

FRONTISPIECE CANADA LANCET.

LESLIE MATTHEW SWEETNAM,

BORN 1859; DIED DECEMBER, 1901.

THE CANADA LANCET

Vol. XXXV.

JANUARY, 1902.

No. 5

THE ETIOLOGY AND EARLY DIAGNOSIS OF PULMONARY TUBERCULOSIS.*

BY D. GILBERT GORDON, B.A., M.D.

Professor of Sanitary Science and Assistant Professor of Clinical Medicine in Trinity University, Toronto.
Physician Out-Door Department, Toronto General Hospital.

IT is not a matter of wonder that the subject of tuberculosis should be receiving, as it always has, so much attention from the members of our great profession all the world over. For does not this dread scourge claim as its toll year by year about one-fifth of those who go down to death? More than all the other infectious diseases put together. Not satisfied with this, it insists, too, that its victims be taken in great part, at that time when it is most sweet to live and most hard to die. The most important causes of the disease and its early detection I desire to treat of in this paper. I feel rather relieved that at the present juncture I need have nothing to say as to the part played by the tubercle bacillus in meat or milk, for we must all be agreed that as far as pulmonary tuberculosis at least is concerned, the tubercle bacillus received into the system by the ingesta must play a very unimportant part in its etiology. The direct inheritance of the disease must also be very rare indeed. The only direct cause worth while troubling ourselves about is the inhalation of dried sputum beladen with the tubercle bacillus. This is practically the only source of pulmonary tuberculosis.

But there are other causes which we speak of as predisposing which are all important to us, for by removing them we will so cripple the enemy, so remove him from his base of supplies, that he will be forced to quit the open field and content himself with the meanest kind of guerilla warfare. What are these causes?

1. Insufficient ventilation and sunlight.
2. Insanitary condition of dwellings, workshops and factories.
3. Density of population.
4. Occupation.
5. Alcoholism.
6. Previous attacks of certain diseases.

* Read before the Canadian Medical Association.

1. *Insufficient Ventilation and Sunlight.*—With regard to the bacilli, it is certainly true that they “love darkness rather than light,” I suppose “because their deeds are evil.” However, we are certain if we could drive them out of their favorite haunts of darkness and dirt, soon their virulency and aggressiveness would be much diminished.

2. *Insanitary Conditions.*—We all know that this is eminently a dirt disease. It should therefore be placed among the commonly known seven zymotic diseases. In this connection allow me to quote the words of Professor P. Brouardel of Paris taken from his paper read at the great conference on tuberculosis held in London a few weeks ago. He says “Before the scientists I have just mentioned had actually made known their discoveries you English people had already begun the struggle. Convinced by observation that tuberculosis thrived in dark and damp dwellings, in 1836 nearly seventy years ago, you passed a law providing for the construction of healthy houses. And since that date your zeal has not abated. You have with admirable perseverance passed more than ten Acts of Parliament; you have rendered salubrious the dwellings of the poor; the work-shop, the town and the whole kingdom.”

Density of Population.—It is a matter of common observation that tuberculosis is not only more prevalent but more rapidly fatal in those communities where people are huddled together in conditions of poverty. I copy here a table by Dr. J. B. Russell to the Philosophical Society of Glasgow taken from the *Hygiene of Transmissible diseases* by Abbott, which shows the truth of the above as found in Glasgow.

Table showing death rate per 100,000 from certain classes of diseases in various sized houses :

	One and Two Rooms.	Three and Four Rooms.	Five Rooms and Upward.
Zymotic diseases	478	246	114
Acute diseases of lungs, including consumption ...	985	689	328
Nervous diseases and diseases of nutrition	480	235	91

It is gratifying to see that efforts are everywhere being made to eradicate this plague. In Canada, it hurts me to say it, we are woefully behind in this respect. The attention of our Governments and our wealthy men should be persistently and emphatically directed to this great need. Although the public doubtless is grateful for millions spent on public libraries in their interests, yet it does seem to me that some millions spent

in providing means to be used to prevent the spread of this awful plague by which undoubtedly hundreds of lives would be annually saved from infection, would yield a more satisfactory interest on investment than that spent to endow public libraries, or even that spent for payment of fees of a nation's prospective University Students.

Occupation.—Occupation bears an important relationship to the causation of pulmonary tuberculosis, but there is no doubt that the occupation itself is less a causative factor than the condition of the surroundings under which the occupation is carried on.

With regard to alcohol as an etiological factor in tuberculosis, Prof. Brouardel states that Sir John Simon was right in saying "that wretched lodging is the purveyor of the public house". And we can add to it that the public house is the purveyor of tuberculosis. In fact, alcoholism is the most potent factor in propagating tuberculosis. The strongest man, who has once taken to drink is powerless against it.

Previous attacks of disease.—This dread disease greatly strengthens its position in its warfare against mankind by the favorable alliances it has succeeded in making with such diseases as la grippe, pneumonia, pleurisy, or bronchitis. An attack by one of these affections frequently acts as an etiological factor in tuberculosis. Or, to continue the metaphor, such an attack may so weaken our defences that we are unable to resist the on-slaught of the relentless bacillus tuberculosis.

The early diagnosis of pulmonary tuberculosis.—Writers on this subject are in the habit of dividing the disease into stages. We therefore see it divided into a first, second and third stage. We speak also of a pre-tubercular stage, the stage before there is any expectoration and generally before the bacillus can be found in the sputum. It is very evident that these stages cannot be well defined. The degree of advancement in each stage differs accordingly to the examiner. This I have no doubt accounts largely for the discrepancies found in statistics as to cures in the different stages. Over and over again I am forced to make up my mind as to this question: has this patient who is trusting himself to me the tubercle bacillus in his lung, or has he not? If he has, and I being at the time a little hurried or perhaps a little wearied, tell him after a very cursory examination that he has a little cold but that it is just in his tubes, and that his lungs are all right, then I have done my patient a great wrong. He goes away relieved, but in a few months, not being well, consults some other man who tells him that he has consumption. We may not be able to make a diagnosis on our first examination, but before we allow the patient out of our hands we should do our best

to ascertain his condition. The means at our disposal for this purpose are :

1st. Ascertaining the presence of certain symptoms indicating the tuberculous condition.

2nd. The patient and careful study of the thorax for the symptoms pointing to the same.

3rd. The examination by the Rontgen Ray.

4th. The use of the tuberculin test.

5th. The microscopic examination of the sputum.

I will first consider the value of a careful study of the existing symptoms, not because I consider them so important as the physical signs in aiding us to make our diagnosis, but because on account of their presence the patient is, for the most part, first led to seek our advice.

In discussing this question I do not purpose to take into consideration those symptoms or signs so evident during the latter stages of the disease, but only those which I have found to be of use in making a diagnosis before, if possible, the tubercle bacillus can be found in the sputum. Our patient is before us. The question of inherited tendencies, or the more important question of exposure to infection, should be considered.

The presence of cough is, in my experience, the most common danger signal. Generally a short, hacking cough, noticed especially if the patient is about to speak, or after full inspiration. It may be the common "clearing of the throat"—it may be bronchial—yet a cough persistent with morning expectoration, bronchial in character, I have found frequently to be tubercular in origin, and I believe frequently is. The cough may simply be due to a bad cold, it may follow an attack of pneumonia or grippe. In these cases we must satisfy ourselves that the condition is not tubercular. There are, of course, other causes for cough, but a persistent cough should make us suspicious.

Hæmoptysis.—As we all know the spitting of bright blood, while not a very common symptom in incipient tuberculosis is a very certain one and often a very early one. Given a case of blood spitting whether in mouthfuls of bright blood or as tinged sputum in which we can exclude laryngeal disease and chronic heart disease by examination of the larynx and heart, and pneumonia and carcinoma by the nature of the expectoration, and one hundred to one the case is tubercular.

Temperature.—A slight elevation of temperature, an elevation of 1 degree or $1\frac{1}{2}$ degrees occurring between three o'clock and four o'clock in the afternoon, and this continuing for some time is a symptom that should claim our attention. Should the temperature go up a little higher after slight exercise and perhaps disappear with a two weeks' rest in

bed we are still more convinced that it is due to tubercular infection. An increased pulse rate we expect with the rise in temperature, which increase persists frequently when the temperature is normal.

Pain.—Sometimes the first symptom complained of is a pain in the upper part or less frequently in the side of the chest, probably pleuritic in character. The absence of pain, in so many of these cases, is one of nature's delinquencies and like many another failure in duty results in dire consequences. Gastric disturbances taken with other symptoms are important.

Physicial signs.—Our attention having been directed by the symptoms to the threatened condition of our patient we proceed to examine his chest. He, or she must be stripped to the waist, placed in a good light (I prefer to have him standing before me when he can be moved about at will), I think it important that a regular order should always be adhered to in making this examination. Repetition tends to perfection. If there is one thing more than another which I would like to emphasize it is this, the importance of taking plenty of time with the examination. The order generally observed, is I think the best, namely, examination by inspection, palpation, percussion and auscultation.

Inspection.—Examination by this method does not give us much information at a very early stage. When, however, the disease has progressed somewhat the information gained in this way is most valuable. Yet inspection tells us something of interest to us even now. The long narrow chest, oblique ribs, prominent clavicles, acute epigastric angle, winged scapulae, will indicate a pre-disposition to tuberculosis. Should the patient have suffered much from pain there may be noticed over the affected part diminished expansion.

Palpation.—By this method we may perhaps distinguish the nature of the pain, if there has existed any. Should there be any considerable infiltration, and that near the surface of the lung we may be able to notice an increased tactile fremitus.

Percussion.—With great care and light percussion a tuberculous nodule or even a small infiltrated mass may cause a slightly dull and high pitched percussion note over the affected part, but what I have found more useful at this stage is a more resonant and prolonged note in the neighborhood of the dulness.

Auscultation.—It is I think to this means of examination that we will have to trust for our most reliable early diagnostic signs. And the first sign I would notice is that of impaired breathing, a most markedly enfeebled inspiratory sound over the affected part, at the same time there may be, if not there will be later an increased expiratory sound, and later still the regular harsh bronchial breathing. Here also the increased voice sound

is a most valuable sign. Bronchophony I have often found very early. Whispering pectoriloquy likewise. It is well to examine at first the patient breathing naturally, afterwards by more forced breathing. There is one other sign which I would like to mention, though rare, it is when present very striking, and often early, that is a markedly interrupted breathing, cog-wheeled respiration. Every part of the thoracic wall where the lung can be reached should be carefully gone over, and here I would like to emphasize the importance of examining particularly the inter and supra scapular regions as well as the clavicular regions for evidences of the disease. While it is not possible to have a standard of normality for chest sounds owing to the different relationship in different persons, yet taking into consideration the thickness of the wall in each case we should have some idea of what would be normal in that particular case. Then we can use to great advantage the rapid comparison of one part with a corresponding one on the opposite side of the thorax. If the phonendoscope is being used for the purpose of testing the voice sounds, on account of the sensitiveness of this instrument we will be led into error should we forget that on account of the greater number and greater size of the bronchi on the right the voice sounds are normally increased.

The Roentgen Ray.—This as a means of diagnosis is certainly valuable, and as a confirmatory sign specially so, and in many cases it will in skilled hands discover the enemy. Dr. Francis H. Williams, of Boston, has done most useful work in this connection. In the *Medical Record*, May 13th, 1899, he states that in five cases he discovered by the X Ray changes in the lung before they could be detected by physical signs. The *Philadelphia Medical Journal* reports six cases examined by Dr. Williams in which he claims that the diagnosis was made more certain by the use of the X Ray. It is a method quite free from risk and should be used where practicable. My own experience has been limited in this method of examination, but where I have used it it has not disappointed me. This month by the kind assistance of Dr. John McMaster at the Toronto General Hospital I examined five patients by the X Ray. In two of these where there was but little doubt; the haziness over the parts affected and the limited excursion of the diaphragm were marked.

In one case where there was some doubt, the diagnosis was not made plainer. In the other two it was most helpful as an aid to diagnosis. The last three cases were in the pre-tubercular stage.

The Tuberculin Test.—This test for diagnostic purposes alone is when used in suitable cases the most certain of all tests, with the exception of the discovery of the germ by the microscope. Advanced

cases appear to be non-reactive. The reaction is imperfect also where sarcoma, carcinoma or syphilis exists. And moreover, it has been pointed out by Trudeau and others that a reaction occurs sometimes in the apparently healthy. In how many of these there may have been latent tuberculosis it would be impossible to say. But what seems to me to exclude from general use this valuable diagnostic test is this, that still many able men aver that the use of this test is dangerous to the patient; that it often kindles the smouldering embers of a dangerous fire. I have used tuberculin recently in a number of cases with gratifying results.

Microscopic Examination.—The discovery of the tubercle bacillus by the microscope is the one absolutely certain sign that we possess of the existence of pulmonary tuberculosis, and where any expectoration can be secured if only a little in the morning, this should be given to a skilled microscopist for examination. But, I would feel inclined to disagree with Professor Llewellyn P. Barbour when he stated in a most excellent paper published in the Medical Record of June 1896 "that if after several attempts by one skilled in the procedure no bacilli are found Phthisis may be excluded". This statement was made in 1896, I think all agree now that the disease can be diagnosed in most cases before the bacilli can be found. I would also hope to believe, and do believe that the statement made by Dr. Barbour in the same paper that not more than one in twenty first-stage cases are recognised, is not true now, and that similar statements made by Dr. Ambler in the New York Medical Journal of 1898 are also now not true. We must not trust to one symptom alone. Neither must we be satisfied by one examination alone, but we must spare neither trouble, time nor expense to prevent our patient the loss of months which will in all likelihood mean to him the loss of his life. The study of symptoms and signs must go together, and while I believe that the stethoscope or some allied instrument is the most useful instrument we have for this purpose, yet we must not forget that there is truth in the statement, which has been so well put, "That absence of audible evidence of internal lesions is a remarkable fact in many cases of even advanced tuberculosis and physical signs may come and go in a way that baffles explanation and discourages the investigator."

BIBLIOGRAPHY.

1. British Medical Journal, July 27th, 1901.
2. Hygiene of Transmissible diseases, Abbott.
3. The Medical Record, July 13th, 1896.
4. New York Medical Record, February 12th, 1898.
5. American Medicine, August 3rd, 1901.

ACUTE MILIARY TUBERCULOSIS.

By JAS. THIRD, M.D.,

Professor of the Principles and Practice of Medicine, Medical Department Queen's University, Physician to Kingston General Hospital, etc., etc.

ACU TE miliary tuberculosis is a specific infection, dependent on the breaking down of an old tuberculous focus somewhere in the body and the dissemination of the liberated bacilli by the blood or lymph stream. It is therefore a secondary disease. The primary focus may or may not be apparent.

The lesion may be in the lung, the lymph glands, the joints, kidneys, Fallopiian tubes, etc.

The avenues by which the bacilli reach the blood were not clearly indicated until Weigert demonstrated the intimate association between miliary tuberculosis and tuberculosis of the blood vessels. According to his view the tuberculous process may invade the adventitia—a periangitis—and the bacilli find access to the blood through a fistulous opening, the result of a breaking down of the caseous mass, or the disease may, though rarely, commence in the intima—an endangitis—in which case the bacilli are swept into the blood current by a gradual softening of the intimal focus.

The pulmonary veins are specially singled out for attack. To branches of these veins we not infrequently find caseating tracheo-bronchial glands firmly adherent and the process gradually working its way towards the intima. Nor is this distribution surprising. It will be remembered that these glands are receptacles for all bacilli from the bronchial tract that are not ingested and destroyed by the broncho-pulmonic phagocytes.

The thoracic duct is a portal through which less frequently the bacilli reach the blood. The tuberculous process here, as in the veins, may penetrate the duct and pour its contents into the lymph stream soon to be lost in the subclavian vein. Clinical experience has shown however, that infection from this source is less virulent than that from the veins, that the disease tends to run a less rapid course.

It is highly probable that the virulence of any attack and the rapidity with which the destructive process goes on, are directly proportionate to the amount of poison thrown into the circulation.

The tubercle bacilli, having gained the blood, do not multiply in the active stream but are carried by it to the minute ramifications of the vessels in the various viscera, where they at once set up embolic foci, each

of which forms a nucleus for that peculiar aggregation of cells that we are accustomed to designate "miliary tubercle."

These miliary tubercles appear on the surface as dirty grayish nodular masses varying in diameter from one to three millimetres.

The minute structure of a tubercle is described elsewhere in this number.

Symptoms—For convenience the symptoms will be considered under the following heads:—(1) Typhoid form. (2) Pulmonary form. (3) Meningeal form.

It must be borne in mind however that there is no hard and fast line separating the typhoid from the pulmonic form. In the former the symptoms are those of an acute toxæmia and probably dependent on the large amount of tuberculous debris thrown into the circulation at one time; in the latter the pulmonic symptoms predominate although the toxæmic are not wanting. In the meningeal form the symptoms point unmistakably to a cerebral affection during the progress of which, symptoms referable to other organs are in abeyance.

Typhoid form.—In this form all symptoms point to a generalized infection. There is in most cases a period of incubation not unlike that of typhoid fever during which the patient complains of malaise, headache, chilliness, anorexia and increasing debility. Rarely the onset is sudden. The presence of the toxins is shown by the fever, the rapid feeble pulse, the flushed cheek, the dry tongue and mental dulness amounting in some cases to stupor or even coma. The temperature range is high, varying from 102 to 104 F., and occasionally in the later stages a temperature of 105 or 106 is met with. It is irregular in type and lacks the step-ladder characteristics that mark the early stages of typhoid fever. The steadiness of the first week of the fastigium is also wanting. Not infrequently we find an inversive type of temperature—a morning exacerbation and evening fall. This has occurred in 50 per cent. of my cases. It may continue for ten or twelve days at a time but it seldom lasts throughout the entire illness. It is met with occasionally in typhoid fever. Rarely the disease is afebrile throughout. The irregularity of the temperature-curve is of importance from a diagnostic point of view.

The pulse is small and its rate is altogether out of proportion to the fever.

The respirations are rapid—probably 30 to 40 per minute and still it is unusual for the patient to complain of shortness of breath. There is more or less cyanosis and a peculiar pallor of countenance characteristic of this form of the disease. No bacilli are found in the sputum because of the rapid and fatal termination of the disease. The only exception to this is

the co-existence of an old ulcerative focus in the lung or respiratory tract. If the disease is protracted the percentage of haemaglobin drops and with this fall there is an oncome of profound prostration.

When the tubercles affect the kidneys they give rise to an acute parenchymatous nephritis, the urin is diminished in amount, febrile in character and contains albumen and casts. Tubercle bacilli are absent. Their presence implies the existence of an old focus in the kidneys in the stage of disruption.

Apart from coma, which is a terminal event, the nervous symptoms are not marked.

The spleen is enlarged but the degree of enlargement is in no way comparable to that of typhoid.

When the disease is widely disseminated, choroidal tubercles are not infrequently found in the eye-ground. Their absence does not militate against the diagnosis of a general miliary tuberculosis. Their presence is positive proof of the disease and suggests the invasion of the meninges. They do not disturb the vision. Their demonstration requires the aid of an expert ophthalmologist. The physical signs, unless in protracted cases, are simply those of an ordinary bronchitis.

The differential diagnosis is not easy, typhoid, septicaemia, septicopyaemia and intermittent fever all claim consideration in this connection.

The intermittent malaria may be excluded by the absence of the haematozoa of Laveran or by the less scientific but equally accurate method of administering quinine "An intermittent fever that resists quinine is not malaria" (Osler).

A primary recognizable site of infection goes a long way in differentiating ordinary septicaemia and septicopyaemia from miliary tuberculosis. A bacteriological study of the blood clinches the diagnosis. There is however a form of septicaemia the "cryptogenetic septicaemia" of Leube that offers greater difficulty. In this form no primary focus has been recognized. These cases are not very infrequent but further investigations are necessary before a classification can be attempted.

By far the greater number of mistakes have arisen in discriminating between typhoid fever and the typhoid form of miliary tuberculosis.

The following are the points of dissimilarity :—(Anders).

Acute General Miliary TUBERCULOSIS.	TYPHOID FEVER.
" Family history of tuberculosis, or presence of an old focus.	Coexistent with an epidemic or following previous cases of typhoid.
Evolution of the disease not characteristic.	Evolution characteristic.

Acute General Miliary
TUBERCULOSIS.

Epistaxis rare.

Temperature-curve irregular in type.

Pulse rapid, out of proportion to fever.

Respirations rapid and labored.

Face dusky, with peculiar pallor. Abdominal symptoms not suggestive.

No characteristic eruption.

Widal reaction absent.
Knee-jerk may be absent.
Leukocytosis may be present.

Choroid tubercles may be detected. Tubercle bacilli rarely demonstrable in the blood.

Hæmorrhage from bowels exceptional.

Perforative peritonitis absent.

TYPHOID FEVER.

Epistaxis a common early symptom.

Temperature-curve of the continued type.

Pulse often dicrotic, slow in proportion to fever.

Respirations moderately increased.

No duskiuess of face.

Abdominal symptoms (stools, enlarged spleen, tympanitis, &c.) suggestive.

The eruption appearing in successive crops is pathognomonic.

Widal reaction present.
Knee-jerk never wanting.
Absent unless complicated by a suppurative process.
Absent.

Cultures from punctured spleen may show typhoid bacilli (dangerous procedure). They may be found in the stools.

Hæmorrhage from bowels common.

Often present."

The agglutination test is of great value but it is not infallible. Like all other reactions it must have clinical evidence to support it. A positive Widal simply means that the patient is having, or has had within a limited time, or at all events that he has, at the time of examination, in his system, probably in the bile, the elements of infection—the typhoid bacilli. It will then be apparent that should the typhoid antedate the tuberculosis, say five years, we might still get the Widal reaction notwithstanding the fact that our patient suffers from tuberculosis. Should we be able to exclude a previous attack of typhoid then the Widal reaction assumes considerable diagnostic significance. Osler, however, reports two cases giving a positive Widal reaction in which there was absolutely no evidence that either had suffered at any time from typhoid fever. In Cabot's collection of 5,978 cases there was a positive reaction in 97.2 per cent.

With tuberculin as a means of diagnosis my experience is limited and not altogether favorable. In 1891, I saw in the Toronto General Hospital, a case of acute miliary tuberculosis develop while the patient was undergoing treatment for lupus with Koch's original tuberculin. Shall we say this was a coincidence? If so Lockwood's experience at Bellevue Hospital furnishes many such. Of the accuracy of this means

of diagnosis there seems little doubt. Osler warmly advocates the use of tuberculin in obscure cases. It may become an agent of value in diagnosis but at present it should be used with extreme caution. A diagnosis is of little consequence if the smouldering fire has been fanned into a wide-spread conflagration.

Pulmonary Form.—A long period of impaired health, with more or less cough, is the usual prodrome of this form. An influenza especially, the thoracic type, may be the immediate cause of the outbreak. During the early part of the present year, when influenza was epidemic in this district, two cases of pulmonic miliary tuberculosis came under my notice following la grippe. Both ran a rapid course, the former terminating on the 23rd day, the latter on the 37th.

In children measles and whooping cough seem to prepare the soil. Whatever may be the predisposing cause the early symptoms and physical signs are those of a diffuse bronchitis, the very late those of a bronchopneumonia. Dyspnoea which attracts little attention in the typhoid form here assumes grave significance, the pallor gives place to decided duskiess, the expectoration is profuse and muco-purulent in character; these coupled with a history of tubercular disease make the diagnosis reasonably certain. In other respects the symptoms are those of the typhoid form and what has been said in respect to differential diagnosis under that head applies here. When an old tuberculous lesion is present in the lung, tubercle bacilli are found in the sputum not otherwise.

Meningeal Form.—Meningeal tuberculosis is said to be occasionally a primary disease, the bacilli gaining admission to the cerebral meninges through the cribriform plate of the ethmoid. The experiments of Strauss at the Charitè Hospital demonstrate the presence of tubercle bacilli in the nasal passages, but beyond this point all is hypothetical. We have no conclusive evidence that infection has ever taken place in this way, and at present we prefer to consider meningeal tuberculosis as invariably secondary, the primary focus in some instances escaping detection. In Eichhorst's series of 100 autopsies a primary focus was detected in 98. The primary lesion was found most frequently in the bronchial glands.

The mode of infection differs in no way from that referred to at the beginning of this article. The chief site of the tubercles is the pia mater at the base of the brain, although not infrequently the meninges of the cervical region and indeed of the whole length of the cord are affected, so that the disease might with propriety be designated cerebro-spinal meningitis of tuberculous origin. The quadrangular space bounded by the "Circle of Willis" and its outlets the Sylvian fissures are the areas

chiefly affected. These areas may be covered by a sero-fibrinous or more frequently a fibrino-purulent exudate. Gently sweeping away a portion of this exudate, the tubercles become apparent on the smaller vessels and are best examined with a small platyscope. In doubtful cases the branches of the middle cerebral arteries should be very carefully scrutinized. In this location the development of tubercles is particularly active. The number of tubercles seems to bear little or no relation to the amount of exudate. Corresponding to the distribution of the tubercles in the pia mater and a little beyond there is a superficial cerebritis—the depth in not a few instances being commensurate with the acuity of the process in the pia mater. The flattened appearance of the convolutions however, is due in part to the accumulation of fluid in the ventricles—acute hydrocephalus—and the consequent pressure from within outwards. This fluid is turbid in character and large in amount, dilating the cavities to their greatest limit and inducing a cadaveric softening of the ventricular walls.

Tuberculous meningitis affects children more frequently than adults. It is rare in the first year of life, most cases occurring between the ages of two and seven. There is usually a history of a fall. The evolution of the disease is characteristic. The symptoms change as the exudate increases. There is usually a prodromal stage of one or two weeks, during which the patient is peevish and fretful, complains of muscular weakness and photophobia and as a rule forsakes his playmates to bury his head in the maternal lap. During sleep he grinds his teeth, due to clonic spasms of the muscles of mastication, and not infrequently the child's initial dose of medicine for this condition has been a worm-powder. The bowels are constipated and there is more or less anorexia with occasional outbursts of propulsive vomiting. Occasionally the disease develops abruptly, especially in adults, and this fact more than any other has given rise to the theory of a primary infection. The stage of irritation is ushered in with vomiting, severe headache and chills followed by fever varying from 101 to 104 F. The headache, frontal in type, may be intense, the child at intervals uttering a short sudden, piercing cry—the so called hydrocephalic cry. The vomiting is uncontrollable, is due to irritation of the vagus, bears no relation to the taking of food and subsides only when the nerve is paralyzed. In this stage the pulse is slow in consequence of irritation of the vagus. As the disease progresses the pulse gradually increases its rate, until by the time paralysis of the vagus occurs, counting the pulse is almost an impossibility. This fact is a valuable aid in prognosing the probable duration of the disease. The bowels are obstinately constipated, due perhaps to spasm of their muscular coats. In the

stage of paralysis diarrhoea occurs. The abdomen is scaphoid or trough-shaped, the tongue coated, the breath offensive.

Convulsions are not uncommon, especially in the patients of two or three years. They occur earlier in those cases where the disease extends along the Rolandic area. There may be spasmodic twitching of the muscles on one or both sides. If the post-basic or spinal meninges are affected there is retraction of the head and perhaps opisthotonus. The expression is frowning and the eyes are closed, although vigilance is a prominent symptom in this stage. The sleep, when it does occur, is much disturbed by distracting dreams, evidenced by the so called night-terrors. If the pupils are exposed to the light the increased pain is the occasion for an outburst of crying. The symptoms of cerebral irritation gradually abate, the child becomes dull and apathetic, until at the end of a fortnight the stage of excitement closes, leaving the patient comatose, and with few external evidences of life other than convulsive movements of the face, the arms or the legs.

The temperature during the stage of coma varies. At first it is high ranging from 102 to 105 F., later it becomes subnormal and remains so until just before death when an ante mortem rise of 106 or even 108 F., is not infrequent. Apart from hyperaesthesia the cutaneous manifestations are not important. A mottled erythema is occasionally observed.

The ocular symptoms are of special importance. Choroidal tubercles are occasionally met with. Optic neuritis is exceedingly common in the late stages of the disease. The state of the pupil is a fair index to the stage of the disease. In the irritative stage the pupils are contracted: as the exudate increases the pupils may be irregular dependent upon the unequal pressure on the 3rd nerve in the area affected. Ere long, the intracranial pressure becomes sufficiently marked to paralyze the motor oculi, when dilatation, ptosis and conjugate deviation result. In tuberculous meningitis of the convexity, without distention of the ventricles, dilatation of the pupils does not occur. In some instances there is paralysis of the 3rd nerve on one side and of the face, limbs and hypoglossal nerve on the opposite side. The eyes remain partially open—a lagophthalmos—and between the lids, the white sclera, and a small portion of the cornea, can be seen as the upturned eyeballs are slowly oscillated from side to side. The course of the disease varies as a rule from a few days to a few weeks. In a recent case the patient, a lad of 14, lived six months. There was no very clear history of tuberculosis. A diagnosis of cerebral tumor had been made.

The recognition of tuberculous meningitis is not difficult. The history, the insidious onset and the train of symptoms leave but little doubt.

Kernig's sign is present in most cases. If the thigh be flexed to a right

angle with the abdomen, the leg cannot be extended on the thigh if meningitis be present. The effort gives great pain. It is present in all forms of acute spinal meningitis. In obscure cases lumbar puncture should be resorted to. The absence of the diplococcus intracellularis in the fluid excludes cerebro-spinal fever. Tubercle bacilli may be found in the centrifugalized fluid; a sterile fluid however does not preclude the possibility of a tuberculous condition. In such a case a guinea pig should be inoculated.

A fatal termination is the rule. A few cases of recovery have been reported. Fürbringer's case, from which he withdrew by lumbar puncture 60 c. c. of cloudy fluid containing bacilli, was apparently well six months afterwards. Freyhan reports a recovery, the diagnosis having been confirmed by lumbar puncture. Barlow of University College Hospital, claims that recovery is possible in circumscribed tuberculous meningitis. He advises the exhibition of mercury. Bromide and chloral are indicated in the convulsive stage. Ice bags have been applied to the head and spine. The treatment however of acute miliary tuberculosis is entirely symptomatic, the course of the disease being uninfluenced in any way by human agency.

EFFECT OF DIET ON SUSCEPTIBILITY TO TUBERCULOSIS.

IN an editorial note in the issue of October 30th, the "Medical Press and Circular" mentions the result of an investigation recently made at the London Zoological Gardens as to the effect of diet on the susceptibility of monkeys to tuberculosis. Two sets of animals were fed, the one on vegetarian, the other on meat diet, and it was found that seventeen out of thirty-five deaths during six months among vegetarian monkeys were from tuberculosis: while of ten deaths among the other class not one was from this cause. Curiously enough this result accords with the view derived from clinical experience in Sanatoria for consumptives, which has lately emphasized the importance of a nitrogenous diet in cases of phthisis, but this only partly explains the reason for the above result, as certain of the herbivora have almost as complete an immunity as the carnivora. Probably the manner of life of the latter class, requiring as it does a higher degree of activity, has something to do with the relative immunity.

In the same number of this periodical attention is called to the danger of the "oxygen fallacy," on the ground that especially in pulmonary tuberculosis there is an over-combustion, a true consumption, where the respiratory changes as measured by the output of carbonic acid are in excess of the normal.

A. J. M.

TUBERCULOSIS OF THE PELVIC ORGANS IN THE FEMALE.

By THOMAS S. CULLEN, M.B.

Associate Professor of Gynaecology in the Johns Hopkins University, Baltimore.

THIS is a subject that, until recent years, has attracted little attention. In 1892 Williams gave a complete review of the observations up to that time, and since then many cases have been reported. I will not here attempt to give a survey of the literature, but merely describe the clinical and pathological findings as we have observed them in the Johns Hopkins Hospital.

TUBERCULOSIS OF THE VAGINA.

This disease is comparatively rare. When the patient comes under observation she usually presents an area of ulceration. The ulcer is irregular in shape, is surrounded by a slight inflammatory halo, has sharp, slightly raised margins, and the base is rather pale in color and sometimes covered by a little pus. Such an ulcer, while rather suspicious, is in no wise characteristic and very often may be mistaken for a malignant process. It is only on histological examination that its true nature can be ascertained.

On histological examination the floor and walls of the ulcer are found to be covered by caseous material beneath which the characteristic tissue composed of epithelioid cells is present. Scattered throughout this are giant cells or typical tubercles. Between the area of ulceration and the normal surrounding tissue is a zone of small round-cell infiltration. Tubercle bacilli are readily demonstrable in the caseous material, and to a limited extent in the underlying epithelioid tissue.

Symptomatology. As a rule the patient in the early stages has little pain. First of all there is some thickening of tissue followed by a gradual ulceration with little discharge. The disease may manifest itself in the young, middle-aged or old.

Treatment. Complete excision, giving the disease a wide berth is naturally the only satisfactory solution.

TUBERCULOSIS OF THE CERVIX.

This is a most unusual condition, and in a period of over eight years we have not seen more than three cases. If situated on the vaginal portion of the cervix it is, of course, visible, but if in the cervical canal may not be suspected. Where present on the vaginal portion the affected area presents a reddened and slightly ulcerated and irregular surface, surrounded by a zone of hyperæmia, and occasionally in this reddened area are a few small slightly raised yellowish nodules—
young

tubercles. On histological examination the typical tuberculous tissue renders the diagnosis easy.

The symptoms of such a case are in no way suggestive of the condition present. There is usually some leucorrhœal discharge, occasionally blood-tinged, and on digital examination some hemorrhage may take place, but much less than we are accustomed to find where carcinoma is present. Where the disease is limited entirely to the mucosa in the cervical canal the tissue may have undergone complete caseation, and yet there is nothing save the leucorrhœal discharge to suggest any pathological condition.

TUBERCULOSIS OF THE ENDOMETRIUM.

During a period of 18 months, although continually watching for mucosa showing evidence of tuberculosis, we failed to find a definite case. However, in the last six years we have encountered over 40 cases. In the early stages the disease is confined chiefly to the mucosa near the uterine horns, and then gradually extends downward, involving the mucous membrane of the entire cavity and occasionally that of the cervix. First small elevations are noticed in the still intact mucosa. They are whitish or whitish yellow in color, and rather firm. In a short time the mucosa becomes slightly ulcerated, the floor of the ulceration is reddish in color, and the margins are slightly raised and often surrounded by discrete tubercles. This process gradually extends downwards and also laterally until in advanced cases the entire mucosa is replaced by caseous material, and the uterine muscle is often involved for half its thickness, and occasionally the process extends as far as the peritoneum.

On histological examination the characteristic picture is present. Where the process is early the surface epithelium of the endometrium is still intact, but over the slightly raised areas is pale-staining and flattened. The uterine glands on the whole present the normal appearance. Scattered throughout the stroma, just beneath the surface, are pale-staining areas consisting of little clusters of epithelioid cells. At other points large or small giant cells lie in close proximity to the glands, and here and there typical tubercles are present. On careful examination we have found that not only the stroma cells but also the gland epithelium takes part in the formation of epithelioid cells. As the disease advances the small tubercles become caseous and show infiltration with many polymorphonuclear leucocytes, while the stroma shows much small round-cell infiltration. The surface of the mucosa gradually disappears, being replaced by an ulcerated area consisting entirely of caseous material beneath which is typical tuberculous tissue. After a

time no trace of mucuous membrane remains, and the tubercles become scattered through the uterine muscle.

Symptoms. There are no distinct signs of tuberculosis of the endometrium. The process is usually secondary to a similar one in the fallopian tube and consequently the tubal symptoms mask the condition present in the uterus. There is usually some leucorrhoeal discharge. Of course examination of the scrapings especially from the vicinity of uterine horns will render the diagnosis certain.



Photomicrograph of a Section taken from the fundus of the Uterus.

Gyn. Path. No. 519. Three uterine glands can be seen. These are recognized by their epithelial lining and by the cavities in their centres. The gland nearest the centre contains some desquamated epithelium. To the extreme left is a dilated gland, along one margin of which the epithelium is still faintly visible. Near the middle of the field three tubercles (*a*) can be seen. In the centre of each is a giant cell. The nuclei of these cells are arranged principally around the margin. Surrounding the giant cells are pale staining epithelioid cells, while scattered throughout the stroma everywhere are small round cells. To the left of the centre in the stroma are two small, pale-staining areas (*b*)—clusters of epithelioid cells.—“Cancer of the Uterus.”—Cullen.

Treatment. In all cases where tuberculosis of the uterus is present this organ together with the tubes should be removed.

TUBERCULOSIS OF THE FALLOPIAN TUBES.

This was formerly supposed to be a rare affection but the observation of Williams and others and our own experience show that tubercular involvement of the tubes is common. Where associated with tubercular peritonitis the tube is usually covered with a mantle of tubercles and this membrane can be peeled off but usually with some difficulty. Small tubercles are in such cases found in the folds of the fimbriae.

Where the disease occurs independent of tubercular peritonitis and is well marked the appearance is typical. The tube is nearly normal in size at the uterine end but on passing outward rapidly increases until near the fimbriated extremity it is two or three times the normal diameter. The surface is reddened, relatively free from adhesions but studding the surface and directly beneath the peritoneum are many small tubercles. The fimbriated extremity although greatly thickened and reddened is invariably free, a condition that is rarely found where such marked tubal disease exists. The fact that the outer end is free instantly suggests tuberculosis. The lumen of the tube often contains caseous material that can be forced out. The tuberculous tube does not always present such a striking or characteristic picture. Sometimes the tube is covered by adhesions, is little thickened and cannot readily be distinguished from a small pus tube. But on gently drawing it between the fingers small spot-like nodules can often be felt. These are tubercles scattered throughout the tube wall.

Histological examination. In the early stages the tubal folds are still intact but scattered throughout their stroma are pale-staining areas composed of epithelioid cells or of giant cells surrounded by epithelioid cells and an outer zone of lymphoid cells. In other words, typical tubercles are present. In these it is possible to demonstrate a few tubercle bacilli. As the disease advances the folds of the mucosa are no longer recognized. The lumen of the tube is filled with young, middle-aged, and old tubercles and the tubal epithelium is so distorted as to resemble small glands. The muscular coats now show islands of tuberculous tissue and small tubercles are abundantly scattered over the peritoneal surface. In the late stages of the disease little or no trace of the mucosa remains. The centre of the tube is filled with caseous tissue and surrounding this is typical tuberculous tissue. Occasionally part of the caseous material becomes calcified. In the caseous material quantities of tubercle bacilli are to be found.

Symptoms. Tuberculosis of the Fallopian tube may occur at any age but is most frequent during the child-bearing period. It may be secondary

to a tubercular peritonitis or to a tubercular process elsewhere or may be primary in character, occasionally being contracted from the husband. The process comes on slowly, may or may not be associated with a moderate rise of temperature and is usually accompanied by indefinite pelvic pains. There are no distinctive signs to differentiate tuberculosis of the tube from pyosalpinx save the examination of scrapings from the endometrium. If the process be advanced we shall expect to find evidence of the tuberculosis in the uterine mucosa and then the diagnosis is certain.

From what we have learned from the description of the tubes vaginal examination will reveal thickening of the tube usually on both sides together with a diminished mobility.

Treatment.—As the process extends to the ovaries and in advanced cases to the pelvic floor and occasionally to the rectum complete removal of the tubes, uterus and frequently of the ovaries is indicated. This is also necessary where the tubal disease is primary as if not removed general tuberculosis may ensue.

TUBERCULOSIS OF THE OVARIES.

The ovaries are rarely primarily involved. Where general tubercular peritonitis exists they are covered to a limited extent by the tuberculous mantle. If the process start in a tube they are often perfectly normal, occasionally, however, the surface of the ovary is studded with typical tubercles and the characteristic tuberculous tissue is scattered throughout the ovarian stroma. In advanced tuberculosis of the tube both the tube and ovary are occasionally merged into one large caseous mass. Of course there is only one line of treatment where tuberculosis of the ovary exists, namely, complete and prompt removal.

RÉSUMÉ.

Tuberculosis of the tubes and ovaries is rarely diagnosed until the abdomen is opened save where uterine scrapings have been examined.

Tuberculosis of the endometrium has no distinctive symptoms but can be promptly recognized by examination of curettings.

Tuberculosis of the cervix, a rare process, is also easily recognized on microscopical examination.

Tuberculosis of the vagina is recognized with ease with the low power.

Tuberculous tissue wherever situated in the pelvis requires prompt removal.

TUBERCULAR DISEASE OF BONES AND JOINTS.

By HADLEY WILLIAMS, F. R. C. S. (Eng.), Western University, London, Ont.

A glance at this subject, in a general way is all that can be done for a discussion of the differential diagnosis, and the various orthopaedic appliances for the hip and spine would be much too lengthy. In a pathologic sense tubercular disease of bone and joints is local and it should be the endeavor of every surgeon to prevent it from becoming general. We know that a bacillus is the cause, and chooses those parts in bone where the cells are young and rapidly proliferating, namely, the first deposit centre of ossification and the region of the epiphyseal cartilage of the cancellous tissue. It is rarely, if ever, met with in the shaft. Here, ossification takes place about the seventh week of foetal life and is practically soon completed, whereas the extremities of all the bones are never the seat of bony deposit until a separate existence for the child. The lower end of the femur is the first to show ossification, is the only epiphysis in which this condition is found *in utero* and then, but a few days at most, prior to the termination of gestation.

The actual presence of a giant cell in a mass of granulation tissue is not positive evidence of tubercle, for similar cells are found in other inflammatory tissue; neither is absence of the bacillus to the staining process and the microscope, proof that tubercle is not present, for inoculation in a susceptible animal of the products of the mass will cause a general tuberculosis.

Almost without a single exception the tubercular process begins in the cancellous structure of the articular ends of bones, either by a somewhat circumscribed spot or a more general and diffuse infiltration. By irritation of the germ and its products, the infection produces around it a tubercular osteitis. There is at first an increased vascularity, the spaces become filled with inflammatory products, the arterioles plugged with debris and the circulation shut off. The enclosed mass now becomes a sequestrum, constantly irritating the living walls of bone by which it is surrounded. Inflammation proceeds, the bony network gradually breaks down, the mass increases in size, the centre becomes entombed and dead, from the absence of blood vessels, and caseation takes place from necrotic and fatty degeneration. All around granulation tissue fills the hollowed out spaces, the limits of the process become more and more indistinct, the bone in some cases being destroyed to a mere shell as in the tarsus and ends of the femur, little or no fibrous tissue is formed, pus may collect and break through the periosteum or granulations infiltrate and finally ulcerate through the cartilage into the joint. In fact, the

whole process is lacking in the qualities of fibrous and bony repair and hence its extension is favored in those cases not combated by treatment. The collection of pus becoming greater may break either into or outside of, and away from, the joint; the skin becomes thinned, the abscess discharges and a sinus forms. Secondary infection by the common pyogenic organisms is liable to take place and the cold abscess of a tubercular process be converted into a mixed infection with all the dangers of hectic, amyloid disease of the organs and general tuberculosis. Acute abscess never occurs in bone, for the early conditions of its formation would lead to occlusion of the blood supply and cause necrosis. Chronic abscess is only found in the articular ends, usually of the tibia and femur, in youth and early adult life principally, and, in nearly all cases, results from tubercle.

The caseation spoken of as "cheesy" never forms pus. The latter cannot be the result of such a dead mass but is formed only by the living tissue in contact with the sequestrum and infected area. When this takes the form of a circumscribed nodule in the articular end it is usually wedge shaped or, rather, more like a cone with the base towards the surface and the apex embedded in the cancellous tissue; there is no tendency to separate and no ambition to form fibrous tissue or bone. Yet, in some cases, the mass under favorable conditions does become sclerosed and shut off, as an encysted bullet, or finally, be calcified and rendered more or less innocuous. But as a rule the process is a progressive one and eventually leads to all the horrors of pain, suppuration, atrophy of muscle and bone and deformity of limb and spine too often seen by the surgeon. Though tubercle is a local process, insidious and slow, it is still a hot-bed of infection that may, at any time, light up with unexpected energy and, like the metastatic emboli of pyremia in the system, cause a general and a fatal tuberculosis.

Disease of the tarsus, for instance, in adults, if at all extensive, seems to require amputation where in the young, removal of a part of or a whole bone offers better results. I once removed the foot in a man of fifty-eight, where the disease had apparently remained local. The results of the operation were good but the patient died a year later from phthisis.

Fortunately, general infection is rare considering the large number of cases in which no secondary deposit is present or, at least causes sufficient trouble to be recognized. But it must not be forgotten how residual foci in bone, quiescent for months or years, as in the hip and knee and shut off by a reparative process will under favorable conditions as lowered vitality or injury or both combined, break out and cause abscess and sinuses as of old. The term "caries" is nothing more or less

than gradual destruction of bone with the presence of pus, that is, a suppurative osteitis, and this is the condition present in the majority of all tubercular disease for, if allowed a free hand, it nearly always ends in supuration. In whatever bones the infective process settles its subsequent course is almost essentially the same but modified as to its termination by the resistance of the individual, the care with which it is challenged, and the success with which it is fought. And it starts in favored situations,—in the upper extremity of the femur either in the new bone which lies close to the epiphyseal cartilage; in the region the centre of ossification for the head, or in the cancellous tissue immediately beneath the encrusting cartilage. But also in some other part, limited to the neck, from which it may extend along the bone and break through the periosteum and form an abscess external to the joint cavity. If in the acetabulum, as may be expected. the process is confined to the “Y” shaped cartilage which separates the three parts of the innominate bone from each other, where the cells are young, and which is analagous to the epiphyseal ends of the long bones. If a vertebra be modified and, by a stretch of imagination, becomes a long bone then the body proper represents the shaft, and the two surfaces, in contact with the intervertebral substance, the epiphyses which, in reality, unite as plates. Here as in the femur, the infective process starts in the intervertebral discs but well to the front of the body.

In no case does tubercle commence in cartilage or ligaments though there is some doubt about the intervertebral substance. The synovial membrane is also the seat of deposit as exemplified in the knee in most of the cases affecting that joint. The course is essentially the same as in bone but modified in accordance with the histological structure of this tissue. The most common is the diffuse variety though the membrane may be the seat of a nodular form or the miliary type. When the cavity is opened the lining synovia has a soft gelatinous appearance, the granulations make the surface rough and shreddy, friable and easily torn away with interspersed spots of caseation. Fluid is nearly always present altered in appearance by the products of tubercular inflammation and containing pieces of granulations and fibrin shreds. If this condition goes on the cartilage is implicated by the exuberant granulations, becomes pitted by softening and breaking up of its fibres, ulceration takes place, the bone attacked and a rarefying osteitis proceeds, as in the primary deposit of the cancellous tissue. The synovial membrane grows thicker and thicker (and to this the swelling is largely due) the ligaments become involved, cold abscess forms in the majority of cases, may discharge and leave a sinus. This is the so-called pulpy degeneration or

white swelling. The joints most frequently attacked are the knee and hip and less often the elbow, shoulder and wrist—the latter having the preference in young adults. In nearly every case one cannot help being impressed with the fact that patients give a history of an injury from which they date the inception of their trouble. Whether the injury itself favors a tubercular deposit or only brings more forcibly to the notice of the patient an already tubercular joint is difficult to decide but, when one considers that the knee, hip and spine are the parts most often implicated and that, in youths, these contain the joints which receive the most shocks from jumping, running and falls, it is rather attractive to suppose that injury of some kind has much to do with the determination of this disease, for doubtless the germ is circulating in the system of many individuals whose powers of resistance to infection are too strong to allow tubercular deposit. The symptoms of this disease are, in many cases, obscure until the formation of abscess and even sinuses.

There is tenderness on pressure over some part of the bone and a tubercular spot may occasionally be located and dealt with. Actual pain is not severe but fairly constant in the early stages and, if synovitis takes place with destruction of the cartilage or apposition of the bony surfaces, often becomes excruciating. Abscess may be the first symptom complained of, the process being so slow and insidious in its progress, and when this takes place there is usually a slight rise of temperature. The tissues are swollen, the contour of the part altered with some redness of the overlying skin, and fluid may collect, especially if connected with a cavity. If a sinus forms, the discharge is at first thin with pulpy granulations springing from the floor, gritty bony particles may come away, and the probe, when introduced, breaks into a soft tissue wanting the solid ring of necrosis. The knee always shows some alteration in shape; there is stiffness, swelling gradually fills up the natural hollows and a sense of weakness to the patient. A hand placed on the joint usually gives a slight increase of temperature and the limb is placed in the position of most perfect rest, slight flexion and rotation outwards. In the older and more advanced cases the tibia is dislocated backwards and thrown outwards, the muscles of the thigh and calf atrophy, the bones, both above and below, become smaller from want of use and good circulation, the patella is often firmly bound down, and contraction and deformity complete the picture.

The diagnosis of extensive and advanced disease of the hip is usually self evident, though not always. It is in the very early stage that a positive opinion is hard to give and a prognosis still harder. Perhaps the first sign is a slight limp, or a short and a long step and, when the child

rests it is on the sound limb. If synovitis be present there is more pain. Flat on the back on a hard sofa and placed in a straight position, the finger of one hand on the anterior superior spine of the ilium while the leg is gradually abducted in the extended position, rigidity will be discovered by the pelvis moving outward with the limb—a valuable sign that should always be sought for. (Rigidity due to the contraction of the psoas moving in extension but be normal when thigh is flexed on the abdomen.) Later, the leg is flexed both at the hip and knee, abducted and rotated outwards, the normal position of rest by relaxation of the ligament. The picture of later stages is well known.

So also, tubercular spine offers many obstacles. Rigidity, as in the hip, is one of the earliest signs and in stooping the patients rest a hand on the knee as a support. Most constant are the gait, attitude (shoulders thrown back if in the lumbar, forward in the dorsal, head tilted in the cervical); belly ache in children and angular deformity. Prone on the table, the ankles grasped and the body lifted, the spine resists over extension. The appearance of an abscess alone is the first indication, occasionally, of anything wrong. When angular deformity is present (remembering that certain spines may be congenitally altered in shape from elongated spinous processes etc.) it constitutes the best and surest sign, for other causes of this condition are counted on the fingers of one hand. They are few and rare.

Fracture dislocation,—the diagnosis of which is self evident, absorption of the bodies from malignant disease; aneurism of the thoracic or abdominal aorta (few are the surgeons who ever saw it); and scurvy, rickets an even still rarer possibility from separation of the epiphyseal discs; syphilitic osteitis may. Practically, then, tubercle is the great cause of angular deformity. Rickets gives a more general curve and easily straightens by bending forwards. Eighty-five per cent of the paraplegias which are a result of pressure on the cord, if seen early, disappear by putting the patient in the prone position and at rest. The most immediately dangerous part of the spine is the cervical region at its upper part on account of the importance of the cord at that point—for the phrenic, straight from the all important respiratory centre, makes its exit with the 3rd, 4th, 5th, nerves on its way to the diaphragm. And since the bodies of the axis and third and fourth cervical vertebrae are very small and the articular processes almost flat, caries is liable to cause a sudden dislocation by the turning of the head, even during sleep. Firm fixation here is necessary. The finger pushed back into the pharynx can always touch the anterior parts of the bodies. If abscess forms it should be opened, by preference, in the neck for by the mouth antiseptic pre-

cautions are unavailable to say nothing of the dangers from pus entering the air passages.

The local treatment of tubercular disease of bone and joints may be summed up by perfect immobility of the part, a conservative attitude, eradication by operation. The limb immobilized by a splint, either of starch or plaster of paris, and long enough to reach beyond the limits of muscular action. Under conservative treatment of the disease we have orthopœdic appliances as splints and the like, the congestion method of Bier and iodoform suspended in some fluid as glycerine, called the Iodoform-glycerine emulsion. These three methods, either singly or together, are adopted by many surgeons believing that they offer, in the majority of cases, better results than atypical severe operations. It is best, perhaps, to consider both methods in all their bearings but not to forget there are conditions where the knife and the gouge are indispensable or even an amputation as one would treat a malignant knee, after the best conservative treatment, fresh air, sunshine, rest and good food. And the earlier this is recognized in any case the better for the patient. Without discussing the various methods of destroying the tubercle bacillus in bone and other tissues of a joint, such as the igni puncture, carbolic acid, caustics, etc., the favor is now given to iodoform.

Of all substances this has the most remarkable curative action used say as a ten per cent. glycerine emulsion, sterilized, though this is not necessary for sterilization takes place soon after mixing by the action of the glycerine. Its use is not without an element of danger—a rapid pulse, high temperature, vomiting, fixed eyes and spasms. But, as the walls of a tubercular abscess absorb very badly, this condition is fortunately very rare.

The contents of an abscess or joint are first drawn off with a middle sized trocar and the emulsion injected into every part, a piece of cotton soaked in iodoform-ether applied and held in place by adhesive plaster and a tight dressing to compress the walls of the cavity and allow every part to come in contact with the injection. The trocar, if entered obliquely, forms a valve-like action in the tissues and prevents the escape of the fluid. But on account of the entirely local action of the iodoform, for it does not act at a distance, it seems difficult by this method alone to reach the individual foci or to attack the infected areas of the cancellous bone. The interval before another injection takes place may be at least a week or even two.

One will notice in almost all the incisions made for tubercular disease a keloid condition of the scar and stitch holes which, in regions like the neck and shoulder, become unsightly, a bar to low dresses and a worry to those seeking social advancement. This can be obviated largely

by using the subcuticular method of closing the wound, and silk worm gut answers very well. The congestion method consists in the application of an elastic bandage to the limb up to the joint and again above for several hours daily which aims at the arrest and death of the tubercular foci by an increase blood supply to the parts. Early this may be tried but, later, nothing offers such good treatment as an opening and the use of a gouge or spoon

R. R., boy, age seven. Hip disease. Pus suspected on outer side of joint beneath trochanter major vaginæ femoris. Incision was made in front two inches in length and the abscess reached. An opening in the capsule was enlarged and the focus sought for. A counter incision further back was necessary from which the tubercular softening was more easily reached. This was gouged out, thoroughly curetted with a hot sterilized normal salt solution running under high pressure, the parts packed with iodoform gauze tightly until the stitches were put in, sterilized iodoform glycerine emulsion applied and the incisions accurately sutured without drainage. The articular head of the femur, as far as could be seen, was unaffected, the focus being at the junction with the neck and breaking into the joint from that point. There was an uneventful recovery from the operation and no sign of reformation of abscess. Extension at night and Thomas Splint by day has been the treatment. This case was lost sight of for some time and now, fourteen months after, there is ankylosis with the femur considerably flexed and much lordosis of the spine. Here, as in all these conditions, forcible straightening under an anæsthetic is to be deprecated on account of the liability of the tubercular disease being again set up in the joint by movement. The operation offering the best results is the division of the femur just below the trochanter major which, under strict aseptic precautions, runs the usual course of a fracture.

Resolution taking place in one part of the body, tubercle may show itself in another either independantly or by metastasis. Albert V., a coachman, age nineteen, well marked tubercular arthritis. Opened knee joint by two lateral incisions, curetted the cavity with hot sterilized salt solution (discovered no bone disease by the finger) and used a drainage tube for forty-eight hours; healed without difficulty. A year later there developed a tubercular peritonitis. The knee for over six months had caused no trouble and motion was very good though not perfect. The abdomen was opened in the usual way and again closed. The patient made an excellent recovery and went back to his home in England. In many of the psoas abscesses the bone can never be reached satisfactorily; septic infection is liable to occur and rapid dissolution take place

Nellie T., age twenty, on arrival in the hospital gave a history of Pott's disease extending over three years. No angular deformity but

scars in lumbar region where an abscess had been opened some months previously—a diagnosis of sacro-iliac disease was at this time favored. A year later she again came under my care with a large lumbar abscess and a small sinus close to the post-superior spine of the ilium. Incision discovered a large cavity extending beneath the gluteus maximus nearly as far as the hip joint, also along the iliac crest and upwards for some inches by the erector spinæ. This was carefully curetted in the usual manner but on account of the patient's low condition could not remove any bone. There was great pain for forty-eight hours; eight days later the stitches gave way and pus discharged in large quantities. The patient weakened rapidly with hectic flights of temperature, and died in ten weeks. The autopsy showed extensive formation of abscess with disease of sacro-iliac joint, pus having worked its way into the pelvis in front of the sacrum. A psoas abscess bulging in the thigh was once mistaken for a reducible hernia in a negro where Pott's disease was never suspected. Phthisis developed later and the dorso-lumbar spine was found to be the seat of tubercular disease. My last case of psoas abscess showed itself on the outer side of the thigh. Here aspiration, under strict asepsis, has been done several times at intervals of about two months in preference to any other method, the dangers of general sepsis being so appalling.

In the following case of tubercular knee, S. P., a barber, age twenty-five, there was a history dating back nine years, during which time rest, plaster casts and other forms of treatment, other than operative had been used. Five weeks previously the joint had commenced to swell and the pain was very severe. When seen in consultation the leg was flexed and rotated outwards, the tibia, which the patient constantly held in his hands to ease the excruciating pain was dislocated backwards, the joint was swollen, dusky in color, tense and evidently filled with pus, and the temperature increased two or three degrees. In short, the picture was one of an acute arthritis. The internal condyle of the femur was very prominent and exquisitely tender. Immediate arthrotomy was advised and the next morning the following operation was performed. Two lateral incisions were carried downwards on either side of the patella and the joint opened. The finger coming on roughened bone over quite an extensive surface the incisions were united in front by division of lig. patellæ and the flap turned up. On flexing the leg the ends of the bones were brought well into view. There were about four ounces of pus, and pulpy granulations everywhere lined the cavity; the articular cartilages were destroyed, the bones carious and cheesy. Some of the tubercular spots in the bone were half an inch in diameter and

penetrated deeply into the cancellous structure. With the knife and scissors the synovial membrane was dissected completely off by going beyond the upper patellar pouch, which was filled with granulations, and working downwards over the end of the femur to the back and sides of the joint. The diseased spots in the articular ends of both bones were gouged out and also others which, at first, were not noticed except by probing the surface. When completed the end of the femur was riddled by holes made with the gouge. The whole joint was then thoroughly curetted with copious quantities of hot sterilized normal salt solution, under high pressure, to remove the clots and debris and stop the oozing of blood. Iodoform gauze was packed tightly into every part until the superficial sutures of silk worm gut were inserted in the skin incisions half an inch apart. The gauze was then removed, two silk ligatures applied to the lig. patellæ, the joint filled with iodoform glycerine emulsion, the stitches tied, and the whole completely closed without drainage. A copious quantity of dry dressing was applied, tightly bandaged and the limb placed on a posterior splint and straightened. The patient as may be expected, prior to the operation, was in a very critical condition, pulse 120 and running up to 140, and the temperature $102\frac{1}{2}$. That evening the pulse was 100 and the temperature $99\frac{1}{2}$, and from that time on never rose above, except the temp. on one occasion for a few hours showing $100\frac{1}{2}$. There was but little pain complained of, and that in the foot, and œdema of the leg. Ten days later the dressing was taken down and the stitches removed. The edges of the capsule were not included in the ligatures but purposely left to allow collections of blood within the joint to escape and prevent tension. To this was due the absence of pain and the ease enjoyed by the patient, for the dressings were soaked to the depth of an inch and formed a hard and firm case. The limb was encased in plaster and showed a good position. One month later a silk ligature escaped from the front. Subsequently no sign of inflammation showed itself, and the patient went home and increased rapidly in weight. A year after he returned complaining of some little pain in the knee at certain times, especially when driving. He had long since removed all support except a flannel bandage, and the limb had become again flexed so that the big toe just touched the ground in the erect position. The muscles of calf and thigh were much atrophied and the tibia smaller than on the sound side. As the patient could not bear much weight, and on account, more particularly of the position and atrophy rather than pain which was very slight in character, he desired amputation. An examination showed not the slightest sign of tubercular trouble, tenderness, swelling, or increased temperature, and it

was unfortunate that the limb should have been allowed to resume its old position. Losing sight of patients after such operations is a source of regret, for failure often follows where success should have been obtained. Not satisfied to destroy what was considered a good result the patient was coaxed to allow an excision. This being refused, amputation above the knee was performed. The joint cavity, on dissection, was obliterated and the opposing surfaces united by strong and numerous fibrous adhesions, the cavities made in the bone by the gouge a year before had completely filled with fibrous tissue and no sign of tubercle anywhere. Had a thin slice of bone been removed from each surface at the former operation, there is not the slightest doubt bony union would have taken place (as was expected from the amount gouged out at the time) and the patient have had a useful though somewhat atrophied limb. He is now healthy and strong. In contrasting the conservative treatment from one of its greatest advocates, the Breslau clinic, with the atypical operations (speaking generally of the hip and knee as being the two joints mostly affected, and which hold for the patient most serious consequences) the following good results were obtained.

Congestion method.....	66 per cent.
Iodoform glycerine.....	82 per cent.
Combined.....	75 per cent.
Atypical operations.....	58 per cent.
Operation and iodoform.....	60 per cent.

Out of 235 cases, 70 per cent showed good results (always more favorable in the young than the old), but "cured" does not mean good movement in all, probably not more than 1-5 recovering with excellent functional activity. The above table shows the "Iodoform Glycerine" method as giving the best results.

Of the operations, only a little over a half were successful, but many of the bad are due to the severity of the cases and secondary infection from want of asepsis. Every cold abscess when opened should be undertaken with strict aseptic precautions, whether by trocar or incision, and accurately closed, or fistulæ with tubercular walls and mixed infection will undoubtedly occur.

Speaking of the knee, König gives 84 per cent good results after arthrectomy, 75 per cent after excision, but though König shows a higher percentage than the best conservative treatment, the actual good results as to the nobility are much less, so that these disadvantages of the operative treatment must be taken into account. Then of the bad results many die from shock, sepsis &c where, in the conservative methods,

the risks of life are perhaps on the average not more than 6 per cent the operative 15 per cent to 20 per cent.

In the hip, where all treatment, is less satisfactory than in the knee, Schede given 60 per cent and Riedel 62 per cent of cures, from atypical operations, whereas the conservative treatment at Breslau shows 75 per cent to 80 per cent. Excisions having the high mortality of over 40 per cent to say nothing of the shortening of the cases in which good results were obtained. Generally, then, where conservative treatment in the hip shows better results than operations, in the knee the tables are turned. It seems therefore that, while the conservative methods leave better results on the whole and are certainly not nearly so actively dangerous to life, the operative procedure takes a much shorter time in the treatment, but is more fatal.

In no part of the body is excision so well indicated as in the knee (a thin slice with gouging answers as well as extensive removal) especially where the patella is bound down, the quadriceps and other muscles atrophied and useless. It is a surprise to all how many of the former so-called "strumous" and "scrofulous" cases recovered without any really practical treatment whatever except rest, good hygiene and a resistant constitution—but, to-day, with well marked symptoms, and wherever possible under strict aseptic precautions to prevent the entrance of common pus organisms, incision with removal of the infected areas freely with the gouge, curettage with ample quantities of hot, normal saline solution under high pressure, iodoform emulsion and accurate suturing without drainage (except in special cases) offers the quickest removal of the tubercular material from a part and, surgically, has a more scientific principle involved than any other treatment since (and this is a most important feature) it aims at the total eradication, and not alone the suppression, of the tubercular process.

TUBERCULOSIS OF THE ALIMENTARY TRACT.

BY R. J. DWYER, M.D.

Lecturer on Clinical Medicine, Toronto University, Physician to St. Michael's Hospital.

THE tendency shown by tuberculous disease to almost uniformly attack certain portions of a given system while sparing others is very marked when the disease invades the alimentary canal. In the latter, indeed, this peculiarity is so pronounced that certain portions of the tract afford nearly all the instances of the lesion, while the remaining portions, when diseased, may almost be regarded as clinical curiosities.

The regions so exempt are the mouth, œsophagus, stomach, and, to a less degree, the duodenum and jejunum. This exemption is due to different causes. In the mouth and œsophagus it is probably due to the constant mechanical disturbance, which does not allow the virus sufficient time to obtain a foothold, while in the stomach, the bactericidal element in the gastric juice (muriatic acid), and also the paucity of closed follicles, such as are in the bowel, are the preventative factors.

In the following consideration it will be convenient to divide the alimentary canal into four divisions, and by describing the disease as it affects each one separately, the feature above referred to will be more clearly shown. The regions referred to are the mouth, œsophagus, stomach and bowel.

(a) Tuberculosis of the mouth, while not so rare as tubercle of the œsophagus and stomach, is nevertheless a rare disease. As might be expected in the majority of the cases, it is secondary to pulmonary and laryngeal disease, yet a fair proportion of cases appear to be primary. The infection may be brought to the mouth either by food, foreign bodies or sputa. The disease may occur in young persons, but the majority of the cases are between the fortieth and fiftieth year. It is found five times as often in men as in women, the result probably of habits in the former, such as smoking, etc. Both in the character of the lesions and in their situation great variation is shown, all parts of the oral cavity being attacked at one time or another.

Lupus forms a considerable portion of the examples. It may extend directly into the mouth from the face, but is often primary, the favorite sites being the free borders of the lips, along the upper jaw or the roof of the mouth. When fully developed it presents a shallow ulcer, with thin, sharp edges, surrounded often by a number of smaller ulcers, and beyond these again isolated tiny nodules, but when the disease is situated on the gums, these become swollen, red and spongy, with more or less ulceration, usually in angle of junction with the lips. If the frænulum is attacked, this, along with parts of the mucous membrane of the

gums, becomes partly detached forming a row of papillary excrescences along the margin of the linear ulcer, which gives a very characteristic appearance. The process may extend to the deeper tissues and cause exfoliation of bone or, very rarely, even perforation of the palate, in this respect resembling syphilis. As in the skin, lupus here runs a very chronic course, lasting often for many years. It may, in time, destroy the uvula and extend into the pharynx and over the tonsils, causing in severe cases very great destruction in all parts of the throat. Frequently there is some swelling of the neighboring lymphatic glands, chiefly those in the submental region and at the angle of the jaw or down the neck. Usually, in this form of the disease, lung symptoms are absent or appear late in its course.

The soft palate, the pillars of the fauces and posterior wall of the pharynx may also be the seat of ulceration in those who are suffering from chronic phthisis. These ulcers are small and shallow, with sharp irregular edges, surrounded by a zone of dark red color. They are usually multiple and resemble apthae, but are distinguished from the latter by their chronic course and the surrounding redness. The tendency for them is to spread superficially and somewhat rapidly, but they soon yield to treatment.

Lingual tuberculosis occurs in two forms, either as a solitary nodule in the substance of the organ with little or no evidence of the disease elsewhere, or as a widespread and destructive ulceration coming on in the latter stages of phthisis. The former consists of the formation of a small, irregular, hard nodule, situated immediately beneath the epithelium on the dorsum or edge of the organ. After a time the epithelium overlying the nodule is destroyed, leaving a small, irregular ulcer with apparently undermined edges and infiltrated floor. Those ulcers which are situated at the edge and while extending deeply into the substance, appear externally only as narrow slits are called "rhagades." From such a point the process may soon spread in other directions, especially over the dorsum, in time giving rise to a large, irregular, shallow ulcer, covered with a dirty yellowish secretion, and having a number of lupus-like nodules in its neighborhood. This form which runs a chronic course and with which signs of disease elsewhere are scanty or absent, is termed the "benign form of lingual tuberculosis."

The more rapid and severe form of the disease occurs late in the course of phthisis and is characterized by the formation usually of more than one ulcer especially on the under surface of the tongue, which surface in the previous form, is nearly always spared. The ulcer forms on

a densely infiltrated area and is characterized by a rapid and extensive destruction of tissue.

Surrounding the ulcers are numerous tubercles in various stages of formation, while the whole affected area is of a dark red color. The angles of the mouth, the lips and the pharynx, may also be the seat of similar lesions, the destruction is great, and in the latter the whole pharynx and root of the tongue may become involved. When on the lips and angles of the mouth, there is often no infiltration or tubercles, but simply a deep, rapidly-eating ulcer with irregular and undermined edges. Apart from the above, there are many transitional forms, one merging into the other or a benign form becoming more active.

Diagnosis.—The presence of tubercular or syphilitic disease in other situations may often determine the nature of the lesions in the mouth, but in lupus and the benign form of lingual tubercle, these are often wanting and it may be very difficult to exclude carcinoma or syphilis. In the former the enlargement of the glands is somewhat different to that of tuberculosis, the glands being smaller and harder; moreover, the glandular involvement in tubercle may extend farther down the neck and also be present on the opposite side, a condition which does not obtain in carcinoma.

Michelson, quoted in the "Twentieth Century," gives the following points in the diagnosis between tuberculosis and syphilis :

(1) Possible presence of evidences of tuberculosis or syphilis elsewhere.

(2) Marked swelling of neighboring lymphatic glands is very rare in tertiary syphilis and common in lupus of mucous membranes.

(3) Gray or grayish yellow spots the size of a pin head or less, often surround the infiltrated or ulcerated area and these sometimes ulcerate giving rise to a number of small ulcers about the large one. Such appearances are never present in syphilitic lesions.

(4) Inflammatory appearances such as redness and swelling are usually but not always more marked in syphilitic lesions than in tubercular. Tertiary specific lesions have a greater tendency to extend into the depth and their edges are sharply defined.

(5) Tuberculosis of the mouth and pharynx is often associated with tuberculosis of the larynx and rarely with that of the nose, while syphilitic ulceration of the mouth is more often accompanied by syphilis of the nose and only exceptionally with laryngeal syphilis.

It may be necessary to resort to the injection of tuberculin to decide a given case. Small doses should be given at first to avoid danger, although these are sometimes not followed by a reaction. The saliva does

not usually contain bacilli but these may be obtained in some forms by staining a deep scraping of the ulcer. In lupus and the benign forms they are usually absent. Pain is pronounced in proportion to the ulceration and is most marked in cases of lingual disease. Eating in such cases increases the pain and often the speech is slow, labored and lipsing.

Prognosis.—In lupus and the benign form the prognosis is good both for local recovery and for life, as in these forms evidence of tubercle elsewhere is often slight or absent. Cure in such form may after be accomplished in a few weeks. In the rapidly spreading disseminated forms the outlook is hopeless especially as it is nearly always complicated by extensive disease in the lungs. Indeed this factor must qualify the prognosis in all cases.

Treatment.—The small ulcers on the dorsum or edge of the tongue may often be cured by several applications of strong lactic acid solution (up to 50%) or iodoform paste well rubbed into the ulcer. In lupus and the more extensive lingual forms surgical measures may be required. These consist in the thorough use of the sharp spoon with or without the subsequent use of the Paquelin cautery. When however the disease is very extensive involving most of the pharynx and nose for example, or if the general health is much impaired from the pulmonary condition then surgical interference must give place to local applications to promote healing and relieve pain. Here again iodoform powder dusted on will give the best results. Lactic acid is also of use in cleaning the ulcer and relieving pain. In severe cases where on account of pain eating is seriously interfered with, the use of morphine or cocaine may be required, the latter with some caution on account of the weakened condition of the patient.

Oesophageal Tuberculosis.—Tuberculosis limited to the oesophagus is unknown. Even when the disease is well marked elsewhere in the body, it is exceedingly rare in this situation. In a series of two hundred and fifty autopsies on cases of chronic tuberculosis, Frerichs, found but one instance.

Flexner in an article on this subject in Johns Hopkins Bulletin, Jan. and Feb., 1893, describes an instance which he met with and also gives an account of the other undoubted cases which has been recorded. He shows that the lesion in the oesophagus is most frequently secondary to disease in neighboring structures, viz., caseous bronchial glands, abscess arising from caries of the lower cervical and upper dorsal vertebrae, and finally ulceration extending from the pharynx. Six cases were due to tubercular bronchial glands rupturing into the oesophagus and had ulcers varying in size from a hemp seed to an inch in the longest

diameter. In one case there were eight small perforations, close together, each opening into adjacent caseous glands. All the ulcers were sharply defined with the mucous membrane at the edges undermined. Extension of ulceration from the pharynx occurred twice, once causing stricture which was recognized during life. Three times abscesses from the lower cervical, fifth and sixth, and upper dorsal vertebrae opened into the oesophagus. Stricture, in one case the result of swallowing an acid, and in another, caused by the thrush fungus, was a predisposing cause, and determined the sites of the ulcers. These were multiple and as in all the cases except those due to carious vertebrae, were accompanied by numbers of submucous tubercles usually most numerous near the ulcers, but occasionally situated at a distance.

The foregoing cases are all examples either of direct extension from a neighboring structure or of a previous traumatism which was doubtless the predisposing factor in causing the lesions. Indeed, it has been held by some observers that a previous injury was essential to the development of the disease in this situation.

Five cases, however, in which none of the foregoing conditions were present disproved this, and show moreover that the oesophagus while relatively, is not absolutely immune. Of this group there was one instance of miliary tuberculosis of the organ occurring as part of an acute general infection. The remaining four cases including Flexner's, showed ulcerations either single or multiple and with numbers of small tubercles scattered about their margins. In Flexner's case, the patient, a woman aged 33, was operated upon for left sided pyo-pneumo-thorax. Immediately after the operation, she vomited some of the foul smelling contents of the pleural cavity. Subsequently portions of the ingesta escaped on irrigating the opening in the chest wall. At the autopsy, two small ulcers were found in the oesophagus, involved the mucous coat only, the other had perforated the entire wall and opened into the diseased cavity. Their edges were undermined and numerous small tubercles were found in their bases and extending for some distance beyond especially into the submucosa. In addition to the lesions in the oesophagus, both lungs were extensively diseased and indeed a small tubercular cavity had also ruptured into the left pleural cavity. It is worthy of note that in all the foregoing cases, there was extensive tuberculous of other organs; always of the lungs and frequently of the bronchial glands, larynx, etc. From the above, which comprise nearly all the instances recorded, it will be seen that the condition is a very rare one, especially when we exclude those cases in which it is due to direct extension from an adjacent structure.

Clinically, the condition, while interesting, is not of much practical

importance. The diagnosis has been made during life from the onset of pain and difficulty in swallowing, occurring in the course of a chronic tuberculosis of the lungs or glands. These symptoms, while suggestive under the circumstances, would not, however, be conclusive, as aneurysm or tumors due to other causes might give rise to the same phenomena.

Gastric Tuberculosis.—The stomach shares with the oesophagus in the relative immunity from tuberculosis. Two reasons have been advanced for this: the comparative absence of closed follicles in its walls, and the possible germicidal action of the gastric juice. That the latter cannot, however, be the most important factor is shown by the fact that the gastric juice does not kill the tubercle bacillus; moreover, in the duodenum, when the gastric juice is neutralized, tubercular disease is also uncommon. The consensus of opinion is that the absence of such structures as Peyer's patches and solitary follicles is the most potent factor in the prevention of the disease. This exemption, however, does not apply to the stomach in its entirety, for in cases of general miliary tuberculosis the serous coat, and even the muscular coat, are frequently studded with grey and yellow tubercles. Several instances of this have been met with in St. Michael's Hospital, one being a very marked example. The patient, a man aged 36, died of tuberculosis meningitis. At the autopsy the entire peritonum was found to be thickly covered with single and conglomerate tubercles. The condition was most evident in the mesentery of the small intestine, on the rectum and sigmoid flexure, the under surface of the liver and the anterior wall of the stomach. In these situations the peritoneum was so crowded by single tubercles and coalesced groups of these that the areas felt as though thickly powdered with sand. Two other instances merely showed twenty or thirty small tubercles scattered irregularly over the surface of the organ.

It is when we look for lesions of the mucous membrane analogous to those that occur so frequently in the bowels that the immunity of the stomach becomes so striking. At Munich in a series of 900 autopsies there were four cases. Another series of 108 autopsies on tubercular subjects revealed but one instance. About thirty cases in all have been reported, but in nearly one-quarter there is some doubt as to the tubercular nature of the lesion, the descriptions given being insufficient to permit of a positive opinion. The ulcers may be single or multiple, and vary in size from one-quarter inch up to two inches or more. When there is but a single ulcer, it is usually, but not always, found in the pyloric region. It resembles very much the oval or round ulcer of the intestine, having a raised, hard and often undermined edge, and with

more or less numerous tubercles scattered in the floor and around the periphery. Usually the floor is formed by the muscular coat, which is more or less infiltrated with lymphoid cells, and may show granular changes. In a large proportion of the cases the lesions are multiple, and may either consist of several round or oval ulcers, similar to what has just been described, or of a large number of irregular sized and shallow losses of substance, involving the mucous membrane only.

Three cases described by Dr. Alice Hamilton in the Johns Hopkins' Bulletin, April, 1897, illustrate this very well. The first was a woman, dead of extensive tuberculosis of the lungs and intestines. In the stomach were about 120 ulcers, distributed over the whole surface. They were round or oval, with thickened or undermined edges. Microscopically, tubercle bacilli, lymphoid and epithelioid cells were found in the edges and floors of a number that were so examined. The second case was a man dead of pulmonary tuberculosis, but with no intestinal ulceration. There were 75 ulcers in the stomach. They are described as irregular and worm-eaten in appearance, many of them involving the mucous membrane in part of its depth. Here, too, epithelioid cells and tubercle bacilli were found on microscopic examination. Dr. Hamilton points out that in this case the naked eye appearances were not those of tubercular ulcer, and suggests that possible hemorrhagic erosions of the mucous membrane preceded and determined the invasion by the tubercle bacilli; indeed in this respect the case would be similar to two of the cases of oesophageal tuberculosis.

The third instance occurred in the body of a girl, dead of widespread pulmonary and peritoneal disease. Numerous small ulcers were found in the small intestines, while the duodenum and the caecum each presented a large characteristic ulcer, with caseating tubercles. Both the serous and mucous coats of the stomach were also affected, the former being covered with miliary tubercles, and the latter presenting two large ulcers midway between the cardia and pylorus, on the lesser curvature. The largest was $1 \times \frac{3}{4}$ inches in size, and both had raised undermined edges, with numerous caseating tubercles in the floor and immediate neighborhood.

As in the oesophagus the disease is always secondary to tuberculosis elsewhere, the lungs constantly and other organs frequently. A curious fact however, is that quite often the remainder of the alimentary canal escapes, as, for example, of fifteen cases five showed no lesions in the bowel. From the rarity of the disease, especially when it is considered how often it is exposed to attack by the swallowing of tuberculous sputa; the natural immunity of this organ must be very great. Why this immunity

should from time to time be broken down is not clear though two conditions have been thought of as bringing this about, viz., lessening of the HCl. in the gastric juice, or the presence of superficial losses of substance the so-called hemorrhagic erosions. The latter are not uncommon and occur in the course of many debilitating and cachectic conditions.

Clinically what was said of oesophageal tuberculosis is also true of the gastric form. Death usually occurs from the attendant disease in the lungs or bowel, and the symptoms of these mark those from the stomach. Marfan quoted by Hemmeter speaks of perforation having occurred six times in fourteen cases. In three of these it was through a tuberculous gland. In three cases death was caused by hemorrhage from an eroded artery in the floor of an ulcer, and in another the fatal issue was brought about by peritonitis following perforation. While in a number of instances the condition has been suspected during life and the suspicion confirmed at autopsy; nevertheless, in absence of perforation or hemorrhage, the condition could not be diagnosed with any degree of certainty owing to the frequency with which gastric symptoms complicate pulmonary phthisis, these being due not to ulceration but to catarrhal and inflammatory changes, the result of the general malnutrition.

TUBERCULOSIS OF THE BOWEL.

Pathology.—The intestinal canal may become the seat of tuberculous disease in three ways.

1. By direct extension of the process from a neighboring organ or tissue, for example, an abscess from carious vertebrae may rupture into the bowel causing a localized tuberculosis, at the point of opening. Caseous mesenteric glands sometimes become adherent to some part of the tract and may even ulcerate into it, and finally tuberculous perinephritic abscesses not uncommonly open into the colon. One interesting case of this came under observation in St. Michael's Hospital. The patient aged ten was admitted suffering from tuberculosis of the bladder and right kidney and an abscess formed about the latter which was opened in the posterior aspect of the right side. About three weeks later while changing the dressings, there was found a quantity of the ingesta—seeds of fruit curds of milk, etc. This continued and increased to such an extent that it was impossible to maintain the nutrition and the child died in rather less than a month.

At the autopsy in addition to the disease of the kidney and bladder, there was found a number of nodules scattered through the lungs. The most interesting find, however, was a perforation in the duodenum at the

junction of the second and third portions. The opening was large enough to admit the tip of the little finger and allow a free communication with the abscess cavity and its edge inside the gut was for some distance infiltrated and presented a number of tubercles.

2. As with other organs, the intestines may be the seat of miliary tubercles in the acute general form of the disease. The tubercles are scattered over the serous coat and also in the wall of the bowel. Usually the peritoneum suffers in company with other serous membranes but occasionally the condition is limited, the infection occurring by way of the intestines and its lymphatics and not as in the first instance through the blood stream. Such an infection of the serous coat may occur with or without a gross lesion in the bowel. In the absence of ulceration of the intestine the bacilli pass directly from the bowel into the lymphatics and mesenteric glands and from thence invade the peritoneum. This form is rare and found mostly in children.

Clinically miliary tubercle of the intestines gives rise to no symptoms unless complicated with peritonitis or catarrh of the mucous membrane, in which case the symptoms are those of the latter conditions.

3. TUBERCULOUS ULCERATION OF THE BOWEL.

This form constitutes the overwhelming majority of the examples of the disease; moreover from the fact that it is found in 50 per cent. of those dying of chronic phthisis, it is one of the more common lesions found in the P. M. room.

Though it is possible that infection by way of the blood may give rise to ulceration, nevertheless, in practically all cases this is caused by bacilli which are swallowed either in food or most frequently in phthisical sputa. The condition may be primary and limited to the intestine, but it is usually secondary to pulmonary or laryngeal disease attended with expectoration.

Primary occurrence in the bowel is rare, being found mostly in children, hardly ever in adults. It is in such cases that the organism gains access to the body with the food, more particularly milk, butter and meat. Though the healthy mucous membrane is no doubt frequently attacked, the presence of catarrhal and ulcerative conditions due to other causes, are predisposing factors in many cases. These conditions are not uncommon in the course of chronic phthisis, and indeed are not seldom found in such cases, no tubercle bacilli being present.

Though no part of the bowel is as rarely affected as the stomach or oesophagus, nevertheless, some portions so often escape whilst others are extensively diseased, that they may almost be considered exempt. By far

the most common site of the disease is the lower part of the ileum and the caecum, from which point upwards, it gradually becomes rarer until finally in the duodenum, tubercular ulcers are but seldom seen.

Passing downwards ulceration of the colon and rectum are by no means uncommon and indeed they may be extensively diseased, even in the absence of any lesion in the ileum. Also it is not to be forgotten that the process may be practically confined to the appendix.

In contrast with the ulceration of typhoid, both perforative peritonitis and hemorrhage are rare. This is due to the comparatively slow progress of the disease which permits of the formation of protective adhesions in the one case and of thrombosis of vessels in the base of the ulcer in the other case.

Even when acute general peritonitis does complicate such a case, it is not necessarily due to a gross perforation but may be caused by the passage of organisms through the diseased wall of the intestine. While, as is mentioned in the paragraph on the morbid anatomy, the tendency is for the ulceration to advance, there may be some attempt at healing, which may give rise to some degree of stricture; but owing to the large calibre of these, and also to the fluid character of the contents of the bowel, such conditions seldom cause symptoms during life.

Morbid Anatomy.—In miliary tuberculosis of the intestine, numbers of grey or yellow tubercles are scattered over the various coils of intestine. If the eruption is very pronounced, numbers of neighboring tubercles may coalesce, giving rise to small irregular raised plaques, which in color and density may almost resemble hyaline cartilage. In acute cases in addition, the intestinal peritoneum may be here and there much injected, having a bright red or pink color with some loss of lustre due to a fine granular deposit of fibrin.

In ulceration of the mucous membrane the first change consists of swelling and induration of the solitary follicles or portions of Peyer's patches. Caseation takes place in the centre of these areas with destruction of the overlying epithelium, and so gives rise to a small ulcer with hardened and raised edges. These gradually extend and fuse with neighboring ulcers, until a large irregular patch with thickened overhanging edges and granular caseation floor is formed. The infiltration extends through all the coats of the bowel, even to the serous, which may present at that point appearances varying from slight loss of lustre to fully developed tubercles, or adhesions to contiguous coils of intestine. From such a spot, too, chains of tubercles, or hard and thickened lymphatics, may be traced running into the mesentery.

As a rule, while these large ulcerated areas are very irregular in outline, their long diameter is transversed to that of the bowel, though they

may be, however, round or oval. The tendency is for the lesions to advance, so that in a well developed instance the whole of the lower end of the ileum, the ileo caecal valve and the caput coli, may be converted into a large ulcer, with here and there strips, or small islands of normal mucous membrane projecting from its floor. More rarely the entire colon to the anus may be in a similar condition. Rarely, also, the lesion may be confined to the appendix, causing thickening and injection of that structure as a whole, with ulceration at its orifice and interior.

Clinical History.—Many of those dead of chronic phthisis present post-mortem well marked ulceration of the bowel, of which there was no signs during life. Especially is this true if the lesions are confined to the small intestine. When, however, the disease gives rise to symptoms, these consist of more or less diarrhoea and abdominal pain, coming on in the large majority of instances in the course of a chronic pulmonary phthisis.

Indeed, in adults, the pulmonary symptoms are usually pronounced, but in young subjects they are more often absent or slight. The diarrhoea is usually obstinate and severe, the stools liquid, and very offensive, frequently containing undigested food, and occasionally tinted with blood. The number of motions may vary in number from four or five a day to ten or more. Abdominal pain and tenderness, while usually present, are not, as a rule, severe. The former is mostly described as intermittent and cutting, though sometimes it is dull and cramp-like in character. Tenderness is generally diffuse, or it may be most distinct in the umbilical region, or it may be slight or even absent. When very marked it points to involvement of the peritoneum. On inspection and palpation the abdomen is usually concave, and if tenderness is present, is firm and resistant. Occasionally the vermicular action of the bowel may be observed. The temperature is generally moderately and irregularly elevated, but has no characteristic curve. Occasionally there may be chills, with higher degrees of fever without any special cause to account for it.

As with all protracted diarrhoeas, general emaciation and dryness of the skin are marked features. Gastric disturbances are common, anorexia and distress after eating being usually present. Gradually increasing asthenia and exhaustion are the causes of death in the majority of cases, though sometimes it is due to an attack of acute peritonitis, either with or without perforation. More rarely haemorrhages may be the immediate cause.

Diagnosis.—Given a pulmonary or peritoneal tuberculosis, persistent diarrhoea and abdominal pain usually point to ulceration of the intes-

tines. It is not to be forgotten, however, that the later stages of pulmonary phthisis are often complicated by a diarrhoea even in the absence of intestinal lesions. Especially is this the case when large cavities with abundant foul secretions are present. Here the diarrhoea is septic in character and has been termed "colliquative."

Digestive disturbances or excessive doses of cod liver oil, during the course of phthisis may also cause a diarrhoea which might be mistaken for that of ulceration, but the character of the stools, however, should prevent error. Abdominal tenderness and diarrhoea may be caused by a peritoneal tuberculosis with amyloid disease of the intestine, no ulceration being present. In such a case the presence of blood in the stools would, however, point to ulceration.

The greatest difficulty will arise in those cases in which pulmonary symptoms are absent or slight. In adults it is rare and so other possible causes of diarrhoea must be always carefully excluded. Ulcerating malignant disease of the rectum and colon especially is to be borne in mind. The emaciation, cachexia and diarrhoea, all may be present and closely simulate tuberculous ulceration. In such a case careful examination of the rectum might reveal the presence of an ulcerating growth or a tumor might be detected on palpation along the course of the colon.

Indeed in all cases of chronic diarrhoea, digital examination of the rectum should not be omitted as apart from malignant disease, both tubercular and dysenteric lesions may sometimes be reached.

The following case which we have under observation will be useful as an illustration of the difficulties which may be presented. A woman, aged 47, was admitted to St. Michael's Hospital suffering from severe diarrhoea with some abdominal pain and tenderness. The motions were liquid, very offensive and numerous, occurring every half hour or oftener. Emaciation and cachexia were very marked and there was some rise of temperature. There were no physical signs in the lungs, and examination of the rectum revealed nothing. The attack had come on ten weeks before, rather suddenly, being preceded for a few days by some abdominal pain, and since the onset she had steadily grown worse. Her personal and family history was good, except that she had nursed two grown up children, and her husband, all of whom had died of tuberculosis, the latter about six months previously. She remained in hospital about six weeks and was discharged much improved, the diarrhoea being limited to two or three stools a day, pain absent, temperature nearly normal, emaciation and pallor much less pronounced. Two weeks before leaving hospital, a well marked stricture was discovered about two inches up the rectum. It was not small enough to give rise to any symptoms, but this

was due partly to the consistence of the stools. Tubercle bacilli were not looked for. She reports continued improvement, being able to do much of her house work.

In young children a positive diagnosis must be made cautiously as many cases of "consumption of the bowels" prove to be gastro-intestinal catarrh with some bronchitis. In such a case there may be rales in both apices, with diarrhoea, abdominal distension, emaciation and some fever. Rickets, intestinal worms, teething and unsuitable foods are the points which commonly require careful attention before arriving at a conclusion. Abdominal distension, high fever, enlarged mesenteric glands, and severe emaciation indicate tuberculosis. Finally it may, notwithstanding every case, be impossible to make a positive diagnosis without repeated and careful examination of the fæces for tubercle bacilli.

Appendicular Form.—Special reference must be made to those cases in which the disease appears to be primary and limited to the appendix or its neighborhood. Such cases resemble very closely the sub-acute and relapsing form of appendicitis or typhlitis. In two such cases operated upon in the hospital as simple appendicitis, the wounds refused to heal, leaving unhealthy granulated sinuses. After a period of some months, one developed tubercular peritonitis and finally succumbed to an acute peritonitis following operation for intestinal fistula.

The other had numerous tubercular abscesses form in the abdominal wall and flank, leaving the whole region riddled with sinuses, causing hectic and exhaustion which finally ended life.

Prognosis.—The prospect for complete recovery is bad. It is very doubtful if such a thing is known. Nevertheless, in adults a number of cases run a chronic course which may last two years or more. In two cases which came under our observation the course was over a year and death was finally due to the pulmonary condition; but in neither case was the diarrhoea severe.

The possibility of acute or chronic peritonitis, and also of hemorrhage must be considered when giving a forecast.

Treatment.—Apart from measures to improve the pulmonary condition, the treatment is directed mostly to check diarrhoea and relieve pain. The food should be carefully ordered and should be nutritious, and easily digestible, with as little residue as possible. Peptonized milk, koumiss concentrated beef extracts, broths, etc., will constitute a large part of the nourishment. When the diarrhoea is not severe, or when some improvement has occurred, semi-solid food may be given, as for example, finely minced fresh fish, rare done roast beef, well chopped up. To these may be added corn starch, rice pudding, or even a little mashed potato. For the

control of diarrhoea the *B. P. pil plumbi cum opio*, as required, is very useful, or large doses of bismuth with 1/16 grain doses of morphia may be tried. The vegetable astringents such as catechu and kino with acid sulph. aromat. are also of service. If the stools are very offensive and the temperature high, showing the presence of numerous putrefactive organisms in the bowels, it may be a good plan to give a calomel and saline purge followed by some intestinal disinfectant and sedative; perhaps the most generally satisfactory being 20 or 25 grains doses of salicylate of bismuth with small doses of morphia. This has been found very reliable in the hospital. Creasote not alone checks fermentation, but perhaps prevents infection of new areas.

Burney Yeo has recently reported the successful treatment of tubercular peritonitis by iodoform ointment inunction into the abdominal wall and this led to its employment in the case above mentioned. Whether *post hoc* or *propter hoc*, the improvement dated from that time. In view of the simplicity of the measure and the reasonable possibility of at least affording some relief, it certainly deserves a trial.

Haemorrhage and acute peritonitis are to be treated the same as when due to other causes.

GENITO URINARY TUBERCULOSIS.

BY GEO. A. BINGHAM, M.B.,

Surgeon to the Hospital for Sick Children, St. Michael's Hospital and the Emergency Hospital; Associate Professor of Surgery, Trinity Medical College.

SO far as statistics are available uro-genital tuberculosis is secondary in two-thirds of all cases (Herberg). This circumstance must, of course, limit the scope of the surgeon in the treatment of the condition. At the same time it should make us more alive to the importance of an early diagnosis of the primary condition and a radical treatment thereof. Primarily, the disease is more likely to attack the genital, rather than the urinary organs. This may be due to the fact that the genital organs are more exposed to diseases and conditions which tend to reduce their resisting power, and favor the development of tuberculosis. Thus, in a patient with a bad family history, I have seen tubercular epididymitis follow a severe attack of gonorrhoea. Direct trauma to the testicle or prostate may result in a similar development in one pre-disposed to the disease. It also appears that direct infection during coitus is possible (Fournier). Then, again, the great circulatory disturbances to which the genital organs are subject during the active period of life would seem to

render them more susceptible to invasion by the tubercle bacillus. A somewhat analogous example is seen in the tendency of the disease to attack the epiphyses of long bones during the developmental period when circulatory changes and activities are greatest.

Once the disease has invaded any part of the uro-genital tract, the tendency is, sooner or later, to spread by ascending or descending infection to other portions of the tract.

The prognosis in the vast majority of cases is decidedly bad because (1) the diagnosis is not made early enough: this is more particularly true in chronic renal tuberculosis, where the progress is peculiarly insidious. (2) the disease is often bilateral at the outset, or rapidly becomes so, thus precluding radical measures; (3) the disease is usually secondary to tubercular deposits elsewhere and the efforts of the surgeon are, therefore, merely palliative.

The cause of death may be exhaustion from cystitis or renal insufficiency, or the development of cachexia.

Renal tuberculosis—The chronic form of the disease is the only one that concerns the surgeon. Here it is of the first importance to find out if the condition (1) is unilateral or bilateral, (2) is primary or secondary. Primary renal tuberculosis is usually unilateral at first, but later on by way of the ureters and bladder, the other kidney is infected. Careful local examination of both kidneys should be made and the ureteral catheter should, if possible, be used, in order that the urine from each kidney may be thoroughly examined for the bacillus.

The diagnosis of primary renal tuberculosis is not easy in the early stages. The following points will assist:—

- (1) More often in males than in females.
- (2) More often under middle life.
- (3) A tubercular family history.
- (4) Hæmaturia, slight, apparently causeless.
- (5) Polyuria, apparently causeless.
- (6) Pyuria persistent, without any other apparent cause.
- (7) Lumbar tumor.
- (8) Frequent urination.
- (9) Tubercular lesions developing elsewhere in the tract.
- (10) Development of the cachexia.
- (11) Demonstration of the bacillus by inoculation or microscopic examination.

Treatment.—If a diagnosis of primary unilateral renal tuberculosis has been made of course the focus of disease should be removed. Through a nephrotomy around the extent of the process may be estimated and a

portion or the whole of the kidneys removed accordingly. One should bear in mind the probability of the other kidney being or becoming infected and therefore nephrectomy, though theoretically the correct procedure in such a case, is not to be lightly undertaken. Nephrotomy gives us a better opportunity for examining the urine from the other kidney, and nephrectomy should, if necessary, be done as a secondary operation. In short the lesion may be treated as a similar condition, for instance in the epiphysis of a bone; abscesses may be evacuated, cavities curetted and drained and indeed the whole nidus removed without destroying the function of the organ. On the other hand when the appearance of the organ combined with the symptoms points to general involvement of the kidney, half measures are useless and nephrectomy is the only advisable operation.

Tuberculosis of the bladder is very rarely a primary condition, being usually secondary to a similar condition in some other part of the genito-urinary tract, either by ascending or descending continuous infection. If the disease be primary and no pyogenic infection be produced by instrumentation, etc. its progress is slow, and under proper treatment extensive and general infection may not occur for years, and the patient be made to enjoy a reasonable amount of comfort. On the other hand when the disease is active and complicated by a similar condition in kidney or epididymis, then general infection and a fatal result may be looked for in the near future. Unfortunately early diagnosis is not easily made. Subacute catarrh of the bladder may be caused by stricture, enlarged prostate or calculus and the symptoms will closely resemble those of tuberculosis. Then the temptation to use the sound is great and thus pyogenic infection may be introduced, at once accelerating the progress of the disease and increasing the suffering of the patient.

If we realize the difficulty of rendering aseptic the anterior urethra and the dangers in a pyogenic infection of an already diseased bladder we will use the sound less and less frequently in our efforts at diagnosis, and should we determine to use sound or cystoscope, instrument and patient should be prepared as scrupulously as for any major operation. Let us depend rather upon a careful consideration of the whole history of the case and of the individual symptoms. Pain, tenderness over the pubes and in the rectum, frequent micturition, merging later into actual incontinence, as the bladder contracts and the ulceration increases, haematuria, pyuria, are all usually present sooner or later in tuberculosis of the bladder. But the pain is not nearly so severe as when calculus is present, nor is the haematuria so profuse and constant; nor do we have the sudden stoppage during urination so characteristic of stone: usually the exclusion of

stricture is not difficult, and senile prostatic enlargement is excluded by rectal palpation.

If, by the process of exclusion, we are thrown back upon the fact of a catarrhal inflammation of the bladder without any appreciable cause, we should suspect tubercle, more especially if the patient be a male under middle life. The microscope may confirm our suspicions by showing bladder cells and tubercle bacilli in the urine, although a negative result is not improbable and should not be given too much weight. A bad family history is of course good corroborative evidence.

Having decided upon the probability of tuberculous disease of the bladder we should seek for other points of infection, because the extent of further infection throughout the system must go far to determine as to the nature and extent of surgical interference desirable. The upper urinary and the genital tracts, the lungs, the long bones, and in the female, the uterus and ovaries should be closely scrutinized for this purpose.

The *constitutional treatment* of this condition is vitally important, and in many cases, provided no pyogenic infection has occurred, the patient may be made comfortable and the disease at least retarded indefinitely by constitutional and local measures. Creasote, guaiacol and cod liver oil are of benefit; sunlight, fresh air, change of climate, a nutritious regimen, careful attention to all the functional activities, everything, in short, that tends to improve his resisting powers will be of undoubted use to the patient. Locally, iodoform emulsion (10 per cent.), bichloride of mercury solution (1-2000), or pot. permang sol (1-3000) may be used *per urethrum*.

Should the condition of the bladder not improve and the general state of the patient warrant it, suprapubic cystotomy is indicated. By this means we can examine the bladder deliberately; drainage, curettment and direct applications may cure the local condition entirely, and the relief which the patient almost invariably experiences is gratifying.

The *epididymis* is the starting point of uro-genital tuberculosis in many cases. Such close observers as Senn and Councilman claim this to be the case in more than 50 per cent. of all cases.

This is probably explained by the tortuous nature of the blood-vessels of the part, the fact that the spermatic artery divides at the epididymis, the exposure of the part to trauma and acute septic infection and the circulatory disturbances incident to the sexual function. Thus is explained the fact as noted by Kocher and others, that the disease is prone to attack young married men, and is always most prevalent during the period of active sexual function.

Statistics also indicate that tuberculous epididymo-orchitis is a pri-

mary affection in a very considerable number of cases. But it is equally certain that the tendency of the disease once established is to rapidly invade the vas, vesiculæ and the rest of the uro-genital tract. An early *diagnosis* is therefore imperative, and in making a diagnosis one should note the family history, the tendency of the process to first invade the globus major, then the globus minor, then the vas (the nodular thickenings of which have been likened to a rosary), and next the vesiculæ or the prostate and bladder.

The process is relatively painless, and is often accompanied by hydrocele of the tunica vaginalis. It often quickly becomes bilateral. Gonorrhœal epididymitis, on the other hand, is quite painful, more rapid in onset, is not accompanied by the nodular thickening of the vas and usually attacks the globus minor first.

As the disease progresses, caseous degeneration of the indurated mass takes place, and at a comparatively early date softening and fistula occur. Fortunately the diagnostic data in this disease are fairly precise, but owing to its insidious onset we do not usually see it in its earliest stage.

The clinical course is variable. A fistula may form, the primary focus be discharged and the disease subside, leaving an atrophied testicle and an indurated epididymis. Then again, trauma or septic infection may light up the process and rapid general infection result. The lymphatics of the testes being connected with the lumbar glands, there is always danger of retro-peritoneal infection, even without involvement of the upper uro-genital tract. It is this very uncertainty in the clinical course and our inability to prognosticate precisely that should determine us in our surgical treatment.

The treatment should be radical if the patient's condition will admit of it. If the lungs or other important non related organs are involved, we must depend upon general tonic treatment. If the disease be bilateral, it has probably advanced too far for radical measures. But if it be uni-lateral and has not extended quite beyond the reach of the surgeon a radical operation is called for. The testicle, the whole of the vas and the seminal vesicle may be readily removed, and in no properly selected case should the patient be denied the undoubted benefit of such a measure. It is probable that as the question continues to be studied, this operation will be advised in every otherwise suitable case, when the disease has extended to any part of the vas deferens.

GLANDULAR TUBERCULOSIS.

By HERBERT A. BRUCE, M.D., F.R.C.S., Eng.

Assoc. Professor of Clinical Surgery, University of Toronto, Surgeon St. Michael's Hospital. Surgeon Outdoor Department, Toronto General Hospital.

IN taking up this subject, I shall confine my remarks to tuberculous disease of the external glands, and chiefly to those of the head and neck.

Etiology. The age at which tuberculosis of the cervical lymph glands is usually seen is from three to ten years. In a large portion of these cases an inherited tendency to the disease can be traced. The commonest source of infection in cervical adenitis is through the tonsils, and the adenoid tissue of the naso-pharynx. That the pharynx is the most frequent seat of primary infection is shown by the fact that the deep cervical glands are generally first affected. In many cases the tubercle bacillus has passed through an apparently healthy tonsil.

Mr. Spencer, in his lectures on the Pathology of the Lymphadenoid structures, says:—"If a culture of tubercle bacilli be injected into the trachea of an animal, the bacilli pass through the intact mucous membrane, and infect the neighboring glands. He further says it is quite an exception to see a combination of hypertrophied tonsils or adenoid vegetation and tuberculous glands in the same patient. George Morgan writing on this subject, in the *British Medical Journal*, says that in many of his cases there was some enlargement of the tonsils, or adenoids of the naso-pharynx. The two media by which the tubercle bacilli may be conveyed to the tonsils are by inhaling tuberculous dust, or drinking tuberculous milk. Pathologists are unanimous in the opinion that the bacillus more frequently enters the body by inhalation than deglutition, the bronchial glands being affected fully four times as frequently as the mesenteric.

Hence the danger of oral respiration and the danger of adenoids as an indirect cause of tuberculous adenitis. But adenoids have more than an indirect influence in the cause of gland trouble:—they are sometimes themselves the seat of local tuberculosis. Krueckmann found tubercle in the tonsils in 60 per cent of tuberculosis, and he asserts that tuberculosis of the cervical lymphatic glands almost always depends upon the invasion of the glands by way of the tonsils. Dr. Walsham says that the tonsils, so far from being immune from tubercle, as has been alleged are very frequently affected by it. The tubercle, he says, may be primary in the tonsils, with secondary infection of the lungs or other parts, the cervical glands being often affected thus secondarily.

Out of 31 cases of tuberculosis, acute and chronic, Dr. Walsham dis-

covered tuberculous of the tonsils in 20 cases. It is clear, therefore, that the most careful attention should be paid to any faucial disorder in children and that all obstacles to free respiration, such as adenoids, and the like, should be removed. Taking these facts into consideration, we see the futility of excising a large gland, and leaving behind the probable cause in the shape of a tuberculous ulceration of the lymphoid tissue of the naso-pharynx, or a tonsil containing tuberculous foci.

Spongy and congested gums carious teeth or stumps are frequently followed in the strumous child by tubercular enlargement of the submaxillary and other deep cervical glands. Other sources of infection are chronic otitis, and from the skin of the face, neck and scalp being affected by superficial wounds, eczema, impetigo, porrigo, etc., which allows the passage of the bacillus.

Lesions.—In the great majority of cases the cervical glands are involved, and generally they are the only ones affected. In 155 cases of tuberculous glands reported by Treves, those of the neck were the seat of disease in 145, and the only seat in 131. Those of the axilla were involved in 17, but alone only in four, the groin in 8, and alone in 6. The glands first affected are frequently the upper set of the deep cervical group. The chain of deep cervical glands which are involved follows the carotid artery.

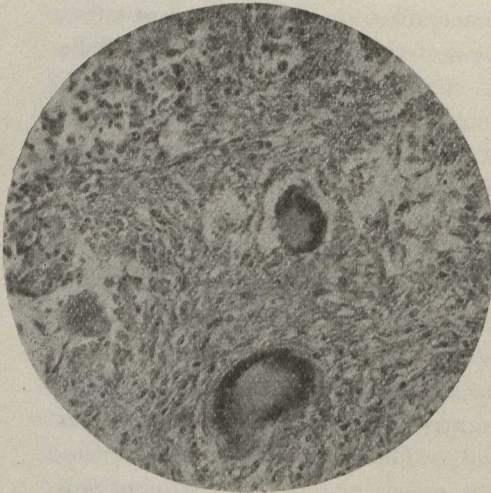
It is very interesting to note a small tract by John Browne, a surgeon of Norwich, reviewed by Mr. D'Arcy Power, in his interesting series entitled *Archaeologica Medica*. Browne, after some remarks on diet, and so forth, in which he seems in many respects to have been ahead of his times, says of surgical means, "These tumors (scrofulous glands) do require extirpation and extraction to be so dexterously performed as that no part be left behind. The glands are to be extracted with great care and caution, so that every part of the cystus or bags thereof are perfectly and thoroughly eradicated, and extracted, the which being done, and the part clean, mundifie the ulcer, digest, incarn, and then induce a cicatrice."

Pathology.—The process in all tuberculous glands is essentially a chronic one. Holt divides them into two groups: in the first the process is more rapid and tends to early caseation and softening, and the products of inflammation are mainly cellular. In the second group the course is much slower, fibrous tissue predominates, and caseation and softening are infrequent. In the first group the glands are swollen and have tubercles scattered through them. These enlarge and coalesce to form a large mass involving nearly the whole gland. Subsequently there is caseation and then softening, which converts the substance of

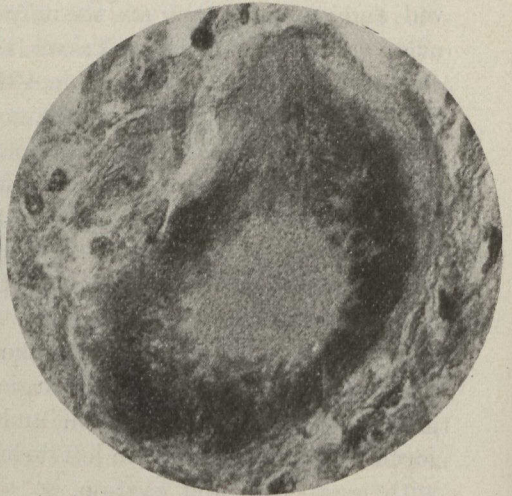
the gland into a whitish, caseous material, mixed with thick, curdy pus. This pus gradually accumulating makes its way towards the surface, and involves the overlying skin, which becomes thinner and redder, until it gives way, and allows the matter to be discharged. The discharge is usually thin and serous, mixed with some of the caseous material.

The sinus thus formed has a characteristic appearance :- its margins are surrounded by œdematous granulations; the cicatrices of the sinuses and cavities leaves a peculiarly disfiguring scar, the cicatrix is often adherent to the deeper parts; and is therefore depressed.

In a second group of cases the process is much slower, and the amount of fibrous tissue is greater. The glands are tough and hard, and the capsules are greatly thickened. They do not, as a rule form adhesions to the surrounding tissue, and are freely movable, while suppuration is exceptional.



Tuberculous Gland—Low Power.



Tuberculous Gland—High Power.

Treves, in speaking of the method of the spreading process, from one gland to another, states that while it often takes place along the direct line of the lymph current, this is not always the case, as sometimes it spreads in the opposite direction. This he believes to be due to an extension of the disease from the gland to the afferent lymphatics, these vessels themselves becoming the seat of disease, with changes similar to those taking place in the glands. In consequence many more tuberculous nodes may be found than there were original lymph glands, a point which has often been noticed but for which there is no other satisfactory explanation.

As to the clinical features it is scarcely necessary to say anything, as they are so familiar to everyone. Their enlargement is generally insid-

ious and painless and at first they are freely movable, but later on the surrounding parts become involved, in a periadenitis, and the gland becomes adherent.

Diagnosis. Tuberculous adenitis will have to be distinguished from the following:-

1. Lymphadenoma, or Hodgkin's disease.
2. Lymphatic Leukæmia.
3. Lympho-Sarcoma

Tuberculous adenitis is more common in the young, and involves the sub-maxillary glands more frequently than those of the anterior and posterior cervical triangles, which are usually affected first in Hodgkins disease. The enlargement may last for years without extending. The glands are often, even when small, welded together, and tend to suppurate, a feature rarely seen in true lymphadenoma. Strict limitation to one side of the neck or to the axilla would point to tuberculous disease, rather than to lymphadenoma. In lymphadenoma the surface of the glands will be smooth and elastic and there will be no adhesions present.

A microscopic examination of the blood will enable one to distinguish tuberculous adenitis from lymphatic leukæmia. In the latter condition there will be a very marked increase in the colorless elements of the blood. The proportion of whites to red may be as 1 to 10, although it is usually less than this. This increase takes place in the lymphocytes. Eosinophiles and nucleated red corpuscles are rare.

Sarcoma, of the round cell variety occurs rarely in single glands or in a group of neighboring glands as a primary affection. It will be distinguished by its more rapid growth, and by its tendency to spread to the neighboring parts and by the absence of leukæmia.

Prognosis.—It would appear from statistics, that it is comparatively rare for patients with glandular tuberculosis to develop diffuse tubercular disease. Poore states that of 52, only 2 were known to have died with tuberculosis. Nordan, on the other hand, says that out of 149 cases, 18 per cent. were known to have died with tuberculosis, and 9 per cent., though living, were suffering from that disease. Though the course of glandular tuberculosis is often protracted, yet one may predict ultimate recovery in the great majority of cases.

Treatment.—I may say at the outset that the majority of surgeons at the present time are of the opinion that the only way to deal with tuberculous glands is to excise them. The old plan of treatment, of applying tincture of iodine, iodine ointment, or other drugs, in the hope of influencing a caseating gland, perhaps deeply seated beneath muscle

and deep fascia, is not only useless, but may be harmful in injuring the skin itself, and interfering with the radical operation of excision later on.

Many physicians are still in the habit of applying tincture of iodine, or iodine ointment, or poultices for a prolonged period, in the hope that this will effect a cure, only advising removal of the glands when they have broken down, and are almost ready to burst spontaneously. The result often is, that when the surgeon first sees the case, he finds the glands broken down and adherent, with the skin over them red and thinned, so that the only thing he can do is to incise, curette, and drain, whereas, if he had seen the case earlier, before softening had occurred, and inflammation in the surrounding cellular tissues, a comparatively simple operation might have been done, with primary union of the wound, and much saving of time and tedious dressing might have been avoided.

Delaying the operation upon tuberculous glands until they are softened and broken down, with the skin over them red and thin and ready to give way, should be considered not only mischievous but reprehensible.

It is still more unfortunate if the case is left until an abscess is formed which opens spontaneously. Here you will have not only the ill-health dependent upon the presence of long-continued discharge, but the ultimate production of an ugly, depressed scar.

It is of the utmost importance in the matter of scars that the offending gland and pus should be removed while the skin is sound, before it has become damaged by inflammation. It is desirable to look upon this question from an æsthetic point of view, and the surgeon should act in such a way as to produce the least amount of blemish. When breaking down has occurred in the diseased lymphatic glands, operation should be done speedily, before the skin becomes thin and red. The use of the subcutaneous sutures of Halsted will be found to leave the least noticeable scar. Next to this, the use of fine horse-hair, in interrupted sutures. Sometimes it is possible to bring the edges of the incision together with strapping without using sutures. When we have an abscess to deal with in connection with tuberculous glands, the surgeon should not be satisfied with incising this and letting out the pus, but he should search for the diseased gland. In some cases the abscess will be subcutaneous, and the gland will be found beneath the fascia or beneath the sternomastoid muscle, and a small opening will be found connecting it with the abscess.

The situation of this can be best determined by the finger feeling a slight depression, then a probe passed into this depression will usually enter a small opening and lead one to the gland. The opening should be enlarged, the gland removed, the whole area scraped with a

sharp spoon, cleansed with carbolic lotion, iodoform emulsion instilled, and drainage of iodoform gauze used.

One may sometimes feel in the capsular cavity left after the removal of a gland the convex bulging of a continuous gland. This should be reached through the wall of the cavity, and removed. Where many glands have to be removed, it is, as a rule, better to remove them through a series of small incisions, rather than through very extensive ones.

After an operation for tubercular glands, the part must be kept absolutely at rest : in the case of the neck this can be done by applying a bandage in the form of a figure of eight around the axillæ below and the head above, or by the use of a stock made of poroplastic felt, or gutta percha, as in cervical caries.

A distinct advance in recent surgical procedure has been made by the adoption of the suggestion of Mr. Watson Cheyne, that in dealing with large masses of glands adherent to the sheath of the cervical vessels, the whole of the underlying internal jugular vein should be removed. I have myself removed a considerable portion of the internal jugular vein, with a good result. The need for this procedure must be very rare.

In operating for tubercular glands one is often struck by the large number of glands lying deeply, without giving any indication on the surface of their presence. For instance, one may examine a patient very carefully, and make out only a single enlarged gland, and subsequently, after removing it, others will pop up, until half a dozen, or more, diseased glands may be found ; so that one should not undertake an operation for tuberculous glands, even though apparently there be only one superficial gland affected, unless one is prepared for a deep and often difficult dissection. About a year ago I removed 176 tuberculous glands from one patient, Mr. D., age 24, referred to me by Dr. Moorehouse. These were located along the cervical vessels on either side of the neck and in the axillæ. The patient made a good recovery.

TUBERCULOSIS OF THE LARYNX.

D. J. GIBB WISHART, B.A. Tor. Uni., M.D., C.M., L.R.C.P. London;

Professor of Laryngology and Rhinology, Trinity Medical College.

BY Laryngeal Phthisis, we generally understand "the invasion of the laryngeal tissues, by tubercle bacilli, accompanied by the formation of tubercular deposits". This invasion is secondary in most instances, but that it may occur primarily is now well known. This definition will not however, include that large class of cases where there is no deposit, but where there are certain changes, the commonest of which is anæmia, frequently associated with the presence of pulmonary phthisis, nor those where the symptoms are essentially catarrhal in character.

PREDISPOSING CAUSES.—*Chronic Laryngitis* is frequent in people who follow sedentary occupations, and the influence of previous or chronic inflammatory conditions in the larynx, is all in favor of the occurrence of a secondary infection of the larynx in phthisis pulmonale through the weakening of the resisting power of its epithelium and the functions of its glandular elements. *Acute Laryngitis* occurring in the victim of pulmonary phthisis is not of necessity followed by tubercular invasion of the parts involved. Syphilis is said to predispose. Age has a marked influence. Males are affected twice as often as females. Occupation is predisposing if sedentary, but there is no specific occupation which in any appreciable degree predisposes to tubercular laryngitis. *Nasal catarrh* and nasal obstruction are not predisposing causes, nor has it been proven that the inhalation of the bacillus is a common mode of infection, and it is rarely found in the nose even in tubercular patients. *Hypertrophy* of the separate masses of lymphoid tissue, which go to make up the tonsillar ring accompanied by the presence of enlarged crypts, often filled with decomposing debris undoubtedly may be considered a factor of importance, as the tubercle bacilli are often found in the crypts both of the pharyngeal and faucial tonsils.

SYMPTOMS.—The subjective symptoms divide themselves into (a) those common to the laryngeal lesion and to pulmonary phthisis, and (b) those peculiar to the laryngeal lesion. To these there are three exceptions, (1) Acute miliary tuberculosis, with early involvement of the larynx. (2) Primary laryngeal infection. (3) Primary tubercular perichondritis.

(a) When the lung disease is deeply seated, or the evidence confined to a few moist rales, or bronchial breathing, the diagnosis is often difficult. The temperature chart is the most reliable assistant, while progressive

loss of flesh with loss of appetite, and night sweats are useful general signs.

(b) Voice.—Nine tenths of all cases exhibit some failure of the voice, as an early symptom. *Aphonia* may be present at an early stage, but is found at all stages and is due to interarytenoid swelling, involvement of the cords and bands, or paralysis of one cord. The early form which is as a rule temporary, is frequently mistaken for the functional variety. *Huskiness* may arise from adhesion of mucus to the cords, or from a nodal lesion, want of cordal tension, or mechanical interference with the working of the cords, as with interarytenoid thickening. *Hoarseness*.—In a short conversation the voice often changes from a gruff hoarseness to a high falsetto, and then into a toneless whisper. *Diplophonia* due to the lodgement of mucus, or to a paresis, is almost peculiar to laryngeal phthisis.

The voice is affected in all pathological conditions of the cords without exception. *The voice is not affected* where the epiglottis alone is involved, or where the swelling is confined to the interarytenoid fold, and insufficient to interfere with the motion of the cords.

Pain.—As in malignant disease, this is often referred to the ear and also to the palate, being due to involvement of the glosso-pharyngeal nerve by ulceration and infiltration, around the laryngeal vestibule. Dysphagia occurring with the swallowing of solids, is probably due to involvement of the epiglottis, or if occurring with the swallowing of fluids to involvement of the arytenoids.

Respiration.—Dyspnoea with stridor may accompany tumefaction, and thickening and ulceration of the vocal cords.

The objective symptoms that may be said to be typical, are swelling of the arytenoids and epiglottis, ulceration and swelling of the cords, sloughing ulceration of the ventricular bands, interarytenoid and subglottic swelling and growths, and extensive destruction of the cords with marked hypertrophy of the ventricular bands.

Marked anaemia of the larynx is a condition found in the pre-tubercular, or the chronic phthisical state, but the parts are not always anaemic when actual disease is present, but instead there is congestion from the irritation caused by coughing, and when typical laryngeal phthisis is present, congestion is practically always marked, although not so much so as in syphilitic affections.

The *Arytenoids* may vary greatly in form from a simple oval swelling, to the large dumb-bell formation, which effectually conceals the parts below. Their color is pink or red. Where there is a lesion of the surface, it is due to superficial ulceration, or to points of suppuration which

appear as minute yellow spots, while small cheesy looking patches are often seen. If miliary tubercles are present, they are not usually visible.

The *Inter-arytenoid* space is usually involved, and swollen or heaped up and somewhat ragged, while, in some cases there appears a sessile distinct tumour, concealing an ulcer, which is deep and covered by a layer of white secretion.

The *Epiglottis* when involved is usually swollen, congested and ulcerated chiefly on the posterior surface. Rigidity is often marked. Ulceration may be so extensive that the part becomes almost totally destroyed.

The *Ventricular Bands* may be swollen and ulcerated, and the latter is of the deep variety. Granulations when present are apt to be pale.

The *cords* are chiefly affected in the posterior two thirds, possibly owing to infected sputum passing over this surface as in the epiglottis, an example of auto-infection. The appearance may be that of shallow ulcer at the vocal processes, cleft like ulcers in the length of the cord, a red and swollen surface, or a saw like irregular edge in one or both. The colour may be a pale pink. Paralysis of the cords is often marked in one cord only, without any other sign of laryngeal involvement, and is here supposed to be toxic, or due to tubercular myositis. When it occurs in the later stages, it is probably mechanical.

Perichondritis.—Is acute or chronic. There are externally tenderness, and swelling of the *pomum Adami*, and internally ventricular swelling, and subglottic fulness with fixation of the corresponding cord, in the acute. In the chronic the process arises from the extension of the disease, through the sub-mucous tissues, and accompanied by exfoliation and expectoration of the necrosed cartilage.

PATHOLOGY.—The anterior surface of the posterior parts of the larynx (arytenoids) and the posterior surface of the anterior parts of the vestibule (epiglottis) are the most prone to be attacked by tuberculosis. These are in the direct track of the sputum, and it is probably due to the passage of the infected material over the parts, that they are attacked. That the blood stream is responsible for the conveyance of the bacilli from the infected lung tissue is hardly tenable, because there is no direct connection between the blood vessels of the lungs and larynx, and again with regard to the lymphatics, the deep cervical and internal mammary sets of glands intervene between those of the lungs and those of the larynx. These two paths would therefore seem to be unlikely ones by which the disease would travel, and we are thrown back then upon the theory of sputum infection, which would take place through the unbroken epidermis, sur-

face erosions, and the gland ducts in the sub-glottic, and ventricular regions. All these modes of ingress have been exemplified by various observers, and may be accepted as proven. A tubercular lesion in the larynx will present the same microscopic appearance as elsewhere, the primary deposit being found in the sub-epithelial layer of the mucous membrane, and causing a projection of greyish nodules on the surface, with the greatest focus of growth around the small blood vessels, and the glandular structures, congregating in small masses enclosing one or more giant cells. Acino-tubular gland tissue is especially prone to tubercular deposit, and this is plentiful in the inter-arytenoid fold, and in the epiglottis. The nodules undergo caseation and finally ulceration. Where there is ulceration of one cord a similar condition will develop at the opposite point of the other cord, probably by auto-infection. Where healing occurs it is by a process of fibrosis.

TREATMENT.—The general treatment of tuberculosis will be taken up elsewhere and here we are not called upon to do more than speak of the purely local methods to be pursued, merely drawing attention to the general fact that when the lung invasion is marked, the disease of the larynx will advance as a rule *pari passu*. The patient should be cautioned to save the voice, and to avoid irritants, atmospheric or dietetic. When pain is present, the diet must be bland, and thickened with white of egg, or arrowroot, and may be sucked through a tube, while lying down. A local anæsthetic may be used shortly before taking food. Open-air treatment is contra-indicated in acute laryngeal conditions, and the atmosphere in these cases should be moist and warm.

This part of the subject naturally divides itself into (a) The application of drugs in various media, and (b) The removal of the disease foci by operative measures.

(a) *Drugs* may be applied as a paint, an injection into the trachea, a powder, a spray, and as a submucous injection. Each of these methods has its particular merit and advantage, and several may be combined in the one case. In each instance the parts require to be previously rendered anæsthetic with a cocaine spray.

Paints should be applied upon a laryngeal applicator armed with cotton wool, the cotton should only be moistened with the drug, for if any drop into the lower parts of the respiratory tract, an awkward and distressing spasm will arise. The paint should be rubbed thoroughly into the diseased parts, and this directly under the eye of the operating physician. The drugs which may be painted upon the diseased parts, and which at present command the con-

fidence of the profession are lactic acid, formalin, menthol, protargol, sulpho-ricinate of phenol, para-mono-chlor-phenol, etc.

Lactic-acid (Krause) Should always be used in a weak solution, say 10 per cent. at first, an increase up to full strength being made gradually as the larynx shows itself amenable. Formalin should be used in a solution of $\frac{1}{2}$ per cent. upwards in the same way. Menthol is best applied dissolved in albolene, and in a strength of from 20 per cent on a swab, or by means of a syringe, 15 minims at first. It acts as an anti-septic anaesthetic, and stimulant. Protargol may be used in a strength of from 5 to 20 per cent solution.

Intra-tracheal injections have been much commended of late, and are said to find their chief use in superficial ulcerations of the larynx with nodular swelling, or with an irritable cough and great subjective throat dryness, the difficulty lies in the accurate use of the apparatus, and in the glottic spasm induced. There is required a syringe of from $\frac{1}{2}$ to $\frac{3}{4}$ of an ounce, the laryngeal nozzle being attached with a bayonet catch to the barrel, so that accident may be avoided. Cocaine must be used, and the injection introduced quickly. The fluid should be heated to about the body temperature and a moderate amount injected about midway between the meal hours, and all coughing avoided for a time after the injection. The medium used is preferably oil or glycerine, and naphthaline, creolin, or guaiacol may be injected.

Powders do not find great favor in laryngeal therapeutics, but exception should be made in favor of orthoform, a powder which when applied upon a surface denuded of epithelium will produce an anæsthesia of several hours duration, without toxic effects, and is therefore of great use in cases attended by pain and dysphagia. Morphia may also be used but is obviously open to serious objections.

Sprays are always open to the objection that the drugs are too widely diffused and if applied by the patient or attendant are generally so badly directed that they fail to reach the parts affected.

The Underwood Inspirator—which has been largely introduced in Canada has not proved of any real value in the writer's hands.

Inhalation of drugs dissolved in oily media is often very satisfactory especially when the patient is equal to the exertion of visiting the physician's office, or is resident in a sanatorium.

Submucous injections are made into the ventricular bands, and embrace solutions of guaiacol or creasote. They have been greatly recommended by Chappell, but of these the writer cannot speak from experience.

(b) *Operative measures*.—When a case proves obstinate under the drug treatment, or when there is deep ulceration and tumefaction, or

inter-arytenoid thickening, the use of the curette as recommended by Heryng is justifiable, and the results are often brilliant. In cord lesions this line of treatment is rarely called for. Operative measures are to be avoided if the general symptoms are marked, or if miliary tuberculosis be present.

As far as possible all diseased tissue should be scraped away, and in the case where the parts are infiltrated they should be incised, afterwards lactic acid may be rubbed into the raw surfaces. This treatment is of course heroic, and difficulty is met in securing the patient's consent thereto.

PROGNOSIS.—Laryngeal tuberculosis while often the precursor of speedy death, is not by any means hopeless, and any neglect of attempt at cure is never justifiable. The pulmonary condition is the important factor.

It is in the primary form, or when this lesion is secondary to tuberculosis above the larynx, that the best results are obtained. The chronic consumptive, and the one with few lung lesions, and a steady temperature, come next in order, while the miliary form is the most hopeless.

Ulceration of the epiglottis, and general ulceration with perichondritis offers most resistance to treatment, because the pain involved prevents sufficient nutrition being ingested.

Disease of the bands and cords on the other hand are the most favorable.

TUBERCULAR DISEASE OF THE MIDDLE EAR.

BY CHARLES TROW, M.D.C.M., L.R.C.P., LONDON,

Professor of Ophthalmology and Otology, Trinity Medical College; Eye and Ear Surgeon to Toronto General Hospital, and to the Hospital for Sick Children, Toronto.

IF we were to search for Koch's bacillus in all suppurating ears, more cases than is generally supposed of tubercular disease would be found.

Undoubtedly we get cures, and probably sometimes when tuberculosis has not been diagnosed, as the local antiseptic, and operative, as well as the constitutional treatment, are to a considerable extent the same as in ordinary cases of suppurating ears. The middle ear, antrum and mastoid, are probably as good a culture ground for the propagation of germs as any part of the body,—having the necessary warmth moisture and protection from external influences.

More than forty years ago Buhl pointed out that when pus was collected in an osseous cavity, the walls facilitated the absorption of the morbid materials, and the consequent superinduction of miliary tuberculosis. A suppurating ear closely resembles an abscess in a bone.

Tuberculosis of the ear may be acute or chronic. In the former there is generally diffuse cellular infiltration of the mucous membrane, and proliferation of the cellular elements; there are few, if any, giant cells, but a large number of tubercle bacilli. The mucous membrane breaks down rapidly with resulting great loss of substance. This form occurs in debilitated subjects, and death usually soon ensues. In the chronic form superficial circumscribed masses of tubercle are seen on the mucous membrane; their centres become caseous, and giant cells are developed; but bacilli are not abundant. Ulceration and fresh deposits of tubercle take place in the deeper layers. The mucous membrane becomes thickened, granulations spring up on the surface, and under favorable circumstances connective tissues may form, with healing as the ultimate result; but unlike simple granulation tissue, there is a constant tendency to retrogressive changes and infection by pus organisms, and thus it is not frequent that we have such a favourable ending. In the great majority of cases the disease extends wider and deeper; the bones become involved, and perhaps the meninges and brain. Scheibe has described cases of what he terms mild aural tuberculosis, laying great stress upon the following points:—

(1) The case is similar to one of ordinary middle ear suppuration; but there is a very large perforation, without any sufficient cause.

(2) Great obstinacy.

(3) There occurs a greyish deposit on the inner wall of the tym-

panum, associated with increased suppuration, and followed by the appearance of granulations which cause it to disappear, and then disappear themselves.

(4) During the presence of the deposit tubercle bacilli can be found.

The sudden painless discharge from the ear is characteristic of the complaint; often no signs of local reaction; hearing so good, probably, that the patient has not noticed any defect. With regard to the diagnostic value of tubercle bacilli in the discharges, it would seem that they are by no means always present, and a negative diagnosis cannot be made by their absence in a single examination; especially is this the case where there is profuse purulent discharge, due to secondary infection from strepto, staphylo, or pneumococci as they have a baneful influence on tubercle bacilli. Milligan says: "Should the staining and examination of the discharge from the ear, as is common, fail to reveal the bacillus, a portion of the granulation tissue may give a more positive result; and this also failing an experimental inoculation with fragments or tissue, especially when scraped from the deep bone after removal of the inspissated debris, often succeeds." He has shown by inoculation experiments that a very large proportion of cases of chronic ear suppuration in infants and young children are tuberculous. McEwen says it is frequently met with in infancy and childhood.

It is much more frequent as a secondary infection than as a primary, and generally takes place through the Eustachian tube or a perforation in the drum membrane. Often it is very insidious, sometimes occurring without rupture of the drum membrane, with no pain, or only a very little of an indefinite character. There may be very little purulent discharge, the bones being eroded by caries sicca. The membrane surrounding the perforations (usually several if the drum is not gone) is usually a pale and greyish-yellow, or Dench describes it—blue-white, glossy, oedematous appearance, and giving issue to a thin ichorous, and frequently foetid discharge. Early implication and enlargement of the surrounding glands is an important symptom. The bony structures may be quickly involved and the entire mastoid broken down. Dench aptly says: "It is well to bear in mind the possibility of systemic infection from this focus; the local process then is sure to extend rapidly. It occasionally spreads through tegmen tympani or petro-squamosal suture to the brain membranes, causing lepto-meningitis, and McEwen says "when this occurs early before much destruction of the bone surrounding the middle ear has occurred and without the membrani tympani rupturing, the primary focus is apt to be overlooked, and the cases are then ascribed as ordinary tubercular lepto-meningitis.

Thrombosis may occur in the sigmoid sinus by gradual invasion by tubercular granulation tissue, or an acute infective process.

Milligan's observations on tuberculosis of the ear in the Medical Annual, 1901, among the causes he enumerates hereditary tendency, unhealthy environment, unsuitable feeding, exposure to infection from tuberculous relatives, tuberculous nasopharyngeal adenoids.

I am inclined to think these latter are not so very uncommon. Many children have enlarged cervical lymphatic glands, which generally disappear after the tonsils have been excised. Have we removed the culture ground? Dr. F. Baup, in the *Annales des Maladies de l'Orille*, in a contribution to the study of *Larval tuberculosis* of the three tonsils, says: "This interesting question of prophylaxis of tuberculosis is of wholly recent origin. It was only in 1894 that M. Lermoyez, having examined adenoid vegetations which he considered suspicious, found in the midst of the adenoid tissue tubercles and Koch's bacilli, and demonstrated thus in the clearest way the possibility of a concealed, latent infection of the tonsil by the bacillus of Koch. The changes caused by an hypertrophy of a tonsil make it an easy prey to germs, tubercle as well as others, and account for the frequency of amygdalitis. Twelve surgeons examined 871 excised tonsils, of which 53 proved to be tubercular. Baup describes three forms of larval tuberculosis of the tonsils, and says they are met with at the ages of 3 to 18. It may co-exist with apparent health; but generally there is some ailment

Large soft ganglia in the neck, coincident with enlarged tonsils, is a sign of great value. Its relation to auricular tuberculosis is well known in Germany. Frankel and Lewin have several times remarked their association.

We all know what a large percentage of cases of suppurative otitis media are due to enlarged tonsils, especially the third (Luska's). Is it not likely that there is more than a partial blocking up of the Eustachian tube to cause this; and may it not be that some are due to the transmission of tubercle bacilli from these tonsils along the Eustachian tube to the middle ear?

When the tubercular process in the ear is secondary, the prognosis is usually unfavorable, and also in the primary if the disease has extended deeply and widely; but I believe there are cases, not infrequent, in which the process is very slow (just as we may see it in other portions of the body), and in these we can hope for a cure. I think in my own practice I have had such cases.

The treatment of aural tuberculosis is essentially that of tubercular disease elsewhere, such as good air, nourishing food, proper clothing, and

the general constitutional remedies as seem most suited to the individual conditions, the hypophosphites, strychnine, creasote, etc. Local treatment may be considered under two headings, surgical or operative and medical, the choice depending upon the extent of the aural involvement, the presence or absence of tuberculosis elsewhere, and the general physical condition of the patient.

When there is marked debility and emaciation, facial paralysis and masses of enlarged glands, and where the discharge is abundant and foetid and frequently bloodstained, palliative measures, antiseptic treatment, and, if possible, residence at the seaside, are more strongly indicated than operation, but the prognosis is bad.

If there is no ascertainable tubercular focus elsewhere, and the area of aural infection is limited, operation may be required. This consists in the free opening of the mastoid cells, if they are affected, scraping away of all softened and carious bone (repeated if necessary), and encouragement of granulations from the bottom.

In the middle ear, keep the part as clean and dry as possible. All pus and debris should be removed as frequently as required. Granulation tissue should be snared away or cauterized and kept down by chronic acid. The use of antiseptic washes and antiseptic powders regularly, at least once or more often, if required each day.

ON THE DISPOSAL OF TUBERCULOUS SPUTUM.*

J. H. ELLIOTT, M.B. (Toronto),

Medical Superintendent, Muskoka Sanatorium, Gravenhurst, Ont.

THERE has perhaps been no greater advance made in medicine in the past few years than the general recognition by both our profession and the public that tuberculosis is a disease which may be cured, and a disease which may be prevented.

Koch's discovery in 1882 of the tubercle bacillus, and his masterful presentation of its causal relationship marked a new epoch in our ideas regarding the disease produced by this ubiquitous bacillus. Knowing as we do that its presence is necessary for the development of the tubercular diseases the prophylaxis resolves itself into the problem of the destruction of the bacilli wherever found outside the body. We know they are present in the sputum in tuberculosis of the res

* Presented at the annual meeting of the Canadian Medical Association, Winnipeg, August, 1901.

piratory tract, in the dejecta in tuberculosis of the bowels, in the urine in genito urinary tuberculosis, and in the ulcers in tuberculosis of the skin. In surgical tuberculosis they never appear outside unless as the result of an abscess opening.

The cases in which the respiratory tract is affected far outnumber all the others, and from the others there is as a rule but little danger of infection when there is any pretence to cleanliness. The sputum we know is a very prolific source of infection, and the one to which our attention must be drawn in our efforts to prevent the spread of the disease from the sick to those about them.

Pflugge and others have shown that in the act of coughing mucous particles are thrown some distance from the patient, and that those particles often contain bacilli. Unless the cough be very forcible the distance does not exceed two or three feet. To prevent infection from this source patients should be taught to always hold a cloth or handkerchief before the mouth when coughing, unless out of doors with no person near. Another handkerchief must always be used for the nose.

Many experiments have been made in hopes of finding a chemical disinfectant which will destroy the virulence of the bacilli present in the sputum. The greatest difficulty presenting itself is the fact that as a rule the sputum is in albuminous or muco-purulent masses, forming an almost impermeable envelope, and any solution applied acts only on the surface of these masses unless it has powers of penetration; and as many of the disinfectants in ordinary use coagulate albumen the possibility of penetration is much lessened.

The disinfectants in most common use are perhaps bichloride of mercury and carbolic acid. Solutions of these 1 in 500 and 1 in 20 respectively acting for 24 hours will not destroy the bacilli in nummular sputum. Guinea pigs inoculated with sputum thus treated develop tuberculosis in almost every instance. Experiments with other chemical disinfectants give like results. These cannot be relied upon unless they are intimately and thoroughly mixed with the sputum, and all the larger masses thoroughly broken up. This is very unpleasant as well as difficult work, and precludes its use.

Boiling in water for five to ten minutes has been looked upon as an efficient method of treating sputum or sputum soiled handkerchiefs, but the recent experiments of Moeller (1) show that this cannot be depended upon. He boiled sputum for ten minutes; the larger masses which had coagulated were opened, and a portion inoculated into guinea pigs. Of

(1) Zeitschrift für Tuberkulose und Heilstättenwesen, Band 2, Heft 2, p. 147.

six inoculated two died of tuberculosis, one of peritonitis in 24 hours and three remained healthy.

Steam disinfection, especially under pressure has been satisfactory, but of course is not available except in the larger hospitals.

Chemical agents then being insecure in their action, and boiling in water useless unless prolonged some other method must be used. The only means which will certainly destroy the bacilli in the sputum, and which at the same time is practical is *incineration*. Destruction by fire of all sputum, and of sputum-soiled cloths should be rigidly insisted upon with every case of pulmonary tuberculosis. The only use for carbolic or other solutions is to cover the sputum, and prevent drying or putrefaction, or to overcome the unpleasant odor present in the expectorated matter of certain cases.

The sputum is preferably collected in a receptacle such as the paper spit box supplied by Seabury and Johnson. When these are used the box and contents are both placed in the fire, and there is no unpleasant handling, and no washing as is the case when earthen cups are used.

When collected in stoneware or enamelled iron cups these should be emptied into a sheet iron receptacle which can be placed in the fire, and the cup then sterilized. It is not safe to simply throw the sputum into the fire of an ordinary cook stove, as perhaps would be done in the case of patients treated at their homes. There would be too much possibility of some of the expectoration running into the cooler part of the ashes, especially if the fire were low, and thus escaping thorough incineration or even heat sterilization.

The proper method is to have an iron box (thin sheet iron is sufficient) of the proper size into which the day's collection may be placed, this can then be placed in the fire with no possibility of any of the contents escaping combustion if the fire be sufficiently hot. The process may be aided by mixing sawdust with the sputum just previous to placing in the fire.

The patient himself, and those about him should be made fully aware of the great risks incurred by all if proper care is not taken and if any of the sputum is allowed to become dry either in the spit box or on handkerchiefs, etc. On the other hand it is but just that the physician also tell the patient and his friends that when proper care is observed there is no danger incurred. There is abroad amongst the people, and even in our own profession such an absolute fear of the disease that many a poor patient is made to feel that he is a veritable pariah. All those coming in contact with the patient should be impressed with the

necessity of great care, but should also be reassured that if such care be taken no danger is to be feared.

Let us also not forget that there is really greater danger of infection from those cases which are up and still at work, and who expectorate indiscriminately wherever they may be, in workshops, offices and on the street, and that these cases often do not know the nature of their trouble.

Whenever tubercle is suspected the sputum should be examined, and if bacilli are present the patient should at once be instructed as to the evil of indiscriminate expectoration.

Only by persistent effort on the part of the profession, and the education of the public can we prevent the spread of the varied diseases caused by the bacillus tuberculosis.

THE RELATIONS OF THE TUBERCULOUS AND THE PUBLIC.

By J. T. FOTHERINGHAM, M.D., C.M., Professor of Therapeutics,
Trinity Medical College.

An unabbreviated form of this title may be constructed as follows :—
The mutual rights and duties of those infected by tubercle bacillus and those not so infected. The question is :—Putting aside sentiment, and having a maximum of regard for the interests of the race, and an irreducible minimum of regard for those of the individual, what measures, (a) of a public, and (b) of a private character can be undertaken for the extirpation of this bacillary scourge, as that other of, say plague, or small-pox, has been extirpated? The barest outlines are possible in an article of so short limits and such wide scope.

First, one is struck, in his reading of the History of Medicine, with the advance of opinion, both professional and lay, on such topics. One becomes optimistic, and hopeful of final success, when he remembers how in civilized and kindly Greece, the Therapia, Temples of Apollo, the gracious Healer, though they welcomed the sick, cast out the dying, and how from superstitious motives the very high priests of the kindly God of Healing expelled from the sacred precincts the unhappy inmate who showed signs of death, lest they should be defiled by the presence of the Great Enemy. The spread of sound knowledge has had even more to do with the change of opinion than the cultivation of ethical and moral considerateness. So that this campaign must be one not of compulsion but of education.

The "irreducible minimum" above referred to implies for the infected sufferer all that public and private kindness and modern science

together can furnish, in the way of climatic advantage, housing, food, and hygienic and medicinal treatment. In return for such benefits the providers of them, the public at large, and the relatives of the sufferer, have the right to demand an intelligent surrender by him of some of his cherished privileges, and an appreciation of the fact that he is in a degree a menace to their safety.

Education being the remedy for the frightful evils arising from the apathy still prevailing, (in the United States 100,000 deaths per annum, in Germany 100,000, in Great Britain 60,000, in Canada 8,000,) how is it to be carried on? Three agencies are available.

(a) The medical profession in their daily contact with the people.

(b) Those who have been inmates of sanatoria in which they have learned the details of prophylaxis, control of infection and means of cure, and who carry home with them as apostles, this knowledge.

(c) The Public Health authorities.

As to *methods* of education, the Public Health authorities are chiefly responsible. They should everywhere do as is already being done in Germany, where at public expense there are about to be circulated among the people of the Empire, millions of leaflets with plain statements of fact as to infectivity, heredity, faulty hygiene, and other predisposing factors and prophylaxis generally. An Augean stable of ignorance must be cleansed before the infected begin to appreciate their duties to the uninfected, or their rights from them; the public must be taught that "catching cold" does not cause consumption; that there is no specific miracle-working substance in the possession of any quack or company, or ever will be; that the disease is not truly hereditary or incurable, and many other such facts.

Dangers and difficulties to be borne in mind in such a campaign of education are, the risk of stampeding the public into panic, an extreme as dangerous as the present apathy. The selfishness which fear arouses will be as fatal to the unfortunate as dull neglect has been. Even now the city of Toronto is balked in making provision for the tuberculous poor for the time by the cupidity and heartlessness of landowners near the purchased site, who have since the purchase, run up shacks within the statutory distance of such a sanatorium from a "dwelling-house", in hopes of driving it out of their neighborhood.

Another difficulty lies in the fact that in a climate like ours the poor are compelled to deny themselves ventilation in their home, in order to keep warm, the expenses of fuel and clothing being beyond their means. Of what value are lectures on sanitation to those so placed?

Public duty toward the infected demands at least the following provisions:—

1. Suppression of the loathsome expectoration so prevalent, as being a public nuisance as offensive and menacing as the "committing a nuisance" of another kind is in any public place. Public spittoons might be provided, for the same reason as public lavatories.

2. *Notification*, as a means of public education, should be at first *requested* in private cases, and *compelled* in public institutions of all kinds, till both profession and public attain the correctness of view which here so generally obtains with regard to smallpox and other contagious diseases. As Fowler points out, tuberculosis is at a disadvantage in three ways; the interval between the infection and the advent of symptoms is so long; the difficulty of tracing infection to its source in any given case is so great; and the proportion of the community under ordinary conditions susceptible to the virus, so small, as compared with say any of the specific fevers, that public opinion is slow to move. In New York City in 1893 the experiment was made of requesting notification in private and requiring it in public cases. There were notified in '94, 4,166 cases; in '95, 5,818 cases; in '96, 8,334 cases. This success led the authorities in '97 to require notification in all cases. Notification of course *per se* does nothing, except help in educating the public; it must be followed by further action soon.

3. The dissemination of correct views as to the disease has been already referred to as being clearly a part of the duty of the Health authorities.

4. Public hospitals for the bedridden, at any stage, and out-patient dispensaries for the relief and education of the consumptive poor, should be established. The latter would be especially suited to the needs of smaller places, and being inexpensive could be all the more numerous.

Where sanatorium treatment cannot be provided a system of public nursing would do much to mitigate the lot of those bedridden in their homes. The poor, in their crowded and unsanitary surroundings and with their careless habits, are mainly responsible for the ravages and persistence of the infective agent.

5. The disinfection of quarters, rooms, clothing, etc., on death or removal of patients, as in the case of other contagious disorders. If anything can be held to be proved about tuberculosis, it is that it is a "house disease."

6. The examination of and reporting upon all suspected sputa and discharges.

7. The provision in all gaols, asylums, etc., of separate accommodation for the infected. The ravages of tuberculosis in Sing-Sing, and

other prisons, are too well known, and will soon be widely considered a public scandal.

The infected one on the other hand, in return for these benefits, should be willing to conscientiously carry out, in the public interest, such simple rules as these :—

1. Sputum, being the main source of danger, must not be expectorated into a rag or elsewhere than into a disinfectant solution or suitable pocket receptacle.

2. Linen soiled by sputa must not be sent to a public laundry till after disinfection.

3. Rooms should be kept clean and well aired, and well cleansed when vacated, and all the rules of health most carefully observed, as to diet, baths, exercise, clothing, sleep, avoidance of sexual and other excesses, etc.

4. Sputum should not be swallowed for fear of infecting other organs.

5. The infected is less of a menace to himself and others the more rigidly he follows out rules, and under ordinary conditions of cleanliness and care, his presence need be but little feared even for infection, and much less for contagion.

TUBERCULOSIS—SOME NEEDED REGULATIONS.

By JOHN FERGUSON, M.A., M.D., L.R.C.S., Toronto.

IT is no longer necessary to argue that tuberculosis, by some means or other, passes from those affected with the disease to those who are still unaffected. No more certain is the relation of the seed to the crop than is the relation of the tubercular germ to the disease known as consumption or tuberculosis. It is true some persons are more prone to the disease than others, but in all cases the germ, or bacillus, must first take possession of the soil. It is a question of seed, soil and harvest—tuberculosis in other words.

The time was when leprosy was very common in Europe. It was very common in Scotland. It is no longer found in the latter country. Tuberculosis is now being studied in the light of a preventible disease. This is the true standpoint to study it from. It is a good thing to find a remedy for any infectious disease, but the fact still remains that prevention is worth more than cure. Shortly after the discovery of the bacillus in 1882 by Koch, I remarked at the Ontario Medical Association that proof was now furnished of what many, on clinical grounds, had

long held, that the disease was a communicable one. I was answered by a member present to the effect that "when as old as he was I would not hang heavy weights on slender threads." The slender threads have stood the test and the disease is now fully recognized as an infectious one. The incubation may be very slow, or it may be quick; but still it is a case of no germ, no phthisis.

Tuberculosis should be made a notifiable disease. It is not intended that undue restrictions would be placed upon those who are afflicted. But their condition ought to be made known. As soon as the case is reported the patient should be furnished with printed instructions as to how he should conduct himself with the view of minimizing the risk to the persons. These instructions would cover such topics as the use of a separate bed, towels, clothing and utensils, and the proper manner of disinfecting them after use. The disposal of the sputum, the kissing of other people by consumptives, and such like matters would also be dealt with clearly and fully.

There should be power placed in the hands of managers of companies, banks, railways, in school boards, municipal councils, colleges, and so on, to insist on a bacillary test by competent experts of all suspected cases. This would remove from the association with others, in offices and schools, of those who are afflicted with the disease, especially in the respiratory organs. It is true this would often work some hardship on those who became ill and were forced to relinquish their situations. But it is a much greater hardship that a person so afflicted should continue day after day with those who are not affected, until they too become affected. We isolate small-pox, and yet it is not as terrible as tuberculosis.

All persons who are known to be afflicted with tubercular disease should be debarred the right of marriage. There is no use having any sentiment in this matter. Time after time I have known young men and women enter into the marriage relationship whom I knew to be affected with tuberculosis, and whom I had advised to remain single. They would not take the advice; I could not enforce it. I need not say what the consequences were in such cases. It is bad enough for those with consumptive family histories to get married, but for those who are actually ill with the disease to marry is unpardonable. The legacy that is too often left to young widows in such cases is a number of delicate children altogether too liable to become affected with this fatal disease.

All known cases of consumptives should be compelled to carry with them a proper spittoon. It is well known that the sputum contains the bacilli in great numbers. These bacilli live long enough for the sputum to become dried and blown about as dust. It thus finds its entry into the

air passages of others. The state tries to protect private property, it should try to protect the life of the citizen against such a danger. But the sputum lying on the sidewalk is picked up by the feet, and the long skirt, and carried home to be carefully deposited on the drawing-room, bedroom and dining-room carpets, from thence to fly through the air on the application of the busy broom. How many have fallen victims to this habit of consumptives spitting in public places no one can tell, but they are legion.

The people are no longer sentimental in the cases of scarlatina, smallpox, the plague and cholera; why should they be sentimental in the case of the worst disease of all—tuberculosis? Because the illness does not follow immediately after the exposure, the danger is lost sight of. It is, however, none the less imminent. Personally, I would sooner have cholera and die soon, or get well, than have tuberculosis and linger a long time and finally die. The great secret of success in the management of tuberculosis is to cease infecting other persons. Those who are ill, less a few who may recover, will die off. Save those who are not yet affected. Destroy fearlessly tubercular cattle. Remove from schools, colleges, offices, stores, workshops, those who are tubercular; safeguard the conduct of those who are known to be afflicted, so as to protect the public to the utmost. Rigidly prohibit the marriage of those affected. These precautions would soon lessen—almost annihilate the consumptive sick and death-rate. Advice is all very well, but people will not always follow advice. Compulsory measures must be called in.

It is quite useless to expect parents to withdraw their consumptive children from school on the advice of some physician. The teacher, who is ill with tuberculosis, will not give up his or her class until the disease is so advanced that rest becomes a necessity. The factory hand will continue his daily toil amongst his fellow workmen coughing and spitting, until his employer lays him off because he is no longer able to earn his daily wages. The consumptive will marry, despite admonition to the contrary. Nothing will control, nor guide, these classes along pathways that are safe to the general public but the strong arm of the public will, as expressed in a well thought out series of legal enactments. We all commiserate the maniac, but we do not allow him to run at large. We need not sympathize with the consumptive less because we try to prevent his giving the dread disease to others. Some inconvenience and restriction might fall upon him, but this is the sacrifice he must make for the good of others. In turn for this, the well must bear some of the burden of the destitute sufferer and afford him a proper retreat.

STATISTICS OF TUBERCULOSIS IN CANADA.

CHARLES P. LUSK, M.D.,

Assistant in Anatomy, Trinity Medical College, Toronto.

IN a study of this subject we are, I am sorry to say, led against a blank wall at the outset, for apart from those of Ontario and Quebec there are no vital statistics obtainable. Through the kindness of Mr. Walter Brown, Secretary of the National Sanatorium Association, communication has been had with each of the Provinces with the answer, "no statistics," with the above exceptions.

The prevalence of the disease generally will have to be simply estimated and our study confined largely to conditions in our own Province. Yet, when we consider its extent and its varied conditions, the field may be large enough to be of value to us. Adopting the report of the Registrar-General, published for the year 1899, as a basis, we find that the death returns in Ontario for tuberculosis and scrofula were 3,405 out of a total of 28,607 in an estimated population of 2,302,705. In Quebec in 1897, there were 3,079 out of a total of 34,287 deaths in a population of 1,626,869.

Respectively these figures show a death rate of 1.5 for Ontario and 1.89 for Quebec per thousand of population, while the total deaths from all diseases were 12.4 and 21.07 per thousand. In other words that of those who died in Ontario, one in every 8.26 died of tuberculosis or scrofula, and in Quebec one in each 11.1. The difference in favor of Quebec being largely due no doubt to the infant death rate in that Province.

Adapting the Ontario rate to the Dominion at large, we would have a total of 7,950 deaths, and by extending the same rate to Great Britain and Ireland, Australia and the United States, we have an appalling total of 189,450 deaths each year. Is it any wonder then that we ask for statistics that by our very fears we may be goaded into greater activity in combating this dread scourge which carries desolation everywhere, and is, without question, our nation's most active foe.

Comparing the death returns in semi-decades during the last twenty-five years, we find that the returns for Ontario show in—

Population.	Total deaths.	From tuberculosis.	Percentage of total deaths.	Rate per 1,000 of population.
1875 .. 1,737,891 ..	22,821	2,297	10.06 per cent.	1.32
1880 .. 1,884,200 ..	19,802	2,154	11.36 "	1.14
1885 .. 1,923,610 ..	22,105	2,313	10.46 "	1.25
1890 .. 2,161,971 ..	24,013	2,503	10.42 "	1.15
1895 .. 2,211,101 ..	22,461	2,472	11. "	1.11
1899 .. 2,302,705 ..	28,607	3,405	11.81 "	1.48

If we now compare the deaths with those caused by other diseases, which have an important place in mortuary returns, we find that—

Influenza has	990	victims
Pneumonia has	1,825	"
Diphtheria and croup have.....	599	"
Diarrhoeas in children have.....	1,089	"
" not infantile, have	425	"
Heart disease has	1,382	"
Typhoid has	452	"
Cancer has.....	1,041	"
Scarlet fever has.....	246	"
Peritonitis and appendicitis have.....	418	"

In carrying our investigation still farther, and more particularly from the clinicians standpoint, it will be interesting to examine as to how many deaths occurred in the different forms of tubercular invasion. Here our Ontario returns are inadequate so that we are obliged to seek figures from the city of Montreal for 1897, when out of a total of 875 deaths there were—

585 or 67	per cent.	due to Pulmonary involvement.
27 or 3	"	" Peritoneal "
104 or 12	"	" Meningeal "
98 or 11	"	" General "
13 or 1.5	"	" Involvement in other organs, and
48 or 5.4	"	" Scrofula.

We have been taught that age, sex, occupation, and climatic conditions are predisposing factors in increasing the individual's liability to infection. On analysis of these 3,405 deaths we find:

319 or 9.3	per cent.	occurring in infants under 1 year.
80 or 2.3	"	" children from 1 to 4 years.
56 or 1.6	"	" " 5 to 9 "
95 or 2.7	"	" " 10 to 14 "
294 or 8.6	"	" young adults " 15 to 19 "
517 or 15.1	"	" " 20 to 24 "
427 or 12.5	"	" adults " 25 to 29 "
309 or 9.0	"	" " 30 to 34 "
291 or 8.5	"	" " 35 to 39 "
216 or 6.3	"	" " 40 to 44 "
147 or 4.3	"	" " 45 to 49 "
262 or 7.6	"	" " 50 to 59 "
217 or 6.3	"	" " 60 to 69 "
88 or 2.2	"	" " 70 to 79 "
21 or .6	"	" " over 80 years.

In the first four decades then the first claims	13.3	per cent.	of all deaths.
The second claims	11.4	"	"
" third "	27.7	"	"
" fourth "	17.6	"	"

On classifying the deaths according to sex we find that 1,772 were females and 1,633 males. If we begin, however, to look more closely we find that in the

1st decade, of 504 deaths,	54.9	per cent.	were males and	46.1	females.
2nd " 309 "	39.3	"	"	60.7	"
3rd " 944 "	41.8	"	"	58.2	"
4th " 600 "	48.8	"	"	51.2	"
5th " 364 "	48.0	"	"	52.0	"
6th " 262 "	50.0	"	"	50.0	"
7th " 217 "	63.5	"	"	36.5	"
8th " 88 "	59.0	"	"	41.0	"
Over 80 years, 21 "	66.7	"	"	33.3	"

Studied as to the effect of occupation we are only able to give somewhat indefinite figures, not having the population classified in this manner. After eliminating 503 children under 10 years and 247 persons of no occupation, we have of those whose work demands a large proportion of time spent out-doors, 865 deaths, while of those whose life is largely indoor we find 1,770 deaths, this including 715 housewives and 495 spinsters, who no doubt are largely subjected to the same conditions as the housewives, aside from childbearing. Farmers account for a large percentage of the total deaths, there having been 440 from this class. Of students we find 89, of servants 84, of clerks 64, while of railway employes there were 22, of gardeners 22, and carpenters 28, and of laborers 228.

As to the proportionate death rate in rural and urban communities, we are simply able to offer an estimate. The city population comprises 445,777, the county town 150,095. If to these we add 200,000 so as to include other towns and villages of the Province, we have a total of 795,872 individuals who account for 1,610 deaths. This would leave 1,795 deaths occurring in the rural population of 1,506,833. Respectively this will give a death rate in the

Urban population of 2.	per 1,000,	and in the
Rural " " 1.1	" 1,000.	

When we come to consider the effect of temperature, relative humidity of the atmosphere, and character of the soil, upon the frequency of the disease, it will, I think, be just to accept as diverse physical conditions as possible. These we find in the Western and Eastern portions of the Province, while an intermediate area will be found in the Niagara Peninsula.

Tabulated so as to present the varying features as distinctly as possible, we find as follows:—

County.	Altitude.	Character of Soil.	Mean Temp.		Relative Humidity.		Death Rate per 1000.
			Winter.	Sum.	Win.	Sum.	
a {	Perth	Clay Loam.					.71
	Waterloo	“ “ & Sandy Loam					1.11
	Wellington	“ “ “	27.3°	58.8°	84.5	78.3	1.05
	Dufferin	“ “ “					1.12
b {	Lincoln	Hard clay and Clay Loam with Subsoil of Red Clay.					1.74
	Welland	Clay and Clay Loam with Subsoil of Clay.	30°	62.6°	80.3	77.1	1.54
	Carleton	Clay Loam with swamp.					2.17
c {	Leeds and Grenville..	Largely clay.	24.6°	60.5°	83.3	77.	2.22
	Stormont, Dundas and Glengarry.....	with clay loam.					1.96

A. and C. present the extremes of height above Sea Level and the latter has a large percentage of heavy clay soil. B. is intermediate in altitude but besides having hard clay soil there is an almost impermeable substratum of clay.

Another and the last series of figures I have to present, are as to the different modes of onset in the disease, dealing with 119 cases.

- (a) Following repeated colds, with cough persisting, 23.
- (b) Cough, with no previous cold nor special debility, 8.
- (c) Cold with preceding debility, 14.
- (d) Cough only, 13.
- (e) Cough with previous history of inflammation or congestion of lung 6.
- (f) LaGrippe, 10.
- (g) LaGrippe with dry pleurisy, 6.
- (h) Pleurisy, “ effusion, 7.
- (i) Pneumonia, 11.
- (j) Measles, 1.
- (k) Initial haemoptysis (in most cases a previous history of debility) without previous cough, 9.
- (l) Slight cough persisting from 1 week to 5 or 6 months followed by haemoptysis, 11.

In summing up the results of our investigation, it is interesting to note. (a) That there has been no decrease during the last 25 years in Ontario, while in England due to improved sanitation, there has been a large decrease.

(b) The death return from this scourge, is as great as that from the combined diseases of influenza, pneumonia, diphtheria and croup, as great as that arising from the diarrhoeas, heart disease, and cancer; and greater than the mortality following pneumonia and the diarrhoeas of children and adults.

(c) The frequency of meningeal involvement in Montreal, causing 12 per cent of the deaths

(d) That almost 10 per cent of deaths are in children under one year. That 15.1 per cent die between 20 and 24, the largest percentage of any period, and that 12.5 per cent die between 25 and 29, while the least mortality 1.6 per cent is that between 5 and 9 years. That of the decades the 3rd, is more fatal by half than that of any other period of life. the next being the 4th.

(e) That the death rate amongst males exceeds in the 1st., decade and during and after the 7th, being still greater after 80 years, whilst amongst females it exceeds between 10 and 40 years, being greatest between 10 and 20.

(f) The great disparity estimated between the rate in the urban and rural population, the town inhabitant being almost twice as liable to infection as he of the country.

(g) That altitude and soil seem to exercise a considerable influence in increasing the individuals liability to infection. The temperature and humidity in the different sections of our province not presenting sufficient variation to warrant deducting any conclusions therefrom.

(h) The large percentage of infections following repeated colds, debility, and those associated with pleurisies. The first two suggest precautionary measures, while the latter tends to confirm the observation that pleurisies are very often tubercular in character. The considerable percentage of cases with an initial haemoptysis suggests that we should be more exact in our examinations of the chest and precise in our discrimination of the conditions there. It would also suggest to us the need of chest examinations in cases of debility, as also does the last set of cases with but *slight* cough.

The writer desires to thank Dr. Bryce, Dr. Elliott, and Mr. Stupart, of the Meteorological Office, for their valuable and kindly aid in obtaining the figures presented above.

MILITARY MEDICAL TOPICS AND NEWS.

Conducted by Major Nattress, P. M. O. M.D. No. 2.

ENLISTMENT OF RECRUITS:—The call for men for the 2nd Regiment Canadian Mounted Rifles was so heartily responded to all over Canada the authorities at Ottawa were prompted to offer to His Majesty's Government an increase of the establishment from four to six squadrons.

This was promptly authorized and brought up the strength of the regiment including the staff to over 900.

A further offer of a Field Hospital has been accepted. The strength of this unit together with its transport will be something over 60, making a total of about 1,000 officers and men for the new contingent.

With so much good material everywhere to choose from the selection has been an arduous duty both for the Recruiting officer and the Medical officer.

For service in this contingent the following standard was fixed :

Not under 20 years nor over 40.

Not under 5 ft. 5 in. in height.

Not to weigh more than 185 pounds.

To have a chest measurement of not less than 34 inches.

To be medically fit according to Imperial Yeomanry conditions.

The medical officer is specially instructed to give his attention to the eye-sight and to the condition of the teeth of the recruit. That is all very well but we have not been given instructions that would apply more particularly to the Canadian Service. Why should not glasses be allowed amongst the rank and file? Astigmatism for example is not a disease and appropriate glasses remedy the condition perfectly. If glasses were permitted even to a limited extent it would save us the necessity of having occasionally to "turn down" an especially desirable applicant.

English Army Regulations say "Loss or decay of many teeth" is a cause for rejection but what about the man who is wearing (with entire satisfaction) a well-fitting complete set of artificial teeth? The same necessity for a recognition of this condition does not obtain in Great Britain as in Canada. The recruits for the English Army are not usually from that class who gives much attention to the teeth.

EXAMINATION OF RECRUITS.—A few remarks on the procedure of examinations might be of some interest to the readers of the Lancet.

Before stripping the recruit is placed with his back to the examiner

at such distance as the room will allow which should not be more than 50 feet, for testing the hearing by the ordinary tone of voice. The voice should be lowered in proportion to the diminished length of the room. The usual question is "What is your name?" Receiving a prompt reply the assistant steps up and places his finger over the right ear in such a manner as to press down the tragus and exclude all sounds from that ear when further questions in the same tone of voice are asked him the assistant stepping to the other side and in turn excluding all sounds from the left ear.

This test proving satisfactory, the applicant takes up a position alongside the medical officer, and standing with his back to the light, is asked to read the "test dot card" held nine feet away, testing first the right eye and then the left. Following this is the examination of his head, face, neck and hands, also his mouth, teeth, nose, throat and voice.

Having satisfied the medical officer thus far, he goes into an inner room to undress and appears again before the examiner absolutely naked. His height and weight are taken. (I would like to say here that some officers fall into the error of taking height and weight before undressing.) His chest measurements, maximum and minimum, are recorded. His heart and lungs are examined and he is here bodily inspected from head to foot, certain regions receiving special attention, such as the groins, perineum, scrotum, spine, legs and feet. Other characteristics indicative of weak bodily state are here noted. For instance, long thin neck, poorly developed muscular system, disproportionate height, weight and chest measurements, loose flabby white skin, long flat feet, very fair complexion, fair hair, etc.

CAUSE OF REJECTION.—Some who present themselves are below the standard measurements fixed, while others are the victims of some chronic disease. A larger number are rejected however for one or more of the following conditions:—Large varicocele, varicoce veins in legs, defective eyesight, chronic discharge from ears with deafness, hammer toe, overlapping toes, exaggerated scoliosis, bad teeth, marked outward deflection of great toe, enlarged glands and old scars in neck, exophthalmic, goitre, undescended testicle, stammering, etc.

ABNORMAL AND EXCEPTIONAL CONDITIONS OBSERVED.—Webbed toes, hypospadias, cleft palate, four rudimentary nipples, scars from operation for hair lip, appendicitis, circumcision, empyema and bullet wounds received in South Africa. Tattoo marks, of course, are very common, also *nævi*.

Remarks.—It is interesting to observe the varying effect a medical examination has upon the nervous system. Taking the heart as an indi-

cation, some are unmoved, the pulse keeping steady at about 60, while in others the heart thumps away at from 130 to 140 per minute. After being seated for some time and witnessing others go through, the excitement passes off. One man was so nervous he could not see. I felt him trembling as I put my hand on his arm, and asked him what was the necessity for being so nervous. I asked him to stand aside and watch others count the dots, but when I tried him again I got the same unsatisfactory result. I left him to complete the examination of those in the inner room. In my absence the assistant tried him and reported to me that he counted the dots every time without a mistake. My third trial, however, was no more successful than my first or second had been.

One sees also as much variety in body form as we meet daily on the street in face and feature. I called the attention of one brawny young Scotch-Canadian from Glengarry to the great length of his feet, when he quietly reminded me that Max O'Rell gave that as the reason why the Scotchman wore kilts, trousers being too narrow to get his feet through.

NO. 10 FIELD HOSPITAL.

The officers selected for this hospital for service in South Africa are:—

Commanding Officer—Lt.-Col. A. N. Worthington, A. M. S., Sherbrooke.

Major—Major G. C. Jones, A. M. S., Halifax.

Captain—Major D. H. Johnson, A. M. S., Charlottetown.

1st Lieutenant—Lieut. J. A. Roberts, A. M. S., Toronto.

2nd Lieutenant and Quartermaster—2nd Lieut. H. E. Tremayne, A. M. S., Toronto.

The selection of officers is an exceptionally good one. They have all been taken from the Army Medical Staff which speaks well for this corps as it is barely two years old, the date of its organization being 1st March, 1900. Col. Worthington has already had a year's service in South Africa with the Canadian Artillery and consequently goes back in possession of a lot of valuable experiences. His staff is an exceedingly good one. It is also gratifying to know the men have been selected almost solely from the only recently organized Bearer Companies and Field Hospitals throughout the Dominion, and comprise many specially qualified from which to select a good staff of non-commissioned officers.

CURRENT MEDICAL LITERATURE.

Conducted by A. J. MacKENZIE B. A., M. B.

RENAL DISEASE AND THE CIRCULATION.

THE *Practitioner* for Nov. 1901, is a special "Bright's Disease number," and contains seven original articles on this subject, dealing with it in its relation to the circulation, to uraemia, to skin eruptions, to the clinical forms, to the mental conditions associated, and to its occurrence with certain specific fevers, and closes with an article on Richard Bright, in the series "Heroes of Medicine," accompanied by an excellent portrait of that famous pioneer in therapeutics.

The first article is by Sir Richard Broadbent and is entitled "Renal disease and the circulation." This distinguished physician sums up the subject by saying that the primary and dominant effect of disease of the kidneys on the motion of the blood is obstruction in the capillaries and the arterioles and he is convinced, notwithstanding eminent authority to the contrary, that the primary seat of obstruction is in the capillaries, the contraction of the arterioles being secondary to this, the evidence from retinal and other haemorrhages being that the arterioles burst, therefore the obstruction is beyond. The sequence of changes is then, first, obstruction, then a protective contraction of the arterioles and small arteries followed by increased pressure and resistance, and compensatory increase in cardiac activity. The resulting character of the pulse in granular contracted kidney is as follows: there is felt no increase or decrease in the size of the artery, but if we flatten the vessel by pressure in the interval, this change of shape is rectified by the increased internal pressure of the pulse wave, or in the words of the writer, "the special character of a renal or high tension pulse is not the force required to compress the artery, nor the force or violence of the beat, as it is impressed on the finger but the point to observe is the fulness of the artery between the beats, and the absence of the sudden subsidence of the vessel after the beat."

The pulse in the earlier stages of Bright's disease will usually be small, the artery being in a state of contraction. The beats will be inconspicuous from the small size of the vessel, and from the fact that it is not readily flattened on account of the internal pressure. Such a pulse is very often described as weak. It will be found that the artery can be felt between the beats, and can be rolled under the finger, and when

the attempt is made to extinguish the pulsation and compress the artery the pulse seems to become stronger as the increasing pressure is applied

Changes in the arterial coats result, causing a thickening of the walls, followed by dilatation due to the tension of the blood within, and then we have the characteristic renal pulse, large, the pulse wave long and dwelling under the finger, gradual in its rise and fall, or more sudden if the arterial system has undergone much degeneration, the artery full between the beats, thick walled, rolled under the finger like another tendon and usually tortuous.

The sequence of changes in the heart is increased vigor of the systole with marked apex thrust, and an accentuated aortic second sound, then enlargement of the left ventricle, hypertrophy, fibroid change and finally dilatation. The indication of the latter is generally reduplication of the first sound, due to lack of synchronism of the two ventricles

In acute tubular nephritis, the effects on the circulation are inconstant owing to the various factors involved as pyrexia, intoxication, etc. Generally speaking, obstruction develops too quickly for compensation by the heart, and we get a pulse rather small, the artery full between the beats, without marked tightness, and in which on compression the wave is easily arrested. Development of renal tension is generally the first step toward improvement.

In the chronic tubular form of Bright's disease, whether primary, or resulting from the former, a moderate degree of arterial tension usually prevails, but the changes in the vascular system are not so important as in the forms previously described. However hypertrophy of the left ventricle and arterio-sclerosis usual result.

The effects of these circulatory conditions may be classed in two divisions, (1) those directly due to lesions of the heart and its vessels, cardiac dilatation and asthenia, with attendant dyspnoea and dropsy, and cerebral, retinal, and other haemorrhages, and (2) the production of conditions due to uraemic poisoning.

The therapeutical indications for the conditions described are venesection, the most effectual and speedy means in case of uraemic convulsions, the use of saline and other purgatives, and the use of vascular relaxants.

PROLONGED ACTION OF THE HEART MAINTAINED BY ARTIFICIAL RESPIRATION.

DOCTORS Redfern and Newby, of the Croydon General hospital, report an interesting case in the *British Medical Journal* of December 14th, 1901, in which prolonged action of the heart was maintained

in a new-born infant by artificial respiration, in the absence of other signs of life. The child, a well-developed male, was delivered with forceps at 3.30 p. m. from a primipara; the cord was found encircling the neck three times, but the delivery was not unusually difficult. The heart was found beating normally and the cord pulsating, but there was no response to attempts to induce natural respiration, so tracheotomy was performed and a tube introduced through which artificial respiration was kept up by means of a small bellows. So long as inflation was maintained the heart beat regularly at a rate of 100 or over, but on cessation the heart showed signs of failure; at the end of two hours and a half, during a short intermission of the bellows action, the first inspiratory effort was made and was repeated shortly after. From this time on, breathing was continued at a rate of twenty to thirty per minute, the bellows being used occasionally, as it seemed to stimulate the heart, and this was maintained until 4.20 a. m. when death occurred, attended by deep cyanosis.

The points of unusual interest in this case are: (1) That the heart beat continued good for two and a half hours, without any voluntary respiratory effort, during which time artificial respiration was carried on; (2) increased use of the bellows produced marked quickening of the heart beat; (3) the child never gave any other sign of life than action of the heart and lungs, and clonic spasms of the right hand.

The causes of respiratory failure in this case involve the consideration of the following possibilities: (1) That it may have been caused by strangulation of the neck by the cord possibly producing pressure on the vagus, or phrenic nerve fibres, or (2) by the action of the chloroform inhaled by the mother and carried through the cord to the child, or (3) by injury to the respiratory centre through pressure of the forceps on the child's head.

If the second of these considerations may be entertained, the case would afford a striking example of respiratory failure preceding cardiac failure, and of chloroform anaesthesia.

THE CANADA LANCET

VOL. XXXV.

JANUARY, 1902.

No. 5.

EDITORIAL.

SANATORIUM FOR TUBERCULOSIS IN CALGARY.

THE City Council of Calgary has appealed to the Dominion Government for assistance and co-operation in erecting a suitable sanatorium for tuberculosis in that place. They protest that many patients from all parts of the Dominion are attracted to that district by reason of its climatic advantages, only to be exposed to hardship and suffering from lack of suitable accommodation for their treatment. They have to live in hotels or boarding houses and thus become a menace to the health of the community. The city council is willing to assist in making provision for these unfortunates, and there is much justice in their request for aid from the Dominion Government, seeing that the matter is not one of purely local interest.

CANADIAN MEDICAL PROTECTIVE ASSOCIATION.

AT the Ottawa meeting of The Canadian Medical Association, a committee was appointed to consider the advisability of forming a Medical Protective Association and to report at the Winnipeg meeting in 1901.

The committee reported that they believed it to be in the interests of the medical profession of Canada that an association should be formed for the protection of such members of the medical profession as may become members, and who may be unjustly prosecuted for malpractice. The object of the association is to protect the members from prosecution where such action appears to the legal advisers of the organization, as well as to the committee in charge, to be unjust, harassing or frivolous.

The report was favorably received and adopted and the organization is now in good working order. The officers elected are:—President, Dr.

R. W. Powell, Ottawa, Vice-President, Dr. Camarind, Sherbrooke; Secretary, Dr. F. W. McKinnon, Ottawa; Treasurer, Dr. J. A. Grant, Jr.

Every member in good standing of the medical profession in Canada is eligible for membership on payment of the annual fee (which for the present has been fixed at \$2.50), except when an action against the physician is threatened or pending at the time of his application.

In case of action for malpractice against any member of the association, if the executive decides that it is a proper case for defense, the matter will be carried through all the courts until a satisfactory decision is obtained, but under no circumstances will a compromise be made.

THE LANCET has advocated the formation of such an association and now that it is in existence it is to be hoped that it will be supported by the profession throughout the Dominion. The membership-fee is trifling considering the protection afforded, and the existence of a strong central organization, as this should be, with means to fight every case to a finish, will do much to discourage litigation. Once remove the motive prompting most of these actions—the extortion of money in the way of a compromise rather than bear the expense, annoyance and uncertainty of defence—and the shyster lawyer will have no object in urging unscrupulous or vindictive individuals to enter actions in which there is no chance of financial gain.

THE ONTARIO MEDICAL LIBRARY ASSOCIATION.

THE fourteenth annual meeting of the above association was held recently when a large representation of the membership was present. While this association since its formation has succeeded in making a large and most valuable collection of medical books, journals and society reports, and has done much to facilitate medical research in Toronto and throughout the Province, the library has not received the support from the profession at large that it deserves. A good library is absolutely essential to those preparing papers for societies or for publication, as well as for those engaged in medical research, and if Toronto is to maintain her position as a centre for medical education, the library must be built up and properly supported. Since the payment of stock originally subscribed, the revenue from the small membership has not been sufficient to pay the cost of maintenance and to provide new literature. The membership must be increased and, if necessary, a higher annual fee imposed if the library doors are to be kept open. Many of those who appreciate the importance of the library, have given freely

of both time and money to make it a success. A special subscription asked from those at the annual meeting was freely contributed to, which has tided the financial difficulty over for the present. There was no disposition shown on the part of those present at the annual meeting to see the library doors closed for want of funds, but it is necessary, however, that a more satisfactory permanent basis of support be established in order to build up a library worthy of the profession of this city and province. Physicians in the province outside of Toronto, have access to the library free, and may obtain books for a limited time on paying express charges on them both ways. For city membership the minimum annual fee is \$2.00, though a number of members voluntarily contribute \$5.00 and \$10.00 annually. By means of arrangements made by the President, Dr. J. F. W. Ross, members of the association may obtain books for a period of two weeks from the Surgeon-General's library at Washington by paying express charges on them. Were the advantages of membership better known no doubt the association would receive the support of all progressive practitioners who can make use of it.

TORONTO GRADUATE NURSES' REGISTRY.

THE organization of a Nurses' Registry in Toronto is a departure that should prove a great convenience to physicians. An unsuccessful attempt in this direction was made some years ago by those who appreciated the advantages to be gained from having an organization to include nurses from all hospitals requiring a recognized standard of training, with a central office to which application might be made when the physician wished to obtain the services of a nurse. On the present occasion we are pleased to learn that Mrs. Macpherson, herself a trained nurse and director of the Rosebery Home, 110 Carlton St., Toronto, has succeeded in establishing a registry. The organization has the support of the Toronto General Hospital Training School Alumnae Association, though graduates from all recognized schools are eligible for membership. The management is placed in the hands of an executive committee elected by the members.

In case a nurse is required by a physician, the latter may apply to the Registry, when he may ask for the services of any particular nurse available at the time, or otherwise, the nurse next in order of rotation will have the chance of accepting the call.

The scheme has many obvious advantages to commend it. It will save the physician much time and trouble by enabling him to apply to a central office, which undertakes to procure the nurse. It is also a guaran-

tee of the professional *status* of those whose names are on the register, and as the organization has the endorsement of the nurses themselves it should receive the hearty support of the medical profession.

TORONTO PATHOLOGICAL SOCIETY.

THE annual open meeting of the Toronto Pathological Society was held on Saturday evening Jan. 4th, Dr. R. D. Rudolf, president in the chair. About one hundred and fifty members of the society and visitors were present. Prof. J. George Adami, of Montreal read a paper on the classification of tumors based on recent embryological developments. The paper, which will be published shortly, dealt with the many difficulties and the unsatisfactory features in previous classifications. It would be an injustice to Professor Adami's paper to attempt to epitomize it, but in the opinion of those who listened to him, he has made a long step in advance in solving the difficult problem of a satisfactory classification of tumors, and the publication of his paper will be awaited with much interest.

Dr. H. B. Anderson read a paper on the Cardiac complications of Gonorrhoea, reviewing the literature of the subject and reporting a case which recently came under the observation of Dr. John L. Davidson and himself. Dr. A. McPhedran and Dr. J. J. McKenzie, made a preliminary report on an interesting case of thrombosis of the cerebral arteries complicating chlorosis, and resulting in death.

A large number of specimens illustrating rare and interesting pathological conditions, was on exhibition.

OBITUARY.

DR. LESSLIE MATTHEW SWEETNAM.

THE news of the death of Dr. Sweetnam at the Johns Hopkins Hospital, Baltimore, on Dec. 11th, came as a great shock to his many friends among all classes in Toronto but especially to his friends and associates in the medical profession. Dr. Sweetnam, in washing his hands after operating on a patient with a gangrenous arm, received a trifling puncture beneath the finger nail with a bristle from a brush. He paid little attention to it for some days until the infection began to spread rapidly up the arm. In order to get rest and freedom from professional responsibility so essential to his treatment, he went to

Baltimore, where one or two small operations were performed on his finger. The infection soon subsided and his temperature had reached the normal point, when quite unexpectedly and without previous indication, convulsions set in on the morning of Dec. 11th and recurred frequently until his death in a few hours. As no autopsy was made, the nature of the convulsive seizures is not definitely known.

Dr. Sweetnam was the eldest son of the late Matthew Sweetnam Esq. He was born in Kingston in 1859 and was educated at Upper Canada College and Toronto School of Medicine, receiving the M. B. degree from Toronto University in 1881.

He began practice in Toronto and his skill, devotion to his calling and kindly disposition soon gained for him a large patronage. He was appointed associate professor of clinical surgery in the University of Toronto Medical Faculty and surgeon to St. Michael's Hospital, Toronto. He was also a member of the Senate of Victoria College. In 1885 he married Margaret Victoria, daughter of C. H. Gooderham, Esq., of Toronto.

Dr. Sweetnam was a member of the Methodist church. He was a gentleman of wide culture and possessed a disposition full of the milk of human kindness. Next to his absolute and unselfish devotion to his profession, probably his most distinguishing characteristic was the personal magnetism, which won for him the complete confidence and made him almost the idol of his patients. His early death, under such peculiarly sad circumstances, at the very zenith of a successful career, called forth expressions of the sincerest regret and sympathy, from the lay press and from all classes of the community. His funeral, the largest which ever entered Mt. Pleasant cemetery, was attended by most of the medical profession of the city and large numbers of other prominent citizens. To the writer, however, the most touching and sincere tribute to his memory, was paid by the dozens of poor men, women and children, in threadbare garments, who hung round the outskirts of the crowd of well-dressed, prosperous-looking citizens who attended the service at his late residence on Church St. They had come to pay their last poor tribute to one who had befriended them.

To have died in the harness, as the result of an infection received while operating on a charity patient, esteemed by all who knew him and worshipped by many, in the height of his prosperity, is not all a matter for sad reflection; and if life were measured by what one has accomplished Dr. Sweetnam reached much nearer the allotted span than his years would indicate.

PERSONAL.

Dr. Golden of Highgate, has removed to Ridgetown.

Dr. McKeough, of Chatham, spent Christmas in Montreal.

Dr. Scott of Oil Springs, leaves shortly to spend a while in England.

Dr. and Mrs. W. H. Rice, of Sydney, C.B., have returned home after a visit to Toronto.

Dr. A. A. McCrimmon, of Beaver Mills, Ont., has been appointed a coroner.

Dr. Clutterbuck, of Delhi, Ont., has accepted a position in the Woman's Hospital, N. Y.

Dr. A. J. H. Hough, of Wiarton, has been appointed associate coroner for the County of Grey.

Dr. J. N. Harvie of Orillia, has resumed practice after a time spent in post graduate work in New York.

Dr. Geo. A. Pickles, of Mahone Bay, a well-known practitioner in Nova Scotia, died on Dec. 30th.

Dr. Henderson, of Sarnia, has been appointed Surgeon of the 27th Regt. with the rank of Surgeon Lieutenant.

Dr. J. O. Orr, of Jarvis St., Toronto, has been appointed Lecturer on Bacteriology to the Toronto Technical School.

Dr. Riddell, of Crystal City, Man., is looked upon as the future Liberal candidate for the Dominion vacancy in Lisgar.

Dr. Frederick Harvey, of Wolfville, N.S., who has been studying in England, has taken up practice in St. John, N. B.

Dr. and Mrs. D. H. Wilson of Vancouver, recently paid a visit to their friends in the eastern part of the Dominion.

Dr. Frank Lundy of Portage la Prairie, visited Ontario lately. He has spent some time in New York in post graduate study

Dr. Culbertson, of Durham, Ont., has returned from Europe where he has spent some time pursuing his medical studies.

Dr. A. B. Osborne, of Hamilton, was married on Jan. 2nd to Mrs. Rose Augusta Tudor, widow of the late Francis H. Mills.

Dr. Bradd, of Peterboro, has been appointed district surgeon for the Grand Trunk Tailway, in succession to the late Dr. King.

Dr. H. L. Dickey, of Charlottetown, P. E. I., has removed to Halifax, where he will confine himself to eye, ear, nose and throat work.

On Christmas day, Dr. Jean Cruickshank, of Weston, was married to Dr. Louis G. Bailey, of the General Hospital, Stonega, Va.

Dr. A. P. Chalmers, (Trinity '92) has resumed practice in Oil Springs, after having spent some time in post graduate study in Europe.

Dr. Norman M. Harris, Associate in Pathology, Johns Hopkins Hospital, has returned to Baltimore after having spent a short time in Toronto.

Professor Adami of McGill College, Montreal, read a paper on the Classification of Tumors before the open meeting of the Toronto Pathological Society, on Jan. 4th.

Dr. J. Alex. Hutchison, of Montreal, surgeon-in-chief to the Grand Trunk railway, has been appointed to a similar position on the Central Vermont Road.

Dr. Macdonald, Superintendent of the Hospital at Dawson City, is paying a visit to Montreal. The doctor states that there has been comparatively little sickness in the Yukon district this year.

Dr. H. Tremayne, who goes to South Africa as a lieutenant in the Army Medical Corps, was presented with a pipe, tobacco pouch, and toilet set by Mimico Lodge, A. F. & A. M., of which he is Senior Warden.

Dr. Little of Brandon, has taken up his residence and begun practice at Alexander, Man., and Dr. Lawther, formerly resident physician in St. Boniface Hospital, Winnipeg, has succeeded to Dr. Little's practice.

Dr. Woolard, of the Winnipeg General Hospital, is suffering from an attack of Scarlet fever, contracted from a patient in the isolation wards of the hospital. Dr. Woolard served with the Canadian Artillery in South Africa.

Dr. Thos. Bradley (Trinity '98), formerly of the resident medical staff of the Toronto General Hospital, has entered into partnership with Dr. Fraser of Sarnia. The latter, we are pleased to learn is recovering from an attack of la grippe.

Dr. Pierre Bedard of Montreal, narrowly escaped drowning in the St. Lawrence river. When returning from visiting patients across the river his sleigh went through the ice but after twenty minutes struggle in the water he managed to get out.

Dr. W. H. Groves, a graduate of Toronto University, who has been in Europe for some time past, was recently appointed surgeon of the R. M. S. Sekondi. flagship of the African Steamship Company, plying between Liverpool and the west coast of Africa.

BOOK REVIEWS.

A TREATISE ON SURGERY BY AMERICAN AUTHORS.

For Students and Practitioners. Edited by Roswell Park, A. M., M. D., Third Edition. Enlarged and Revised, Lea Bros. & Co., 1901.

This beautifully printed and illustrated volume gives evidence upon every page, of a most painstaking and conscientious attempt to exhibit the present status of the science and art of surgery within the compass of a single book. The work of the contributors throughout is of a very high order and it is equally evident that the editor has permitted no slighting of any section of the work. Since the death of Drs. J. H. Etheridge and H. H. Mudd certain changes in the editorial staff have been made. The chapter on Surgical Gynecology is exceedingly well prepared by Dr. M. A. Crockett, of Buffalo, while the editor-in-chief has revised the section on Fractures and Dislocations. In no other work with which this reviewer is acquainted has the subject of blood examinations as applied to surgery been so satisfactorily dealt with. The new and growing importance of this subject justifies the space given to it. One has only to compare a volume like this, or this volume itself, with works upon surgery issued but a few years ago, to understand how rapid has been the advance in surgery and how admirable are the methods by which such advancement is brought within reach of every practising surgeon. It is a genuine pleasure to commend such work as that which has been done by Dr. Park and his co-labourers, in the preparation of this volume. Credit is reflected upon American surgery by it and we all become the debtors of such earnest, accurate and progressive teachers.

N. A. P.

AN AMERICAN TEXT-BOOK OF PATHOLOGY.

Edited by Ludvig Hektoen, M. D., Professor of Pathology, Rush Medical College, Chicago; and David Riesman, M. D., Professor of Clinical Medicine, Philadelphia Polyclinic. Handsome Imperial Octavo of 1245 pages, 443 illustrations, 66 of them in colors. Philadelphia and London: W. B. Saunders & Co., 1901. Cloth, \$7.50; Sheep or half Morocco, \$8.50 net, Canadian agents, J. A. Carveth & Co., Toronto, Ont.

THIS work which has just come to hand, marks an epoch in the study of pathology on this side of the Atlantic, and represents both in form and matter, the modern American method of viewing scientific subjects. The series of "American text-books" which has been offered to the medical public during the last few years represents, in its own line, that

tendency toward the practical, that dependence on collaboration, and that faculty of making use of other men's labors that characterises the work of the western scientist. Of the advantage of these composite works there can be no question, of the living interest and real usefulness of these works all who use them must be convinced, but they are marred by the lack of unity, and by the tendency to broad generalisations and deductions wider than experiment warrants. When compared with works by British or foreign authorities, one finds knowledge estimated by the measure of utility, and the atmosphere of the clinic-room rather than of the laboratory.

Pathology as a science is a unit, it has a constant and underlying vital principle which is not and cannot be the subject of experiment, but which is a constant factor in all pathological manifestations, and there is a danger that in the treatment of the subject by various authorities the impression gained by the student will be that of a group of subjects without the necessary unifying constituent: the result is that this work in common with other members of the series will always be a work of reference rather than a treatise. On the other hand we must recollect that we have not had a satisfactory text-book in the subject, that many of the deficiencies of other text-books are here supplied, and at least we get the very latest views as well as the great abiding principles. The practice of medicine has become too engrossing, the field of knowledge too wide, for any one man to be an authority on all aspects of the subject, decidedly so, if we would require an authority to be skilled in laboratory methods, as well as in practical applications. A work prepared by a number of specialists in various branches of pathology would perhaps not be so useful to the ordinary student or practitioner whose aim is to combat disease, as one where the point of view of the writer was his own, but we venture to think that it would be a better treatise on pathology. Now if we examine the list of authors of this work we find that of the nineteen contributions, eleven are men known for their ability and standing as surgeons, and physicians, or lecturers on these particular branches. Two are anatomists, while only the remaining six are employed and recognized as practical pathologists. This marked complexion of authorship is well reflected in the subject matter for we are constantly reminded that the point of view is that of the diagnostician, the clinician, the operator, rather than that of the man who devotes his time to adding to world's knowledge of pathological processes. Then too, while the position of the various authors is an index of their standing and merit, we cannot help noticing that, taking all in all, the physicians, surgeons and gynaecologists rank higher in their own branches of the profession

than do the pathologists in theirs. The position of the former cannot be taken as an index of their ability as authorities in pathological subjects for many of them are men whose interests are wide and varied, and whose time is necessarily too limited to permit them to devote the time and labour necessary for an independent and authoritative research of even one aspect of the subject; as to the "pure pathologists" prominent as they are, one notes the absence of several names conspicuous for their eminence in this branch of science in America.

Canadians will be gratified at finding the first section of the work, the general introduction, written by one of our own graduates, Llewellys. A. Barker, Professor and head of the department of Anatomy in the University of Chicago and Rush Medical College. This article, occupying eighteen pages, is comprehensive, interesting, and suggestive, and on the vexed questions of immunity and heredity the varying views are impartially treated, while Metschnikoff's phagocytic theory and the tempting "Seitenkettentheorie" of Ehrlich receive an appreciative but non-committal discussion. It is interesting to read under the heading, "On the methods of studying Pathology," the following expression of opinion, "The phenomena of disease are so complex and the problems connected therewith so difficult that it is folly for the untrained mind to approach them. Before entering on the study of pathology, therefore, a liberal education is a *sine qua non*."

It is, of course, impossible in the space at our disposal to review each separate subject, and we will confine our attention to a few of special interest. The senior editor, Ludwig F. Hektoen, writes on three divisions, "General Morbid Processes," "The Osseous System," and "The Ductless Glands." To the first subject 124 pages are devoted, the headings being, disturbances of the circulation, retrogressive and progressive changes, and inflammation. The process of coagulation of the blood is summed up as follows: "Coagulation of the blood, then, depends upon the chemical reaction between fibrinogen of the blood plasma and the nucleo-albuminate of calcium, in consequence of which an insoluble albuminate of calcium-fibrin is precipitated. Fibrinogen and calcium salts exist in the circulating blood, but the nucleoprotein is derived from the disintegration of the formed elements of the blood, as the leukocytes and the blood-plates. The exact reaction which occurs when fibrin is formed cannot be stated, but it would seem to be quite satisfactorily settled that fibrin is a compound of calcium with a part of the fibrinogen molecule." The author does not venture an independent opinion on the origin of the blood platelets, but contents himself without lining the various theories.

In the discussion of inflammation the work of Metschnikoff, Cohnheim

and Councilman is described and their view of the intra-cellular and phagocytic action of the leucocytes is stated, but the writer holds with Nuttal and others that this gives but one side of the question, and that there is an extra-cellular and microbicidal action also which is an essential part of the process. He sums up as follows: "The broad biologic conception which recognises in inflammation an adaptive, protective, and reparative tendency common to the reactions to injury among all animals is the only theory that allows the full meaning of inflammation to be grasped."

Tumors are discussed by Prof. A. P. Ohlmacher of the North-western University. Under the heading of etiology Cohnheim's embryonal theory is given, namely, that the inception of tumors is due to misplaced cells or aggregations of cells, which, during the various and complicated foldings of the embryo, become misplaced. This is, however, insufficient; there must be a stimulating cause which results in the production of tumors from these remains, for they frequently remain quiescent during life. Bacteria and sporozoa have been suggested, but these are dismissed and the weight of responsibility is laid on the blastomycetes which alone of the organisms found in tumors have been proven capable of external cultivation.

A most interesting chapter is that on Teratology by Henry F. Lewis, of Rush Medical College, in which are swept away by a clever argument the remnants of superstition which ascribe moles, naevi, monsters, etc., to influences, such as fright, directed toward the maternal parent during the period of gestation; while the true causation from fission of the embryonic cell-mass, or abnormal amniotic bands is just as clearly shown.

About 770 pages are devoted to the consideration of special Pathology, the first division being "The blood and blood-making organs" by Cabot, whose work on this subject is a standard text-book. The article, though brief, is comprehensive.

The pathology of the digestive system is discussed by Albert G. Nicholls, Lecturer on Pathology in McGill University, and Assistant Pathologist to the Royal Victoria Hospital, in an exhaustive and careful, if not brilliant, article. Worthy of special mention is the section on gastro-intestinal, auto-intoxication and auto-infection, where we find the work of McCallum, of Toronto, noted, on absorption of iron from the intestine. Adami, of McGill, is quoted on latent infection and sub-infection, which he describes as follows: "This latent infection probably explains the examples of terminal and cryptogenic infection with which we occasionally meet. Micro-organisms are constantly passing into the animal economy from the intestinal tract even under normal conditions,

and they reach the liver and kidneys where they become practically inert. We need only some cause, which increases the virulence of the bacteria, or depresses the vitality and resistance of the parenchymatous cells of the body, to render such infection possible."

Sub-infection, on the other hand, is described as a condition in which, as a result of chronic inflammatory disturbances in connection with the gastro-intestinal tract, there may, for long periods, pass in through the walls of the intestine or stomach a greater number of bacteria; and while the bacteria undergo the normal and inevitable destruction by the cells of the lymph-glands, the liver, the kidneys, and other organs, nevertheless, the excessive action of the cells and the effect on them of the bacterial toxins liberated in the process of destruction may eventually lead to grave changes in the cells and the organs of which they are a part.

Evidence is adduced with regard to cirrhosis to prove that alcohol is not the causal factor, but that its action is rather to promote absorption of toxins from the intestine and to diminish the resisting power of the liver.

The chapter on the ductless glands by Hektoen is extremely instructive and contains much new matter. The parathyroids, which in man are generally found in the capsule of the larger gland, if remaining after thyroidectomy serve as a protection against cachexia thyropriva and myxedema, but the results of experiments with the view of producing this condition are so varied as to be inconclusive as yet. This is true also of the hypophysis which developmentally is analagous to the thyroid.

The pathology of the kidney is very fully treated by David Riesman of the Philadelphia polyclinic, but space forbids us to mention more than the discussion on the theories of displacement of the kidney, and on the so-called kidney of pregnancy.

As to the general features of the work, one must mention the excellent typographical work, which is always a feature of the books produced by these publishers, with the use of black letter type for headings and italics when new terms are introduced, which is such a boon to the student. The illustrations, nearly all of which are original and 66 of which are in colors, are beautifully executed and form an atlas of pathologic anatomy and histology.

A.J.M.