcer or malignant growth. The prognosis, therefore, very largely depends on a correct diagnosis. If this is made early, before the patient is suffering from excessive debility owing to the mechanical

effects of the tumour, or from dense adhesions or peritonitis, the prognosis is decidedly favourable under brisk antisyphilitic treatment. With dense adhesions or formation of scar tissue, surgical treatment may be necessary. Profuse hemorrhage may very exceptionally arise.

**Acute Dilatation.**—This may cause death in a few hours, with pain, anuria, severe symptoms of collapse, associated with a very copious and rapid secretion into the stomach. A fatal result is not uncommon in spite of energetic treatment and gastric lavage. Sudden dilatation, arising from injudicious feeding during convalescence from prolonged exhausting diseases such as typhoid fever, may lead to immediate death.

**Chronic Dilatation.**—The outlook depends very much on the cause, the general health of the patient, and the length of time the trouble has existed before treatment is adopted. In atonic dilatation, the course of the illness is frequently very prolonged, running into years, very frequently with incomplete restitution of the normal size of the viscus at the end of lengthy and careful treatment. With mechanical obstruction prognosis is more hopeful, if early surgical treatment is available. Severe forms of gastric dilatation may be associated with tetany, which, if well marked, is of serious significance. This condition has, however, been treated quite successfully by gastro-enterostomy, with subsequent cure of the patient. (With reference to the prognosis of coincident acidosis, see Acidosis.)

*J. R. Charles*

#### STOMACH, SURGICAL AFFECTIONS OF THE.

**Gastric Ulcer.**—Our conception of 'gastric ulcer' has entirely changed in recent years; formerly considered easy of diagnosis it is now known to be difficult, even in long-standing cases. For this reason the prognosis of cases not verified by operation is entirely a matter of conjecture.

Two distinct lesions are included under the term gastric ulcer—the acute ulcer, frequently multiple, called 'mucous' by Sir Bertrand Dawson<sup>1</sup> and the indurated chronic ulcer, usually single.

With regard to the relative frequency of these, we are entirely in the dark. Owing to the recent extension of surgical activity in the upper abdomen, we now know that symptoms which formerly were considered pathognomonic of gastric ulcer often owe their origin to extra-gastric causes, and are entirely removed by treating these.

That chronic gastric ulcer is a serious disease carrying with it a very considerable mortality is now becoming well known.

The results of the medical treatment of patients presenting the symptoms of chronic gastric ulcer have been investigated by several. Among the earliest figures are those given by Bulstrode,<sup>2</sup> who compiled statistics of all the cases of 'gastric ulcer' admitted into the London Hospital from January, 1897, to August, 1902. These numbered 500, 402 women and 98 men. Of these cases, 42 per cent had had previous attacks. The death-rate was 18 per cent: 40 per cent from perforation, 2½ per cent from hæmatemesis, 5½ per cent from other causes.



These figures did not include late results such as pyloric stenosis, hour-glass contractions, etc.

That the mortality rate is unreliable and much too low is evident from the sex relationship, 402 women and 98 men. The conditions which mimic chronic gastric ulcer are more common in the female sex, and rarely fatal.

Of the 317 cases of gastric ulcer upon whom I have operated, 204 were males. This is in accord with the experience of other surgeons.

Habershon's figures give a more correct idea of the death-rate in cases of chronic gastric ulcer medically treated. Of 60 cases in private practice, there were 24 deaths, 16 males (6 perforation, 7 hamatemesis, 3 exhaustion) and 8 females (5 perforation, 3 hamatemesis).

MacNevin and Herrick's<sup>4</sup> figures are instructive. Among 55 fatal cases of gastric ulcer examined post mortem, 25 had died of hamatemesis (19 males, 6 females); 30 of perforation (8 males, 22 females).

Greenough and Joslin<sup>5</sup> published the results of the medical treatment of 187 cases; the initial mortality was 8 per cent. After five years, 115 patients could be traced; 57 had had recurrence, and 15 had died of gastric disease.

Figures based on the medical diagnosis of gastric ulcer, although minimizing the real risks, show very strongly the futility of medical treatment in the majority of the cases.

It is evident from the discrepancy between the sex distribution in the medical and surgical statistics that there are two distinct conditions: one more common in women, in which acute ulceration followed by perforation may occur; the other more frequent in men, in which the immediate cause of death is not uncommonly hamatemesis. In this group, perforation is uncommon.

The cases formerly diagnosed gastric ulcer in young women are usually examples of extra-gastric disease with, in many cases, acute gastritis or mucous ulcers the result of septic infection. The relation between the two groups is at present obscure, but it seems certain, from the sex incidence of chronic lesions, that in the majority of cases, although symptoms recur, chronic gastric ulcer does not follow. Careful medical treatment of this group of case, if the condition causing the gastric disturbance—septic teeth or chronic constipation—can be dealt with, is successful, but if disease of the gall-bladder or the appendix is responsible, treatment of these alone will cure.

In chronic gastric ulcer, in addition to the dangers from hemorrhage, perforation, and malnutrition the result of stricture, there is the appreciable risk of the development of carcinoma. Considerable difference of opinion exists with regard to the frequency with which this occurs.

The most widely-quoted figures are those of Wilson and MacCarty,<sup>6</sup> obtained as a result of their examination of specimens removed by operation in the Mayo clinic. In 109 out of 153 cases (71 per cent) there was evidence that malignant disease had supervened on chronic gastric ulcer.

On the other hand, in 72 consecutive cases in which I have excised chronic gastric ulcers, diagnosed at operation as simple, I have had serial sections examined microscopically, and in two only was any trace of malignant development perceptible.

Burk<sup>7</sup> records 24 cases of excision of chronic gastric ulcers, in 6 of which microscopic examination revealed early malignancy.

Looking at the subject from the clinical standpoint, I have operated upon 489 cases of gastric carcinoma, 67 only of whom were women; this fact is suggestive. In a third of the cases (166) I obtained a history of gastric disease, on which I should base the diagnosis of chronic gastric ulcer extending over more than five years.

Although the frequency has probably been over-stated, I think there can be no doubt whatever that previous gastric disease is a predisposing cause of carcinoma.

Thorough medical treatment after removal of septic foci during the first attack of gastric symptoms can be expected to result in cure in 30 to 40 per cent of the cases. If relapse occurs it is obvious that the exciting cause is beyond medical assistance. If chronic ulcer has developed medical treatment appears to be a failure in every case.

*Perforation.* The prognosis depends upon the time at which operation is carried out. If within twenty-four hours, the death-rate should certainly be below 10 per cent. The older figures, which are widely quoted, are much too high. Gross and Gross<sup>8</sup> found the death-rate of operation in collected cases within the first twenty-four hours to be 50 per cent, and within the first twelve 25 per cent, a figure which agrees closely with those given by Banner,<sup>9</sup> these closely correspond with the personal figures of Miles,<sup>10</sup> in 1906: 19 cases within twelve hours of operation, 25·3 per cent mortality; 9 cases between twelve and twenty-four hours, 44·4 per cent mortality.

Snclair Kirk<sup>11</sup> has recorded a series of 11 cases operated on, 10 before the twelfth hour and 1 at twenty hours, with recovery in all.

Of 13 cases upon whom I have operated within the first twenty-four hours, all recovered. On the other hand, in 23 cases over this period, there were 12 deaths.

The immediate result of operation in these cases is excellent, but a certain number suffer later from dyspeptic symptoms similar to those from which the majority suffered before perforation. There is, however, considerable difference of opinion with regard to this. Hale White<sup>12</sup> said: "Judging from our results at Guy's Hospital, it appears that patients who survive an operation for perforated gastric ulcer do so well that a gastrojejunostomy is quite unnecessary." This is, however, not the experience of surgeons if the word 'operation' is used instead of gastrojejunostomy.

Paterson found that 23 per cent of patients relapse within a year of operation.

It is obvious that as the ulcer which perforates is a chronic one in only a small proportion of cases, the continuance of the symptoms depends upon extra-gastric causes.

If the ulcer which perforates is a chronic one, gastrojejunostomy should be done at the time of closure of the perforation, if the condition of the patient will allow. This I was able to carry out in 8 cases who have had no further return of symptoms. Five of the remaining patients who recovered have had symptoms necessitating further operation.

Prolonged medical treatment in those cases in which gastrojejunostomy is not carried out, will still further lower the number of cases requiring further operation.

*Hæmatemesis.* Dr. Cecil Wall<sup>1</sup> found that 6 per cent of the men and 12 per cent of the women who were admitted to the London Hospital suffering from chronic gastric ulcer diagnosed clinically, died of this complication. The death-rate is far in excess of this, for included are many cases which were certainly not chronic gastric ulcer. This is shown by all reports of post-mortems, while hæmatemesis is undoubtedly more common in women than in men. Thus MacNevin and Herrick found hæmatemesis to be the cause of death in 25 out of 55 cases of chronic gastric ulcer which came to post-mortem. Of these, 19 were males and of the women, all except one were over thirty. These figures correspond to my operative experience that chronic gastric ulcer is three times as common in men as in women.

The prognosis of the hæmatemesis of young women is extremely good; the death-rate is less than 5 per cent. I believe that life cannot be saved in this condition by operation. The bleeding often takes place from many foci and continues unchecked in spite of gastrojejunostomy.

I believe the death-rate from hæmatemesis in chronic gastric ulcer is over 50 per cent. If treated surgically as soon as possible after the first hæmorrhage, the outlook is good. Operation consists in directly controlling the source of hæmorrhage by excision of the ulcer or tying the vessels on either side, combined with inversion and gastrojejunostomy if necessary.

I have treated 15 cases in this way with 2 deaths. On the other hand, death occurred in three patients whom I had seen and who had refused operation, recurrence of bleeding proving fatal.

Operation as soon as possible after the first hæmorrhage—this is usually within twenty-four hours in all cases of chronic gastric ulcer—will render the prognosis favourable.

**Chronic Gastric Ulcer.** There is still a difference of opinion with regard to the exact form surgical treatment should take. The immediate risk, if the operation is carried out by one skilled in upper abdominal surgery, is a small one.

Up to June 1, 1917, I had operated upon 276 cases of chronic gastric ulcer uncomplicated by hæmatemesis or perforation, with 10 deaths.

The following were the operations performed (thirty-nine, complicated by hour-glass stomach are separately tabulated):—

- Excision alone : 7 cases, 1 death.  
 Excision and gastrojejunostomy : 24 cases, 1 death (this patient had urethral stricture and cystitis, and died a month later from this cause).  
 Partial gastrectomy : 32 cases, 3 deaths (1 from acute gastric dilatation, 1 from pulmonary embolism, 1 from pneumonia). These cases treated by partial gastrectomy were all patients in whom the ulcer had perforated, its floor being formed of pancreas or liver, or in which there were suspicions of malignancy.  
 Gastrojejunostomy alone : 174 cases, 3 deaths (2 from pneumonia, 1 from hæmatemesis, the result of erosion of the splenic artery).

In the 39 cases of hour-glass stomach the following were the operations carried out :

- Posterior no-loop gastrojejunostomy : 13 cases, no death.  
 Anterior no-loop gastrojejunostomy : 6 cases, 1 death (twelve days later; no attempt at union).  
 Double gastrojejunostomy : 4 cases, no death.  
 Modified Roux's operation : 2 cases, no death.  
 Partial gastrectomy : 14 cases, 1 death twenty-four hours later; at the post-mortem no cause could be discovered. In all the cases in which partial gastrectomy was performed, the floor of the ulcer was formed by the pancreas.

W. J. Mayo<sup>11</sup> records 128 cases of chronic ulcer of the stomach operated on at the Mayo clinic, with a mortality of 2.4 per cent.

It is obvious that the immediate mortality is much less than that given in any series of cases medically treated.

With regard to the remote results of surgical treatment, it is undoubted that the majority of patients with chronic gastric ulcer, wherever situated, are cured as the result of gastrojejunostomy alone.

The following are representative figures of the results of cases operated upon over two years :

- Sherren,<sup>10</sup> 160 cases, traced over two years, 125 remain quite well, 4 were reoperated on and ulcers adherent to pancreas excised, and in 2 cases gastrojejunal ulcers excised. The remainder, with one exception, were relieved.  
 Paterson,<sup>12</sup> After history of 143 collected cases, 82 per cent over two years' duration.  
 Petren,<sup>13</sup> 157 collected cases, 53 per cent cures, 78 per cent very much better.  
 Busch,<sup>17</sup> 64 cases, 85 per cent cures.  
 Koehler,<sup>15</sup> 67 per cent cures, 89 per cent a good result.

It is obvious from these figures that while gastrojejunostomy alone will bring about a cure in probably 70 per cent, and give great relief in another 10 or 15 per cent, there is yet a margin in which further improvement is desirable.

In many of the recorded results, the cause of the continuance or recurrence of symptoms has not been noted, and it may be that they are due to other conditions overlooked at the first operation. In three of my cases the 'recurrence' of symptoms—as due to gall-stones—subsequent operation proved that the ulcers had healed.

Thorough examination of the whole abdomen, and gastrojejunostomy combined with excision or resection in suitable cases, will still improve our results and bring about a lasting cure in over 95 per cent of the cases of chronic gastric ulcer, with a death-rate of less than 5 per cent.

Much discussion has taken place with regard to the correct operative procedure, but no law can be laid down. Cases of chronic gastric ulcer cannot be treated by set operation: the decision must be made in each case after the abdomen has been opened.

In my experience, cases of posterior ulcer eroding the pancreas rarely heal as the result of gastrojejunostomy, and should be treated by partial gastrectomy.

Excision alone may fail. Busch,<sup>19</sup> in 12 cases, found 2 in which gastrojejunostomy was necessary later. Dobson<sup>20</sup> in 40 cases, had to operate for recurrence in 4, in 2 of which the appendix had been removed at the original operation. In my series of the 6 survivors of the cases treated by excision alone, I was able to free 5. I have since operated on all for recurrence of ulceration. It is obvious that excision alone is a failure.

Hemorrhage and perforation have been recorded after gastrojejunostomy: these complications may be avoided by treating the ulcer directly—either inverting it or, in posterior adherent ulcers, performing excision or resection combined with gastrojejunostomy. In the patient of mine who died from death took place from hematemesis, I should, at the present time, have excised the ulcer.

It has been pleaded in favour of excision in every case that malignant disease may supervene and that it is impossible to tell if this has already taken place. Kättner<sup>21</sup> states that 5 out of 12 patients (41 per cent) died of cancer of the stomach, and that 43 per cent of ulcers excised were malignant. Busch, on the other hand, draws attention to the small percentage of cases in which this occurs. In 3 of my cases carcinoma of the stomach was the probable cause of death, after seven, five, and four years of perfect health. In only the last case am I certain that the cause of death was carcinoma of the stomach. In the other 2 it was certainly a malignant growth of some abdominal organ.

**Hour-glass Stomach.** The result of treatment in the 37 survivors has been good. All but one remain perfectly well, 12 more than three years, 21 over two years.

Veyrasset<sup>22</sup> records 181 collected cases. Of these, 73 were treated by gastrojejunostomy, with 14 deaths, 6 of which were due to an error in technique, the anastomosis being made to the pyloric pouch *distal* to the constriction. Of the 58 survivors, 57 were cured.

**Duodenal Ulcer.** In duodenal ulcer, medical treatment after the first attack is not only futile but dangerous. Delay is not to be countenanced: the danger of perforation is great, and frequently occurs between attacks when the patient is free from symptoms and apparently well. Perforation of a chronic gastric ulcer is unusual, of a caecic duodenal one frequent. Perforation of an acute duodenal

ulcer is rare; it occurred in only 2 cases out of 34 upon whom I have operated.

The same sex predominance is seen in perforation as in the cases operated on before this has taken place: a very different condition from chronic gastric ulcer. Brummer<sup>23</sup> found in 341 cases of perforated gastric ulcer only 68 men, whereas in the unperforated cases the ratio is 3 men to 1 woman; in the cases of perforated duodenal ulcer, 8 women out of 82, 1 to 10, as in the unperforated cases.

That the danger of perforation in chronic duodenal ulcer is greater than in gastric is evidenced from the figures given by Gruber<sup>24</sup> from post-mortem examination. He found that while 17 per cent of the cases of duodenal ulcer had died of perforation, only 5.6 per cent of the gastrics succumbed, and gives the death-rate of duodenal ulcer as 25.5 per cent, of gastric ulcer 9.8 per cent.

Kuttner<sup>25</sup> states that the prognosis of duodenal is decidedly less favourable than that of gastric ulcer on account of the frequency of perforation and hemorrhage. He quotes statistics of post-mortems at Hamburg showing that when duodenal ulcer was found post mortem it was the cause of death in 40 per cent.

Hemorrhage is the same lethal complication as in cases of chronic gastric ulcer.

While malignant disease frequently supervenes in cases of chronic gastric ulcer, this change is rare in duodenal ulcer.

In 360 cases of chronic duodenal ulcer personally operated on before perforation, in 1 only had malignant disease supervened after a history pointing to chronic duodenal ulcer extending over many years. Moynihan<sup>26</sup> also has recorded an example in which malignancy supervened after ten years.

No case has been recorded of carcinoma of the duodenum arising after gastrojejunostomy.

*Perforation.*—If operation is carried out within the first twenty-four hours, the prognosis is extremely good.

Sherren: 34 cases of perforation with 18 recoveries. Of 18 operated upon within the first twenty-four hours, all recovered except 2, one of whom was suffering from advanced genito-urinary and pulmonary tuberculosis. The other was a patient in whom fat necrosis<sup>27</sup> was found at operation, and a perforated ulcer was overlooked.

Mitchell<sup>28</sup> has recorded 16 cases operated upon without a death. Of these cases, 11 were operated upon within twelve hours of perforation, 6 within five hours, 1 each at seventeen and a half, eighteen, twenty-five, thirty-six, and forty-nine hours after perforation.

Struthers<sup>29</sup> quotes 24 cases with 19 recoveries.

It is evident that operation can be carried out within the first twenty-four hours with a death-rate of less than 5 per cent. In all cases in which a chronic ulcer perforates, gastrojejunostomy should be done at the time of closure of the perforation. This I did in 16 of my cases, only 1 of whom died, the patient mentioned above. Of the cases in which this was not carried out, I have since had to perform

it for recurrence of symptoms. In addition, 1 have had to treat surgically 9 cases after perforation of a chronic ulcer had been closed by other surgeons and recurrence of symptoms had taken place.

The immediate risk of operation in cases of non-perforating duodenal ulcer is small. Moynihan reports 302 cases operated upon, with 5 deaths.

Sherren: 360 cases, with 9 deaths (3 of these occurred among the 35 patients in whom the operation was an emergency one on account of hemorrhage: one of these died from a continuance of hemorrhage, another from pulmonary embolism, and in the third his abdominal wall broke down twelve days later and he died of pneumonia after re-suturing); 2 died of bronchopneumonia; 1 died of pulmonary embolism; in 1 no cause could be discovered at the post-mortem; 1 died of hæmatemesis; 1 died of regurgitant vomiting which developed ten days after operation.

Gastrojejunostomy is followed by cure in at least 80 per cent of the cases.

Of personal cases, 227 have been operated on over two years: 1 have been able to trace 222; 191 remain perfectly well, or were well until death from another cause more than two years after operation; 9 have been re-operated upon for gastrojejunal or jejunal ulcer; 22 complain of occasional discomfort, but in only 3 of these has it been sufficient to need treatment.

In Moynihan's cases, 82.78 per cent are recorded as cured, and 7 per cent improved.

It is important to see that treatment is carried out for at least three months after operation.

The complication most to be feared after gastrojejunostomy is jejunal ulceration. This may occur at the suture line, when it is termed gastrojejunal, or in the jejunum not far removed from it, the true peptic jejunal ulcer. The former condition is preventable; it is due to the use of unabsorbable sutures. Nothing but catgut should be used in doing the anastomosis. The true jejunal ulcer is situated in most instances on the anterior surface of the distal limb of the jejunum, about 1 in. from the anastomosis. This is rare, and was present in 2 only of my 9 cases; in the remainder the ulceration was due to the outer unabsorbable suture working its way into the stomach. Very occasionally it is proximal; in 58 cases recorded by van Roojen<sup>9</sup> it had this situation in 6 only.

The question of the actual exciting cause of jejunal ulceration is uncertain, but it has undoubtedly an association with hyperchlorhydria, is most often met with in males, and follows operation for chronic duodenal much more frequently than those for chronic gastric ulcer.

As the probable cause of jejunal ulceration is similar to that of the ulcer for which the operation is carried out, it is less likely to occur if careful search is made at the time of the primary operation for other foci of disease in the abdomen, particularly in the appendix and gall

bladder. In addition, medical treatment should be carried out for at least three months following operation. In cases in which there is a great increase in acidity, it would be well to investigate the gastric contents from time to time.

The question of the influence of the removal of a diseased appendix upon its incidence has not yet been worked out.

True jejunal ulceration occurs in less than 2 per cent of the cases.

Symptoms usually arise within the first two years; thus, in 66 cases collected by van Roojen,<sup>30</sup> 44 occurred within the first two years, 27 within the first twelve months.

In Moynihan's cases of chronic duodenal ulcer, jejunal ulcer developed in 2. It is interesting to note that in the 4 cases operated upon by him, all had followed duodenal ulcer.

So far as could be ascertained, no example of jejunal ulcer arose in 745 cases in which gastrojejunostomy was performed for chronic gastric or duodenal ulcer in the Mayo clinic,<sup>31</sup> but there were 2 cases of gastrojejunal ulcer, in one of which, however, Murphy's button had been used, and it was retained in the stomach.

**Gastric Symptoms associated with disease elsewhere in the Abdomen.**—There are three groups of cases in which symptoms mimicking gastric or duodenal ulcer may be present; they are due to, or associated with, disease in the ileocecal region, gall-bladder, and urinary organs.

In the first named the symptoms may be due to disease of the appendix, or to such conditions as interfere with the function of the caecum, terminal ileum, or ileocecal valve. It may be difficult before operation to say to which condition the symptoms are due, for they all bear a resemblance to each other. It is usually possible, however, to suggest an appendicular origin, for, as I have pointed out,<sup>32</sup> pain in the right iliac fossa is an accompaniment, not of chronic appendicitis, but of interference with the function of the caecum.

Examples of true appendicular dyspepsia do well after operation. In 1914 the writer published the results of operation in a series of cases in a paper on the "Relations of Appendicitis to 'Dyspepsia' and Diseases of Stomach and Duodenum."<sup>33</sup> Up to that date I had operated on 81 patients, 46 of whom were men. These were cases operated upon for 'indigestion' in whom, after exploration of the upper abdomen, the appendix was removed. In 65 the appendix was of the thin, obliterative, and adherent type; it is interesting to note that this was the type found in 84 out of 106 removed during operation for chronic gastric and duodenal ulcer during this period. I was able to investigate the condition of 52 more than twelve months after operation: 36 were absolutely well, 6 were nearly well, and 2 'better'; 8 were no better, although their symptoms were identical with those cured by the operation.

Further experience has confirmed these results—that about 75 per cent of the cases of this type are cured by removal of the appendix. That some fail to receive any relief is suggestive of the presence in



these cases of early gastric lesions undiscoverable in the course of the exploration. The paper by Lansdown and Williamson,<sup>14</sup> giving a preliminary report of their pathological investigations, points strongly in this direction.

The cases in which, in addition to indigestion, there is a more or less constant pain in the right iliac fossa, are not usually cured by an operation consisting of removal of the appendix alone.

Many are relieved by aperients, abdominal exercises, and the use of a well-fitting belt; others in addition need the freeing of adhesions, sometimes ileocolostomy with removal of the ascending colon.

The now well-known gastric symptoms associated with gall-stones are *entirely* relieved by operation.

Renal calculus may be the cause of symptoms mimicking gastric, or more often duodenal, ulcer. These entirely disappear after operation.

In a few cases, urinary obstruction, the result of enlargement of the prostate, is associated with gastric symptoms. Operation results in cure.

Gastrojejunostomy has no beneficial effect on any of the above conditions. It is an operation that should be carried out only in the presence of definite organic gastric disease.

**Gastroptosis.**—The fact that the stomach is lower than normal does not constitute disease. The symptoms associated with this condition are practically confined to the female sex. It must be remembered it is not the stomach only that is prolapsed, nor is it from this organ that symptoms arise in the majority of cases. The patients are of the thin, long-thorax type, and the beginning of the illness is usually constipation. This later becomes associated with irregular gastric symptoms, flatulence, pain at various intervals after food, and occasional vomiting. Neurasthenic symptoms often supervene. In the early days of gastric surgery many of these cases were treated by gastrojejunostomy. Of three treated by myself, all developed bilious vomiting necessitating further operation.

Rovsing<sup>15</sup> has put it well: "Gastrojejunostomy . . . is a highly injurious operation, inasmuch as not only do the existing symptoms deteriorate greatly, but an entirely new complex of symptoms also supervene, nausea and gall-vomitings." In eight patients he had to operate again, separate the anastomosis, and restore the parts to their previous condition.

In the cases comprised under this heading the symptoms are by no means always due to the one cause. In a few, gastric symptoms may predominate, and a stenosis of the pylorus by kinking, or a chronic obstruction of the duodenum by the mesenteric vessels, be discovered. In others the symptoms are secondary to change in the ileocecal region.

Thorough investigation by all modern methods should be carried out, including *x*-ray examination after bismuth meals, in order to discover if there is obstruction in any part of the canal.

In no patient should operative treatment be resorted to until all other measures have failed. Rest in bed, diet, and massage, followed by the wearing of an abdominal belt and strict attention to the bowels, will ameliorate many.

Operation on the stomach is contra-indicated except in those rare cases in which pyloric stenosis is produced by kinking. In 3 of these upon whom I performed Finney's gastroduodenostomy, complete cure resulted. In 2 patients in whom there was marked obstruction of the duodenum at the point at which the superior mesenteric vessels crossed it, duodenojejunostomy was followed by cure. This may be the type of case in which it has been recorded that gastrojejunostomy gives relief.

Rovsing<sup>16</sup> is an advocate of gastropexy, combined, if necessary, with colopexy in the majority of cases. His results in 163 cases are as follows: Cure, 59.6 per cent; great improvement, 14.7 per cent; improvement, 11 per cent. These results are excellent. All the cases of gastropexy, however, that have come under my personal observation were no better as the result of gastropexy.

**Infantile Pyloric Stenosis** (*see also* PYLORUS, CONGENITAL STENOSIS *of*).—If untreated or treated late, this condition is almost invariably fatal. Cantley and Dent<sup>17</sup> stated that, unless operated upon, all die before reaching the age of four months.

Neurath<sup>18</sup> records 41 cases in infants under a year, all of whom died under medical treatment. On the other hand, Robert Hutchison<sup>19</sup> records 20 cases medically treated with 18 recoveries, and Heubner<sup>40</sup> 21 cases with 19 recoveries.

The collected death-rate after operation is over 40 per cent, although individual surgeons have been more successful. Nicoll<sup>21</sup> has so far obtained the best results from his pyloroplasty combined with pyloric stretching: 13 cases, 11 recoveries.

The best results are to be obtained by systematic medical treatment as soon as symptoms appear. If, in spite of gastric lavage and suitable food, weight is steadily lost and the quantity of curd returned in the wash shows no diminution, surgical treatment should be adopted without delay. This should consist, where possible, of some form of pyloroplasty.

The after-history of the cases treated without operation is not fully known. Maylard,<sup>22</sup> and more recently Barling,<sup>23</sup> have recorded instances in young adults in which the condition found was suggestive of infantile stenosis. The writer has had two cases under his care in which symptoms of dilatation of the stomach in early adult life were associated with a difficulty in feeding in infancy.

**Carcinoma of the Stomach.**—Unless treated by operation, life is rarely prolonged more than twelve months from the appearance of symptoms. The results, both immediate and remote, of the treatment by partial gastrectomy are yearly improving. With regard to the immediate mortality, Deaver and Ashhurst<sup>24</sup> collected 747 cases of partial gastrectomy with a death-rate of 25 per cent.

The most successful series of cases are those published by W. J. Mayo.<sup>15</sup> The immediate mortality in the last 100 cases was 7 per cent; in the last 50, 4 per cent. In 863 operations for carcinoma of the stomach, resection was carried out in 307; 36.6 per cent of the patients are alive and well more than three years after operation, 22 per cent more than five years.

Feurer<sup>16</sup> records 58 resections with a death-rate of 19 per cent; 12 per cent of those operated upon survived more than four years; most died within three.

Weil,<sup>17</sup> from Küttner's clinic, reports 135 partial gastrectomies with a death-rate of 22 per cent; in 16 per cent of those operated on, life was prolonged more than three years.

In 140 from Kocher's clinic,<sup>18</sup> 20 per cent remained well over four years.

Sherren: 44 partial gastrectomies, 5 deaths from operation; 16 are still alive, 2 over seven years, 2 over five years, 1 over three years, 2 over two years, since operation. Death occurred from recurrence, the earliest three months, the latest thirty months, after operation.

Langwill, reporting on cases from Caird's<sup>19</sup> clinic: In 54 excisions, mortality 49 per cent, 8 alive and well at three, ten, eleven, thirteen, fourteen months, five, twelve and fifteen years.

The percentage of cases suitable for radical operation must vary in every clinic, depending as it does upon the education of the physician to modern surgical doctrines in the area drained by the hospital. It should get higher as time passes. It is roughly, at the present time, from one-third to one-fifth.

W. J. Mayo, 307 out of 863.

Caird, 59 out of 189.

Poncet,<sup>20</sup> Delore and Leriche, 40 out of 137.

Sherren, 44 out of 189.

Mayo sums up the present outlook as follows: "A patient with a cancer of the stomach which is sufficiently localized to be removed radically has better than a 90 per cent chance to recover from the operation, better than a 36 per cent chance of a three-year cure, and at least a 25 per cent chance of a five-year cure."

When recurrence takes place, the average duration of life is eighteen months, but the quality of that life is much better than if gastro-jejunosomy alone had been done. Comfort is usually given until shortly before death, which does not generally occur from recurrence of growth in the portion of stomach which remains. Recurrence is rare after two years, and if life extends beyond four years is very unusual.

Even the collected cases of Paterson, in 1906, gave a percentage of 15 per cent out of 79 alive and well more than five years after operation, and 38 per cent well three years after.

It is obvious that the outlook in carcinoma of the stomach, if operated upon early, is extremely good. But it is necessary to refer suspicious cases to the surgeon at once. The death-rate of simple

exploration is small; among 84 of my own cases, 31 died within forty-eight hours. As a rule, death occurs within three months, and occasionally a period of improvement occurs and all symptoms disappear. Eight such cases have been under my care. In one the symptoms remained in abeyance for eighteen months, in another for fourteen.

*Total Gastrectomy.* It is rarely that this operation is indicated in cases of carcinoma of the stomach of the usual type. It is necessary in rare instances in which the disease arises in the fundus, or in the small group of cases of plastic linitis-leather-bottle stomach of the malignant type. The immediate death-rate is higher than that of partial gastrectomy.

Mayo, in 7 cases in which an almost complete operation was carried out, had 3 operative deaths, and no patient survived two years.

*Carcinoma of Cardiac End.*—At the present time, radical treatment of malignant disease in this situation is not established upon a successful technique. Several cases, however, have been recorded in which the growth was removed and oesophago-gastrostomy done. Death occurred in all within a few days. Zaaïjer<sup>51</sup> has recently recorded a successful case in which, after the performance of gastrostomy, the growth was removed in two stages.

*Palliative Operations in Carcinoma of Stomach.*—Gastrojejunostomy is of striking service in the relief of symptoms when the growth is causing pyloric obstruction, and in the rare cases of malignant hour-glass stomach. Its performance should be limited to these, for it affords little or no relief when the growth is not causing mechanical obstruction.

The immediate death-rate is much higher than when the operation is carried out for simple conditions. Thus:—

Poncet, Delore and Lercle: 87 cases, 33 per cent.  
Moyulian (up to 1906), 35 cases: 14 per cent.  
Sherrin (up to 1917), 63 cases: 40 per cent.

The average duration of life is about six months. The longest in my series was two years, with twenty-two months' absolute comfort, another fifteen months, 2 over a year.

The relief afforded is striking, and the operation certainly one to be recommended. The patients are usually able to resume ordinary life.

*Gastrostomy and Jejunostomy.*—These operations do not stand on the same plane with gastrojejunostomy. As a routine procedure in inoperable carcinoma of the stomach they are inadvisable. It is one of the operations that must be left to the choice of the patient, remembering that the quality of life is not good, and that the discomfort of artificial feeding is very great to some individuals.

The immediate death-rate of gastrostomy is low. As a rule, life is not prolonged more than six months, usually less.

Jejunostomy in 127 cases collected by Billou<sup>52</sup> gave a death-rate of 29 per cent, and the majority lived less than two months.

**Sarcoma of Stomach.** There are clinically two types of this disease: one in which the tumour is often round-celled and the symptoms resemble those of carcinoma; the other in which a polypoid tumour is present, springing usually from the greater curvature. The average duration of life is about fifteen months in the round-celled, twenty-eight months in the polypoid.

Gosset<sup>52</sup> has recently collected 61 cases of sarcoma of stomach treated by operation. Of these, 29 were of the polypoid type, 10 deaths. The longest survival was seven and a half years. Of the first type there were 22; 13 were resected, with 5 deaths, 3 patients living one, four, and six years after operation.

The writer has treated by resection 2 cases of the polypoid type. In 1 already recorded,<sup>51</sup> recurrence took place within three months. The other, a boy of fourteen, remains well four years later.

**Plastic Linitis** (*Cirrhosis of stomach; fibromatosis of stomach*; Alexis Thomson). This disease is characterized by a diffuse fibrous thickening of the stomach involving the submucous coat and starting usually in the pyloric region. The condition may be either simple or malignant. The relative frequency of the two types is difficult to estimate, for it may be impossible, even after microscopical examination of the stomach, to say to which group it belongs. Sections of the stomach may appear simple, yet secondary deposits may be present in the liver. Unrelieved by surgery the disease is uniformly fatal.

Lyle,<sup>55</sup> in an exhaustive paper bringing the subject up to date, found in 43 cases the average duration of life was forty-nine months (shortest three months, longest twenty years). In 37 of the so-called malignant type, the average was 23.9 months.

He records 25 cases treated by operation: 3 total gastrectomy, 1 well four years later; 13 partial gastrectomies—details of many of these are lacking, but life was prolonged beyond two years in at least 3 cases; 8 gastro-enterostomy—of these there were 4 operative deaths, 1 died four years after operation, cause not known; others were alive and well eight years, four, and three and a half years after operation. There is, in addition, Moynihan's case of complete gastrectomy<sup>56</sup> for the malignant type of the disease in which death occurred four years later.

Jejunostomy: 4 cases: 3 died within a few days, 1 is alive and well five years later.

Seven cases have been operated on by the author. To the naked eye, all were typical of this condition. Three were certainly malignant, although in 1 with secondary deposits in the liver, sections of the stomach wall revealed no trace of malignancy. Of these cases, 5 were treated by gastrojejunostomy: 1 is alive and well six years later, and 1 four years later; 1 lived in comfort for a year and died in twenty months, 1 died five months later, 1 died the day following operation.

In 1 patient in whom I performed jejunostomy, life was prolonged in reasonable comfort for four months. Gastrectomy, complete or

partial, failing, this gastrojejunostomy allows of prolongation of comfortable life with a prospect of cure.

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James Sherren.

**STOMATITIS** (see also CANCERUM ORIS and SCURVY).—Most of the conditions included under this title are, of course, transient and of no great importance.

**Simple Catarrhal Stomatitis**, **Thrush**, the **Aphthous** variety, and the **Chronic** form sometimes met with in adults, very seldom do any harm, and yield in a week or two to treatment, such as removal of the cause and the use of mouth-washes. In weakly infants, however, infection with the *Oidium albicans* is sometimes a serious matter, and may turn the scale against the child by leading to semi-starvation and septic absorption. Multiple simple ulcers of the mouth in adults sometimes show a tendency to relapse every spring, and may last for weeks at a time.

**Mercurial Stomatitis** seldom lasts long, or does any harm, if it is recognized and the drug withdrawn; but if this is long delayed, the patient's mouth may get into a dreadful state, and in rare cases in the past there has been a fatal issue, so that at one time it was a capital offence in France to prescribe mercury as a medicine.

**Ulcerative Stomatitis** is also a grave disease in weakly children. Usually it yields to treatment with potassium chlorate and other similar remedies, but when the mouth is very foul, with gangrenous areas and white or grey sloughy ulcers, there is considerable danger to life. The writer has seen a case in a boy of twelve, beginning as

an ulcerous condition of the gums, and steadily advancing all over the alveolar borders, but, unlike cancerous oris, sparing the cheeks. Mercurialism and senexy were excluded, and there had been no previous illness. In spite of canterization and other energetic treatment the boy got worse, and an attempt was made to burn away the foul areas; but he was *in extremis* and died under the anæsthetic.

*L. Rendle Short.*

**STRICTURE OF ŒSOPHAGUS.** (*See* ŒSOPHAGUS, STRICTURE OF.)

**STRICTURE OF URETHRA.** (*See* URETHRA, STRICTURE.)

**STROKES.** The term stroke, or *ictus*, is applied to a spontaneous cerebral attack due to some form of vascular disease, whether obstruction or rupture of a cerebral vessel. In a severe case, the patient at once becomes comatose and hemiplegic; in other cases, hemiplegia occurs without loss of consciousness.

**Prognosis as to Life.**—The prognosis of recent hemiplegia depends upon the *nature, extent, and situation* of the cerebral lesion.

*The Nature of the Lesion.* With regard to this, we have to determine whether the case is one of arterial obstruction from embolism or from thrombosis, or is one of hæmorrhage from a ruptured vessel. The rapidity of onset of the symptoms is of diagnostic significance.

Embolism, as a rule, occurs suddenly, the arterial obstruction being due to a plug of fibrin carried in the blood-stream from the left side of the heart, or from the roughened wall of an aortic aneurysm. Consciousness may or may not be lost in cerebral embolism; in most cases it is lost, and the cases where it is not affected are generally those in which the obstructed artery is a small one, and where the paralysis is of correspondingly less extent.

Cerebral thrombosis from disease of the vessel wall, syphilitic or otherwise, or from morbid coagulability of the blood (e.g., during pregnancy or the puerperium), is usually rapid in onset, though less so than in embolism. In syphilitic cases, it is often preceded for days by headache or mental confusion, or there may be pre-hemiplegic convulsion—sometimes unilateral. Unconsciousness deepening into coma may be present, as in embolism, if the thrombotic lesion be a large one.

Cerebral hæmorrhage from rupture of a diseased artery or a miliary aneurysm is usually associated with conditions of high blood-pressure, whether from general arteriosclerosis, as in the gouty diathesis or in old age, or from chronic renal disease. In arteriosclerotic cases the actual attack is often precipitated by excitement, emotion, or physical exertion, and a particularly common time of onset is during straining at stool. Other cases occur in morbid blood conditions without vascular disease, as in the bleeding diseases (hæmophilia, purpura, leucæmia, scorbutus, pernicious anaemia); also in certain cases of whooping-cough, where the hæmorrhage is usually due to rupture of a cortical vein during a paroxysm of coughing.

Other things being equal—i.e., in lesions of equal size and similar situation—the prognosis as to life is more serious in hæmorrhage than in thrombosis, since it is easier to stimulate the circulation in cases of thrombosis than to depress it in cases of hæmorrhage. Embolic cases, as a rule, have a good prognosis, except when due to ulcerative endocarditis, in which the infective nature of the embolus renders the prospects hopeless.

*The Extent and Situation of the Lesion.* The size of the lesion is an important element in prognosis. The larger the area of brain tissue that is destroyed, the graver the prognosis. This statement, however, must be qualified by the further consideration of the situation of the lesion: since it is obvious that a relatively small lesion in the medulla or pons may be rapidly fatal, whereas in the corona radiata it may produce comparatively slight symptoms.

*Coma.*—The occurrence of coma, and its duration, have an important prognostic value. Coma is one of the signs of increased intracranial pressure, and the larger the hæmorrhage, as a rule, the deeper the coma. (There is an important exception to this rule in the case of hæmorrhages in the region of the medullary vital centres, where a small lesion may prove rapidly fatal.) If the coma be slight in degree, or if it be short in duration, even if deep, we give a favourable prognosis as regards life. Where it is profound and early in onset, a very guarded prognosis should be given; and where it persists for over twelve hours without any diminution in intensity, the prospects of survival are small. In cases which are likely to recover, signs of consciousness usually begin to return in two or three hours. Cases which remain deeply comatose for twenty-four hours rarely survive. If a patient with initial hemiplegia and coma returns rapidly to consciousness, and then suddenly relapses into coma, this suggests the presence of a hæmorrhage into the ventricles, and the outlook is practically hopeless.

*Temperature.*—A study of the patient's temperature is also of importance. A normal temperature is a good sign. In cerebral hæmorrhage there is often an initial fall, followed by a moderate pyrexia. The more severe the lesion, the more profound are the temperature reactions. In a bad case, the temperature may fall to 96° F., or even 94.4° F., and the patient may die before the occurrence of any pyrexial reaction; generally the initial fall is followed by a rise. The higher the temperature, the graver the prognosis; and if hyperpyrexia of 105° to 108° F. occurs, the outlook is hopeless.

*The Cardio-vascular signs* should also be carefully observed. If the pulse becomes abnormally slow or quick, or if its rhythm becomes irregular, the prognosis is unfavourable. A progressive rise of blood-pressure is another unfavourable sign.

*Deepening Stertor* of breathing, and the occurrence of a *Cheyne-Stokes type of respiration*, are also signs of deepening coma.

*Albuminuria or Glycosuria*, if present, increase the likelihood of a fatal issue, since these conditions indicate the activity of other factors in addition to the mechanical one of the vascular intracranial lesion.



*Convulsions*, occurring in a comatose and hemiplegic patient, are always of grave import: they indicate cortical irritation, either from a meningeal hæmorrhage, or from sudden increase in the intracranial pressure, as when a hæmorrhage bursts into the ventricles or into the substance of the pons.

**Prognosis as to Recovery.**—The foregoing signs concern themselves mainly with the immediate prognosis as to life. Should, however, the patient survive the particular attack, the further question arises as to how far his hemiplegic symptoms are likely to clear up. The answer to this question depends upon the size and situation of the lesion. A small lesion which does not interrupt the pyramidal fibres, but merely compresses them, may produce signs and symptoms which ultimately clear up completely. In other cases, where a certain proportion of pyramidal fibres are destroyed, whilst others are merely temporarily compressed, as in a small cortical or subcortical lesion, the original hemiplegia may recede to a monoplegia as the clot shrinks by absorption and the uncovered fibres recover their function. It is difficult to lay down definite rules for guidance on this point, but it is generally recognized that if any material improvement in the hemiplegic symptoms is likely to occur, some signs of return of power will be found within a week or ten days. Improvement, as a rule, begins in the lower limb before the upper. Prousscau stated that when the arm begins to recover before the leg, the ultimate result is less satisfactory; but this dictum is not absolute.

The occurrence of early rigidity of the hemiplegic limbs—i.e., within the first week—is unfavourable as regards recovery of motor power. Rigidity of later onset, with increased deep reflexes, indicates permanent degeneration of the pyramidal fibres.

The appearance of an acute sloughing bed sore on the hemiplegic side, whether over the sacrum, great trochanter, outer malleolus, or heel, in a patient who is being assiduously nursed, and whose skin is being watched and protected (as that of all paralyzed patients should be), is of grave import—the *decubitus ominosus* of Charcot. Sometimes it occurs within a few days after the onset of paralysis and is resistant to treatment: it occurs chiefly in cases of profound hemiplegia in which there is a degree of mental obtuseness. Purves Stewart.

**SUBPHRENIC ABSCESS.** Under this heading we include abscesses beneath the diaphragm of varying origin, the majority following perforation of a gastric or duodenal ulcer, or of the vermiform appendix. Tropical abscess of the liver, spinal caries, and a number of other primary causes lead to subphrenic abscess, but much less commonly than those first mentioned. We are greatly indebted to the late Mr. Harold Barnard for his classical study of the subject, based upon the records of 76 cases at the London Hospital.

As a complication of appendicitis this disease is not uncommon, and, unless early recognized and energetically treated, it is almost a death warrant. The usual course of events is that the patient is

operated on about the third or fourth day or later, and a fairly widely-diffused peritonitis is found: the appendix is removed and a drainage-tube put in, but the temperature remains high, or falls for a few days and then rises again, and the patient wastes, and may vomit or have rigors. Careful examination may reveal a resistant or tender area in the right upper abdomen, or there may be dullness and absent breath-sounds at the base of the right lung. A skiagram shows very prettily the fixed, high-arched, raised dome of the diaphragm on the affected side.

Having defined what class of cases enters into the argument, we may now inquire into the prognosis.

Barnard reported on 76 cases. Of these:—

	12 cases not operated on :	0 lived,	12 died = 100 per cent
	64 cases operated on :	40 lived	24 died = 37.5 ..
Barnard's own,	21 cases operated on :	17 lived,	4 died = 19 ..

Of the 36 fatal cases, 24 are classed as avoidable, that is, they either passed undiagnosed, or the operation did not secure proper drainage, as for instance when an anterior drain was used in cases demanding a posterior. Posterior drainage is secured by removing part of a lower rib, and traversing the pleural cavity as well as the diaphragm.

In 23 out of 76 cases, the abscess ruptured spontaneously (into bronchus or pleura 9 times, into stomach 8 times).

The operation mortality given by various German authors agrees closely with the figures just quoted.

In estimating the prognosis in any particular instance, it must be borne in mind that when the stomach is the primary locus of the disease the outlook is graver than in appendicitis cases (Keen). Rigors are an unfavourable sign, 6 out of 10 dying (Barnard), and so is jaundice, because these may indicate portal pylephlebitis. Early operation gives much better results, of course, than late: according to Sachs:—

Operation within 3 weeks :	15 per cent died
Operation after 3 weeks :	50 per cent died

Posterior drainage gives better results than anterior, as is shown by Barnard's table.

26 posterior operations :	7 died	27 per cent
43 anterior operations :	17 died	39.5 per cent
4 lateral operations :	3 died	75 per cent

Personally, I have been very satisfied with a postero-lateral drain beneath the diaphragm and lower ribs: this avoids the necessity of having to go through the pleura.

We may conclude, therefore, that in practice about one-third of the cases die, but that careful diagnosis and prompt efficient drainage would probably save four out of five.

REFERENCE.—*Brit. Med. Jour.* 1908, i, 371, 429. *A. Bendle Short,*

### SYPHILIS.

1. **Prospect of Immediate Cure in the Primary Stage.**—Excision of the primary chancre was claimed by Anspitz to have cured the disease in 25 per cent of 33 cases so treated, but in the experience of other observers this plan was not attended with success. It is possible that the cure may be considerably modified, and even aborted, by this treatment, if supplemented by injections of salvarsan. The size and situation of the initial lesion seldom admit of this procedure, owing to the mutilation which would be entailed; but there is one class of chancre for which this treatment is appropriate, viz. when the sore is situated at the preputial orifice and can be completely removed by circumcision, the inguinal glands being also excised at the same time.

The earlier the constitutional treatment of syphilis is commenced, the better is the ultimate prognosis, and the best test of the efficacy of treatment is the absence of subsequent relapses. The advantage of commencing treatment in the primary stage is well exemplified by statistics on the subject recently brought forward by Colonel Gibbard and Major Harrison, R.A.M.C., as shown in the following tables:—

Table I.

THE ADVANTAGE OF COMMENCING TREATMENT IN THE PRIMARY STAGE: NUMBER OF RELAPSES WHICH OCCURRED WHEN SALVARSAN TREATMENT WAS COMMENCED IN THE PRIMARY AND SECONDARY STAGE RESPECTIVELY.

Period of observation	Stage of treatment	Total	Number of relapses				Per cent of relapses
			1st	2nd	3rd	4th	
Six months	Primary	92	5	5	6	6.5	11.9
	Secondary	174	7	4	31	17.8	21.8
Twelve months	Primary	70	3	4	5	7.1	11.4
	Secondary	130	10	7	34	26.1	33.8

From this table it will be seen that the prognosis as regards relapses is far more favourable when treatment is commenced in the primary stage than when it is deferred to the secondary period.

2. **Comparative Value of Salvarsan, Neosalvarsan, Mercury, and the Iodides.**—It is a matter of some difficulty at the present moment to compare the relative merits of salvarsan and neosalvarsan with those of mercury. Ardent advocates of the two former preparations, relying on the Wassermann reaction, claim that by their agency alone syphilis can be cured, and they further claim that mercury by itself has never cured a case of syphilis. The salvarsan treatment has not been in existence for a sufficient period to enable one to assert that any case of syphilis has ever been cured by its agency alone, and further

experience is required before one is justified in stating that salvarsan is capable of preventing the manifestations of tertiary syphilis and of nerve syphilis. Before its advent, innumerable cases of syphilis, treated by mercury alone, were apparently cured; the patients married and produced healthy families, and moreover, their Wassermann reaction, taken since the discovery of that valuable test, has been rendered negative by mercurial treatment alone.

Table II.

COMPARISON OF DIFFERENT METHODS OF USING SALVARSAN: NUMBER OF RELAPSES WHICH OCCURRED IN PREVIOUSLY UNTREATED CASES OF SYPHILIS.

Period of observation	Treatment	Total Cases	Localities		Wassermann reaction without iodine injection		Percentage of cases relapsed
			Cases	Per centages	Actual	Per centages	
Six months	Salvarsan only ..	71	5	7	12	16.9	23.9
	Three salvarsan and four calomel ..	63	2	3.1	10	15.8	18.9
	Two salvarsan and nine mercury ..	132	5	3.7	15	11.3	15.1
Twelve months	Salvarsan only ..	48	7	14.5	9	18.7	33.3
	Three salvarsan and four calomel ..	52	1	1.9	12	23	25
	Two salvarsan and nine mercury ..	100	5	5	18	18	23

NOTE.—From December 12th to April 13th, of 91 cases treated with three to five weekly injections of 0.6 gm. salvarsan and ten weekly injections of mercury, none have so far relapsed clinically or given a positive Wassermann reaction.

Certainly no case of syphilis has ever been cured by the iodides alone, and they may be regarded as only of value in relieving certain manifestations of the disease, such as ulcers of mucous membranes, and in promoting the absorption of the products of syphilitic inflammation, as in periostitis, etc., but as curative agents they may be disregarded and dismissed from consideration. It is futile to pit two such valuable remedies as salvarsan and mercury one against the other, for there is much to be said for or against either of these two modes of treatment; but it appears now to be generally accepted that the best means of eradicating the disease is by a judicious combination of the methods, and, with a healthy subject thus treated, one may safely give a most hopeful prognosis as regards cure, as regards the impossibility of transmitting disease to the offspring, and as regards immunity from nerve syphilis. In confirmation of this statement, reference may again be made to the valuable statistics recently published by Colonel Gibbard and Major Harrison, in which the relative merits of salvarsan alone

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and in combination with calomel cream and mercurial cream are compared. From these figures it will be seen that the percentage of relapses was far less in cases treated by two injections of salvarsan and nine of mercurial cream (Hg, gr. 1) than in those treated by salvarsan alone, or by the combination of salvarsan and calomel cream (Hg Cl., gr.  $\frac{1}{2}$ ).

In summarizing the results of their experience, Colonel Gibbard and Major Harrison state that "even if no improvement is made in the method of using salvarsan which has given the best results in our hands, its routine use for the treatment of syphilis in the army is likely to effect an annual saving of 70,000 to 80,000 hospital days, an economy equivalent to the cost of keeping a battalion of infantry in hospital for three months."

The combination of salvarsan and mercury is immeasurably superior to the treatment by mercury alone, as will be seen on reference to the following figures, also supplied by Colonel Gibbard and Major Harrison.

Table III.

COMPARISON BETWEEN SALVARSAN AND EXCLUSIVELY MERCURIAL TREATMENT: TOTAL RELAPSES AND AVERAGE TIME LOST BY EACH SOLDIER IN HOSPITAL, AND ATTENDING AS AN OUT-PATIENT, UNDER TREATMENT WITH MERCURY, AND WITH MERCURY AND SALVARSAN, RESPECTIVELY, DURING THE FIRST YEAR.

Treatment	Total cases	Average number of days lost to out-patient relapses	Cases only	Cases, relapses			Average time lost by out-patient relapses	Average time lost by out-patient relapses		
				Two only	Two or more times	Total number of relapses		In hospital	At out-patient	
Mercury alone	378	42	151	115	19	315	83	66.2	17.6	83.8
Mercury and salvarsan	152	23.2	6	0	0	6	3.9	25.2	15.8	41

The above was written when salvarsan and neosalvarsan were readily procurable in our country; but at the present time the original preparations are no longer at our disposal, and consequently recourse must be made to one of the substitutes. These are galyl, luargol, arsenobenzol and novarsenobenzol (Billon), and kharsivan and neokharsivan (B. W. & Co.). The first-named of these preparations is, in the experience of the writer, far the most satisfactory, since it is not followed by signs of local irritation such as thrombosis in the injected vein, or by signs of arsenical poisoning. The number of injections of galyl necessary for the disappearance of all symptoms of syphilis is far greater than that of salvarsan or neosalvarsan, and

a course of ten or twelve injections of this substitute is requisite before a negative blood test can be obtained. But it has been amply proved that treatment by galyd will ensure a permanent negative Wassermann test, and consequently a favourable prognosis may be given after a sufficient course of this substance.

**3. Prognosis as to Infectivity.** The sooner the contagious stage of the disease can be abolished, the greater the advantage both to the patient and to the community. The rapidity of the action of salvarsan in the early stages of syphilis is remarkable, and both the primary sore and the secondary syphilides will be found to yield to this treatment in a few days, where a similar improvement would only be arrived at after weeks of mercurial treatment.

**4. Prospects of Appearance of Tertiary Symptoms.** The treatment of syphilis has for its object, not only the relief of the early and contagious symptoms, but the prevention of its progress into the tertiary period, and, if carried out on the principles before indicated, there is a reasonable prospect that the disease will be arrested before that stage is arrived at. The best regulation for the duration of treatment is the Wassermann test, and as long as that remains positive, the indication is that treatment should be persisted in. If, after a provocative injection of salvarsan, the test remains negative, the inference is that the disease is cured.

But there are certain conditions in which the progress of the disease is not so favourable, and where considerable caution must be exercised before giving a good prognosis. The combination of syphilis with tuberculosis renders the outlook far less hopeful, since the disease is then liable to assume a malignant form and one intractable to all measures of treatment. Chronic alcoholism is also a condition in which the disease is less amenable to treatment, and in which obstinate ulcerative lesions, and visceral and arterial degenerations, are liable to supervene. When complicated with malaria, Bright's disease, or diabetes, a very guarded prognosis must be given.

The prospects of the supervention of nerve syphilis depend upon the duration and efficiency of treatment, upon whether the disease is accompanied by any of the complications previously alluded to, and upon the methods and habits of the patient. The man who is leading a strenuous and anxious business life and is overtaxing his mental energies, is certainly more liable to develop symptoms of nerve syphilis than he who is living in the country and enjoying fresh air and exercise, free from all the cares and worries of business.

**5. Inherited Syphilis.**—The number of cases of hereditary syphilis is decreasing, as is also their gravity, an improvement which may be attributed to the more efficient treatment of syphilis in general and to a better recognition of the danger of hereditary transmission. Formerly it was impossible to state with any degree of accuracy if or when a patient was cured of his syphilis, and consequently many persons were permitted to marry prematurely, but at the present time no one who has been infected with syphilis in the past should be advised

to marry until his Wassermann reaction has been proved to be negative. In a certain number of cases, energetic treatment may have been carried out for years and yet the blood tests may continue positive; but it does not follow that marriage should be prohibited, if in the opinion of the surgeon the treatment has been adequate to prevent any possibility of the transmission of the disease; in other words, a continuously positive Wassermann reaction, despite prolonged courses of salvarsan and mercuric, is not an absolute bar to marriage or to the procreation of perfectly healthy children. In the case of a woman contracting the disease during pregnancy, it is possible by energetic treatment to modify the symptoms in the child, if not to prevent their appearance. The condition is one in which the treatment by salvarsan is of the utmost value, and the injections should be given in small doses, supplemented by mercurial treatment, either in the form of injections orunctions. The prognosis as regards the child improves with each succeeding pregnancy, and confident hopes may be held out that the mother will eventually be able to produce children free from all hereditary taint. The prognosis in the case of a child the subject of hereditary syphilis will depend upon the date at which the symptoms of the disease first manifest themselves, and the later that date the better the prognosis. Minute doses of salvarsan administered intramuscularly are indicated in hereditary syphilis, followed by mercurial ununctions.

*J. Ernest Lane.*

#### SYPHILIS, CARDIAC. (See CARDIAC SYPHILIS.)

**SYPHILITIC JOINTS.** There are three varieties of syphilitic joint disease not infrequently seen:

1. **Acute Syphilitic Epiphysitis**, the so-called syphilitic pseudo-paralysis of infants. This indicates a severe type of the disease which may be fatal, but if other signs are not very extensive, the joints recover well under mercurial treatment.

2. **Synovitis of Older Children**, the painless hydrops of the knee which occurs in children from six to sixteen, often with interstitial keratitis. It usually clears up completely under treatment in the course of weeks or months, but in one boy under my care double fibrous ankylosis had resulted.

3. **Gummatous Arthritis**, the so-called 'white swelling' of joints with tertiary acquired syphilis, usually met with in adults, and most frequently affecting the knee. Unless treatment is very early and thorough, these cases are apt to get a stiff knee, which may also be painful; and in one or two instances which the writer has seen, a good result was not obtained until the joint was excised.

*A. Reindle Short.*

**TABES DORSALIS.** The outlook in cases of tabes dorsalis depends, to a large extent, upon the stage at which the disease is first recognized. By the time the patient has become ataxic in his gait, with absent knee-jerks and bladder trouble, the disease is already well advanced:

and if, in addition, there are trophic changes in the skin or joints, gastric or other crises, and evidences of cystitis, the prognosis is correspondingly worse.

It is, therefore, highly important for the physician to recognize the disease in its early or pre-ataxic stage, when the patient is still able to walk and stand securely, and when the chief, and perhaps the only, symptoms consist in paroxysmal lightning pains, generally in the limbs; these pains are often mistaken for rheumatism, since they are aggravated by cold or damp weather. Or the earliest phenomenon may be some transient ocular palsy, with diplopia, squint, or ptosis. It is commonly stated in text-books that the diagnosis of tabes in the early stages is established by the combination of lightning pains, reflex indolegia, and loss of knee-jerks. But it is generally possible to make a diagnosis long before the knee-jerks are lost. In many cases, the ankle-jerks disappear whilst the knee-jerks are still quite brisk. The diagnostic significance of loss of ankle-jerks is therefore of the utmost value. Most important of all is the presence of lymphocytosis of the cerebrospinal fluid. This is the earliest and most constant physical sign in tabes (as in general paralysis), and should be looked for in every doubtful case. It precedes all the other signs and symptoms.

The course of tabes, as a whole, apart from special complications to which we shall refer later, is steadily downwards; the patient's power of walking grows gradually worse, the ataxia being often apparently aggravated by the violence of his own efforts. Some cases become severely ataxic in the course of a couple of years after the onset of the first symptoms. In others, the disease progresses much more slowly, and the patient may remain in the pre-ataxic stage for many years, complaining only of occasional lightning pains. In others, again, the disease becomes spontaneously arrested at a somewhat later stage, and the patient, already ataxic, gets about for an apparently indefinite time. Some of the symptoms, such as pains, early ocular palsies, and various visceral crises, may disappear as the disease advances; but once the patient has become ataxic, his inco-ordination persists, though it may sometimes be alleviated, e.g., by means of special courses of exercises.

Tabes does not necessarily shorten life, and it has been truly said that many a tabetic patient outlives his physician. A few cases, however, run an extraordinarily rapid course, and may become bed-ridden within a couple of years, or even less. Thus, I recall the case of a man who acquired syphilis at the age of twenty-three. His first tabetic symptom was that of transient squint at thirty-one. This cleared up completely in a fortnight. At thirty-three he developed deficient sensation in the lower limbs and along the ulnar borders of both upper limbs. A month later, the first signs of ataxia of the legs appeared, and within six weeks he became unable to stand or walk.

The presence or absence of bladder trouble has an important bearing on the prognosis of tabes; and of all the complications, this is one of the commonest, and one which has a truly serious import. Cystitis,



## INDEX OF PROGNOSIS

in tabes, is secondary to chronic dilatation of the bladder. This dilatation, again, is the result of deficient sensation in the organ, so that the patient does not realize when the bladder is distended, and may even pride himself upon the length of time during which he is able to hold his water. If the bladder becomes habitually over-distended, its contractile power diminishes, and a residuum of urine remains after micturition. This residual urine gradually increases, and ultimately becomes so large in amount that the imperfectly-contracting and dilated organ develops overflow incontinence. Either at this stage, or earlier, the use of a catheter becomes necessary; and the patient's life now depends upon the precision with which an aseptic technique is carried out from day to day. Sooner or later the bladder becomes infected, and the patient is now in a still more critical stage, his danger here that of an ascending infection to the kidneys, with a terminal pyelonephritis. This gloomy sequence of events, however, is fortunately preventable if, at the very onset of the disease, as soon as we have made our diagnosis, we instruct the patient to empty his bladder at short intervals of three or four hours, day and night, independent of any spontaneous desire to do so, and without waiting for any sensation of distention. If the bladder is never permitted to become distended, dilatation is prevented; and the necessity for catheterization, with the subsequent chain of complications above referred to, is avoided.

Tabetic atrophy of the optic nerve, with progressive failure of vision, has an important prognostic significance as regards the course of the other tabetic symptoms. In cases with blindness from optic atrophy, the ataxic symptoms are sometimes absent for many years; so that the patient, although blind, is able to walk steadily, and to use his upper limbs for fine movements of various sorts, such as typewriting, etc.

The various crises (gastric, intestinal, etc.) usually occur comparatively early in the disease. During the course of a crisis, with its urgent pain and intractable vomiting, the patient may become intensely collapsed; but the symptoms often cease suddenly, and recovery then takes place rapidly, usually within a few days.

So-called laryngeal crises are generally of the nature of exacerbations of a chronic bilateral abductor palsy, to which is superadded some slight spasm or hyperaemia of the larynx, producing urgent dyspnoea. The prognosis of such attacks is correspondingly grave, and unless promptly relieved by tracheotomy or intubation, the attack may actually prove fatal.

Perforating ulcer on the plantar surface of the great or little toe, or on some part of the sole of the foot, is a painless trophic affection which may occur early in the course of the disease. Formerly it was taught that perforating ulcers progress from bad to worse, ultimately producing an ulcer or sinus leading into the subjacent joint, or even resulting in gangrene and necessitating amputation. This, however, is not necessarily the case. Rest in bed for a few weeks, and simple

antiseptic dressings, will produce healing of the great majority of such ulcers. Even where the bone or joint beneath the ulcer has been implicated, a bony sequestrum may come away, and the superjacent tissue may then cicatrize.

Tubercle arthropathies, so-called Charcot joints, occur most frequently in the knee, hip, or foot, but may affect the joints of the upper limbs, or indeed any joint in the body. They are often multiple, and sometimes symmetrical. The outstanding characteristic of this variety of joint affection is its painlessness. Not only is the initial effusion into and around the affected joint unaccompanied by pain, but even when destructive changes are far advanced, with loss of articular cartilage, coarse crepitus between the bare ends of the bones, and abnormal mobility of the joint from relaxation of its ligaments, the patient still suffers no pain. After the affection has persisted for weeks or months, it will be observed that the joint changes are not purely destructive, but that a certain amount of bony hypertrophy occurs in the neighbourhood of the affected joint, producing osteophytic outgrowths at the margins of the articular ends of the bones, and often resulting in huge bony masses in which the original outline of the bones becomes completely buried, as if it were nature's attempt to immobilize the diseased joint.

Spontaneous fractures of the bones, in tubercle patients, chiefly occur in the long bones, and often in the neighbourhood of a joint which is already the seat of a tubercle arthropathy. These fractures occur spontaneously, i.e., after inadequate or trivial causes. They are absolutely painless, and unless the mechanical conditions be such as to render locomotion impossible, the patient may continue to use the broken limb without any consciousness of what has occurred. The prognosis as to union of such fractures is good, as a rule. Most cases become firmly reunited, but with an excessive amount of callus.

Although ataxia is present in a large proportion of cases, it is not necessarily an early symptom: many tubercles suffer from the disease for years without developing it. There seems to be little doubt that physical exertion tends to precipitate its occurrence. If, therefore, we establish our diagnosis in the pre-ataxic stage of the disease, we may sometimes succeed in retarding, or possibly in warding off completely, the onset of ataxic symptoms, by impressing on the patient the necessity for abstaining carefully from severe or prolonged muscular exertion. Thus, for example, the amount of walking he is permitted to do should never be enough to induce the slightest fatigue.

Once ataxia has supervened, it may either become slowly and insidiously worse, or it may remain for years practically of the same degree of intensity. Or again, in other cases, it may attain to an extreme degree with extraordinary rapidity, within a few weeks, or even days. An acutely-advancing ataxia of this sort is aggravated by the very energy with which the patient strives to overcome it. In some cases the ataxia may even improve: and the patient, previously unable to stand or walk, may, by practising carefully-planned

exercises under supervision, re-educate his limbs and become able to walk once more with only a moderate degree of ataxia. The cases which are most likely to benefit from such a course of re-educative exercises are those in which the disease has advanced slowly and gradually. In patients with ataxia of rapid onset, it is wise to wait until the ataxic phenomena have apparently ceased to advance, before commencing re-educative exercises. *Purvis Stewart*

**TALIPES.** The prognosis in congenital and paralytic talipes must be considered separately.

**Congenital Talipes Equinovarus.** There is no tendency to spontaneous improvement; rather, indeed, unless carefully watched, to relapse after operation. Untreated cases are generally able to walk, but in a very painful and cumbersome manner, lifting one foot over the other at each step.

Given proper treatment before the child has learnt to walk, it will be possible, in the milder degrees of the deformity, to obtain a perfect result; but not if there is great rigidity or bony alteration. If treatment begins after walking, it is often possible in the milder cases, or in patients with rigidity in a bad position not due to bony change, by means of tenotomy and plaster, to get a foot which, if unshapely, will be sound functionally. If there are bony changes, it will be necessary to excise the astragalus or a wedge from the os calcis and cuboid. Some pain on walking, but not permanent deformity of the foot, must then be anticipated in most cases, although the operation will probably effect great improvement.

Much depends upon the patience and perseverance with which the parents bring the child for supervision. Up to the age of twenty there is a tendency to relapse, but the relapses can be cured. Care, therefore, is needed for months and years after any operation.

The methods of treatment are fortunately almost free from risk. Non-union of tendons after tenotomy is *very* rare, but sometimes a long, thin, weak bond of union may result. There are a few cases on record of aneurysm following nicking of the posterior tibial artery.

**Paralytic Talipes.** It is almost always possible, both in children and adults, to obtain a shapely foot with plantigrade walking by means of tenotomies, tendon-transplantation, plaster, and orthopedic apparatus, but it is not possible to restore power to the paralyzed muscles after the lapse of a year from the onset of the infantile palsy. To this statement one qualification must be made: a muscle which has been long overstretched may recover a good deal of its power if it is kept for several weeks in a relaxed position.

REFERENCE: *Tubby, Deformities, including Diseases of Bones and Joints*, vol. 1. *A. Rendle Short*

### TENOSYNOVITIS.

**Simple.** This may be classified under four headings: *crepitating serous*, *purulent*, and *adhesive*.

The two former are usually met with in the tendon-sheaths around

the back of the wrist, and are harmless and transient affections, though there is a certain tendency to relapse. The duration depends upon the time at which efficient treatment is undertaken; if a splint is worn and iodine applied, it is uncommon for the trouble to last more than a couple of weeks.

*Paralent tenosynovitis* is most often met with in the sheaths of the flexor tendons of the fingers. It is very seldom dangerous to life, except in feeble or aged persons when it has rapidly extended to the larger sheaths around the wrist, and then gone on to destroy the bones or joints. Apart from this, however, suppuration in a tendon-sheath is a serious disease, because it is almost certain, unless the pus is let out very thoroughly and very early, that a stiff finger will result from *adhesive tenosynovitis*, and this is such an obstruction that, for many occupations, it is better to amputate the finger.

**Tuberculous.** There are two principal varieties, the *pulpy* form, going on later to caseation and softening, and the *milium-seed body* form, which runs a much more chronic course. There is no essential difference between them; the writer has found the pulpy form in the extensor tendon and milium-seed bodies in the flexor tendon of the same finger, and also a mass of pulpy tissue at the wrist containing a few milium-seed bodies in the middle of the pulp.

The prognosis is not very satisfactory. In early cases, before softening and septic infection have occurred, healing is often to be obtained by fixation and, if this fails, by excision and scraping of the tendon-sheath with the application of iodine, iodotannin, or carbolic acid. But, unfortunately, the tendons may be stiff and adherent, or the tuberculous process may recommence at a distance, in the same or another sheath. Where suppuration has already occurred on an extensive scale, especially if the joints are invaded, the prospects of useful recovery are usually so small that amputation is to be advised.

*A. Rendle Short.*

**TESTIS, NEW GROWTHS OF.** The nomenclature of the new growths of the testis is very confused. The older authorities divided them into fibrocystic disease, sarcoma, and carcinoma, the first of which often contained cartilage and was supposed to be innocent. Modern writers (Nicholson, Morriston Davies, Russell Howard) deny that there are any innocent tumours of the testis, except the very rare dermoid cysts. The patient from whom Sir James Paget's original type-specimen of chondroma was taken eventually died of recurrence in the heart and lungs.

The modern classification, given by Morriston Davies after Nicholson, is:

Embryoma	Solid
	Cystic (dermoids)
Carcinoma	Encephaloid (alveolar or non-alveolar)
	scirrhus
Sarcoma (round-celled)	
Endothelioma. (Rare.)	

Authorities differ as to the relative frequency of these forms. Carcinoma and sarcoma are not distinguishable clinically or with the naked eye, and, as far as we know, the prognosis is the same. Some of the embryonata, including the fibrocystic and cartilaginous growths, are much slower and less malignant than the soft vascular tumours.

It should be mentioned that growths of the testis are very frequently confused with hamatoceles, and that the patient may give no history of injury in the latter case. This must be borne in mind in giving a prognosis.

**The Operation Mortality** of treatment by castration is very small except in broken-down individuals. At St. Bartholomew's Hospital, 2 out of 33 died as a result of this operation. From the literature, Kober reports 5 deaths in 106 cases after castration for sarcoma. The more modern procedure of opening up the retroperitoneal tissues about the bifurcation of the aorta and inferior vena cava in order to remove enlarged glands, is no doubt a serious operation, the mortality in 14 cases collected by Hinman being 11 per cent.

**The End-results** of operation for malignant growths of the testis are very disheartening. The following statistics are available. They are all collections of cases from the literature, not purely hospital records, and are therefore likely to be unduly favourable.

END-RESULTS OF CASES OF NEW GROWTH OF THE TESTIS  
TREATED BY OPERATION.

Reporter	Operation mortality	Cases followed	Well over 5 years	Well over 3 years	Recurred or died
Butlin	6	53	6		
Kober (sarcoma)		48		6	33
Chevassu		100	19		81
Codman		56	23		33
Hinman		24	3	1	20
" with removal of retroperitoneal glands	11	36	9*	11	16
Coley (majority also given toxins)		60	7	5	48

\* Over 2 years.

In Kober's statistics (1900), 30 out of 48 followed were known to have recurred, and 3 more died within a year. In Chevassu's series, 81 out of 100 died within a few years. Many observers have been impressed with the great rapidity of recurrence. Within a few months of the castration, there is a huge growth in the retroperitoneal glands. Nearly all the recurrences are in the glands, and take place within a year.

Codman reports a series of 56 cases operated on during forty years at one hospital—the Massachusetts General—most of them verified by the microscope. Of these, 13 were still alive, and 40 died of some

extraneous cause, so that the comparatively large proportion of 41 per cent survived the disease. Perhaps a few of these were not malignant, as the records of some are very old.

Hinman, on the other hand, reporting on a series from Johns Hopkins Hospital, found 20 dead out of 24.

Coley records 60 cases treated for the most part by orchidectomy, followed sooner or later (usually not till recurrence occurred) by his toxins. Of these, 7 were well three years and 5 for a shorter period, and 18 recurred or died. These figures put the treatment to a severe test, as they include many who had already recurred.

Microscopical details as to the cured cases are furnished by Chevassu, Hinman, and Coley, from which it appears that the pure cancers do better than the mixed-celled tumours. Coley's successful cases were nearly all sarcomata, but probably these were specially selected to send to him.

Growths of the undescended testis are likely to be diagnosed late, and do very badly.

We may conclude, therefore, that about a quarter of the patients with a growth of the testis will be saved by castration, that a few of these are of a quiet fibro-cystic or cartilaginous type from the first, and that even if recurrence occurs in the sarcoma group, Coley's fluid may pluck a few as brands from the burning.

In children, growths of the testis are ultra-malignant, and cure is practically never obtained. Tumours of the epididymis are very unfavourable. Operation is useless if the retroperitoneal glands can be felt enlarged.

**Removal of Retroperitoneal Glands.**—Of late years, in view of the very unsuccessful results just quoted, several surgeons have made a practice of removing the retroperitoneal glands around the bifurcation of the inferior vena cava and aorta. A patient was submitted to this operation recently at the Bristol Royal Infirmary (there was a remarkable contrast between the huge incision for the retroperitoneal removal, and the size of the one gland found, which was about as large as a filbert); but within a few months the patient returned with a large inoperable recurrence.

Hinman publishes a study of 44 cases in which this radical operation was carried out. Of these, 11 per cent died of the operation. About half the cases showed malignant involvement of the glands microscopically; as half of these again were inoperable, the operation was only really valuable in 25 per cent of the total number, which compares unfavourably with the high mortality, especially as it is so easy to fail to find every infected gland. Certainly, however, the end-results are promising, though not followed up long enough. The value of the operation is therefore still *sub judice*.

REFERENCES. Butlin, *Operative Surgery of Malignant Disease*, 2nd ed.; R. Howard, *Clin. Jour.* 1910, xxxvii, 6; Morrison Davies, *Lancet*, 1912, 1, 418; Chevassu, *Rev. de Chr.* 1910, xli, 628; Codman, *Boston Med. and Surg. Jour.* 1914, Feb., 267; Hinman, *Jour. Amer. Med. Assoc.* 1914, Dec. 5; Coley, *Ann. Surg.* 1915, lxi, 90.

A. Rendle Short.

**TESTIS, TUBERCULOUS.**—(See EPIDIDYMITIS, TUBERCULOUS.)

**TETANUS.**—Considerable progress in our knowledge of this disease has been made by the experiences of the Great War.

**Prospect of Acquiring Tetanus after a Wound.** It has long been recognized that clean wounds are seldom followed by tetanus, but that when the injury is earth-infected (particularly if the earth has been contaminated by animal faeces), is deep, suppurating, and contains dead tissue, there is a real risk that this terrible disease will supervene. In America, burns contracted in streets or gardens from fireworks on Independence Day have been a potent source of infection. The heavily manured soil of Flanders gave rise to a serious outbreak amongst the wounded in the early stages of the Great War. About 15 per cent of the wounds contained the bacilli. Some German and French figures, quoted by McConkey, go to show that of 83,000 wounded, before antitetanic serum came into routine use, 0.65 per cent developed tetanus. In the Franco-German war of 1870 the German figure is given as 0.36 per cent; in the Crimean war, amongst 12,000 English wounded, 0.15 per cent.

Both in animals and in man (Semple), intramuscular injections of quinine appear to have the property of lighting up the activity of tetanus germs buried in some old healed wound.

Wounds of the leg appear to be more likely to lead to the disease than those of other parts.

Wounds that are already granulating are not easily infected.

The commonest day to show symptoms is the tenth; after the third week the risk is very small, but a case has been recorded as late as 365 days after receipt of the wound (Bruce).

**Prevention of Tetanus.**—Tetanus may be prevented to a considerable extent by early and efficient treatment of the wound, and by giving a prophylactic dose or doses of antitetanic serum.

The most important factor in the treatment of the wound is the excision of damaged tissues, removal of foreign bodies, and provision of good drainage. By this means suppuration is controlled, and the niches of the tetanus germ in dead muscle or clot removed. Antiseptics are of much less value. Carbolic acid (1:20) takes fifteen hours to kill tetanus spores; pure phenol is no better (Embleton). Eusol is said to kill in a few minutes. Hydrogen peroxide appears to be of some value.

There is clear evidence of the value of prophylactic injections of 500 units (I.S.A.) of antitetanic serum. Deaths from Independence Day tetanus rose to 117 in 1903. A campaign in favour of the use of serum injections for the burn was inaugurated by the American Medical Association, and the figure fell to 6 deaths in 1912 and 3 in 1914.

During the present war the incidence of tetanus has undoubtedly become much less since serum has been used as a routine prophylactic, but reliable statistics bearing directly on this point do not appear to

be available. Wolf describes what he has seen in a stationary German field hospital on the Western front; before December, 1914, without antitoxin, 4.4 per cent of wounded developed tetanus; in the seven months following, all grenade and shrapnel wounds getting antitoxin, the incidence fell to 0.16 per cent. Far more cases of the disease were seen in England during September and October, 1914, than in the following months; but this may be partly due to differences in evacuation.

The immunity has been shown experimentally to last only about a week. It is therefore probable that much better results will be obtained when antitoxin is repeated weekly so long as a dirty deep wound is present.

The serum treatment has certain drawbacks, especially when given by the intraspinal or intravenous routes. An urticarial rash several days later is common. If the serum is infected, suppuration may follow. If the patient has had horse serum—whether with an antitoxin or otherwise more than ten days previously, anaphylactic symptoms may follow, and two or three deaths are on record; this may be avoided by giving fractional doses.

There are cases recorded by Simon and others, of which the writer has seen one, in which within twenty-four hours the serum causes trismus, which looks very alarming. They recover in a day or two.

**The Prognosis in Declared Tetanus.** The pre-war mortality of tetanus was about 83 per cent of acute, and 41 per cent of chronic cases. In Italy, judging by published statistics, it appears to be a good deal less. In Denmark, the figure is given as 79 per cent (Permin, 190 hospital cases).

In individual cases, several factors have to be considered.

*Age and sex* are not important.

*The incubation period* is significant. Permin quotes:

Incubation period of 10 days or less,	94 cases,	94.7 per cent died
.. .. over 10 days,	57 ..	70.2 .. ..
.. .. unknown,	48 ..	58.3 .. ..

In Sir David Bruce's first series (234 cases):

Incubation period of 10 days or less,	63.6 per cent died
.. .. 11th to 25th day	39 .. ..

When there is no history of a wound, or a very remote one, the majority get well.

*Survival Period.*—Hippocrates pointed out, and my experience in a series of 28 cases at the Bristol Royal Infirmary confirms his statement, that if the patient survives the fifth day the chances are slightly in favour of recovery. After ten days the probabilities are great.

*Second Attacks.*—French authorities quote four or five instances of these. Some die; some recover.

*Severity of the Symptoms.*—It is most difficult to judge of the prognosis from these, unless the case is abnormally slight or abnormally



severe. Frequent or powerful spasms, indicating involvement of the cerebrum, as well as the spinal cord and mid-brain (which are responsible for the tonic condition), are almost a death warrant. High fever is a bad sign. There is sometimes a delusive temporary improvement on the third day, followed by death.

In the cases that will recover, there are usually few and slight spasms, or none at all.

Recovery is slow; the patient may lie still for a month or more, the masseters relaxing last.

There is a type of *local tetanus*, lately recognized, especially by French writers (Courtellemont, Montais and Broca), Napier Burnett and Tulloch, and Ritson, in which, after a wound of a limb, there is persistent spasm and rigidity, with exaggerated reflexes, even under an anæsthetic. This may last many months, but is not usually fatal. A similar condition is met with after injecting tetanus toxin in small animals.

According to French war experience, the Rose cephalic type, associated with facial palsy, is rather favourable.

**Prognosis as Influenced by Treatment.**—Patients who have had antitetanic serum as a preventive do better than those who have not. In Sir David Bruce's first series of 231 cases in English base hospitals, August, 1914, to August, 1915, 57.7 per cent died. Only 37 had had antitoxin, and only 8 on the day of the wound; of these 37, 51.3 per cent died. In his third series, August to October, 1916, 200 cases, the results are better:—

1st series: 231 cases, 57.7 per cent died:	37 had had serum, 51.3 per cent died
3rd series: 200 .. 36.5 ..	102 .. .. 27.3 ..
	87 perhaps .. .. 44.8 ..
	11 had not had serum, 54.5 ..

It must be remembered, however, that these figures might be vitiated by the time factor. If cases are kept longer in France now, as is very possible, the later series would represent patients with a longer incubation period, and therefore a milder type. This would not explain the difference in mortality between the inoculated and non-inoculated. A recent series of 160 cases from base hospitals in France shows a mortality of 72.7 per cent (Leishman and Smallman). It is not very conclusively proved, therefore, that prophylactic antitoxin makes for a milder attack, although this is probable.

**Curative Value of the Antitoxin after the Symptoms have Appeared.**—This is still in some doubt. Many observations have been made to find the best method of administration. Both in experimental animals and in man the value of the serum is much less after the onset of symptoms than as a prophylactic, because the tetanus toxin is already bound to the nerve-cells.

A table of reliable statistics collected by Permin from the records of Danish hospitals shows:

Treated with nit antitoxin, 199 cases, 79 per cent died
.. with .. 189 .. : 58 ..

*Route of Injection.* Park and Nicoll injected twice the fatal dose of tetanus toxin into guinea-pigs, and seventeen to twenty-four hours later gave an antitoxin by various routes, with the following results:—

6	guinea-pigs	were	treated	subcutaneously,	6	died
15	"	"	"	intracardially,	13	"
16	"	"	"	intraspinally,	3	"

There is some human evidence that the intraspinal route is the best, as shown in the accompanying table. Sir David Bruce's careful statistics are specially trustworthy. The usual dose is 3000 units, and it may well be repeated, under an anaesthetic, supplemented by injections of serum subcutaneously.

TREATMENT OF TETANUS WITH ANTITOXIN.

Author	SUBCUTANEOUS		INTRAVENOUS		INTRASPINAL		INTRACEREBRAL	
	Cases	Mortality PER CENT	Cases	Mortality PER CENT	Cases	Mortality PER CENT	Cases	Mortality PER CENT
Bruce: 1st series	116	60.3	24	7.5	215*	45.2	—	—
Von Graff	—	—	—	—	—	—	88	80
Hofmann	13	54	—	—	16	12	—	—
Rogers	—	—	7	43	—	—	—	—
Ashurst	—	—	23	56	—	—	—	—

\* Some of these were intravenous or intracerebral injections.

Sir David Bruce's third series, however, does not show any advantage for the intraspinal over the other routes, so the point cannot be regarded as settled.

Intracerebral injection is dangerous, and has led to abscess of the brain. Neither it nor the intravenous route presents any advantage. Sir David Bruce cannot find any evidence from his statistics that colossal doses give any better results, but before the war Jacobsen and Pease cured 15 cases out of 20 by this means. Their patients, however, seem to have suffered from a mild type of the disease.

*The Carbolic-acid Method* has been severely hit by war experience. Baccelli, its author, quoted 92 out of 94 'severe' cases recovering, and 16 out of 38 'very severe.' Apparently no mild cases were treated! The figures were obtained by a most misleading method—picking out from the literature isolated reportings of one or two cases treated by a host of Italian doctors. Tetanus also seems to be comparatively mild in Italy. Sir David Bruce quotes 33 war cases; 63.6 per cent died.

*Magnesium Sulphate Injections into the Spinal* There are also falling into disrepute, because several cases of fatal respiratory failure have occurred. Sir David Bruce reports 9 cases, with 7 deaths. Phillips had 7 cases, with 3 deaths.

Rest, quiet, and sedatives, especially chloroform, appear to make the patient more comfortable, and probably improve the prognosis. It would seem to be dangerous to attack the wound during the presence of symptoms: theoretically, this might cause more toxin to be absorbed.

REFERENCES. McCoukey, *Brit. Med. Jour.*, 1914, ii, 609; McCoukey, *Ibid.*, 1915, ii, 849; Bruce, *Ibid.*, 593; Bruce, *Ibid.*, 1917, i, 888; Wolf, *Monat. med. Woch.*, 1915, No. 39; Browning, *Brit. Jour. Surg.*, 1916, July, 14; Pernu, *Mitteil. u. d. Grenzgeb. d. Med. u. Chir.*, 1914, xxvii, 1; *La Pratique de la Chirurgie de Guerre*, 1916, p. 51; Burnett and Tulloch, *Brit. Jour. Surg.*, 1916, July, 43; Risso, *Ibid.*, 49; Park and Nisoll, *Jour. Amer. Med. Assoc.*, 1914, July 18; Hofmann, *Brit. J. Clin. Chir.*, 1907, iv, 697; Ashhurst, *Amer. Jour. Med. Sci.*, 1913, cxlvi, 77; Baccelli, *Berl. Klin. Woch.*, 1911, xlviii, 1021; Phillips, *Proc. Roy. Soc. Med. (Ch. J. Sect.)*, 1910, ii, 39.

A. Rendle Short.

**THORACIC DUCT, WOUNDS OF.** Very alarmist reports have been given in the past as to the probable fatal consequences of this accident. In actual practice, however, it is certain that no serious harm need be anticipated. Apparently the chyle finds its way into the veins by some alternative channel. Zesas has collected the records of 49 cases from the literature, of which 5 died; but only in one of these, and that doubtfully, had the accident anything to do with the fatal issue. Gauze plugging sufficed to cure most; some required ligature.

In a case recently reported by Mr. Harrison, of Hull, the duct was implanted in the external jugular vein with success. He gives some account of the literature.

REFERENCES. Zesas, *Deut. Zeits. f. Chir.*, 1912, 197; Harrison, *Brit. Jour. Surg.*, 1916, iv, 394.

A. Rendle Short.

#### TIC DOULOUREUX. (See NEURALGIA.)

**TONGUE, CANCER OF.**—Cancer of the tongue and floor of the mouth is one of the most malignant forms of epithelioma, and although there has been a considerable improvement of late in the results of treatment, the outlook is much graver than in cases of cancer of the lip or breast. The prognosis may be considered under the following headings:

1. **Prognosis Apart from Operation.**—It is doubtful if any authentic cases have ever recovered, and it is very unusual for the patient to live more than two years. Not uncommonly the period may be as short as a time as six months. Patients are sometimes extraordinarily inobservant, and may appear to notice nothing wrong until within a few months of the end. The average duration of life, in cases not operated on, may be taken as about fourteen months from the first onset of symptoms (Rowntree, average of 90 cases). In 37 cases operated on but recurring, the duration of life was seventeen months; but possibly these were rather slower growths from the outset.

The cause of death is nearly always from lung troubles such as septic pneumonia or abscess (114 cases out of 146 autopsies—Rowntree). A few (9 out of 146) die from hemorrhage. Secondary growths in the

neck are almost constant: in the viscera they are rare. In 147 autopsies Rowntree reports the following metastases: liver in 8 cases: lungs in 7: pleura, kidney, and larynx, 4 each: suprarenal, 3.

The patient's last few months of life are generally very miserable. The foul, ulcerous mass in the mouth, profuse salivation, pain in the tongue and ear, and inability to talk, constitute the principal part of his sufferings. The glands of the neck form a huge adherent mass which occasionally suppurates and fungates, or may press on the air-passages: but it is well known that death from glandular involvement is far less terrible than that from the growth in the tongue. Palliative methods of treatment, such as cutting the lingual nerve, give only a brief and partial respite. Radium is less effectual for cancer in this than in other situations, and seldom delays the growth much.

2. **The Mortality of Operation**—It will be obvious that this will vary much according to the type of operation performed, the state of the mouth as regards sepsis, and the stage which the growth has reached.

A considerable body of reliable statistics is now available, from which we may judge of the mortality with accuracy. Some of them are hospital figures, probably the best information obtainable. Others are the results of individual operators, which do not appear to be fabricated in any way, and a few are collected from the literature, which is always unreliable as an indication of mortality, because successes are reported while failures are not.

Table 1.—MORTALITY OF OPERATIONS FOR CANCER OF TONGUE.

Author (Hospital)	Whitcomb (1887)		Whitehead (1894)		Kemp (1895)		Carr (1897)	
	Cases	Per cent	Cases	Per cent	Cases	Per cent	Cases	Per cent
Rowntree, Middlesex (glands usually left)	109	10.9			32	28.1		
Whitehead (tongue only)	116	2.6						
Do. (all operations)	139	14.3						
Massachusetts	20	5			29	10.3	9	33
Boyd and Erwin			33	24.2				
Lürsch, Vienna			49	25				
Lürsch, German and Swiss literature			306	16				
Carr (all operations)			47	14.8				
Butlin			197	10				
Do. from literature, 1887							47	27
Bristol Royal Infirmary	12	8.3	17	5.8				
Probable average		5		15		18		30

Simple removal of the tongue, or rather of half the tongue in the great majority of cases, without touching the glands of the neck, appears to have a mortality of about 5 per cent, though Whitehead reports a long

series in which he only lost 2.6 per cent. He also gives figures inclusive of all his operations (Syme's method, etc.), with a mortality of 14.3 per cent. Rowntree's figures for the Middlesex Hospital do not distinguish between the many in which the neck was untouched, and the few in which all the glands were cleared. His statistics relate in part to the surgery of many years ago, and for these two reasons the figure, 10.9 per cent, is too high. The Bristol and Massachusetts Hospital patients are but few.

In the cases included in this table, laryngotomy and tracheotomy were not performed.

*Removal of Half the Tongue, followed by Clearing the Glands of the Neck.* This, which is now regarded as the best form of treatment in ordinary cases, has a mortality probably of about 15 per cent in cases where the two operations are performed at the same time; when they are separated by an interval, it is perhaps no more than 5 or 10 per cent, as in Butlin's and the Bristol figures. Some of the deaths in Card's cases appear to refer to Syme's operation. The German and Swiss figures lack details of method, and in the Vienna statistics given by Ehrlich, the neck and tongue were usually cleared at the same time. Butlin records 22 cases with 4 deaths when both were dealt with at once, and 18 cases with only 2 deaths when there was an interval of a few weeks.

*Kocher's Operation.* Few modern statistics of this method, in which the tongue is removed by the submaxillary route, appear to be available. The Middlesex Hospital figures, in which the operation was reserved for bad cases, show a mortality of 28.1 per cent. At the Massachusetts Hospital, where it was resorted to much more freely in comparison with other methods, only 10 per cent died.

*Syme's Operation.* When the jaw has to be divided to remove the cancer, the outlook is necessarily grave. The few available figures suggest a death-rate of 1 in 3 or 1 in 4.

**The Prospects of Cure.** We are now in possession of sufficient evidence, from a variety of sources, to be able to judge of the prospect of a lasting cure, and as we have hospital figures as well as those of individual surgeons, we may accept them with some confidence. If recurrence is going to take place in this particular form of cancer, it almost always does so in less than three years.

Taking all cases and all operations together, it will be seen that the percentage of patients cured is probably from 15 to 20. Butlin's extensive figures give a much better result than this, but hospital statistics are less favourable than his.

It makes a great difference to the prognosis whether or no the neck is cleared of glands as a routine, even when no enlarged glands can be felt. Thus Butlin reports: glands left, 29 per cent cured; glands removed, 42 per cent cured. In our Bristol figures, the writer finds: glands left, 8 per cent cured; glands removed, 41 per cent cured. Several operators fail to get such good success in spite of clearance of the neck. The Vienna figures are very poor (13 per cent cured):

Ehrlich's report of German and Swiss literature shows that of 306 cases, 19 per cent were well three years, and a further 11 per cent still free from recurrence for a shorter period.

Table II. — PROSPECT OF 'CURE' AFTER OPERATIONS FOR CANCER OF THE TONGUE.

Name of Hospital	Operation performed	Cases operated	Free from recurrence	Time (in years) followed
Bath	All operations	175	31	3
Do.	Tongue only removed	41	29	3
Do.	Tongue & glands removed	57	42	3
Massachusetts Hospital	Tongue removed, glands usually left	58	17.2	3
Boyd and Unwin	Tongue & glands removed	31	19.3	1
Carl	Tongue & glands removed	25	16	3
Ehrlich, Vienna cases	Tongue & glands removed	49	13	3
Ehrlich, from German and Swiss literature	Sometimes glands also removed	306	19	3
Bristol Royal Infirmary	All cases	29	11.4	3
Do.	Glands left	12	27.5	2
Do.	Glands & tongue removed	17	8	2
			41	2

We may conclude that about a third of cases operated on by removal both of tongue and neck glands will be cured. This is a much better result than was obtained years ago.

Information as to the prospect of cure in special circumstances is not so complete. When it is necessary to split the jaw (Syme's operation), recurrence is very probable. Of 5 Bristol cases and 9 Massachusetts Hospital (14 in all) not one was cured. Statistics of Koehler's operation do not appear to be available.

In almost all the patients mentioned in the table, only half the tongue was removed. Probably slightly better results could be got, at the cost of severe crippling, by a total removal. As Lenthal Cheate has pointed out, surgeons have not been in the habit of removing the half-tongue deeply enough. The geniohyoglossus should be taken.

When glands are palpable in the neck, the outlook is very grave, but not hopeless: the Massachusetts records show six cured in spite of this sign. In one of our Bristol cases the glands proved to be tuberculous. Operation for recurrence occasionally gives a cure. Bullin records two living respectively 8 and 13 years, out of eight operations for recurrence in the neck glands.

**The Time and Situation of Recurrence.** In modern practice, recurrence in the neck and in the mouth occurs with equal frequency. In older days, such as is represented by the Middlesex Hospital figures, which go back for many years, a more restricted removal was attempted and local recurrence was commoner.

Rowntree found that glandular recurrence averaged seven months

after operation, and local recurrence six months. In two of our Bristol cases there was freedom from symptoms for nearly three years, one recurring in the tongue and the other in the neck.

Table III. SITE OF RECURRENT.

Source of Report	Cases	Recurred in Tongue	Recurred in Neck
Rowntree, Middlesex Hospital	90	33	57
Bothin	90	45	45
Bristol Royal Infirmary	14*	7	6

**The Condition after Operation.** Removal of half the tongue usually makes but little difference, eventually, to the speech. One of our Bristol cases, a schoolmaster, could talk perfectly. Swallowing is also unaffected. It must be admitted that if the geniohyoglossus is removed, speech is more seriously affected. Even after bilateral removal the patient may be quite intelligible, but there is of course marked speech defect in these cases. One can almost always promise that the speech will be interfered with much less by the operation than by the progress of the growth.

If there is no local recurrence, the patient's condition is undoubtedly far less miserable than it would have been apart from the operation, because the glands of the neck do not give rise to the same pain and horrible fetid mouth condition. Even if the cancer returns in the mouth, there is often six months or more of comfort first.

REFERENCES. Rowntree, *Arch. Middlesex Hospital*, 1916, vii, 131; Whitehead, *Practitioner*, 1903, lxx, 585; Greenough and others (Massachusetts Hospital figures); *Boston Med. and Surg. Jour.*, 1909, clx, 503; Boyd and Cowan, *Practitioner*, 1903, lxx, 626; Clibb, *Arch. f. Clin. Chir.*, 1909, Bd. 88, s. 127; Caud, *Educ. Med. Jour.*, N. S., vi, 1911, 5; Bothin, *The Operative Surgery of Malignant Disease*, London, 1900, 2nd ed., 150; Bothin, *Brit. Med. Jour.*, 1909, i, 4; A. Rendle Short, *Brit. Med. Jour.*, 1912, i, 877 (an amplified account is here made use of).

A. Rendle Short.

**TONGUE, PAPILLOMA OF.** This condition very seldom gets well apart from treatment, but an early free removal usually leads to cure. It must be borne in mind, however, that in persons over forty the majority of these cases undergo malignant changes, and what appears to be a simple tumour often returns in a few months or years.

A. Rendle Short.

**TONGUE, SARCOMA OF.** There are about fifty cases of this rare disease in the literature, but probably only about thirty are worthy of acceptance. The outlook is not so grave as in sarcoma generally, and is better than that of cancer of the tongue. Of 26 cases followed after removal, 11 were cured (7 over three years) and 13 recurred.

REFERENCES. Fripp and Jocelyn Swan, *Practitioner*, 1903, lxx, 673.

A. Rendle Short.

**TRIGEMINAL NEURALGIA.**—(See NEURALGIA, TRIGEMINAL.)

**TROPICAL FEVERS.**—The more important fevers of the tropics are dealt with under their respective names. Those with little or no mortality are the following.

**Three-day or Pappataci Fever** is of common occurrence in North-West India and around the Mediterranean Sea, but is unattended with mortality unless it happens to complicate some more serious disease.

**Dengue Fever** (with which may be included the seven-day fever described by Rogers, which many authorities consider to be sporadic dengue) also has no mortality except rarely in old or feeble subjects, but may leave much debility.

**Malta or Undulant Fever** is a more serious affection, on account of its long duration and occasional severity. Hughes found its mortality in military hospitals in Malta to be but 2 per cent, although it has been stated to be as high as 9 per cent among the civil population of the island, who are less favourably placed regarding treatment. A malignant type of the disease, with a typhoid-like temperature, dry tongue, and tendency to hyperpyrexia, caused over three-fourths of the mortality within a month or two of the onset, while the remainder occurred in relapses with debility and anæmia.

A gradual decline of the temperature to subnormal, with a clean tongue, usually indicates the termination of the disease. The discovery that the infection is carried by goat's milk has led to the disease being practically eradicated from the military forces at Malta. Serum treatment has not been successful, but recently sensitized vaccines have been reported on favourably. *Leonard Rogers.*

**TRYPANOSOMIASIS AND SLEEPING SICKNESS.**—This is one of the most deadly diseases known, although apparent recoveries have been recorded in patients treated in the early stages: but when the organisms reach the cerebrospinal membranes in the later stage of sleeping sickness the disease is always fatal within a few months. In the earlier stages the prognosis varies in the two types of the disease, that due to *T. gambiense*, occurring in the more northern parts of Africa, being less virulent than the type caused by *T. rhodesiense* of more southern Central Africa, which is almost invariably fatal within a few months, while no recovery has yet been reported. The first type, however, often lasts for several years, and a few cases have been recorded in which, under prolonged treatment with arsenical and antimony preparations, the parasite and fever have remained absent and good health been maintained for a number of years, with a fair prospect of the recovery being permanent. *Leonard Rogers.*

**TUBAL DISEASE.**—(See SALPINGITIS.)

**TUBAL PREGNANCY.**—(See ECTOPIC PREGNANCY.)



**TUBERCULOSIS.** (*See* ARTHRITIS, CECUM, ENTERITIS, EPIDIDYMITIS, LYMPHADENITIS, AND PERITONITIS, TUBERCULOSIS; LARYNX, TUBERCULOSIS OF; PULMONARY TUBERCULOSIS.)

**TYPHOID FEVER.** — There are several factors which influence the prognosis in this disease, and the most important of them are: (1) *The age of the patient*; (2) *The sex*; (3) *The character of the attack*; (4) *The presence of certain symptoms*; (5) *The occurrence of certain complications*; and (6) *The treatment*.

1. **Age.** The following figures, derived from the records of 21,371 patients admitted into the hospitals of the Metropolitan Asylums Board during the years 1871 to 1907, indicate to what extent age is of importance in prognosis in respect of recovery:—

FATALITY ACCORDING TO AGE.

Age	Female Per cent	Male	Total Per cent
Under 5	9.6	10 to 34	24.3
5 to 9	7.6	35 to 39	25.5
10 to 14	10.4	40 to 44	27.1
15 to 19	15.7	45 to 49	28.0
20 to 24	18.8	50 to 60	32.4
25 to 29	22.5	and upwards	

From this table it will be seen that the most favourable ages are those between five and ten years, and those under five the next most favourable. Over ten years, the fatality steadily increases from 10.4 to 32.4 per cent as the age rises. One of the reasons for the lower fatality under ten is the infrequency of the serious complications of hæmorrhage and perforation at those ages; from which fact it may be inferred that deep and extensive ulceration of the bowel is not so common in children as in adults.

2. **Sex.** The prognosis is, on the whole, slightly more unfavourable in the male than in the female sex. The total fatality of the 21,371 cases quoted above was 16.3 per cent; amongst these, the fatality for males was 16.8 per cent and for females 15.9 per cent.

3. **Character of the Attack.** All who have had a wide experience of typhoid fever recognize that the clinical characters of the cases which come under their observation vary considerably from time to time. In some years the disease is more fatal than in others. Thus, at the Eastern Hospital, Hammersmith, the annual fatality has varied during the course of twenty-one years from 6 to 28 per cent. The variation has been quite irregular. The incidence of complications also varies in much the same way. Doubtless there are several factors which have an influence on the character of the attack. Age has already been mentioned. Besides this, there are the factors of the

virulence of the particular typhoid bacilli concerned, and the resisting power of the patients. Possibly, too, the dosage (i.e., the number of the bacilli with which the patient has been infected) is of importance. There are reasons for believing that the larger the dose is, the shorter is the incubation period and the more severe the attack.

4. **The Presence of Special Symptoms.** The following symptoms must always be regarded with apprehension: A continuously frequent pulse, 130 to 140 or over, more especially if it is at the same time dirotic (a dirotic pulse, provided that the pulse-rate is not too frequent, is not necessarily a bad sign); cutaneous hemorrhages; cyanosis, which may be due either to a failing heart or to hypostatic congestion; coma or semi-coma, with muttering delirium and substultus tendinum; frequent action of the bowels, with loose and offensive stools; tympanites; a dry, fissured tongue; involuntary passage of the urine and faeces; a strong presentiment of death.

A continuously high temperature (103° to 104° F.) is not of necessity unfavourable, unless accompanied by some of the symptoms just mentioned. But if the temperature shows no signs of falling after four weeks of illness, the outlook becomes less bright. A rigor, though an alarming symptom, is, on the whole, not an unfavourable one, unless it is accompanied by symptoms indicative of perforation, of which it may be one of the signs. Rigors occur under a great variety of conditions in typhoid fever. Often they are entirely inexplicable. A rigor during convalescence may be the herald of a relapse.

It has been shown by Harold Scott that the prognosis is aided by a careful study of the serum (Widal) reactions. It is well known that the property of agglutinating the specific bacilli is not usually present, at any rate in any marked degree, during the first few days of the illness. According to Scott, in a case of average severity the reaction is usually quite distinct by the seventh day of the fever. If it occurs as early as the third or fourth day, the case is most likely to run a mild course. On the other hand, if the appearance of the reaction is delayed to beyond the end of the first week, the case is likely to be very severe. In some of the most serious cases the reaction continues to be negative for some three or four weeks after the beginning of the illness.

5. **Complications.**—The occurrence of almost any complication affects the prognosis unfavourably, even though it may be to a slight degree only, because it prolongs the course of the illness and keeps up the risk of additional complications. But some are much more grave than others. The two worst are perforation and hæmorrhage.

*Perforation* is by far the most serious complication of typhoid fever, and accounts for a fourth to a third of the total number of fatal cases. It occurred in 3.41 per cent of 8997 cases which were under treatment in the hospitals of the Metropolitan Asylums Board during the ten years 1900 to 1909; but the incidence varied in different years from 2.7 to 5.1 per cent. Unless remedied by operation, perforation is

nearly always fatal, for not more than 1 per cent of the cases recover. Usually, death from peritonitis results in three to four days from the perforation, but occasionally the fatal event is due to collapse, and may occur within a few hours or even minutes. Further consideration of this complication will be given later when the treatment is being discussed.

Occasionally one is able to diagnose *peritonitis* without being certain that it is due to perforation. But the former is as grave a complication as the latter, because it is nearly always due to it, though the symptoms may not be clear.

The symptoms of perforation are: sudden, and often (but by no means always) severe, pain in the abdomen, especially in the right iliac region; pain on palpation of the abdomen; alteration in the condition of the abdomen, usually in the direction of some distention; rigidity of the abdominal wall, especially on the right side; thoracic respiration; an increase in the pulse-rate; a sudden rise or fall of temperature; occasionally vomiting and a rigor; collapse.

*Haemorrhage from the bowel* is, next to perforation, the most serious complication. It is considerably more frequent than the graver event, and was observed in 9 per cent of the cases referred to above. In these statistics, only those cases of haemorrhage are included which were sufficiently severe to call for treatment. Both haemorrhage and perforation are met with in the most serious cases of typhoid fever; and neither of them can occur except when the bowel has been deeply ulcerated. Haemorrhage is seldom fatal of itself at any rate immediately; but a repeated loss of moderate amounts of blood weakens the patient, and so conduces to and hastens a fatal termination. As bleeding in any considerable amount cannot take place unless the bowel is deeply ulcerated, it is not surprising to find that perforation is preceded by haemorrhage in not a few cases; I have seen it in about one-fifth of the cases of perforation at the Eastern Hospital. Profuse arterial is more serious than profuse venous haemorrhage. Occasionally haemorrhage is concealed, that is to say, the blood does not pass per anum. In that case it may be diagnosed by the occurrence of pallor, restlessness, a frequent, feeble pulse, collapse, and sighing respiration. The combination of these symptoms is most serious.

None of the remaining complications of typhoid fever, whether serious or not, are at all frequent: they do not exceed 3 per cent. The most grave are *lobar pneumonia*, *meningitis*, and *nephritis*. These are dangerous to life. *Ulceration of the larynx* is usually met with in severe cases only. If the patient recovers, permanent stenosis of the larynx may remain. *Haemorrhagic typhoid fever*, in which cutaneous and subcutaneous haemorrhages and bleeding from various mucous membranes occur, is almost invariably fatal.

A *relapse* is to be expected in about 10 per cent of the cases. Usually it begins within three weeks of the final cessation of the fever. In a few cases, however, I have known a relapse to occur after a longer

interval, even six weeks. It is impossible to prognosticate the occurrence of a relapse with any degree of certainty; but J. D. Rolleston states that the diazo-reaction reappears at its commencement, and that the disappearance of the abdominal reflex is also a warning. This reflex vanishes during the acute stage of most cases of typhoid fever, but reappears when the temperature has become normal. The fatality of relapses is about half that of primary attacks; and they are less likely than the latter to be accompanied by complications.

There are a few complications which are prone to show themselves more often during convalescence than during the febrile stage of the disease. Of these the most common are *venous thrombosis* and *acute periostitis and necrosis*. They occurred respectively in 2.3 and 1.2 per cent of the cases referred to. The former may follow an acute phlebitis, which may arise in almost any vein, but is met with most often in one of the veins of the leg. But most frequently thrombosis is due to a combination of a sluggish circulation and an altered condition of the blood. The veins most frequently affected are those of the left thigh and leg, which become swollen. It is usually months, and it may be years, before the limb regains its normal state. Sometimes the oedema is permanent. In this complication there is always some risk of the detachment of a fragment of clot, and therefore of pulmonary embolism or cardiac thrombosis; but fortunately these results are rare.

*Acute periostitis*, which may result in necrosis of the underlying bone, may arise at any time after the acute stage of typhoid fever. Usually it comes on within the first few weeks, but it has been known to show itself years after an attack. Sometimes a definite sequestrum forms; in others, the necrosed bone crumbles, and these cases are prone to become tedious and to resist treatment. The bones most frequently affected are some of the long bones, especially of the leg; but almost any bone in the body may be the seat of the inflammation. Rarely are the bones forming a joint involved, but when they are, the joint may be permanently damaged.

In *'typhoid spine'* there is a periostitis of the vertebrae. This complication is rare. It has been met with in the male more frequently than in the female sex. The course of the disease is prolonged, extending to several months or a year; recovery is usually complete.

In a few cases an attack of typhoid fever is followed by, or it would be more correct to say becomes merged in, one of *acute dementia* (mania or melancholia). As a rule this condition is connected with a very severe attack of the fever, but I have known it follow quite a slight attack. The prognosis is, on the whole, favourable, and the patient recovers in about a year's time.

*Influence of Pregnancy.*—I have had under my care 38 women who have been attacked by typhoid fever during pregnancy. Of these, 8 died, a fatality of 21 per cent, about the average rate amongst women of the child-bearing ages. Miscarriages or premature confinements took place in 27 instances; all the fatal cases occurred amongst

these 27. If a pregnant woman is attacked by typhoid fever before the child is viable, miscarriage is very likely to occur: in fact it did occur in 25 of 30 such cases. If she is attacked after the child is viable, there is a better chance of her going to full term; though even then the child may be weak and frail. Some of the women left the hospital undelivered. Supposing that each of them was subsequently confined of a healthy child, then, of 38 pregnancies, 8 ended favourably both to mother and infant. But certainly in 28 of the 38 cases the child was either born dead, or died within a few hours of birth. The prognosis, therefore, in the case of the child is bad.

6. **Treatment.** Of few, if any, of the acute infectious diseases of this country has more been written concerning treatment than has been written of typhoid fever. Baths (cold and warm), intestinal antiseptics, liberal feeding, semi-starvation, copious water-drinking, serum and vaccines, have all had, and still have, enthusiastic supporters, each of whom proclaims that his is the best treatment, and indeed the only one worthy of consideration. But unless the observer has at his disposal a very large number of cases, extending over a considerable series of years, the conclusions he draws from them are likely to be highly erroneous, on account of the natural variation in the severity of the disease from one year to another.

The most extensive series of cases in which a particular form of treatment was contrasted with another, is that given by F. E. Hare. Of 1828 consecutive cases treated during the years 1882 to 1886 in the Brisbane General Hospital, Queensland, by the 'expectant' method, 271 died, a fatality of 14.8 per cent. This is about the average fatality in most places under this form of treatment. Of 1902 consecutive cases treated in the same hospital during the years 1887 to 1896 with cold or tepid baths, 143 died, a fatality of 7.5 per cent. The variation in fatality in the first group was from 13.3 to 17.0 per cent, whereas in the second it was from 4.3 to 11.3; that is to say, the highest annual fatality amongst the patients treated with baths was lower than the lowest of those who underwent the 'expectant' method. These figures are strikingly in favour of the bath treatment. I cannot bring forward so large a series of cases; but, from my clinical experience, I am persuaded that the bath treatment is better than any other of those which have been given a fairly extended trial; and that, other things being equal, the prognosis is more favourable in cases which are bathed than in those which are not. But the bathing must be commenced fairly early in the disease.

The evidence as to the value of the specific methods of treatment by *antityphoid serum* and *vaccines*, including Besredka's sensitized vaccines, is still somewhat conflicting, though on the whole it is in their favour. Thus, among 1120 vaccine-treated cases collected by Callison and Walters, there were 71 deaths, a fatality of 6.3 per cent. Petrovitch (Serbia, 1916) has reported 2270 cases, with a fatality of only 2.7 per cent, whereas the fatality of 1020 cases treated by ordinary methods was 12.8 per cent. Other observers record encouraging

results. On the other hand, Whittington was disappointed with 230 cases treated with stock vaccines. My own experience with serum, and with stock, autogenous, and sensitized vaccines, injected subcutaneously, is that their action is very uncertain. Now and again a case is met with in which the fever appears to be brought to an end in a few days, in rare cases, indeed, very abruptly in a few hours; but in most of the cases no beneficial result has been observed.

As regards the *diet* of typhoid patients, there is evidence to show that the more liberal scale introduced again of recent years conduces to a lower fatality and complication rate, and to a more speedy convalescence, than does the exclusive, or almost exclusive, milk diet. Thus, Coleman, of New York, writing in August, 1907, reports the result in 44 patients, half of whom were placed on a liberal and half on a milk diet. The fatality of the former was 84 per cent, of the latter 47.6. To obtain the best results, the diet-scale should be carefully planned so that the patient receives the equivalent of 3000 to 4000 calories a day in various food-stuffs, given in proper proportions.

*Surgical Treatment.*—I am not aware that, in respect of the complications, there is any one treatment that is of more certain value than another, except in the case of perforation and peritonitis. It has been stated above that this complication is extremely fatal, and that not more than 4 per cent of those who fall a victim to it recover. That observation applies to cases which are not treated surgically. There can be no question, now, that the patient's chances of recovery are considerably enhanced if the peritoneal cavity is opened and the ulcer which has perforated is sutured. While the reports of published cases show that hardly any case is hopeless, yet there is one condition which especially makes for success, and that is that the operation shall be performed as soon as possible after the perforation has occurred. A few hours' delay will make all the difference. Therefore the physician must be constantly on the watch for the symptoms of perforation, and must be prepared to call the surgeon to his aid, not only as soon as he is fairly certain that there is perforation, but even when he can go no further than to state that most probably it has taken place. By operating early, the acute, caecal peritonitis that almost invariably follows perforation may be averted. It is true that the surgeon who makes a practice of operating early in perforation will occasionally meet with a case in which no perforation can be found, in which, indeed, no perforation has occurred; there may not even be peritonitis; experience, however, has shown that, in the majority of such cases, little or no harm is done; of 16 such cases reported by Gibbon, of Philadelphia, recovery took place in 10.

Another important factor which influences the prognosis of the operation for perforation is the condition of the patient at the time of operation. Those cases do best in which the patient has begun to convalesce when perforation has taken place; and the outlook is worst in those in whom it occurs during the height of the disease.

Still, no case should be looked upon as absolutely hopeless; and the only contra-indication to operation is a moribund state of the patient.

It is difficult to estimate the true recovery rate after laparotomy for perforation. Published statistics vary from about 8 to 50 per cent, but it is certain that more instances of successful than of unsuccessful cases are reported. The series which shows the best results is that published by G. E. Armstrong, of Montreal, in which there were 78 cases of operation, with 24 recoveries, a recovery rate of 30.7 per cent, an extremely good result. Gibbon has recorded 96 consecutive cases (in all of which perforation was found), with 17 recoveries, that is, 17.7 per cent. Of 107 consecutive cases operated upon in the hospitals of the Metropolitan Asylums Board during the nine years 1901 to 1909, 8 recovered, a recovery rate of 7.5 per cent. Only perforation cases are included amongst these. Armstrong's report does not state whether perforation was found in all his cases. The recovery rate is higher in cases of operation in which no perforation has occurred than in those in which it has occurred: in the latter case it probably does not exceed 20 per cent. But even the 7.5 rate quoted above is better than the 1 per cent of recovery in cases of perforation which are not submitted to operation.

**Antityphoid Inoculation.** The prognosis, both as regards protection from an attack, and recovery when attacked, is well illustrated by the figures which were published in May, 1913, by the Antityphoid Committee appointed by the Army Council in 1906. The committee investigated the histories of 19,314 soldiers, whose period of service abroad, in places where they were likely to be exposed to the infection of the disease, averaged twenty months. Of these soldiers, 10,378 were inoculated, and 8936 were not. The incidence of typhoid amongst the non-inoculated was 30.1 per mille, while amongst the inoculated it was only 5.39 per mille. In respect of the influence of inoculation on the severity of an attack, the committee investigated the histories of 258 cases of typhoid fever amongst these soldiers. Of these, 202 occurred in soldiers who had not been inoculated, and 56 in those who had been inoculated. The cases were divided into two classes, the mild and the severe (including the fatal). Amongst the inoculated men, 66.1 per cent belonged to the mild class, and 33.9 to the severe; while amongst the non-inoculated, 29.3 per cent belonged to the mild, and 70.7 per cent to the severe.

These figures may be supplemented by those derived from the experience of the present war. During the winter of 1914 and the spring of 1915, cases of typhoid fever, relatively few in number, appeared amongst the British troops in Flanders. Up to May 22, 1915, there were 827 cases. Of these, 508 occurred amongst the non-inoculated men, and 106 were fatal, a case-mortality of 20.8 per cent; while 319 occurred amongst the inoculated, and 22 were fatal, a mortality of 6.8 per cent. The incidence of attack was fourteen times higher amongst the non-inoculated than amongst the inoculated.

The British conclusions have been confirmed by the experience of antityphoid inoculation on a large scale in the armies of the United States, France, and Germany, especially the first of the three. Since the last quarter of 1911, antityphoid vaccination has been made compulsory for all persons in the military service of the United States under 45 years of age. The practice had been first employed on a small scale in 1909, and was voluntary up to the date just mentioned. Large numbers of men were vaccinated during 1910 and 1911. Before 1910 the number of cases of typhoid per mille of the mean strength varied from 3.1 in 1905 to 6.9 in 1902. In 1910 it was 2.4, in 1911 0.8, and in 1912 0.3, while for 1913 and 1914 it was less than 0.1. It is not certain, however, whether the whole of this improvement is due to inoculation.

E. W. Goodall.

**TYPHUS FEVER.**—The factors which must chiefly be taken into account in considering the prognosis in this disease are: (1) *The age*; (2) *The sex*; (3) *The habits and physical condition of the patient*; (4) *The occurrence of complications*; (5) *The presence of certain symptoms*; and (6) *Treatment*.

1. *Age.* The influence of age is well illustrated in the following table compiled by Murchison, which shows the facts in respect of 18,268 cases admitted into the London Fever Hospital during the twenty-three years 1848 to 1870:—

FATALITY ACCORDING TO AGE.

Age	Fatality per cent.	Age	Fatality per cent.
Under 5	6.69	40 to 44	30.79
5 to 9	3.59	45 to 49	42.54
10 to 14	2.28	50 to 54	49.62
15 to 19	4.46	55 to 59	53.96
20 to 24	10.33	60 to 64	60.25
25 to 29	15.47	65 to 69	75.53
30 to 34	20.55	70 to 74	72.62
35 to 39	25.92	75 & over	85.71

The fatality for all ages was 18.92 per cent.

From this table it appears that the fatality is moderate below twenty years of age, and is indeed low in the age-group ten to fourteen. There is a very considerable increase in the fatality after nineteen years of age, and a constant rise for every decennium after that. The disease is extremely fatal after the fiftieth year.

2. *Sex.*—Murchison's figures go to show that on the whole the disease is slightly more fatal in males than in females, the fatality being 19.67 per cent for the one sex and 18.92 per cent for the other. The difference is most marked at ages over forty-five. In children



from five to fourteen the fatality is rather higher in females than males.

**3. Habits and Physical Condition of the Patient.**—The prognosis is unfavourable in very fat and in big, muscular persons, in those of intemperate habits, and in those who are the subjects of chronic diseases, especially of the kidneys.

The influence of pregnancy is shown by the following figures. Of 107 pregnant women who came under Murchison's care at the London Fever Hospital, 49, or 45·8 per cent, aborted about the tenth to fourteenth day of the disease; 9 of those who aborted died, but the remaining 98 all survived. From these figures it appears that if a pregnant woman is attacked by typhus, she is very likely to abort; and that if she does so, the prognosis in her case becomes worse.

**4. Complications.**—Murchison stated that, in his experience, death in patients under fifteen years of age was almost always due to some severe complication. Fortunately, however, complications are not very common in this disease.

Those most frequently met with are *bronchitis* and *hypostatic congestion of the lungs*, and the occurrence of the latter augments the gravity of the prognosis. *Laryngeal inflammation and ulceration* is a rare but very dangerous complication. *Suppurating buboes* of the neck (due to inflammation of the parotid and submaxillary glands and the surrounding tissue) are relatively common, and usually add to the severity of the attack.

**5. Special Symptoms.**—The following are unfavourable symptoms: an abundant rash with a large proportion of petechiæ; cutaneous hæmorrhages; hypostatic staining of the skin; cyanosis; hurried respiration; profuse perspiration at the crisis; a pulse-rate persistently over 120, especially in adults; pronounced nervous symptoms, viz., sleeplessness for three or four days, delirium (especially violent), convulsions, coma, coma-vigil, muscular twitchings, hiccough, contraction of pupils to a pin-point; extreme prostration; a notable diminution in the amount of urine; a presentiment of death. The earlier severe cerebral symptoms appear, the worse the prognosis. It is a favourable sign if at the end of the first week the temperature drops a little, and still more so if it does not rise again before the crisis. On the other hand, it is very unfavourable if the temperature keeps steadily high, and especially if it rises and keeps up during the second week. An abrupt rise to 105° F. or more, just before the crisis is expected, is of very grave omen. Relapses are very rare.

E. W. Goodall.

#### ULCERATIVE ENDOCARDITIS — (See ENDOCARDITIS, ULCERATIVE.)

**UREMIA.** The prognosis in uræmia must always be guarded; as a general rule, it is very grave. Will the patient survive the immediate attack, and if so, will the condition recur?

In acute nephritis, when the patient exhibits all the phenomena of an acute inflammatory affection of the kidneys, with partial or total

suppression of urine, death may result from an initial convulsion; but if appropriate measures have been effective in controlling the convulsions, and if there be favourable response to further treatment, no more uræmic phenomena may develop, and the ultimate prognosis becomes that of an attack of acute nephritis, and may be entirely favourable.

In chronic nephritis, whether diffused or interstitial, the outlook is very serious. In the convulsive form, death may occur early from failure of heart and respiration during a convulsion, or the patient may die comatose after repeated convulsions. Even if temporary improvement takes place under treatment, recurrence of uræmia in some form is almost certain; and the prognosis is very grave, the fatal issue being, as a rule, only a question of weeks. When, in the uræmia of chronic nephritis, the onset of the nervous phenomena is gradual but progressive, the prognosis is immediately very unfavourable. The patient is, at first, merely dull and apathetic, possibly very irritable when roused; the kidney function is very deficient, and nitrogen retention is present. In a few days, apathy becomes more marked; the patient is difficult to rouse, and passes into coma; and a series of convulsions may precipitate the fatal issue.

Chronic uræmia, giving rise to alimentary symptoms, also justifies a very grave prognosis. The chronic nephritic who develops a dry, furred, cracked tongue, persistent vomiting, and possibly diarrhœa, is in a critical condition. In the dyspnoic form of uræmia, a fatal issue is probable; for even if there be favourable response to treatment, the kidney inadequacy is marked, and recurrence of uræmic symptoms is almost certain. Other phenomena of chronic uræmia, such as persistent headache, amaurosis, giddiness, paralytic phenomena, and marked insomnia, are all grave symptoms which point to pronounced deficiency of renal function.

*Francis D. Boyd.*

**URETERAL CALCULUS.**—(See KIDNEY AND URETER, CALCULUS OF.)

**URETHRA, RUPTURED.** *The immediate mortality* of ruptured urethra depends upon two factors: whether extravasation of urine has taken place, and whether there are other grave injuries, such as fractured pelvis. Apart from these, there is no great danger at the time.

In 205 literary cases, uncomplicated by other injuries, Kaufmann gives the mortality as 14 per cent, but only 91 of these had an operation within two days; of these latter, 9 per cent died. The deaths were mostly due to extravasation; when this had occurred, 36 per cent were fatal.

Martens records 17 patients, 4 of whom had fractured pelvis, who were operated on at once, and only 1 died. This would be more in accord with modern practice.

*The late result* is an intractable stricture. In the older surgery this was almost inevitable, but early operation does much to ward off the danger. Rutherford reports 7 cases treated promptly by perineal section and suturing; 5 remained free from stricture for years, but 2

developed a narrowing. Cabot followed 5 operation cases for five years, no stricture following.

REFERENCE. Thomson Walker, "Ruptured Urethra," *Burghard's System of Operative Surgery*, A. Reville Short.

**URETHRAL STRICTURE.** One of the axioms of the older surgery was, "Once a stricture, always a stricture," and it has even been suggested by a famous surgeon that maxims of this sort should be framed and hung up to adorn the walls of hospital wards instead of the texts which used to be customary! To-day, the axiom is not quite true.

Urethral stricture may come on at any time after an injury. It follows gonorrhoea at one of two periods, the first about two to four years after the attack, and the second between ten and sixteen years after. Traumatic strictures are usually worse than those due to gonorrhoea.

The dangers to which stricture may give rise depend entirely upon the willingness or unwillingness of the patient to allow proper treatment. Granted a willing patient, stricture need never cause any severe symptoms, except in old, neglected cases of long standing, and in a few of the worst of the traumatic strictures. In a careless or timid patient, of course, a long string of troubles may follow—attacks of retention, peri-urethral abscess, perineal fistula, cystitis, epididymitis, extravasation of urine, rupture of bladder, and septic pyelonephritis. Any of the last three may end fatally. A patient with stricture is in danger of his life when the urine is very foul, when rigors and fever follow attempts at instrumentation, or when the bladder remains full for days. Too rapid emptying, in such a case, will often lead to death from suppression. Other signs of renal infection are a fall in the urea output, wasting, sweating, thirst, and urinous odour of the breath.

Rupture of the bladder is a rare event in acute retention; more commonly the membranous urethra gives way, leading to extravasation of urine.

**The Effect of Treatment.**—*Rapid or continuous dilatation*, the routine treatment, is safe, except in patients whose kidneys are seriously involved, but it seldom, if ever, cures the stricture, and must be repeated at intervals of one to three months. Sometimes, however, it takes years for a well-dilated stricture to contract down sufficiently to trouble the patient much.

*Internal urethrotomy* is used by some surgeons where others would dilate. The mortality is about 1 per cent; of 1018 cases treated at St. Peter's Hospital, 0.78 per cent died, and of 1086 cases collected from the published records of various surgeons, 1.1 per cent died. In the great majority of cases well followed through, a subsequent dilatation will be found necessary at intervals of three to six months, but in rare cases it cures outright. On the other hand, a few patients need to have the operation repeated.

*External urethrotomy* seldom cures; it is now usually reserved for the

worst impassable strictures, and subsequent regular dilatation will be required. Sometimes the operation has to be repeated. The mortality in 100 cases at St. Peter's Hospital was 8 per cent (1895 to 1908), and older figures agree well with this.

*Eversion of the stricture* is sometimes a perfect cure, but the results are not always very satisfactory in the bad cases on which it is usually tried. Its success greatly depends on whether the urine is clean or foul. Many cases of permanent cure are, however, quoted by Thomson Walker from the literature.

REFERENCE. Thomson Walker, "Stricture," *Burghard's System of Operative Surgery*,  
A. Rendle Short.

**UTERUS, CANCER OF.** Two distinct clinical conditions require consideration under this head: (I) *Carcinoma of the cervix*, in which the results are by no means favourable, the cures not exceeding 25 per cent of all cases; and (II) *Carcinoma of the body*—a comparatively rare disease—where, on the other hand, the results may be said to be good.

#### I.—CANCER OF THE CERVIX.

It is necessary to consider the outlook both from the clinical side and also in relation to treatment.

Now the prognosis at the present time turns not only upon whether the case is operable, but upon whether it is eradicable. Even its more enthusiastic advocates do not advise irradiation in all cases, although in certain instances the growth has disappeared and not recurred in over five years.

**Prognosis in Relation to Clinical Conditions.**—The following points present themselves for consideration in any particular case: (1) The size of the growth; (2) Its extension; (3) The glandular enlargement; (4) The condition of the growth; (5) The general state of the patient.

1. *The size of the growth* is not *per se* a very good criterion as to operability; thus a comparatively large vaginal growth which is freely movable is sometimes seen, and merely indicates a slow-growing type—more especially in elderly patients; while a comparatively small cervical growth may yet be fixed. It is in relation to the degree of fixation that the size becomes important.

2. *Extension of the growth* superficially along the vaginal surfaces is fortunately not common, but when present it usually indicates some involvement of the wall of the bladder or rectum, so that such cases are no longer suitable for radical operation. Unfortunately, too, X-rays and radium, when applied to these cases, frequently give rise to fistulous openings.

As regards thickening, or apparent extension into the pelvic tissues in any direction, one must be careful to recognize that early fixation is an inflammatory process of a chronic nature, representing septic absorption from the growth, and practically always preceding an

extension of a growth. Clinically there is nothing more difficult than to decide whether the fixation present, be it to bladder, rectum, or pelvic wall, is inflammatory or malignant. In many cases the doubt will only be solved by an exploratory laparotomy with attempted removal of the uterus.

Thickening in the broad ligament, if well marked and extending right out to the pelvic wall, is likely at any rate to contain malignant cells in the portion adjacent to the uterus, and therefore more reliance is to be placed upon consolidation of the base of the broad ligaments. However, even in these cases the uterus may escape invasion, and be dissected out from a mass of growth during operation. It is probable that the rhythmic waves of contraction serve to protect it against invasion. The prognosis in such cases is not good, but life may be prolonged and made more comfortable by operative measures. Farrar Cobb<sup>1</sup> records a case in which the uterus was dug out, and the patient was alive and free from recurrence thirteen years later.

3. *The glandular enlargement* is only occasionally to be detected on examination. As a rule it is only noted during operation, and then as more commonly affecting the iliac and obturator group of glands. The enlargement of the lymph glands must not be taken as in all cases indicating malignant metastasis. Thus, some enlargement of the lymph glands is present in 90 per cent of cases, but evidence of malignancy, even after microscopical examination, only occurs in 15 to 20 per cent of cases operated upon.

4. *The condition of the growth* will often explain the cachexia. Foul, ulcerating growths, both by reason of the associated hemorrhage and the septic absorption, lower the resistance of the patient, so that the shock of an extended operation may prove too severe, or during convalescence a cystitis or pyelitis may determine a fatal issue.

Another serious risk is that during operation the peritoneum or operation area may become infected from the septic cervical growth, and so cause an acute peritonitis or a deep pelvic abscess. Probably at least 20 per cent of all deaths are to be attributed to this cause.

5. *The general condition of the patient* is often too readily dismissed with a cursory examination. Thus, until recently it was customary to regard a cachectic state as an indication of advanced growth, while another patient, fat and healthy looking, was considered as being probably in a less advanced condition. But this is by no means generally true; for the post-mortem records of cancer institutions show that not more than 50 per cent of the cases of cancer of the cervix die in a cachectic state, while the remainder are well covered, and in many cases even fat. Now in many of these latter cases the cause of death has been an ascending pyelitis supervening on a hydronephrosis and dilated ureter or ureters, the result of lateral extension of the growth. It is evident that cachexia is merely an accident of the disease, depending upon septic infection of the growth. Consequently, in judging of the risk of operation and the chances of complete cure, a careful examination is required which shall include investigation as

to the cardiac condition, the degree of anæmia, and above all, the renal sufficiency.

Further, it is to be remembered that a certain degree of fatness increases considerably the difficulty of complete extirpation and in consequence the risk of injury to the bladder or rectum, and also renders difficult the immediate arrest of hæmorrhage during the surgical procedure.

Nevertheless, it yet remains true, that in cases showing well-marked cachexia, with septic conditions of the growths, the prognosis is not good.

**Prognosis Apart from Treatment.**—Apart from treatment, the duration of life is usually from one to two years. Death may be due to anæmia and cachexia, or to uræmia. Sometimes the patient's end is less mercurial, and the scene is only terminated after months of pain, with bladder and rectal troubles. Peritonitis or pulmonary lesions are occasionally met with.

**Prognosis in Relation to Treatment.** The results of treatment by radical operation vary within certain limits according to the selection of cases, the extensive nature of the operation, and the removal of lymphatic trunks. Speaking generally, it may be said that a careful selection of cases will show a high percentage of cures amongst those operated upon; but the percentage will be low if all the cases seen are included; and if an extensive operation is performed, the immediate mortality is usually high.

*As to operability.* Mayer, in a large series of cases between 1902 and 1905, condemned 35 per cent as inoperable. This 65 per cent of operability represents a fairly average figure; but an idea of the variation may be gauged by the fact that many surgeons at the present day condemn 60 per cent as inoperable. In the Massachusetts General Hospital the surgical staff rejected 230 cases out of 367, or 62.4 per cent, as unfit for radical operation; and Farrar Cobb<sup>1</sup> records that he operated on 3 cases condemned as inoperable by other men, with the result that 2 were cured and the third died of recurrence nearly two years later. With many patients it may be said that it is impossible to decide without an exploratory laparotomy and attempted operation whether a case is operable or not; and as an instance, Farrar Cobb<sup>1</sup> quotes a woman alive and free from growth in whom, thirteen years before, he had 'dug' the ureter out of the parametric growth during the course of operation. The percentage of operability with the most expert surgeons now reaches 75 to 80 per cent of all cases.

*As to the type of operation,* in so far as 'cures' are concerned (that is, cases free from recurrence five years after operation), there is no doubt that the radical method known as Wertheim's hysterectomy holds precedence of place; unfortunately the immediate mortality is still high, although tending to diminish. Operation by the vaginal route is largely practised by Schauta. We subjoin figures comparing the results of Wertheim and Schauta, from which it will be seen that

the operative mortality in expert hands for the more extended abdominal operation need not be greater than that for the vaginal operation, while the end-results are much better, and the number of cases which are operable by the abdominal method exceed those operable by the vaginal route.

It would be easy to multiply statistics in which the literature of recent years abounds; but the figures of Wertheim and Sebanta represent the results of two specialists employing their own operative procedures, while the figures of Mayer, who used both methods, are more representative of the average results to be expected. It must be remembered that the two methods are not entirely antagonistic; for in certain cases, especially in fat patients, and in special instances of lesions in other organs, the vaginal route offers the best chance of recovery and cure.

Except in the presence of exceedingly early growths, hysterectomy is the only operative measure to be adopted. No less extensive procedure can be justified by its results.

#### RESULTS OF RADICAL OPERATION FOR CANCER OF THE CERVIX.

Reports	Cases	Survived Operated	Percentage	Operative Mortality	Percentage
			percentage		
Wertheim <sup>1</sup> (abdominal)	500	194*	38.8	250	57.6
Sebanta <sup>1</sup> (vaginal)	498	88	17.7	258	57.9
Mayer (both)	118	20.9	17.7	46	28.9

\* 30 per cent in first 100 cases; 9 per cent in last 150 cases.

#### Palliative Treatment (including x rays, radium, and mesothorium).

*Irradiation* cannot as yet be regarded as anything but a palliative measure, although it has resulted in some cures in isolated instances. The treatment is still of recent date, and the cases are comparatively few in number.

Bumm<sup>1</sup> well illustrates the effects of irradiation. He has obtained the uterus in five cases at varying periods after treatment. In each case some focus of disease remained, although in two of them it was only microscopically detectable. In the majority of cases the results depend upon the type of growth—that is to say, with a superficial papillomatous mass an excellent result will be obtained, simulating, if not actually producing, a cure; while in penetrating growths the external appearance of the cervix and the relief of symptoms will suggest a cure, but the growth proceeds in the depths and in the lymph tracts. The best results will be obtained where the cervix is eroded before applying the radium, so as to get greater and more widespread radiant effect.

A disadvantage of the treatment, as acknowledged by Degrais and Bellot,<sup>2</sup> is that there is a tendency to the production of fistule when

the growth has already invaded the vesical or rectal wall. Also there is often frequency of, and pain on, micturition, or rectal tenesmus, after the application.

Finally, it must be said that in inoperable cases both radium and mesothorium offer very good palliative treatment. Relief of symptoms and the effects on the growth itself are most marked. Unfortunately, facilities for such treatment are limited owing to the expense.

Of other palliative measures it is only necessary to mention two procedures.

*The use of the cautery* is often most beneficial in its effect, especially with the slow-growing superficial tumours. It helps to clear the growth, and formerly it was much more extensively employed. Wherever possible, however, radium is preferable.

*Ligation of the internal iliac arteries* for the continuous hemorrhage has in many instances caused complete relief from the bleeding, and the diminished blood-supply has seemed occasionally to retard the growth.

#### II. CANCER OF THE BODY OF THE UTERUS.

This is a comparatively rare disease, but the end-results are very much superior to those of malignant disease of the cervix. The frequency of the disease may be gauged from the fact that in 218 cases of uterine growth recorded by Mayer, only 37, or 14.9 per cent, were localized in the body.

**Prognosis from the Clinical Aspect.**—As a rule there is little in this respect upon which to base an opinion as to the outlook. In the first place, the diagnosis is frequently obscured by the presence of fibromyomata, to which are accreted the symptoms of the disease; in the next place, the symptoms and the knowledge to be gained by bimanual examination, together do not furnish sufficient information for the recognition of growth in the majority of cases.

Certain features may be taken as indicating advanced growth, and therefore limiting the chances of eradication. The size of the uterus, in the absence of myomata, is a distinct index of the extent and amount of the neoplasm. Again, a mass outside the uterus may indicate a metastatic nodule affecting the appendages or pelvic structures—but it is not to be invariably taken as of serious import; because, in perhaps the majority of cases where such a mass exists, it is of inflammatory nature, and results from extension of the septic infection from the uterine growth.

Another clinical feature of some importance is the character of the discharge. Excessive bleeding, through the resulting anaemia, obviously detracts from the safety of undertaking operation. A foul discharge is still more important, both on account of the septic absorption which goes on, and from the risk of spreading the infection during operation. Infection of the peritoneum, and of the operative field generally, probably accounts for the greater part of the operative mortality.



**Prognosis in Relation to Treatment.** The results of treatment are those of total hysterectomy—no other measure is to be recommended. It frequently happens that a small growth affecting the body is discovered by the pathologist during coexistence, and in many such cases a subtotal hysterectomy only has been performed. In such cases it must be decided whether the margin of healthy tissue between the growth and the point of resection is sufficient to justify the risk of leaving the cervix. There are no precise figures obtainable, but from general experience it may be said that such a procedure appears comparatively safe. The presence of large fibroids renders the vaginal operation unsuitable in many cases.

Mayer, before 1906, operated on 26 cases with the following results: 3 (11 per cent) died from operation; 7 (26.9 per cent) showed recurrence; and 13 (52 per cent) alive and well. Doderlein quotes Schantz as obtaining 83.3 per cent of cures, and states that the chief danger is infecting the stump or peritoneum with either septic matter or new growth. Lindley quotes Kelly as recording 81 per cent of recoveries in 46 cases. From all of which it will be seen that the results of treatment in cancer of the body of the uterus are relatively good.

REFERENCES: *Boston Acad. and Surg. Jour.*, 1911, June, 864 (1 seq); *Annals of Gynec. and Obs.*, 1911, xxxiv, 461-6, June; *Brit. Med. Week.*, 1913, Nov., 2086; *Brit. Med. Week.*, 1911, Feb., 193; *Gynec. Pract. and Rev.*, 1911, June, 334; *Hegars Reports*, ix, 461-2; *Diagnosis of Women*, 1911, 680.

By Helen Glanville.

**UTERUS FIBROIDS OF.** The prognosis is influenced by so many factors, that each case must be considered as regards its peculiar features. The subject may be discussed under two heads: (1) *The prognosis from the clinical point of view*; (2) *The prognosis in relation to treatment*.

#### I. PROGNOSIS IN RELATION TO CLINICAL FEATURES.

Many women have small fibroid nodules of the uterus which, being symptomless, are either overlooked or only discovered by accident during the course of an examination, or post mortem. It is estimated that 20 to 30 per cent of women who reach the age of forty years show fibroid tumours in the uterus.

**Risks due to the Presence of a Fibroid.** The possessor of a fibroid may be said to incur the following risks in varying degree: (1) Enlargement of the fibroid; (2) Degenerative changes in the tumour; (3) Excessive menstrual loss; (4) Extrusion of the tumour; (5) Inflammatory changes; (6) Pressure symptoms; (7) Increased chance of carcinoma of the body of the uterus; (8) Abnormal conditions in pregnancy and labour.

The degree in which these risks are incurred is difficult to estimate. Where the patient is approaching the climacteric and the tumour is small, and more particularly if it be subperitoneal in position, the chances of any of these ill effects are slight. When, however, the patient is relatively young (under forty years of age), the period of

time that intervenes before the menopause considerably increases the liability to certain of these risks.

1. *Increase in size* of a tumour is usually slow, but may in certain circumstances be rapid. It will then be difficult to decide whether the increased size is due to mere rapidity of growth or to degeneration.

2. *Degenerative changes* as a rule cause enlargement of the tumour, but except in the case of 'red degeneration' give rise to little anxiety. Thus, almost the only consequences of calcareous, myxomatous, or cystic degeneration are an increase of pressure symptoms.

'Red degeneration' is a more serious condition which, from the peculiar symptoms and the frequent association with pregnancy, must often be a source of worry. The frequency of the condition, as estimated by Noble<sup>1</sup> in 2274 cases, is 47 per cent; but this figure is probably high. If treated surgically, the results are uniformly good. If untreated, the end-results may be suppuration, or, in the case of subperitoneal tumours, a localized peritonitis with adhesions to bowel or omentum. Eventually many of the tumours become calcareous.

Sarcomatous degeneration of a fibroid, according to Noble,<sup>2</sup> occurs in about 45 per cent of all the tumours removed by operation, but is less frequent if all the cases are taken into account. In calcareous degeneration there is an actual shrinkage of the tumour, and therefore a relief from symptoms may often be expected.

In general it may be said that the liability to symptoms arising from degenerative changes are in direct ratio to the size of the tumour and the relative youth of the patient.

3. *The chances of the menstrual loss becoming excessive* depend almost entirely on the situation of the tumour. Subperitoneal fibroids, because they do not encroach on the uterine cavity, have but little tendency in this way. Even, however, when the tumour felt is obviously in this situation, it is impossible to exclude the chance of some smaller tumour being present more nearly in relation with the endometrium. Indeed, since it is rare to find a single tumour, it may be argued that where one large mass can be felt—whatever its position—it is pretty certain that one or more other tumours exist, too small for recognition, but which, by their possibility of subsequent growth, render the supervision of menorrhagia not unlikely, although at the moment no such symptom may be present. The hemorrhage due to a fibroid is rarely directly fatal nowadays, because the case comes to operation before such a disaster has time to occur. It does occasionally still happen, however.

Indirectly, the severe menorrhagia is responsible not only for many of the fatalities, but also for many of the tardy convalescences, that follow operation. The intense anaemia induces a generally enfeebled state of the tissues, and particularly of the heart muscle, with consequent cardiac dilatation. It is amongst this class of patients that most of the deaths following the removal of fibroids are found, the fatal result being due to exhaustion, sudden cardiac failure, or pulmonary embolism. Further, the anaemic state of the patient tends to

favour the occurrence of venous thrombosis, with its attendant risk of pulmonary embolism. Post-operative femoral thrombosis, when it occurs, is nearly always seen in intensely anemic patients. Apart from the risk of pulmonary embolism, this complication delays recovery for from six weeks to three months. The left leg is the one usually affected.

4. *Extrusion of a fibroid* may take place in one of two ways. In the first, a submucous tumour practically becomes polypoid and is pushed through the cervix, a process associated with smart hemorrhage and sometimes with pain. In the second, a sessile submucous tumour becomes inflamed and sloughs, the capsule of endometrium covering it gives way, and the mass, often in a putrescent and stinking condition, is forced out of the uterus. This process is one associated with symptoms of more or less acute sepsis, and is one of considerable danger.

The liability to these happenings is obviously dependent upon the situation of the tumour in the first instance. Further, they are comparatively rare below forty years of age. The consequences are hemorrhage and septic absorption: but the chief danger arises when such tumours are removed by the abdomen, when the chance of infecting the peritoneum is serious.

5. *The chances of inflammatory changes* or changes leading to inflammation taking place in or around the tumour are definite, for in a considerable proportion of the cases operated on such an event has occurred. Thus, salpingitis is quite commonly found, usually of the sclerotic or hydrosalpingitic variety, but occasionally the tubes contain pus. Another not uncommon condition to find is haemato-salpinx, usually on both sides. The liability to salpingitis is increased if the patient has undergone intra-uterine treatment, such as curettage, electrolysis, ionization, and so forth, and also if pregnancy occurs, since fibroids increase the chances of sepsis during the puerperium.

Pedunculated fibroids may undergo axial rotation, but this is a much less common event than is the case with ovarian cysts.

6. *The chances of pressure symptoms* developing depend upon the situation of the tumour. When it is low down, and especially when it is growing from the supravaginal cervix, such symptoms are very common; when it is situated in the upper part of the uterus they are less likely.

Most patients with fibroids in the uterus experience more or less frequency of micturition. Cervical fibroids, if impacted in the pelvis, cause retention of urine. Similarly, a fundal tumour may cause the uterus to retrovert and become fixed under the promontory, with a like result. The ureters, strangely enough, are rarely pressed upon.

Acute intestinal obstruction may be caused by a fibroid rarely by simple impaction in the pelvis, much more commonly by inflammatory adhesions.

7. *The presence of a fibromyoma in the uterus undoubtedly predisposes to carcinoma developing in the corporal endometrium.* It is found

that carcinoma of the corpus is associated with fibroids in 4 per cent of cases. The exact degree of risk that a patient runs in this connection is impossible to estimate, and it must be remembered that corporeal carcinoma is not a common disease under any circumstances. The possibility of this change supervening should always be borne in mind when the regular periodic hæmorrhage of a fibroid uterus begins to give place to irregular or constant loss.

Carcinoma of the cervix is rarely (0.7 per cent of all cases) associated with fibromyomata, since the latter are common in sterile women and the former is more particularly associated with fertility.

8. *With regard to pregnancy and labour*, the question of fertility in relation to fibroids constantly calls for decision. These tumours are frequently associated with sterility. Findley<sup>1</sup> states that 30 per cent of myomatous women are sterile, as opposed to a 10 per cent rate for the female population in general. The sterility may be due to the fibroid itself obstructing the meeting of sperm and germ, or to some endometrial change.

If conception occurs, there is an increased chance of miscarriage, but not to the extent that might be thought, because in such cases the fibroids are often subperitoneal in position and do not interfere with the uterine development.

Pregnancy tends to an increase in size, often more apparent than real, of the fibroid tumour. There is also an increased liability of the tumour to undergo degeneration and softening. Allusion has already been made to the frequent association of 'red degeneration,' which may require surgical treatment.

The risks during labour depend on the situation of the tumour. Large masses low down will obstruct delivery and necessitate surgical measures, but when superficial and growing from the upper part of the uterus, no ill results may follow. There is, however, an increased risk of post-partum hæmorrhage in all cases.

During the puerperium a fibroid may inflame, necrose, or be extruded. These events are fraught with grave risks to the patient. If in the course of a difficult delivery the tumour has been bruised, septic necrosis is likely to follow.

It will thus be seen that the possession of a fibroid tumour very definitely increases the risks of child-bearing. On the other hand, the various complications that may arise in the course of pregnancy, labour, and the puerperium can in most cases be foreseen, or at all events watched for, and if treated early can be successfully overcome.

## II.—PROGNOSIS IN RELATION TO TREATMENT.

**Operative Treatment.** This is the course to be advised in the vast majority of fibroids giving rise to symptoms, for not only is it the only certain method of cure, but it is also the quickest, and in the long run the least expensive.

*Abdominal hysterectomy* will be first of all resorted to. The surgery

of these tumours has been so greatly improved of recent years that the average mortality of the most radical procedure—hysterectomy—is probably not much over 1 per cent in expert hands, no greater in fact than that of appendectomy in the quiescent period.

Each case must, however, be considered on its own merits. Hysterectomy is, in many cases, a perfectly straightforward operation, one that may be performed 'by the book' even by an operator of very little experience. But, on the other hand, it may be an extremely formidable undertaking, in which the question as to whether an expert or a tyro is to perform it makes all the difference in the prognosis. No one who is not fully competent to carry through successfully the most difficult case should undertake this class of surgery at all, for it is often impossible to gauge beforehand the degree of difficulty that will be met with.

The operation of subtotal hysterectomy—the cervix being left behind—is the one most generally applicable to cases of fibroids. It is considerably easier than the total operation, especially in the more complicated cases, and if the cervix is healthy there is no good reason to remove it.

The total operation should be reserved for special cases where the cervix is unhealthy, the uterus above it carcinomatous, or where vaginal drainage is desired.

In either operation the ovaries should be conserved if they are healthy; or if this is not possible, then one, or at least part of one, should be left behind. The ovarian function continues unimpaired after hysterectomy, and in this regard the patient is no worse off than other women.

Patients often ask what effect removal of the uterus will have on their nervous system and upon sex feelings and intercourse in particular. The answer is that the operation leaves them in this respect unaltered. Child-bearing is of course impossible, but with this restriction marriage is able to be entered upon without any drawback.

The risks of the operation are of course increased if the fibroid be complicated by one or other of the superposed conditions that have been referred to. Of these, septic infection and necrosis are the most dangerous.

In the case of a patient very ill with a fibroid tumour, the objection to an operation is frequently made that she is too weak to undergo it. The reply is that she will not get stronger by waiting, and that the difficulties of the operation will certainly increase.

In conclusion, as illustrative of the results of hysterectomy, we quote the returns for 1912 and 1913 of the Chelsea Hospital for Women,<sup>2</sup> representing all the cases operated upon by the various members of the staff:

Total hysterectomy for myomata: 21 cases, no deaths. Subtotal hysterectomy for fibroids (with or without complications such as diseased appendage or appendages, ovarian cysts, etc.): 203 cases, 1 death.

These figures represent the result in expert hands under good conditions. They are therefore good; but they are the results of operations by all the members of the staff, and may in consequence be taken as an index of what is easily realizable.

*Myomectomy*, with the conservation of the uterus, offers an alternative treatment in certain instances. The object is to allow if possible for the supervision of pregnancy, and to maintain the menstrual function. With regard to the latter point it may be said that, as in many cases of myomata the patient seeks treatment from the surgeon for the cure of excessive menstrual loss, myomectomy in many instances does not offer a complete cure, because the operation leaves behind a much hypertrophied uterus from which a continuance of the menorrhagic symptoms is not unlikely. The prospects of future pregnancy would not appear to be great, as it is generally believed that not more than 10 per cent of these patients subsequently conceive. Reliable statistics are, however, unknown to us.

It is likely, nevertheless, that in competition with radium, myomectomy will be more extensively performed. The fact remains, however, that myomectomy is limited to special cases where the tumours are not abundant, where menorrhagia is not marked, and where the uterus itself is not hypertrophied.

The mortality in expert hands is low. W. Mayo<sup>1</sup> reports 1 death in 157 cases of myomectomy in the last decade.

*Vaginal operations* are sometimes called for. Vaginal hysterectomy is now seldom employed; no radical operation by this route is advisable.

The removal of a fibroid polypus is a simple procedure without practical risk.

Large tumours are sometimes best removed in this way, especially sloughing submucous fibroids, for in such cases the profound sepsis makes an abdominal operation undesirable if it can be avoided.

Curettage as a cure for fibroid menorrhagia is not to be commended. It carries with it a definite risk of infection of the tumour, and in any case its effect is merely temporary.

**Irradiation.**—Recently many cases of fibroids have been treated by *x* rays or by radium, and good results have been claimed; but sufficient time has not elapsed to prove their permanence.

There are certain classes of cases in which such treatment is absolutely contra-indicated—namely, where the nature of the tumour suspected of being a fibroid is not certainly known, where inflammatory signs, or signs of incipient malignant disease, are present, and where urgent symptoms due to pressure or degeneration have declared themselves.

Irradiation seems to act by destroying the function of the ovaries and inducing a premature menopause, with its attendant train of symptoms. As such, it is undesirable in relatively young patients. The treatment takes some weeks to carry through, and though menorrhagia would appear to be cured in many of the cases, and the tumour made to shrink in a lesser proportion, absolute disappearance of the

mass does not occur. The patient, therefore, cannot be considered as cured.

In the light of our present knowledge, therefore, the treatment by irradiation must be considered quite inferior to the surgical removal of the tumour.

Having regard to the interest now attaching to this form of treatment, it will be well to give some figures of results taken from recent literature of the subject.

As regards *x* rays, Birdsall<sup>1</sup> quotes the following statistics collected by Holding: Of 667 cases, 56 per cent were considered cured, 31 per cent improved, 11 per cent unimproved, and 2.03 per cent died. Marek<sup>5</sup> gives the following figures: Of 16 cases, 4 were cured, or 56 per cent; 4 were better, or 25 per cent; 3 were unimproved, or 19 per cent; only in 3 cases was a diminution in volume recognized.

As regards radium, Kelly and Burnam<sup>6</sup> treated 21 cases in this way: in 2 the tumours disappeared, while the menstrual periods persisted regularly; in 1 the treatment failed, and operation was undertaken; in 1 inflammation occurred, and an abscess formed; in 6 the tumour apparently disappeared; and in 13 the tumour was reduced in size.

**Palliative and Expectant Treatment.**—This is based on the chance of the tumour shrinking in size and ceasing to give rise to symptoms after the menopause. The likelihood is shown to be much less than was formerly supposed.

Fibroids prolong menstrual life, and the menopause is frequently not attained till the patient is well over fifty. After the cessation of the periods, the tumour does slowly shrink in a fair proportion of cases; but in others it continues to grow, or remains stationary. So long as it is present, the possibility remains of some complication supervening, and operations on elderly women have commonly to be performed on this account. The period of the menopause and after would indeed appear to be that in which degeneration, inflammation, and malignant change are most common.

The mortality in expectant treatment is estimated at 30 per cent.

REFERENCES. <sup>1</sup>Findley, *Diseases of Women*, 1911, 586; <sup>2</sup>Chelsea Hospital for Women, 42nd and 43rd *Annual Reports*; <sup>3</sup>*Surg., Gyn., and Obst.*, 1911, Feb.; <sup>4</sup>*Med. Rec.*, 1911, May, 892; <sup>5</sup>*Wien. klin. Woch.*, 1911, May, 745; <sup>6</sup>*Jour. Amer. Med. Assoc.*, 1911, Aug., 22.

Bryden Glendinning.

**UTERUS, RUPTURE OF.**—The outlook in rupture of the uterus must still be regarded as very serious, as less than one in four cases recovers at the present day. Recent figures, however, show a vast improvement in results, the mortality being reduced by half, and this improvement is largely due to a revolution in treatment.

It is important to bear in mind that, although the gravity of uterine rupture is thought to be due to the ensuing hemorrhage, yet it is rarely that such hemorrhage is sufficient to cause immediate death. Thus the majority of deaths occur between three and twelve hours after

the time of rupture when the shock has to some degree passed off and further oozing occurs. Hemorrhage proved fatal in 42.8 per cent of the cases occurring in the Moscow Maternity Hospital in a series collected by Ivanoff.<sup>1</sup> In at least 50 per cent of cases a dangerous hemorrhage occurs, but it is not necessarily fatal.

On the other hand, the part played by septic infection in these cases is very considerable; it is estimated that 37 per cent, or according to Eden<sup>2</sup> 50 per cent, succumb from this cause.

It is thus seen that hemorrhage and sepsis are much more serious than shock, which accounts for a small number of deaths.

Although the tendency of the present day is to ignore to some extent the division into complete and incomplete rupture of the uterus as regards method of treatment, yet it will be well to retain the grouping when considering the prognosis.

**Incomplete Rupture.**—The prognosis is influenced by (1) The extent of the rupture; (2) The stage of parturition; and (3) The conditions under which it has occurred.

1. *The Extent of the Rupture.*—Ruptures involving only the lower segment present a much better outlook, in that the hemorrhage is readily controlled by packing, and there is no risk of internal bleeding. The chances of septic complications are also considerably less. On the other hand, where the rupture extends well up the uterus to the peritoneal reflection, the condition is, speaking generally, just as serious as in the complete variety, and the prognosis differs little from what obtains in that condition, except that direct peritoneal infection is excluded. The hemorrhage in these cases is often subperitoneal, and has been known to extend extraperitoneally as high as the kidney. Klein<sup>3</sup> collected 30 cases in which extraperitoneal hemorrhage occurred in this way, with a mortality of 70 per cent.

In many of the more extensive ruptures of the uterus it has been found that considerable difficulty was experienced in recognizing, by digital examination, whether the peritoneum was actually torn or not.

2. *The Stage of Parturition.*—In ruptures occurring before the final expulsion of the child, or while the placenta yet remains undelivered, the expulsion of the afterbirth will certainly increase the risk of further hemorrhage; and should manual removal be necessary, the manipulations may almost unavoidably increase the extent of the tear.

3. *Conditions under which Rupture Occurs.*—These are important in many ways. For instance, rupture of the uterus frequently occurs while turning the child for some malpresentation, such as a prolapsed arm. In this instance the presenting part will have been returned to the uterus, and the operator's hand will also have been introduced under such circumstances it is difficult to exclude the risk of sepsis.

Again, in cases where rupture is spontaneous, which is rare in the slighter incomplete forms, the outlook is good once the hemorrhage



tees stopped. In these cases equally good results are claimed both by those who favour douching with drainage, and by those who insist that packing with gauze is essential.

**Complete Rupture and Large Incomplete Ruptures.** The factors which enter into consideration in these cases are somewhat different, and may be considered under the following headings: (1) The amount of haemorrhage; (2) The facilities for operative procedure; (3) The treatment adopted.

1. *The Amount of Haemorrhage.* This must to a large extent be judged by the condition of the patient. It is to be remembered that the bleeding is almost entirely intraperitoneal—except in the incomplete variety, where it is largely extraperitoneal. A factor which seriously complicates the problem in these cases is the estimation of the accompanying shock. It will be found that blanching is of more value as an indication of the amount of haemorrhage than the actual state of the pulse. The most reliable information is to be gained from a consideration of the condition of affairs in the pelvis. In a uterus from which both the foetus and the placenta are delivered, either externally or into the peritoneal cavity, and which has contracted down firmly, the amount of bleeding is not immediately dangerous. On the other hand, in a uterus still occupied by the placenta, the haemorrhage must always be serious; it is to be remembered that the more serious bleeding is the secondary haemorrhage or coazing that takes place as shock passes off. Some idea of the effect of haemorrhage is seen in Ivanoff's series of 124 cases in the Moscow Maternity Hospital, where haemorrhage proved fatal in 12.8 per cent; while in the Bucharest Hospital it was fatal in 24 per cent.

2. *The Facilities for Operative Procedure.* While there are a certain number of cases in which the haemorrhage is rapidly fatal, yet, if in the remainder effective surgical measures could be adopted within a short time, the mortality would be small. The necessity in the majority of cases of waiting until operation can be undertaken, or of transport to a hospital, has in many instances been disastrous.

Further, while to the experienced gynaecologist there is nothing inherently difficult in the operative treatment of rupture, to any one not so practised the altered relationships of the parturient uterus increase considerably the operative risks, both by reason of the possible damage to the neighbouring structures and by the time lost in orientation. Therefore the absence of operative facilities and of an experienced obstetric surgeon militate against the chance of recovery.

3. *The Treatment Adopted.* The results of operative treatment are so very much better than those of any expectant method, that the latter can only be justified in very exceptional circumstances.

Of operative procedures, the question resolves itself into deciding whether the better results are to be obtained by securing the bleeding point and repairing the rent, or by hysterectomy. It would be thought that the simpler procedure would give the better results;

but when it is remembered that somewhere about 15 per cent of cases die of sepsis, the risks that are run in leaving the uterus behind are considerable. A more remote effect is sometimes seen in the subsequent history—the liability to a second rupture. Farmer<sup>1</sup> has collected 15 cases in which a second rupture occurred, with a mortality of 33 per cent. Again, it has happened in a few instances that, owing to difficulty in suturing the rupture, further bleeding has been possible. On the other hand, in a perfectly clean case when fertility is desired and the conditions are favourable, the simple repair of the rent offers a very good prognosis.

However, hysterectomy, and especially abdominal hysterectomy, will offer the best chance in the majority of cases. Its efficacy, the direct control of hemorrhage which is obtained, and the elimination to a great extent of serious septic complications, outweigh the loss of the uterus and the slightly greater shock in most cases. vaginal hysterectomy has not been performed extensively, but Kobomickin<sup>2</sup> has collected 3 cases with 1 death, and Klem<sup>3</sup> 7 cases with 4 deaths.

In conclusion, we give a few general figures:

Some of the most reliable are those collected by Kodomickin,<sup>4</sup> which represent cases treated in special institutes only—where the conditions may be said to have been most favourable. Of 119 cases, 97 were treated conservatively, with a mortality of 61 per cent; 33 were treated by hysterectomy, with a mortality of 36 per cent.

Farmer<sup>1</sup> between 1885 and 1897 treated 11 cases by packing, douching, etc.; 10 died. Between 1897 and 1902 he treated 12 cases; 6 died before operation could be done, 3 died after operation, 3 were cured.

Blacker<sup>5</sup> treated 8 cases; 3 were operated on—all recovered; 2 did not admit of treatment—both died; 3 were plugged with gauze—2 died, 1 recovered.

REFERENCES. <sup>1</sup> *Ann. de Gyn. et d'Obst.*, 1904, lxi, 149; <sup>2</sup> *Proc. Roy. Soc. Med. (Obst. and Gyn. Sect.)*, 1909, May; *Arch. f. Gyn.*, 1901, lxi, 2; <sup>3</sup> *Ann. de Gyn. et d'Obst.*, 1901, 249; *Monats. f. Geb. u. Gyn.*, 1903, xvii, 345; <sup>4</sup> *Lancet*, 1912, Jan, 43.

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#### VARICELLA. (See CHICKEN-POX.)

**VARICOCELE.** This anatomical defect is extremely common in young men, and the great majority of them never suffer any inconvenience from it. In a small proportion, however, it causes aching pain which may be quite severe. Many patients are very apprehensive that it will lead to sexual disability or other ill effects, and it appears to be true that the testes on that side may be smaller and softer than the other, but it is practically unknown for any interference with function to result. Except in rare cases of malignant growth of the left kidney, region leading to the development of a varicocele, which is, of course, of ill omen under such circumstances, it is unusual to meet with men over forty getting any trouble from the venous dilatation, and in

old men the condition is practically never seen, so that we may take it that varicocele retrogresses after the prime of life has been passed.

It used to be customary to reject candidates for the services if they suffered from varicocele, from fear of future disability owing to real or pretended pain; but if it has given no trouble before twenty-five, it is not likely to do so afterwards.

The operation of ligature and removal of the veins for this ailment is, of course, as trifling as any in surgery, as far as the immediate mortality is concerned; it must be far below 1 per cent. But it is by no means so certain that real benefit will be obtained. Corner and Nitch examined, at considerable periods after the operation, a hundred cases of varicocele. They found that in nearly one-fifth there was still some pain, and that 4 per cent of the patients were actually worse after this treatment, in that they now had symptoms where previously there had been none. The following table sums up the results:

TABLE SHOWING THE RESULTS OF OPERATION FOR VARICOCELE EXAMINED SUBSEQUENTLY.

Testis harder	90	Tender hydrocele	8	Varicocele recurred	2
" enlarged	55	Painful hydrocele	15	Cured or improved	70
" smaller	21	Spermatocele	2	*Scrotum better for	
Scrotum thick	50	Pain in testis	14	" worse	26
		Pain in seat	5	*Worse	1

Even the above table does not quite complete the list of unfortunate consequences. The writer has seen or conversed with two patients operated on by various surgeons, in which so many vessels were taken away that the testis became gangrenous and had to be removed. Suppuration occasionally occurs.

We conclude, therefore, that operation should only be recommended for varicocele when it is genuinely a nuisance to the patient by causing pain which a suspensory bandage is not sufficient to relieve, and that, in operating, care should be taken to leave the testis an adequate blood-supply.

REFERENCE.—Corner and Nitch, *Brit. Med. Jour.*, 1906, i, 191.

J. Rendle Short.

**VARICOSE VEINS.**—It is almost too well known to require comment, that in addition to the aching pain so often complained of, varicose veins may also lead to ulceration, eczema, rupture, or thrombosis. In rare cases, a fatal result may follow from hæmorrhage, or pulmonary embolism after thrombosis. There is no tendency to natural cure, except that the varicose veins of pregnancy improve very much after delivery. Thrombosis may leave the leg permanently œdematous.

It is difficult to estimate the probability of fatal embolism after

thrombosis of a vein in the leg, but typical cases are relatively infrequent, and the risk is less than 1 per cent if the patient takes proper precautions. The greatest danger is after the first week, when the clot is gelatinous, and before the fourth, when it is fibrotic and adherent. Massage and movements increase the risk.

There are three well recognized methods of operation for this condition: (1) *Removal and ligature vein by vein*, (2) *Trendelenburg's operation*, division and ligature of the saphena vein in the groin, (3) *Schede's operation*, a circumferential cut being made wholly or partly round the leg just below the knee, and all the veins divided and tied.

1. **Removal and Ligature Vein by Vein.** The objection to the first method is that it is a long and tedious operation if the veins are numerous. The result, for the years immediately following, depends entirely upon the thoroughness of the surgeon. Many of the cases get into trouble again, after seven to ten years, from the development of a further crop of veins, and this in spite of combining the removal with a Trendelenburg ligature. It is not common, however, for the patient to need a second operation. Jaenckel, in his report to the French Congress of Surgery in 1910, found complete cure in patients followed from a few months to ten years in 52 out of 70 cases, that is, 74 per cent. When the whole saphena vein in thigh and leg was removed, 73 out of 77 (95 per cent) were cured.

2. **Trendelenburg's Operation.** It is possible to obtain more definite evidence of the effects of this operation—and of Schede's—proceeding, as they do, upon a more stereotyped plan. Goerlied<sup>1</sup> has made a personal study of 69 cases operated on by the Trendelenburg method in von Bruns' clinic: of these, 84 per cent were cured as far as symptoms were concerned, but only 27 per cent were free from varicosities. In 47 cases the saphena vein had been restored, in spite of division and ligature. He also collected the results of 1125 literature cases, with cures in from 56 to 85 per cent. Miller<sup>2</sup> followed, for periods of from six months to ten years, 41 cases operated on by the same method in Halsted's clinic. The patients were pretty equally distributed over the various years. Of 19 cases followed 1 to 4 years, 89 per cent were cured; of 19 cases followed 5 to 8 years, 63 per cent were cured. This shows the danger of late return of the trouble. Jaenckel reported only 56 per cent cured out of 697 cases treated by the Trendelenburg operation, and followed from two months to twelve years. When this was combined with removal of the prominent varices, 60 per cent out of 365 patients, followed up to fourteen years, were cured. It is probable, however, that the worst type of cases were treated by this method.

3. **Schede's Operation.** The results of this operation were much less satisfactory, though the evidence was slender. Only 3 out of 9 patients were cured, and two of these were quite recent. Ulceration of the leg followed several times. It was interesting to find that the veins, in spite of division and ligature, reunited; photographs show them



MICROCOPY RESOLUTION TEST CHART

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RESOLUTION TEST CHART

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running right across the incisional scar, and a vein dissected out still displayed the mark of the ligature upon it.

The principal danger of surgical treatment is pulmonary embolism, of which a fair number of cases have been reported; but long series, comprising several hundreds of operations, have been recorded in which this cause of death does not figure; it must be quite rare.

We conclude, then, that the best results are given by total removal of the saphena vein in the thigh and leg; that multiple resection vein by vein, with Trendelenburg ligature, takes second place; that the Trendelenburg ligature alone comes next; and that Schede's operation is not satisfactory.

REFERENCES: *Goethel: Beitr. Klin. Chir.*, xlv., 278; Miller, *J. Clin. Hosp. Hosp. Bull.* 1906, xvii., 289; *V. Roulli: S. int.*

#### VARIOLA. (See SMALL-POX.)

**VOMITING OF PREGNANCY.** In all cases in which the vomiting of pregnancy is excessive and persistent (grouped together), the outlook becomes very favourable. The vast majority react perfectly well to efficient treatment. Medical literature abounds in records of two or three cases successfully treated by some special medication when all other means were apparently failing. At the present time these records relate to cases treated with injections of blood serum. Previously, much success attended thyroid or suprarenal extract administration. The truth is, as noted above, that the vast majority are readily amenable to treatment, but there is a small group—the toxæmic—which it is difficult to recognize, and which when inefficiently treated suddenly prove fatal.

Whitridge Williams classifies cases into the following groups: (1) *The neurotic*—by far the most frequent; (2) *The toxicæmic*—the most serious group; and (3) *The reflex*—the least frequent. Underlying each of these is probably a chronic toxæmia—indicative of a failure of physiological adjustment between the maternal organism and the fetal sac; but the recognition of the class to which any case belongs is never at once self-evident, but only becomes revealed during the course of treatment.

Both the neurotic and the reflex groups react readily to treatment—such as intestinal antiseptics, stomach washings, and a carefully restricted diet, with complete rest in bed. Thus J. H. Martin treated 17 cases in the Glasgow Maternity Hospital by rest in bed, washing out the stomach, a diet of peptonized milk or milk and soda, and purgation, with the result that 16 cases were cured.

The toxæmic group is more serious. The chief problem in these cases lies in deciding when to interfere with the pregnancy. On the one hand, the natural desire is to allow the pregnancy to continue; on the other, emptying the uterus shows decidedly good results, provided it be not too long delayed. That the results are not better is largely due to the tendency on the part of the obstetrician to try how

long he can postpone evacuation of the uterus, often with disastrous results to the patient. Milder cases do undoubtedly react to absolute rest and rectal feeding, with saline subcutaneous.

The clinical features which should be relied upon as indicating the prognosis or calling for more drastic treatment are the following:

1. *The loss of weight* should not be allowed to exceed one-third of the total body-weight; this is, however, of little use when, as often happens, the initial weight is unknown.

2. *The urinary examination*, though not always reliable, when performed regularly and showing an increasingly high ammonia coefficient, with a diminished quantity of urine in the twenty-four hours, points to an aggravated condition. If saline injections are being employed, this will tend to keep up the quantity of urine passed.

3. *The pulse* probably forms one of the best guides. Many authors advise emptying the uterus when the pulse-rate exceeds 100 per minute in cases which are being treated by absolute rest and low diet. Certain observers, however, insist that a pulse of even 120 is not by itself of grave import.

4. *The vomiting*, when persistent, and accompanied by wasting and a rise in temperature, is to be taken into account. Many cases cease vomiting toward the end, and what is often looked upon as an improvement is in reality an indication of approaching death.

5. *Delirium* and *diarrhoea* are indications of great danger.

In toxicæmic cases which do not react to ordinary measures, recourse must be had either to thyroid extract, suprarenal extract, or blood serum. But little time should be lost on these measures. If within 36 to 48 hours there is no improvement, emptying of the uterus is indicated without delay. These patients are by this time in too feeble a condition to stand a large or prolonged operation; consequently, from the point of view of prognosis it is most important that the quickest and least brutal method should be employed. At such a stage of pregnancy this is undoubtedly a vaginal hysterectomy, by which the uterine contents can be rapidly removed. Equally important, too, is the anaesthesia employed. The condition of acidosis, resulting from the starvation of vomiting, precludes absolutely the use of chloroform. The best anaesthetic in such cases is a combination of gas and oxygen, but ether may be used where the former is for any reason not available. It too frequently happens that the emptying of the uterus has been successfully accomplished, but the patient dies from shock or from delayed chloroform poisoning.

Vomiting of pregnancy is not an uncommon affection. Robert Barnes himself saw 9 patients succumb to it. The mortality of the toxicæmic variety is variously given as 60 per cent by some authors and 30 per cent by others.

*Bryden Glouching.*

**VULVA, CARCINOMA OF.** The growth in the majority of cases is an epithelioma, and conforms to the character of such tumours in being comparatively slow growing. Its superficial position ought



also to lead to its early detection; but unfortunately, the fact that the majority of malignant vulval growths are secondary to leucoplakia vulvæ has resulted in obscuring the onset of malignancy. In order to rectify this tendency, some surgeons insist that it is wise to regard leucoplakia vulvæ as in all respects comparable to leucoplakia of the tongue—that is, as a pre-cancerous state.

A distinction should be made between this group, arising in leucoplakic conditions and mainly involving the labia, and that group arising in an otherwise healthy vulva, and usually situated in the neighbourhood of the clitoris and urethra, for the former is more amenable to treatment.

The factors mainly influencing prognosis, and requiring more special consideration are, (1) *The site of growth*; (2) *The stage of advancement when first seen*; and (3) *The treatment adopted*.

1. **The Site of the Growth.**—The growths of the vulva are readily divided into two groups. In the first place there is the smaller group arising in the vicinity of the clitoris, in a frenal fold, where it forms a small nodular mass covered with unaltered skin. The proximity of the growth, on the one hand to the bone, which limits the extent of resection, and on the other hand to the urethra, which is often preserved with undue risk of recurrence, both affect the prognosis adversely. Further, the rich lymphatic drain of this region promotes deposits in the inguinal glands of both sides.

The second and larger group comprises those arising in the labia; here the margin of tissue is a little greater. These cases generally develop in a pre-existing leucoplakia, and if all cases of leucoplakia vulvæ were regarded with the same suspicion as leucoplakia of the tongue, the chances of early detection and successful treatment of the developing epithelioma would be considerably enhanced. The growths in this region more frequently ulcerate, or show a roughly papillary surface, which renders their nature unmistakable owing to the clinical features.

2. **The Stage of Advancement.**—It is obvious that with a growth already down to the underlying bone, the chances of recovery are small.

In judging of the gravity of the case, the state of the inguinal glands should be considered. Enlargement of the inguinal group, especially if slight, is by no means an indication of secondary deposits, but is to be regarded as an index of septic absorption until the presence of new growth has been demonstrated microscopically. Considerable enlargement, however, does as a rule indicate malignant deposit; but even in these cases, radical operation offers the best chance of a cure.

3. **The Treatment Adopted.**—Operative procedure in which a wide area surrounding the growth, and also the whole tract of lymphatic drainage, including the inguinal group of glands, are removed, will show better results than will purely circumscribed operations. Many operators, while widely resecting the region of growth, and

also removing the inguinal lymph glands, yet leave the connecting lymphatic tracts, with disastrous results as to recurrence.

Again, if leucoplakia is regarded with due suspicion, and the earliest development of malignant disease is countered by wide resection, results will be obtained showing great improvement on those of the present day.

When the growth has recurred, the application of *x* rays, radium, and diathermic cauterization, offer chances of considerable relief from the distress of a fungating ulcerated mass, and in rare instances may even result in a cure. The application of *x* rays and radium is still of too recent a date to permit of the compilation of figures of results, but there is at present no question of the relief afforded in otherwise intractable conditions.

*Byrken Glendinning.*

**WAR WOUNDS.**—(See *GUNSHOT WOUNDS.*)

**WHOOPIING COUGH.** The prognosis in this disease will be here considered under the following heads: (1) *Age*; (2) *Sex*; (3) *Complications*; (4) *Special symptoms*; (5) *Physical and social conditions*; (6) *Season*.

1. **Age.**—The Aberdeen figures furnish us with the most trustworthy information on this point. Whooping-cough was made a notifiable disease in that city for the twenty years 1882 to 1900, and details have been published which give the age incidence of the cases and deaths for the last ten years of that period. During those ten years there were 15,093 cases with 722 deaths, a mortality of 4·7 per cent. The following table shows the fatality at the various ages up to five years:—

FATALITY ACCORDING TO AGE (ABERDEEN).

Age	Fatality per cent
Under 1	12·5
1 2	10·1
2 3	3·3
3 4	2·2
4 5	1·6
Over 5	Under 1
6 7	Practically nil

From these figures it follows that whooping-cough is a disease of considerable danger to infants and children under two years; but after that age it becomes much less serious.

Cases treated in hospital show a much higher fatality, because it is the most serious ones which are sent to hospital for treatment. But the same relative severity of the disease according to age still appears in hospital-treated cases, as is shown by the following table, which

gives the numbers of cases and deaths in the Metropolitan Asylums Board Hospitals for the four years 1911 to 1914:

TOTALITY ACCORDING TO AGE (METROPOLITAN ASYLUMS BOARD).

Under 1	672	167	24.5
1-2	1220	202	16.5
2-3	929	78	8.3
3-4	712	39	5.4
4-5	529	16	3.0
Under 5	4062	500	12.3
5-10	604	14	2.3
10-15	25	0	0.0
15 & over	3	0	0.0
Total	4695	514	10.9

2. **Sex.** The Aberdeen figures show that the fatality in this respect, for all ages, was the same, 1.7 per cent; and that amongst the patients over six years of age there were no deaths amongst the males, though there were several amongst the females.

3. **Complications.** In whooping-cough death is much more often due to some complication than to the virulence of the disease itself. Of these complications the most formidable is *bronchopneumonia*. It occurs in about 13 per cent of cases treated in hospital, and from 25 to 50 per cent of those so affected die.

*Convulsions* are also extremely serious. According to the returns of the Metropolitan Asylums Board, they are met with in 2 per cent of the cases. Convulsions are most grave when they occur apart from lung complications, and when they are repeated.

*Otitis media* arises in about 5 per cent of the cases.

*Cerebral complications* are fortunately uncommon. They are highly dangerous; and if not immediately fatal, they often lead to permanent impairment of the functions of some part of the nervous system.

4. **Special Conditions.** As a rule the longer the duration of the catarrhal, the less severe is the paroxysmal stage. The severity of the latter chiefly depends upon the frequency and intensity of the paroxysms. The ability of the child to retain his food has a great influence. Frequent vomiting, which often goes with frequency of paroxysm, retards recovery, and may contribute to a fatal result.

5. **Physical and Social Conditions.**—Ill-fed, rickety, and tuberculous children are very bad subjects. Even in a normal child a severe attack of whooping-cough, especially if complicated with bronchopneumonia, may result in permanent thoracic deformity or

chronic pulmonary disease; but such results are most likely to follow in the case of tickety patients.

Adenoids and enlarged tonsils often prolong the paroxysmal stage. In the Aberdeen cases it was found that while the average fatality was 4.7 per cent, that of patients in families living in one room was 7.8 per cent; in those living in two rooms, 5 per cent; in three rooms, 4.3 per cent; in four rooms, 3.4 per cent; and in five or more, 2.2 per cent. This may be taken as evidence that the social state of the patient considerably affects his chances of recovery.

6. **Season.**—In Aberdeen it was found that the fatality was highest in the months of February, April, and May—the end of winter and the beginning of the spring (6.5 to 6.9 per cent). As in this disease death usually takes place somewhat late in its course, the onset of these fatal cases may be referred to the winter or the end of the autumn. On the other hand, the fatality was lowest in October and November (3.8 per cent); here the onset of the disease was during the autumn or in the late summer.

Whooping-cough, like most of the acute infectious diseases, varies considerably in its virulence from time to time. Thus, in Aberdeen the average fatality for the years 1882 to 1889 was 10.5 per cent; while for the years 1900 to 1910 it was 5.3 per cent. *E. W. Coubill.*

#### WOUNDS, GUNSHOT. (See GUNSHOT WOUNDS.)

**YELLOW FEVER.**—The mortality of yellow fever varies widely in different outbreaks, but the extensive figures of Berenger-Féraud show it to average 40 to 45 per cent in the West Indies, on the Mexican Coast, and in West Africa, but to be only about 25 per cent in the United States, Brazil, and European countries. In mild types it is said occasionally to be as low as 10 per cent.

The severity in individual cases varies from extreme malignancy, causing death in the first two days before the characteristic third stage has developed, down to the mildest cases, in which the disease terminates favourably after two or three days without the development of the more typical symptoms, being consequently liable to be overlooked, although still capable of spreading the infection. In the third stage, beginning with the second rise of temperature after the temporary remission of the fever, the characteristic and serious symptoms appear. The most dangerous are copious albumin in the urine with diminution of the secretion, which may go on to suppression, always fatal if it persists for from fifteen to twenty-four hours; hæmorrhages, especially the dreaded black vomit and mælena or bleeding from the mouth; intermittent pulse, with tendency to sudden syncope; cyanosis; and coma. Recovery may, however, take place after an apparently desperate stage has been reached, and convalescence is often remarkably rapid. Sternberg's mixture of sodium bicarbonate and perchloride of mercury is said to reduce the mortality. Intravenous injections of sodium bicarbonate, as used successfully in threatening uræmia in cholera, are worthy of trial. *Leonard Rogers.*

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