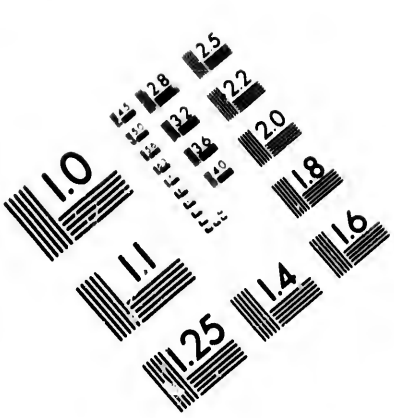


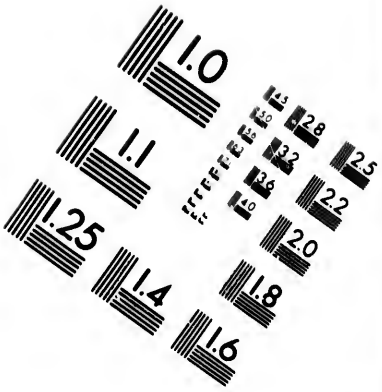
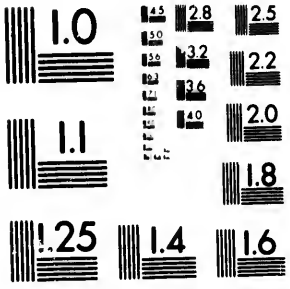
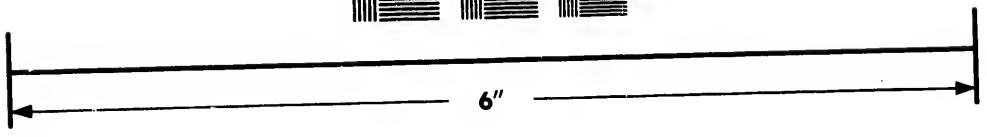
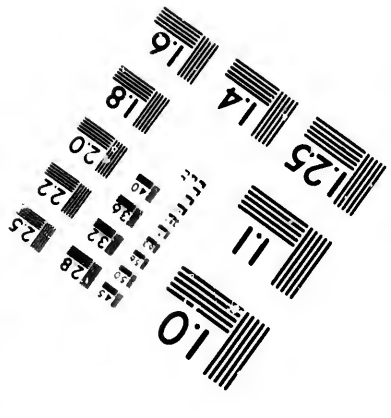


IMAGE EVALUATION TEST TARGET (MT-3)







Photographic Sciences Corporation

23 WEST MAIN STREET
WEBSTER, N.Y. 14580
(716) 872-4503

Technical and Bibliographic Notes/Notes techniques et bibliographiques

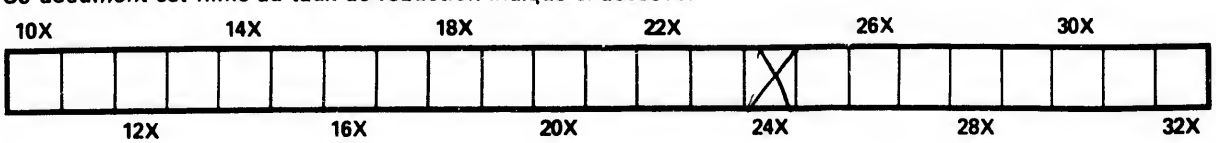
The Institute has attempted to obtain the best original copy available for filming. Features of this copy which may be bibliographically unique, which may alter any of the images in the reproduction, or which may significantly change the usual method of filming, are checked below.

L'Institut a microfilmé le meilleur exemplaire qu'il lui a été possible de se procurer. Les détails de cet exemplaire qui sont peut-être uniques du point de vue bibliographique, qui peuvent modifier une image reproduite, ou qui peuvent exiger une modification dans la méthode normale de filmage sont indiqués ci-dessous.

- [x] Coloured covers/ Couverture de couleur
- [ ] Covers damaged/ Couverture endommagée
- [ ] Covers restored and/or laminated/ Couverture restaurée et/ou pelliculée
- [ ] Cover title missing/ Le titre de couverture manque
- [ ] Coloured maps/ Cartes géographiques en couleur
- [ ] Coloured ink (i.e. other than blue or black)/ Encre de couleur (i.e. autre que bleue ou noire)
- [ ] Coloured plates and/or illustrations/ Planches et/ou illustrations en couleur
- [ ] Bound with other material/ Relié avec d'autres documents
- [ ] Tight binding may cause shadows or distortion along interior margin/ La reliure serrée peut causer de l'ombre ou de la distortion le long de la marge intérieure
- [ ] Blank leaves added during restoration may appear within the text. Whenever possible, these have been omitted from filming/ Il se peut que certaines pages blanches ajoutées lors d'une restauration apparaissent dans le texte, mais, lorsque cela était possible, ces pages n'ont pas été filmées.
- [ ] Additional comments:/ Commentaires supplémentaires:

- [ ] Coloured pages/ Pages de couleur
- [ ] Pages damaged/ Pages endommagées
- [ ] Pages restored and/or laminated/ Pages restaurées et/ou pelliculées
- [ ] Pages discoloured, stained or foxed/ Pages décolorées, tachetées ou piquées
- [ ] Pages detached/ Pages détachées
- [ ] Showthrough/ Transparence
- [ ] Quality of print varies/ Qualité inégale de l'impression
- [ ] Includes supplementary material/ Comprend du matériel supplémentaire
- [ ] Only edition available/ Seule édition disponible
- [ ] Pages wholly or partially obscured by errata slips, tissues, etc., have been refilmed to ensure the best possible image/ Les pages totalement ou partiellement obscurcies par un feuillet d'errata, une pelure, etc., ont été filmées à nouveau de façon à obtenir la meilleure image possible.

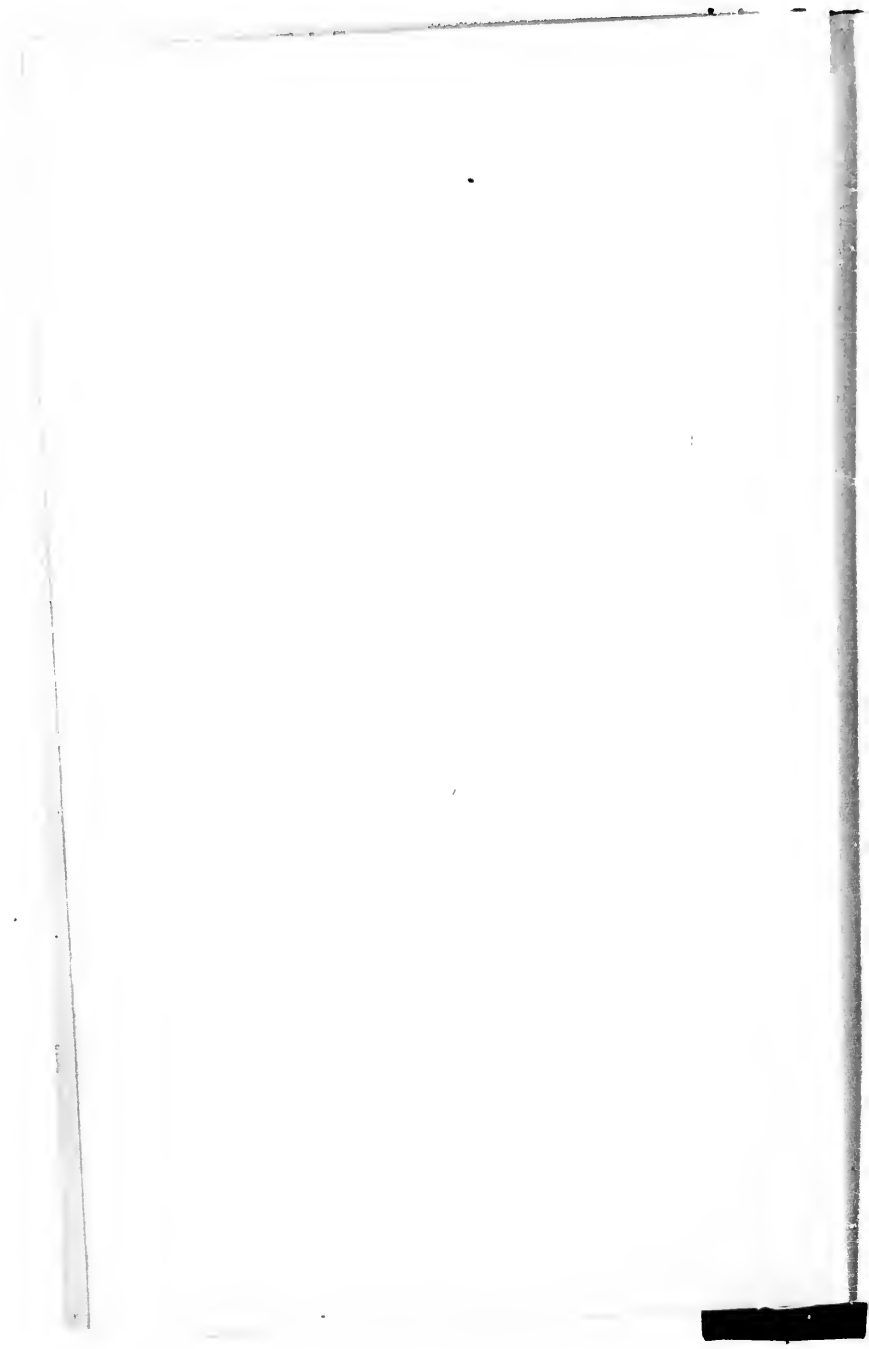
This item is filmed at the reduction ratio checked below/
Ce document est filmé au taux de réduction indiqué ci-dessous.




DISEA
KIDNE
BLADD
R
900
M

DISEASES
OF THE
KIDNEYS
AND
BLADDER

M^c NUTT



DISEASES

OF THE

KIDNEYS AND BLADDER:

A TEXT-BOOK

FOR

STUDENTS OF MEDICINE.

BY

W. F. McNUTT, M.D., M.R.C.S. Ed., L.R.C.P. Ed.,

PROFESSOR OF THE PRINCIPLES AND PRACTICE OF MEDICINE, UNIVERSITY OF CALIFORNIA; PROFESSOR OF DISEASES OF THE KIDNEYS AND HEART, POST-GRADUATE DEPARTMENT OF THE UNIVERSITY OF CALIFORNIA; CONSULTING PHYSICIAN AND SURGEON TO ST. MARY'S HOSPITAL AND TO THE CHILDREN'S HOSPITAL; MEMBER OF THE INTERNATIONAL MEDICAL CONGRESS, OF THE AMERICAN MEDICAL ASSOCIATION, AND OF THE CALIFORNIA STATE MEDICAL SOCIETY; PRESIDENT OF THE CALIFORNIA GYNECOLOGICAL SOCIETY; EX-ACTING ASSISTANT SURGEON U. S. NAVY, ETC.

PHILADELPHIA:

J. B. LIPPINCOTT COMPANY.

1898.

Printed by J. B. Lippincott Company, Philadelphia.

PREFACE.

This book is based upon notes of lectures delivered to the medical students of the University of California.

Some of the lectures have been revised and elaborated, and divided into chapters.

The nomenclature of kidney diseases, particularly of the inflammatory varieties, has been simplified as much as possible, in the hope that it may thus be the more readily understood by the student.

The illustrations are original, and for some of the pathological specimens I am indebted to my *confrères* Professors R. A. McLean and D. W. Montgomery, and to Professors J. H. Stallard and Louis Bazet of the Post-Graduate Department.

I have also to express my thanks and obligation to Dr. Frances M. Greene for the interest, zeal, and intelligence she exhibited in reporting these lectures, and for assistance in their revision.

104 Sutter Street, San Francisco,
September, 1892.

CONTENTS.

SECTION I.

SECTION II.

DISEASES OF THE KIDNEYS.

SECTION III.

DISEASES OF THE PELVIS.

SECTION IV.

DISEASES OF THE BLADDER.

SECTION V.

LIST OF ILLUSTRATIONS.

DISEASES

OF THE

KIDNEYS AND BLADDER.

SECTION I.

CHAPTER I.

ANATOMY AND PHYSIOLOGY OF THE KIDNEYS.

THERE may be organs in the body the etiology and pathology of whose diseases we may understand and perhaps treat intelligently without a knowledge of their anatomy and physiology; but the kidneys cannot be classed among them. A thorough knowledge of the normal anatomy, physiology, and histology of the kidney is indispensable to the proper understanding of the etiology and symptoms of its pathological conditions.

The first thing to realize is that the kidneys are glandular organs, situated one on each side of the vertebral column, behind the peritoneum and between the upper border of the twelfth dorsal and third lumbar vertebræ. The right kidney, by reason of its vicinity to the liver, is slightly lower than the left, its upper border being on a

level with the lower margin of the eleventh rib, while that of the left side begins at the upper margin of the same rib.

The kidneys are about four inches in length, from two to two and a half inches in breadth, and rather more than an inch in thickness. The weight of the kidney in the male is from four and a half to six ounces; in the female it is somewhat less.

It is well to remember that on the right side the kidney is in relation above with the right lobe of the liver, and below with the descending portion of the duodenum and the upper part of the ascending colon: on the left side, with the under surface of the stomach, the extremity of the pancreas, and the descending colon.

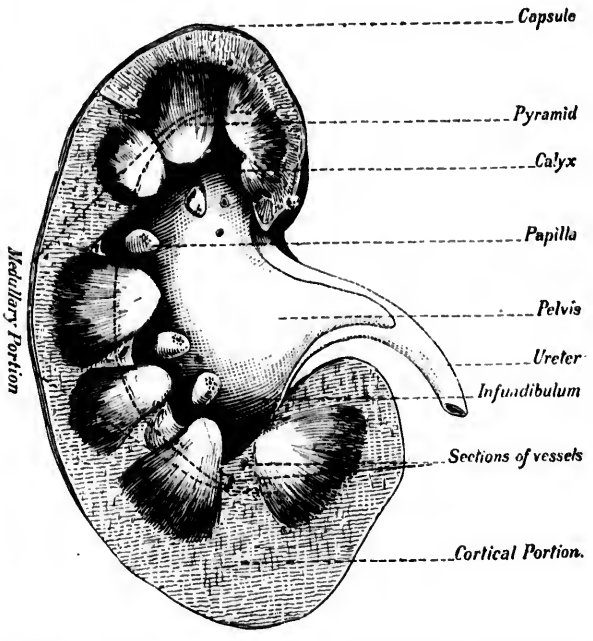
In examining the kidney for enlargements, tumors, etc., always place the patient in the dorsal position and use the bimanual method,—one hand being under the patient on the lumbar region between the lower rib and the crest of the ilium, the other on the abdomen directly over the kidney.

A few spasmodic efforts of the hand on the abdomen will fail of results. But with the patient's knees drawn up and pressure made steadily with the upper hand during expiration, keeping it firm and inactive during inspiration and continuing the pressure during the next few expirations, you will find that in a few minutes the kidney will be between your hands, and you can feel its size and shape. This, of course, cannot be easily accomplished in corpulent persons. Jerky movements will cause failure in any case. On percussion you will find dulness between the twelfth rib and the crest of the ilium, and you must judge of the size of the organ by the area of the dulness: be careful, however, not to confound it with liver-dulness, as percussion does not always yield a very exact knowledge of the size of the kidneys. Do not forget that they

lie behind the peritoneum, and that the right kidney moves with respiration.

So far as the diseases of the kidney are concerned, it is necessary for the physician to remember that the kidney

FIG. 1.



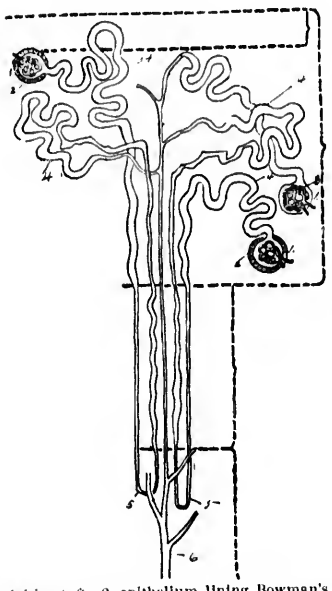
consists of three distinct tissues,—viz., uriniferous tubules, blood-vessels with their Malpighian tufts, and the intertubular structure, generally called fibrous interstitial tissue. We divide the kidney into two principal portions, the cortical and the medullary. The medullary portion is subdi-

vided into pyramids, composed for the most part of straight collecting-tubes, whose bases rest on the cortical portion and whose apices converge toward the centre, where they form the papillæ which project into the calices or expansions of the ureter. The cortical portion is more vascular than the medullary, and contains the greater number of Malpighian bodies, small rounded masses averaging about one one-hundred-and-twentieth of an inch in diameter.

Each of these little bodies is composed of two parts, a central glomerulus of vessels, called a Malpighian tuft, and a membranous capsule, or capsule of Bowman, which is the commencement of a uriniferous tubule. These Malpighian tufts are made up of a net-work of capillary blood-vessels held together by scanty connective tissue and derived from a small arterial twig, the afferent vessel, which, with the resulting vein, the efferent vessel, pierces the capsule at a point opposite that at which it is connected with the tube. The capsule which surrounds the glomerulus is composed of hyaline membrane containing a small amount of fine connective tissue which is continuous with that of the tube and is also reflected over the capillary net-work and covered by squamous epithelium. Thus a cavity is formed between the capsule and the glomerulus, which varies in size according to the state of secretion and the amount of fluid present in it. The uriniferous tubules commence at the constriction or neck of the capsule, and become convoluted while pursuing a considerable course in the cortical portion, where they are termed the *proximal convoluted tubules*. The convolutions then disappear, and the tubules, now termed the *tubules of Schachowa*, approach the medullary portion of the kidney in a more or less spiral manner. As they enter the medullary portion, the tubules suddenly become much smaller, straight in direction, and, dipping down for variable depths in

the pyramids, constitute the descending limb of a curve known as Henle's loop; enlarging as they reascend to the cortical portion, they become again spiral in direction, forming the ascending limb of Henle's loop. After enter-

FIG. 2.



1, Malpighian tuft; 2, epithelium lining Bowman's capsule; 3, epithelial covering; 4, convoluted tubes of cortical portion; 5, Henle's loop; 6, collecting tubes.

ing the cortical portion narrower and irregular in outline, they once more dilate, become convoluted, forming the *distal convoluted tube*, and with a final bend enter the straight collecting tubes, which continue downward through the medullary substance to open at the apices of the pyramids,

acting simply as ducts through which the urine finds its way into the pelvis of the kidney and ureter.

These collecting tubules, commencing by minute openings at the apices of the papillæ and extending into the kidney, dividing dichotomously, form the greater part of the pyramids of the medullary substance. In the cortical portion they are arranged in conical groups, called medullary rays, or pyramids of Ferrein, and receive on each side the curved extremities of the convoluted tubules.

Epithelium.—The epithelial lining of the tubuli uriniferi differs in its character in the various parts of the tubes. The capsule and neck are lined with flat cells containing an oval nucleus. In the proximal convoluted tubes, the spiral tubes of Schachown, and the distal convoluted tubes, the epithelium is polyhedral in shape. These cells are made up of more or less rod-like fibres, one of whose extremities rests upon the basement membrane, the other projecting into the lumen of the tube, giving the cells a distinctly striated appearance. In the descending limb of Henle the epithelium resembles that which lines the capsule and neck, while in the ascending limb it again becomes polyhedral in shape. The cells lining the irregular tubes are very angular, with more prominent striations and rod-like markings than any other portion of the tubules. The epithelium of the straight tubes becomes more or less columnar, this tendency increasing toward the papillary portion, where it is distinctly columnar and transparent. This arrangement must have some design. Charcot says he believes that the epithelial cells are the real secreting portion of the organ, all the urine that is not filtered through in the capsule being secreted here. The constrictions in parts of the tubules would seem to be for the purpose of arresting the too rapid onward flow of the urine until the epithelial cells have

performed their office and added to the watery portion of the urine its solid ingredients.

It is very necessary for you to remember the principal features of the circulation. The first thing to attract your attention is the fact that the renal artery is the largest, in proportion to the size of the organ supplied, of any artery in the body. It may seem strange that it is the largest, not only in that respect, but also in proportion to the renal vein. When we consider, however, that in other organs about the same amount of blood is returned by the veins as enters the organs through the arteries, while in the kidney a quart or two of fluid is filtered through the corpuscles each day, we shall see the necessity for its veins being of smaller calibre than its arteries. The renal artery on entering the pelvis of the kidney divides into several branches, bearing the name of arteriæ propriæ renales, which, after traversing the columns of Bertini, supplying in part the pyramids of the medulla and afferent vessels to the Malpighian bodies in that region, divide at the base of the pyramids into two sets of branches for the further supply of the organ,—viz., the interlobular arteries and the arteriolæ rectæ. The interlobular arteries pass directly outward between the pyramids of Ferrein and terminate in the capillary net-work of the capsule. From these arteries are derived the afferent vessels of the glomeruli of the cortical portion. The arteriolæ rectæ supply the medullary pyramids, whose substance they traverse, terminating at their apices.

The veins, as we see, are derived from the three arterial divisions. Those beneath the capsule are stellate in arrangement, pass downward, receiving branches from the plexuses about the tubuli contorti, and at the bases of the Malpighian pyramids join the venæ rectæ, which are derived from the plexuses at the apices of the pyramids

and from the proper renal veins. The venæ propriæ renales accompany the arteriæ propriæ renales between the pyramids, receiving in their course the efferent vessels from the glomeruli, and in the sinus of the kidney join with the veins from other pyramids to form the renal vein, whose ultimate destination is the inferior vena cava.

All the arteries and veins interlace and completely surround the tubules.

It is well to bear the foregoing facts in mind, as we shall see when we come to the subject of hyperæmia that the resistance encountered by the blood which passes through the glomeruli is far greater than that met by the vessels that flow directly into the capillaries, and hence, when the blood-pressure is raised to any degree from the heart's action, the hyperæmia will be confined to those portions of the kidney where the blood meets the greatest resistance, which are, of course, the glomeruli and the cortex. This explains the increased secretion of urine from heart-pressure. We shall see, on the other hand, that when the hyperæmia is the result of venous obstruction, the engorgement is confined to the veins and capillaries and cannot extend through the narrow efferent vessels into the glomeruli. You will then understand the natural results of such conditions.

The fibrous intertubular or interstitial tissue is not very abundant. In the cortical portion the tubes are not surrounded by much fibrous tissue; but I desire to impress upon your mind the fact that the capsules are completely enveloped in this fibrous tissue, and that the capillaries of the glomeruli are covered with a fine, delicate connective tissue, which also lines the capsules. This will be recalled to you when we take up the pathology of gouty kidney.

The kidney is plentifully supplied with nerves from the solar plexus, the semilunar ganglion, and the splanchnic

nerves. These completely surround the tubules and blood-vessels,—a disposition which explains how it is that small infarctions or gravel may give rise to the exquisite pain which they occasion. They also communicate with the spermatic plexus, whence the sympathy existing between the kidneys and the testicles.

A word about the urine itself. We know that it is made up largely of water holding in suspension organic and inorganic salts, the most important of the former being two substances rich in nitrogen,—viz., urea and uric acid. In other words, it holds in suspension the salts which are the result of tissue-metamorphosis. The skin, liver, and bowels do their part in elimination, as must also the kidney. The question now is, What part of the kidney secretes the urine? There is no longer any doubt that the Malpighian tuft is the part where most of the watery portion of the urine is separated from the blood; and it is probably almost a mere filtration. Ludwig and others tell us that the urine is entirely the result of filtration, and hence is an excretion. This is an error: if the tuft excretes the watery portion and the salts also, for what purpose were the intricate and delicate tubules with their epithelial lining added? The short straight tubes would have been sufficient.

As it is, the watery portion must follow the course of the tubules, being retained in the constricted portions and in close contact with the epithelial lining and its secreting cells. It is here that most of the salts are received and secreted by the epithelium. The filtration is a purely physical process, while the secretion of salts in the tubules is a vital one.

Some authors contend that even the watery portion is not a filtration, because of the fact that the epithelium lining the capsules is reflected on the tuft. It is a thin

layer, but it is there. If it serve no other purpose, it perhaps regulates the filtration, increasing or lessening the quantity, as the case may be. It has something to do with the filtration, and may have much to do with the excretion of albumen.

Some of the salts found in the urine are found in small proportion in the blood. Of these, urea and uric acid are the most important. Hippuric acid and creatin are not found in the blood.

Whether all the urea and uric acid is simply eliminated from the blood as such, or whether part of it is secreted by the epithelium lining the tubules, is an undecided question; but the probabilities are that the tubules play an important part in their secretion, because other salts found in the urine are not found in the blood as such, and must be secreted by the epithelium of the tubules.

CHAPTER II.

ANOMALIES OF POSITION, FORM, AND NUMBER.

The kidneys, like other organs, are subject to certain deviations from their natural position, form, and number. Most of these are congenital; others are acquired later in life, through accident or disease. Some of them are appreciable during life, and may simulate widely different pathological conditions, challenging the careful attention of both physician and surgeon, a correct diagnosis in the majority of instances being very difficult and in some cases impossible.

More frequently, however, these anomalies produce little or no inconvenience, the renal functions being satisfactorily performed.

A combination of several of them may occasionally be present in the same subject without giving rise to any disturbance which might lead to their detection during life.

I.—ANOMALIES OF POSITION.

Misplacements of the kidney are usually divided into three varieties, fixed, movable, and floating, according as the misplaced organ remains permanent in its abnormal position, moves in the retro-peritoneal space with more or less freedom, or floats in the abdominal cavity.

Fixed malpositions of the kidney are mostly congenital, the organs also being frequently abnormal in size and shape, while, as a rule, they are normal in structure.

When acquired, the malposition is often the result of tumors dragging or pushing the kidney out of its normal position, when it becomes fixed by inflammatory action.

The arrangement of the renal vessels and ureters often deviates more or less from the normal; and malposition of some portion of the large intestine and peritoneum is not an unusual complication.

The supra-renal capsule rarely accompanies the misplaced kidney, but occupies its usual position. Some writers assert that this is invariably the case; but in three cases out of eight observed by Dr. David Newman the capsule was found misplaced with the kidney; and in upward displacements it is found, according to Cruveilhier, on the inner side of the kidney.

The abnormal positions in which the kidney is liable to be fixed are numerous. It may be fixed in front of the vertebræ, on the brim of the pelvis, or within that cavity, where it may be felt either through the abdominal wall or through the vagina and be mistaken for a tumor. When so situated, it is liable seriously to embarrass and complicate parturition.

The most frequent congenital malposition is that in which the kidney is found lying obliquely on the sacro-iliac synchondrosis. It has also been found situated beside the uterus, lying transversely between the rectum and the bladder, or across the prominence of the sacrum.

The renal artery in these cases usually arises from one of the iliacs, or from the aorta immediately above its bifurcation. In a case reported by Mr. Durham,[1] in which the left kidney was found over the sacro-iliac synchondrosis, there were three arteries, the principal one being a branch of the aorta arising just above its bifurcation, another arising from the common iliac of the opposite side, and a third from the internal iliac of the same side, each supplying different parts of the organ.

Occasionally the lobulated appearance of the fœtal kidney is preserved, suggesting an arrest of development in early fœtal life. In a case recorded by Mr. Canton,[2] the left kidney, lobulated and of a rudely oval shape, was situated below the bifurcation of the aorta and between the common iliac arteries. Its pelvis was directed forward and dilated, owing to the impaction in the upper part of the ureter of an oxalate of lime calculus weighing two and a half drachms. The patient died of bronchitis at the age of twenty-seven. There had been no renal symptoms during life.

Congenital fixed misplacements affect by preference the left kidney. In twenty-one cases collected by Roberts, fifteen occurred in the left kidney and six in the right; in every instance the abnormality was confined to one kidney. Of forty-four cases collected by Weisbach, thirty-five occurred in the left, eight in the right, and one in

[1] Guy's Hosp. Rep., 1860.
[2] Pathological Transactions, vol. xiii.

both kidneys. As regards sex, men seem more predisposed than women: of twenty-nine cases, twenty were in men and nine in women.[1]

Acquired fixed malposition of the kidney occurs as the result of continued pressure upon the organ either by a tumor growing in the vicinity or by an enlarged liver, spleen, pancreas, or supra-renal body. It may also be the result of tight lacing; or the kidney may be dislocated by a sudden jar or blow, and bound down in its new situation by subsequent adhesions.

The movable kidney is usually an acquired affection. The relation of the organ to surrounding parts is perfectly normal, except for the increased laxity of its attachments, which is due to a diminution in the amount of fat surrounding it or to detachment of the peritoneum from the muscle.

Sometimes the adipose capsule is large and loose, and permits of the movement of the kidney within it; in other instances it closely surrounds the kidney and moves with it; whilst in still others the kidney moves within its adipose capsule, and the capsule also moves about with the kidney behind the peritoneum.

The movable kidney is often healthy, and when found diseased there is no positive evidence that its mobility is responsible for its pathological condition. The disease may have preceded and caused its mobility.

This condition is almost never acquired during childhood or after the fiftieth year. It occurs in women at least five times as often as in men, and three or four times more frequently on the right side than on the left. The degree of mobility varies considerably, though, of course, it is always limited by the length of the renal vessels.

[1] Ziemssen's Cyclopædia.

The peritoneum may be sufficiently loose to allow the kidney moving behind it to leave its natural position and fall below the brim of the pelvis, or as far forward as the anterior abdominal parietes, or across to the opposite side of the spinal column.

In the report of the committee of the Pathological Society of London,[1] mention is made of a case in which the kidney moved under the peritoneum through a space described as a circle with a diameter of eight or nine inches.

Among the causes for movable kidney rapid child-bearing comes first. It is not difficult to perceive how, in the forcible contraction of the diaphragm during vomiting and parturition, and the consequent downward pressure more especially exercised on the liver and right kidney, we have a combination of conditions favorable to the development of movable kidney; especially if the woman too early resumes the erect posture, thus giving the displaced organ no time to become fixed.

You will find in all your books on this subject that the sudden loss of intra-abdominal pressure after delivery is looked upon as a powerful etiological factor in displacements of the kidney, and to this loss of pressure is largely attributed the frequency of that condition in child-bearing women. This is, however, a fallacy. If the kidney has not been displaced by the vomiting of pregnancy and the forcible contraction of the diaphragm upon the liver and kidney during the labor, you may rest assured that the relaxed abdominal wall after delivery will not drag the organ out of its place. The notion that the kidney can be thus displaced is as absurd as the one you will find repeated in so many of your books on the treatment of

[1] Path. Soc. Trans., vol. xxvii.

renal colic,—viz., "Give hot baths and opiates to relax the ureter, in order to let the stone pass through." The stone is forced through the ureter by the accumulation of urine behind it.

The influence of vomiting and retching in displacing the kidney is immediately apparent. A few days since I examined a man (a physician) whose right kidney is very movable. He discovered its mobility at the termination of a long sea-voyage which had involved eighteen days of sea-sickness, with constant vomiting and retching, and the emaciation was considerable. The emaciation no doubt assisted the vomiting and retching in displacing the kidney.

It is stated that movable kidney is very common among child-bearing women of the poorer classes in Austria, Poland, and Holstein. Rapid general emaciation and absorption of the peri-nephritic fat naturally favor mobility of the kidney. Increased weight, either from a tumor developed in the kidney or from stones impacted in its pelvis or ureter, may tend to loosen and drag it down. The congestion of the kidney which, according to Becquet,[1] takes place at every menstrual period, may also be an etiological factor. This opinion is shared by Roberts, who states that in a case under his observation a displaced and movable kidney seemed to become larger and more sensitive to the touch two days before the catamenia appeared. It may have been the woman and not the kidney that became more sensitive. In a case observed by Dr. Ritchie and cited by Roberts, who was afforded an opportunity of watching the condition of the kidney during two menstrual periods, its size was seen to be increased by quite one-half, and it was much more sensitive to the

[1] Medical Times and Gazette, 1887.

touch. Enlargements of the liver force the right kidney down, thus dissecting up the areolar tissue which fastened the peritoneum to the lumbar muscles. Heavy lifting, especially in persons with loose abdominal walls, is liable to start the kidney from its bed; falls are often the cause, and perhaps in some cases a perinephritis. In one case which came under my care I thought it possible that the constant use of a sewing-machine had caused the trouble, the motion of the muscles separating the kidney from the peritoneum and allowing it to move in the retro-peritoneal space.

Some three weeks ago a young woman came to consult me about a cough and abdominal pain. She was slightly built, thirty-three years of age, and had never been married. She had never worked on the sewing-machine, and was at present doing very light work, which, however, necessitated her being on her feet most of the day. Both kidneys were movable,—the right very much more so than the left. The abdominal walls were very thin and relaxed, both kidneys being readily felt. The right kidney would move down to the iliac fossa and when pressed upon would quickly return to its normal position. Its lateral motion was also considerable. While the left kidney was quite movable, it had no such latitude as the right. The patient had been well up to ten years before, when she weighed one hundred and forty pounds. Her present weight is one hundred pounds. Ten years ago she had an attack of gravel on the right side, accompanied by severe vomiting and retching. The retching and emaciation, with a severe cough, are undoubtedly responsible for the mobility of the kidneys. Two years ago a physician told this patient that she had a floating right kidney, and a few months ago she herself discovered the mobility of the left kidney.

Floating kidney, the third variety, depends on a congenital irregularity of the disposition of the peritoneum, a fold of this membrane completely enveloping the kidney so as to form a mesonephron, thus allowing the organ to float about in the abdominal cavity in any direction.

This anomaly, to which the distinctive term "floating" kidney has been applied, is necessarily associated with an elongation of the renal vessels. An intermediate form, also congenital, has been found, in which there is no mesonephron, nor is even the anterior surface of the kidney covered by peritoneum, but, owing to some abnormal arrangement associated with malposition of the colon, the kidney is left unsupported and free to move between diverging processes of the peritoneum. The report of a case of this kind, by Mr. Durham, will be found in Guy's Hospital Reports of 1860. These varieties are of rare occurrence.

Diagnosis.—Any movable tumor about the size and shape of a kidney may be mistaken for a floating or movable kidney. It is necessary to bear in mind that a movable kidney may be misshapen, and larger or smaller than normal. A kidney, however, that weighs over eight or ten ounces is not likely to be very movable.

Omental or mesenteric tumors may simulate movable kidney, while small ovarian tumors are less likely to do so.

Upon physical examination one might mistake scirrhus of the pylorus for movable kidney. The history of the case, however, ought to guide to a correct diagnosis.

I once found a uterine fibroid with a long pedicle that on first examination I took for a floating kidney. On another occasion I had a patient with a very movable tumor about the size and shape of the kidney. It was impossible to make a positive diagnosis, but the tumor

was thought to be a floating kidney both by myself and by others who examined it. The woman had borne children. She had thin, lax abdominal walls, and the tumor could be plainly felt. She finally died of Bright's disease and chronic diarrhœa. At the autopsy the tumor was found to be composed of normal hepatic tissue suspended from the liver by a pedicle. It had never given the patient much pain, except occasionally from the pressure of her garments. I have never seen nor heard of any other case of this kind.

Distended gall-bladder may be mistaken for movable kidney, as also may a tumor of the pancreas.

After all, when we find a movable tumor in the upper part of the abdomen, about the size and shape of a kidney, we must rely largely for a diagnosis upon the extent of its mobility, and upon our ability to press it back into the normal position of the kidney, where it is likely to remain so long as the patient continues perfectly quiet. This cannot be done with a floating kidney, or with an omental, mesenteric, uterine, or ovarian tumor. A distended gall-bladder is not very movable downward, and, besides, usually gives one the feeling of a cyst, which ought always to be aspirated with a fine needle.

Treatment.—In the majority of cases of movable kidney no treatment is called for. If physical exercise produces unpleasant symptoms, perfect quietude must be enforced. Functional disorders of the bowels should be corrected, and anæmia or loss of muscular tone should be dealt with by appropriate remedies. A fat-making diet should be prescribed, with the view of increasing the natural packing of the kidney. Some sort of truss-like support, such as an accurately-fitting belt or a pad, especially one of inflated rubber, may be worn with benefit. The temporary support given by a gravid uterus has been known to

diminish the mobility of the kidney. In a small proportion of cases the suffering is so great, however, that some more radical means than the use of a belt or pad is called for. Of the two operations which have been employed in such cases,—viz., nephrorrhaphy, or fixation of the kidney by sutures, and nephrectomy, or removal of the kidney,—the former should be chosen when practicable. (See chapter on Surgery of the Kidney.)

SUMMARY OF ANOMALIES OF POSITION.

FIXED.

Congenital.—More frequent in men than in women; affects by preference the left kidney; associated with abnormal arrangement of renal vessels, ureter, and large intestine; kidney frequently misshapen, as well as misplaced; supra-renal capsule usually in its natural position, though occasionally accompanying the kidney.

Acquired.—Results from pressure by a tumor or an enlarged neighboring organ; from tight lacing; from a sudden blow or jar, with subsequent inflammatory adhesions.

MOVABLE.

Acquired.—More frequent in women than in men; affects by preference the right kidney; results from emaciation, rapid child-bearing and too early resumption of ordinary duties, tight lacing, vomiting, etc.

FLOATING.

Congenital.—Rare.

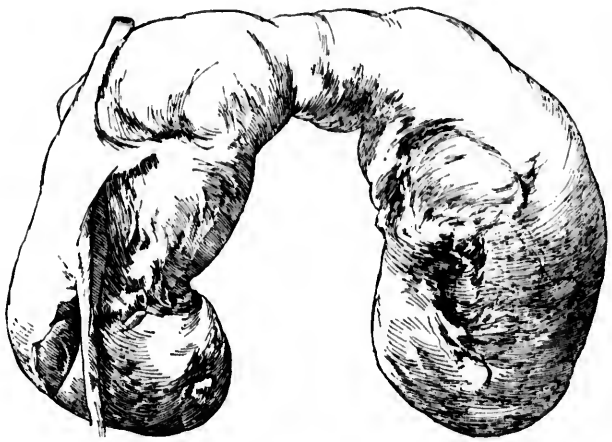
II.—ANOMALIES OF FORM.

Malformations of the kidney are mostly congenital. Occasionally, however, we meet with acquired cases, the kidney having become changed in outline and dimensions in consequence of disease of the organ itself, as hydro-nephrosis, pyo-nephrosis, cystic enlargements, cirrhosis, and morbid growths, or as a result of pressure of tumors or morbid enlargements of neighboring viscera. Misshapen kidneys are generally also misplaced. The more or less lobulated kidney, already mentioned (page 18), is not un-

common, or the organ ...e divided into two or three indistinct irregular portio... by shallow depressions on its surface. Sometimes one kidney is found to be two or three times larger than its fellow, both being otherwise perfectly healthy; this condition probably arises from deficient development of one of the renal arteries.

The variety of malformation most frequently met with is the so-called horseshoe kidney (Fig. 3), the two organs

FIG. 3.



Horseshoe kidney, from autl or's collection in University Museum (natural size).

being fused into one by means of an intermediate transverse portion, usually consisting of true renal secreting structure, though sometimes merely of condensed fibrous tissue, which connects their lower ends across the front of the vertebral column so as to form a crescent or horseshoe-shaped body, with the concavity directed upward.

In rare instances the concavity is directed downward, the upper ends being united, or the connecting bridge may extend from the hilum of one kidney to that of the other. The two halves of a horseshoe kidney are usually complete in themselves, having each a distinct pelvis and ureter. Most frequently the ureters descend in front of the transverse portion, when this unites the lower ends of the kidneys; more rarely they pass behind it. In a few exceedingly rare cases the supernumerary renal parenchyma is not united to the two kidneys, so that the middle piece constitutes an independent kidney, receiving blood from both the lateral parts, but possessing also independent vessels.

There are a few cases on record where one or both kidneys have had two distinct pelves. In most instances these have been found to unite so as to form one single ureter. In a case reported by Dr. Evarts, however, both kidneys were furnished with two distinct pelves and ureters which ended separately in the bladder, all four ureters being pervious.

III.—ANOMALIES OF NUMBER.

Supernumerary kidneys with separate blood-vessels and excretory ducts are occasionally met with, while in a number of instances only a single kidney has been found. As long as this remains healthy there is no derangement of the urinary function; but should it become diseased or its excretory duct obstructed, fatal uræmia will rapidly supervene. The term "solitary kidney" is sometimes applied to all cases in which there is only one renal organ. Ordinarily, however, it is limited to fusion of the two kidneys into one mass, entire absence of one kidney being designated as "unsymmetrical kidney." The former is always congenital, the latter usually so, except where one

kidney has been removed by nephrectomy or destroyed by disease. Congenital atrophy or rudimentary kidney belongs practically to the same class.

Among the recorded cases of solitary kidney we find every conceivable variety of form and degree of fusion, from the ordinary horseshoe kidney (*ren angiliformis*), which represents the lowest grade of fusion, to the completely united variety, in which the two organs form a single disk-like mass provided with a double or single pelvis. Dr. Broesike, of Berlin, reports[1] a case of S-shaped fusion of both kidneys (*ren sigmoideum*), consisting in union by renal tissue between the lower end of the left kidney, which occupied its normal position, and the upper end of the right, which lay wholly to the left of the vertebral column, with its hilum directed to the left and its convex border to the right. On the anterior surface of this double kidney, which extended from between the eleventh and twelfth dorsal vertebræ to the middle of the last lumbar, the line of union between the two organs was indicated by an oblique furrow running downward and outward (to the left), and lodging in the left ureter, the posterior surface being perfectly smooth throughout. A much-divided renal artery, entering at the hilum, supplied the upper, or left, kidney, while the lower, or right, received two distinct arterial trunks, one arising from the aorta just above its bifurcation and entering the convex border of the kidney; the other, a branch of the left common iliac, terminating near the lower border of the hilum.

In unsymmetrical kidney, or congenital absence of one organ, the renal vessels as well as the ureter are likewise wanting. Where these exist, the case may be presumed to be one of atrophy, congenital or acquired. When the

[1] Virchow's Archiv, Nov. 1884.

only existing kidney has two ureters and a double set of blood-vessels, it may be regarded as solitary.

A single kidney, of whichever variety, is in the majority of instances, but not always, hypertrophied, and may attain an enormous size, weighing several pounds. It is frequently misplaced and more or less abnormal in form. It should be remembered that anomalies of the kidney are often associated with some defect of the generative organs, and, where the latter exists, the utmost caution should be exercised where nephrectomy is contemplated, lest an only kidney be removed and the patient be left without any renal organ.

Absence of both kidneys, as well as of the ureters and bladder, has often been found in still-born children, especially in acephalous monsters. M. Moulon, of Trieste,[1] has recorded the case of a girl who died at the age of fourteen of chronic gastro-enteritis, in whom neither kidneys nor ureters were found. The bladder was also wanting; and the umbilicus, from which there had, since birth, been a continual discharge of a urine-like liquid, was situated where the mons Veneris usually is, the symphysis pubis being replaced by a wide gap covered only by the skin. The external genitals were very defective, and the anus, which was inordinately large, opened where the vaginal orifice should have been; but the uterus, ovaries, and Fallopian tubes were perfect. M. Moulon concluded that the blood in this case gave up to the liver those constituents which go to form the urine, and that they were conveyed by the umbilical vein to the umbilicus, and there excreted. The liver was gangrenous, as were also the intestines in spots throughout their extent. The pancreas was converted into a sac of pus, and the great omentum was in part destroyed.

[1] Archives Générales de Médecine, tome xvii. p. 424.

SECTION II.

DISEASES OF THE KIDNEYS.

CHAPTER I.

NEPHRALGIA.

Nephralgia, or neuralgia of the kidney, is a name applied in a general way to pain in the kidney.

Etiology.—By far the most frequent causes of nephralgia are renal calculi, either large calculi in the pelvis or smaller ones in the uriniferous tubules.

The next most frequent causes of pain are new growths in the kidney,—cancer, cystic diseases, etc. We find that gouty kidney is subject to frequent nephralgias, as are also the kidneys of those addicted to alcoholism: that of the former may be due to the contracted condition of the kidney or to irritation caused by deposits of crystals of urate of sodium, which are found in great numbers in the intertubular spaces. In the latter case the pain may be due either to the irritating quality of the urine or to the hyperæmic condition of the kidney. We have already observed, in studying the anatomy of the kidney, that, from the arrangement of its nerve-supply, a distended condition of the blood-vessels, either active or passive, must necessarily produce pain.

A movable or floating kidney often gives rise to pain.

Symptoms.—Pain is the pathognomonic symptom of nephralgia; that is, pain of a sharp, severe, lancinating

nature. Pain of a dull, heavy, aching character is not called nephralgia. The pain often follows the line of the ureter to the groin, at times producing pain in the testicle or in the head of the penis, or extending partially around the body. This is particularly the case with the intemperate, who, during or following the attack, experience frequent and painful micturition, the urine being high-colored and turbid. In the intemperate the nephralgia is occasionally accompanied by hemorrhage, even where there is neither stone, gout, cancer, nor tuberculosis. In this class of cases, however, we are apt to find albumen. I may add that nephralgia is often accompanied by severe vomiting or retching.

Diagnosis.—In making a diagnosis it is necessary to remember that pain in the right kidney might be mistaken for heptalgia, or passage of gall-stone, for the severe pain of obstruction of the ascending colon, or even for pain in the appendix. Nephralgia on the left side is not so apt to be mistaken.

For the diagnosis of the different conditions that give rise to nephralgia, we shall find a detailed account of the symptoms under their respective headings, as stone, tuberculosis, etc.

Treatment.—The indication for treatment is to relieve the pain. Heat is sometimes efficacious. Morphine should be administered hypodermically, that being the best way to administer this analgesic in nephralgia, as we have seen that the pain is apt to cause excessive vomiting; or, where a syringe is not at hand, morphine or opium may be given by the rectum in the form of injection or suppository. The desired relief may be obtained by the inhalation of chloroform or ether. Further indications for treatment will be found under the headings of the diseases of which nephralgia forms a prominent symptom.

CHAPTER II.

HYPERÆMIA—CONGESTION OF THE KIDNEYS.

Renal hyperæmia may be active or passive.

Etiology—*Active.*—In taking up the subject of hyperæmia, let me again impress upon you the importance of a thorough understanding of the circulation in the kidney. (See chapter on Anatomy.) No doubt the large size of the renal artery facilitates hyperæmia where there is over-action of the heart from hypertrophy of the organ or from over-stimulation by such drugs as digitalis; but many drugs, such as turpentine, cantharides, copaiba, cubebs, and carbolic acid, may cause hyperæmia, acting, however, by direct irritation or stimulation of the kidney itself.

It may be produced by injuries, renal calculi, or concretions in the tubules, and not infrequently it accompanies the acute infectious diseases. Of the acute infectious diseases, scarlatina, cholera, and diphtheria most frequently produce hyperæmia. Exposure of the body to sudden changes of temperature is another cause of renal hyperæmia; and I may remind you that this condition always precedes acute inflammations of the kidney.

Pressure upon the abdominal aorta below the renal axis must, of course, produce increased blood-pressure in the kidneys, and consequent hyperæmia.

Passive.—Passive hyperæmia is caused by such tumors in the abdominal cavity as may press upon or interfere with the inferior vena cava above the entrance of the renal veins,—aneurism, cancer, etc.

Diseases of the renal veins may obstruct the circulation and produce passive hyperæmia; and diseases of the right side of the heart, such as fatty degeneration and dilatation

or mitral regurgitation, which produce obstruction of the pulmonary circulation, will bring about the same result.

So also may any organic disease of the lungs which obstructs the right heart, as fibrous phthisis, excessive pleuritic adhesions, emphysema, chronic bronchitis, etc.

Symptoms—*Active.*—The patient will complain of aching pains about the loins, sometimes extending along the course of the ureters, or radiating to the hips. There is usually tenderness on pressure, and not infrequently nausea, and perhaps vomiting, accompanied or not by headache.

No doubt the increased quantity of urine that is usually present in gouty kidney is owing to the high pressure from the hypertrophied heart. On the other hand, we not infrequently find blood in the urine where there is active hyperæmia, particularly in that of acute nephritis, in the hyperæmia of the intemperate, and in that following injury.

Passive.—In this condition, aside from the symptoms of the lesion which causes the hyperæmia, there will be a diminished excretion of urine, which will be porter-colored, owing to the presence of disintegrated blood, and will contain some albumen and casts.

Care must be taken not to mistake this for the urine of acute Bright's disease. An examination of the heart may reveal the cause of the passive congestion or renal obstruction. The heart will be, perhaps, in a state of fatty degeneration; or there may be dilatation of the right heart from organic disease of the lungs, or a severe mitral regurgitation may be producing the pulmonary obstruction.

In these conditions of the heart, not only the kidneys, but also the liver and the portal circulation suffer from the passive congestion; and it is this fact that enables us to differentiate between passive and active congestion, as

well as to distinguish the albumen of passive congestion from that of acute Bright's disease.

PATHOLOGY—*Active.*—In active hyperæmia the morbid process lies mainly in the renal arteries and the arteries of the Malpighian tufts. The kidneys are large, moist, and of a dark red color. The capsule strips easily. On section the Malpighian bodies are recognized as dark-red points that dot the surface.

Passive.—In passive hyperæmia, which has its seat in the veins, the kidneys in the early stages may be enlarged, but later will be of normal or diminished size. The whole organ is firm, with an elastic or tough feeling, and is of a slaty-blue color. The capsule is easily removed. On section, the Malpighian bodies are seen to be prominent, but the most marked changes are in the medulla, the bases of the pyramids showing marked congestion, and the deeply-congested vessels shining out very prominently between the bundles of uriniferous tubules, giving the tissue a striated appearance.

In old-standing cases, irregular pale patches make their appearance, and the organ may feel almost fibroid.

PROGNOSIS.—In active hyperæmia, the prognosis depends on the exciting cause; when this is functional the hyperæmia is simply transitory.

In passive hyperæmia we must judge of the prognosis by a consideration of the disease which produces the obstruction.

TREATMENT—*Active.*—In treating active hyperæmia the indication is to remove the cause, if possible. Where it depends upon hypertrophy of the heart, for instance, we must modify the heart's action. When it accompanies the acute infectious diseases there is no special indication for treatment. Where injury is the cause, absolute quiet and rest will be necessary, with cold, cupping, or perhaps

leeches, applied to the back. Give something to allay the pain, avoid stimulants, and confine the patient strictly to a non-nitrogenous diet. I am in the habit of keeping my patients on thin rice gruel.

Passive.—In cases which depend on dilatation of the right side of the heart or on fatty degeneration, the patient usually requires both alcoholic and heart stimulants: that is, it is the heart that requires treatment, rather than the kidneys; at the same time, the portal circulation, having also experienced the passive congestion, should be unloaded by a saline cathartic. Where the passive congestion is produced by tumors, aneurism, etc., it is entirely a matter of dealing with the cause, which we may or may not be able to remove.

Among heart stimulants we have the choice of digitalis, convallaria, strophanthus, caffeine, nitro-glycerin, etc. Many patients when once relieved by stimulants will be greatly benefited by a systematic course of heart tonics, the best of which in my hands has been strychnine, given with phosphoric acid to older patients and with iron to the younger. I usually begin a course of strychnine with doses of from one-fiftieth to one-sixtieth of a grain, increasing to one-thirtieth or one-twenty-fifth of a grain. Occasionally, however, it produces headache: in this case quinine will be found to be a good substitute. I have also found patients who took nux vomica and phosphoric acid with benefit, in whom strychnine produced headache.

As the amount of urine secreted depends chiefly upon the degree of pressure within the vessels of the glomerule, its secretion necessarily becomes more profuse in that form of renal hyperæmia which involves the arterial system of the kidney, including the vessels of the Malpighian tuft. In such cases the pressure in the glomerule is hardly ever sufficient to occasion transudation of albumen, or to rup-

ture the vessels and cause extravasation of blood into the Malpighian corpuscles.

A very different train of symptoms follows upon a moderate degree of *obstructive engorgement*. In almost every case of obstruction of the veins of the kidney, the degree of tension within its arteries is very small, and there is a diminution instead of an increase in the secretion of urine. On the other hand, the strain upon the capillaries becomes exceedingly severe, since they cannot discharge their contents into the already overloaded veins until the pressure within them exceeds that in the veins. Hence, not only does the plasma of the blood escape from them into the tubules, so that the scanty, concentrated, dark-colored urine contains albumen casts, but the delicate walls of the capillaries give way before the strain, so that the urine is also full of blood-corpuscles.[1]

CHAPTER III.

HÆMATURIA.

Hæmaturia is the term employed to denote the presence in the urine of blood derived from any part of the urinary tract,—whether from the kidneys (*nephrorrhagia*), the ureters (*ureterorrhagia*), the bladder (*cystorrhagia*), or the urethra (*urethrorrhagia*).

Etiology.—We not infrequently find hæmaturia in hyperæmia, either active or passive, as well as in cases of contusions, wounds, and other injuries of the kidneys. Heavy lifting or over-exertion sometimes produces hemorrhage. Renal calculus is one of the most common sources of

[1] Niemeyer.

hæmaturia. In gouty patients with diseased arteries, this condition occasionally arises. It is not frequent in the course of tubular nephritis, except in initial active hyperæmia, or in patients addicted to the excessive use of alcohol. Tuberculosis, tumors, and cancer of the kidney cause destruction of tissue and hemorrhage.

Of the blood glandular diseases and diseases of nutrition, purpura hæmorrhagica and scurvy are the most apt to be accompanied by hæmaturia. I have had several cases of hæmaturia during the congestive stage of malarial fever, and have seen malignant attacks of an acute infectious disease produce it. Nor must we overlook the facts that hæmaturia may be vicarious, and that syphilitic patients may be the subjects of hemorrhage from the urinary tract, as well as from any other mucous membrane.

Pathology.—The pathological condition of the kidney which is the subject of hæmaturia varies with the etiology. That resulting from renal calculus may be either from hyperæmia of the kidney produced by the presence of the stone, or from subsequent ulceration of the mucous membrane of the pelvis. Hæmaturia from injury is the result either of ruptured blood-vessels or of hyperæmia. The hemorrhage from gout is usually dependent on a diseased condition of the blood-vessels and hyperæmia, while that from purpura hæmorrhagica, scorbutus, and the blood glandular diseases is generally due to the pathological condition of the blood, although it may depend upon an abnormal state of the blood-vessels as well. The hæmaturia of renal tuberculosis is due to ulceration, while that from cancer or other tumors is likely to be from hyperæmia in the neighborhood of the neoplasms. The so-called endemic hæmaturia is the result of the hyperæmia produced in the mucous membrane by the presence of parasites.

SYMPTOMS.—The pathognomonic symptom is, of course, blood in the urine, which may be of a dark, smoky color, the blood being disintegrated. At other times the blood imparts to the urine a fresh red color, or it may be voided in clots. By careful observation and examination of the urine we learn whence the hemorrhage comes. If the urine is alkaline, the hemorrhage is probably from the bladder, and the blood-corpuscles will soon become disintegrated; if it is acid, the corpuscles remain distinct and the hemorrhage is probably from the kidney. If the blood comes from the kidney, it will be completely mixed with the urine, unless the hemorrhage is excessive, which is seldom the case except where it is traumatic. If the urine contains clots or streaks of blood, the bladder is the seat of the trouble. If the blood is almost pure and is passed just in advance of the urine, we must look to the urethra; if it follows the urine, the base of the bladder is its most probable source.

Dark, smoky, porter-looking urine, of a high specific gravity, containing disintegrated blood-corpuscles and albumen, is the characteristic urine in hemorrhage from passive congestion of the kidney. In such cases investigate the kidney itself. It may be enlarged. There may be tubercular trouble or cancer. Is the patient gouty? Gouty patients may have hypertrophy of the heart, and frequently degeneration of arteries, with consequent hemorrhage, the result of high blood-pressure and arterial rupture. In cases where there is any doubt, the microscope will determine the presence of blood-corpuscles in the urine.

When the blood comes from the kidney, besides being well mixed with the urine, the patient generally complains of uneasiness, heat, and dull pain about the back, while occasionally the blood, by distending the pelvis or ureter,

gives rise to severe pain (nephralgia) simulating an attack of gravel. If with the well-mixed deposit of blood we find casts, there can be little doubt that the hemorrhage is renal.

Prognosis.—The prognosis must depend entirely upon the etiology of the hemorrhage. In cases of injury the prognosis is generally fairly good, unless the kidney is disorganized or other injuries have been received of a serious nature. In cancerous kidney the only hope of recovery lies in the early removal of the organ, while tubercular kidney is generally complicated with tuberculosis of other organs, the bladder, testicles, or lungs. In hæmaturia from gouty kidney there is seldom danger from mere loss of blood. The prognosis in these cases must depend on the condition of other organs, the blood-vessels particularly, as many of these patients die from apoplexy. Hemorrhage caused by a calculus is not likely to be serious, and the prognosis, as far as the hemorrhage is concerned, is good. Serious results, however, may be produced upon the kidney.

Treatment.—In the treatment of hæmaturia we must be governed in a measure by the etiology. Absolute rest, however, and the strictest attention to diet, apply equally to every case. You will find that many insist upon milk diet. I have, however, found that thin rice gruel—that is, rice-water made from ground rice—answers the best purpose, and I would strongly advise you to try it. It is prepared by boiling for half an hour a teaspoonful of rice flour in a half-pint of water, with a little salt added. In cases where hemorrhage is the result of injury, it may often be well to apply leeches, or cups, wet or dry, over the back, while ice applied over the region of the kidney may be found efficacious in any case.

Medicines.—A great variety of astringents and hemo-

statics are used. Sometimes the hemorrhage is accompanied by pain, and will require opiates in combination with astringents. Under these circumstances you will find that one grain of acetate of lead and from two to five grains of Dover's powder every two hours will answer admirably.

Of the astringents, where no opiate is required, gallic acid in ten-grain doses every two hours will usually meet the indication. In the administration of gallic acid it is necessary to give it at short intervals, at least every two hours, in order to keep up its effect, as it is readily absorbed and quickly eliminated. A very nice preparation is the compound syrup of gallic acid, an old Edinburgh dispensary formula, which can be combined with a little laudanum when there is pain. Tincture of cannabis indica, from five to ten minims, repeated every two or three hours, I sometimes use successfully.

Turpentine, given in emulsion with powdered acacia and cinnamon-water, in ten-drop doses every two hours, often does well in gouty cases.

Of the ferruginous preparations, I have found the ammonio-sulphate of iron—the alum iron of the druggists—the very best preparation, given in about ten-grain doses, well diluted in water, every two hours.

Fluid extract of ergot, alone or combined with tannic acid, or ergotine given hypodermically, sometimes stops the hemorrhage where all other remedies fail.

I would have you remember that for the treatment of hæmaturia depending upon passive congestion of the kidneys, especially that form which you are most likely to meet, namely, that resulting from disease of the heart, astringents are not indicated. In these cases the liver and other abdominal organs are equally in a state of passive congestion. The indications, therefore, for treat-

ment are an active saline cathartic to unload the portal circulation and deplete the congested abdominal organs, and the free administration of cardiac stimulants, digitalis, strychnine, and alcohol. Under this treatment the hemorrhage will cease, as will also the albumen.

Strongylus gigas is a parasite which is seldom found in the kidneys and urinary passages of man, but which often occurs in lower animals. It is barely possible that it might produce hæmaturia.

CHAPTER IV.

ENDEMIC HÆMATURIA.

ENDEMIC or Parasitic Hæmaturia occurs endemically in many hot countries, and is caused by a parasite embedded in the small veins of the mucous membrane of the pelvis, the kidney, the ureter, and the bladder.

HISTORY.—The endemic nature of this form of hæmaturia was first established in 1812 by Chapotin, in the Isle of France. Dr. Bilharz, while studying the diseases of Egypt, first discovered the entozoon that produced the mischief. Subsequently Dr. John Healey, while studying the diseases of the Cape of Good Hope, established beyond a doubt that the endĕmic hæmaturia of hot climates is caused by a parasite. Besides Egypt and the Cape of Good Hope, this hemorrhage is indigenous to Brazil and the Mauritius. Bilharz named the parasite *Distoma Hæmatobium;* Dresing named it *Gynæcophorus Hæmatobius;* Cobbold, however, named it for the discoverer,—viz., *Bilharzia Hæmatobium.* The last is the name generally used.

It is a white, elongated, soft-skinned, bisexual entozoon,

three or four lines in length, and belongs to the trematode order of worms. The body of the male is comparatively thick and short, and is provided on its ventral aspect with a furrowed canal (*canalis gynæcophorus*) for the reception of the longer, delicate, filiform female during congress. The ovisac dehisces longitudinally; the eggs are about one one-hundred-and-seventy-sixth of an inch long, and are oval, with an anterior terminal spiny projection. The newly-escaped embryo is flask-shaped and covered with cilia, by the aid of which it moves rapidly about.

Etiology.—It is now beyond question that the hæmaturia is caused by the presence of the *Bilharzia Hæmatobium* in the small veins of the mucous membrane. It is not, however, clearly understood how it finds its lodgement there. It probably enters the body in various ways,—being taken into the stomach with the water, vegetables, or mollusca. It has been suggested that the ova may attach themselves to the skin of persons bathing, and thence find their way into the tissues. Most of the cases occur between the ages of five and twenty-five years, more males being attacked than females.

Pathology.—The parasite is not always confined to the mucous membrane of the urinary tract. It has been found in the portal veins, in the liver, and in the veins of the alimentary canal, where it causes hemorrhage, diarrhœa, or dysentery. When embedded in the mucous veins of the alimentary canal it does not, as a rule, produce so much disturbance and disorganization as it does when present in the mucous membrane of the bladder, where it is found more frequently than in the pelvis of the kidney or the ureter. When the parasites are deposited in great numbers, they thicken the mucous membrane, and in this way sometimes cause obstruction in the ureters.

Parasitic ova have been found to form the nucleus of

a stone, both in the pelvis of the kidney and in the bladder.

Symptoms.—The pathognomonic symptom is blood in the urine, intimately mixed when it comes from the kidney, and in clots or following the urine when it comes from the bladder. Exercise increases the quantity of blood, though the amount of urine is not likely to be affected. There is little or no pain, except as the result of violent exercise. If long continued, anæmia must result.

Prognosis.—Very few deaths can be traced directly to the effects of the hæmorrhage, and children seem to outgrow the hæmorrhagic tendency.

Treatment.—Dr. Healey established the fact that it is useless to give the ordinary astringents employed in other forms of hæmaturia, but that the parasites or ova in the pelvis of the kidney can be destroyed by turpentine and oil of male fern.

For their removal from the bladder he found nothing to equal injections of a solution of iodide of potassium containing about five grains to the ounce of water.

CHAPTER V.

HÆMATINURIA — SPURIOUS OR FALSE HÆMATURIA — HÆMOGLOBINURIA.

Hæmatinuria is a paroxysmal disease or condition characterized by the passage of bloody-looking urine, almost black or porter-colored, and containing albumen, but no casts or blood-corpuscles.

Etiology.—We know little of the etiology of this disease. It occurs almost exclusively in males, and usually

between the ages of twenty and forty. Very few cases occur at any age before twenty or after forty. Some authors tell us that it is produced by cold, as the paroxysms are usually preceded by cold and recurrent chills. The cold and chills, however, are probably the result of the condition of the blood, and not its cause.

Hæmatinuria is sometimes caused by a septic condition induced by the inhalation of certain gases, especially arseniuretted hydrogen, and is likely to be present in blood glandular diseases.

Pathology.—The discoloration of the urine is caused by the disintegration of the blood-corpuscles setting free the hæmoglobin or coloring-matter of the blood. Under ordinary circumstances the hæmatin of the blood becomes the pigment of the urine, but in hæmatinuria the disintegration takes place too rapidly and the hæmatin is in excess. It is barely possible that the coloring-matter of the corpuscles may escape without corpuscular disintegration. So little is known of the pathology of the disease that it is difficult to decide whether it is purely a disease of the blood, a disease of nutrition, or a blood glandular disease. The only case that I recollect having had under my charge was the subject of chronic malaria with enlargement of the liver and spleen.

Symptoms.—Attacks are usually paroxysmal, weeks or even months elapsing between them. The passage of the black urine is preceded by a chill, depression of the nervous system, and pain about the loins. The urine always contains albumen, but neither casts nor blood-corpuscles. That voided during the night is generally free from the abnormal color; that passed during the day, for perhaps several days, will be of the color peculiar to the diseased condition. Patients are generally cachectic, and often suffer from chronic malaria.

PROGNOSIS.—The prognosis is generally good so far as the paroxysm is concerned, and otherwise is governed entirely by the condition of the patient,—that is, whether he is suffering from organic disease or not.

TREATMENT.—As yet we have found no specific for this disease, and probably we shall find none until we know more of its etiology and pathology. The most successful treatment consists in placing the patient under the best hygienic and dietary conditions: rest, quiet, and tonic treatment, consisting of iron, strychnine, arsenic, etc., treating any organic disease as indicated, if present.

CHAPTER VI.

ANÆMIA.

THE kidneys, like all the other organs of the body, may be the subject of anæmia, and must share in any general anæmic condition, such as chlorosis, pernicious anæmia, etc. We may have primary anæmia of the kidneys from obstruction of the renal vessels, the result of disease of the arteries, or of tumors, cancer, etc., which may press upon those vessels. Under any of these circumstances the kidney must suffer in function and in nutrition.

It will be apparent from the etiology that anæmia from obstruction may be confined to one kidney, while in general anæmia both kidneys will be equally affected.

PATHOLOGY.—Where the condition is that of general anæmia, we should find a pale, anæmic-looking organ; but where the anæmia is the result of obstruction for a long period, we should expect to find the organ atrophied as well as anæmic.

SYMPTOMS.—There are no special symptoms to indicate

this condition; but if there be a tumor in the abdomen and a marked lessening of the quantity of urine without albuminuria and much vomiting, we may judge that the kidney is suffering from lack of nutrition. Where only one kidney is involved, the probabilities are that there will be no indication of the condition.

PROGNOSIS.—The prognosis depends upon the cause. If the anæmia be the result of a cancerous cachexia, the prognosis will be bad; if of chlorosis, it will be favorable.

TREATMENT.—The treatment must depend upon the etiology. In a general anæmic condition we must rely on general treatment. In special anæmias of the kidney, —that is, where there is obstruction—the indication is, of course, to remove the cause.

CHAPTER VII.

DISEASES OF THE RENAL BLOOD-VESSELS.

THE blood-vessels of the kidneys are subject to the same diseases as those of other parts of the body. In the kidney, however, they are of more interest to the pathologist than to the clinician, as it is extremely difficult, and sometimes even impossible, to diagnose their exact condition. It is nevertheless important to know that obscure symptoms, and pain in or hemorrhage fr[om] the kidney, may depend upon a pathological conditio[n] renal blood-vessels.

DEGENER[ATION] OF ARTERIES.

The causes that produ[ce] atheroma or calcareous degeneration of the renal arteries are the same as those that produce general atheroma of the other blood-vessels. Whether the renal arteries are as subject to atheromatous

degeneration as the other arteries is very questionable. While it is not impossible for the renal arteries to be the subject of atheroma independently of a general similar condition, it is probably very seldom the case.

We find the renal arteries the subjects of atheroma in gouty and rheumatic patients.

The hæmaturia in gouty patients is no doubt often owing to this cause. At the same time, there is no possible way of arriving at certainty as to the etiology of a hæmaturia. We shall see that this condition of the arteries plays an important part in atrophy of the kidney. In old persons, at post-mortem the kidney is often found small from atrophy, the result of nutritive disturbance caused by a lessening of the calibre of the arteries from atheroma or calcareous deposits. The vessels are also very frequently atheromatous in the small granular kidney, but in this instance their condition is not the cause of the small size of the organ.

ANEURISM.

There is no reason why we may not have aneurism of the renal artery. As a matter of fact, we do, occasionally, at post-mortems find aneurism of this vessel. It is, as a rule, discovered only after death; since, unless quite large, it would be impossible to diagnose it during life. Pain in the kidney accompanied with hæmaturia and a pulsating tumor would certainly justify a diagnosis of aneurism of the renal artery.

EMBOLISM AND THROMBOSIS.

It is impossible to ascertain the frequency of embolism in the renal arteries as compared with embolism in the brain, for instance; since it is seldom, if ever, possible to diagnose such a condition of the renal arteries. From the large size of the artery as compared with the organ itself,

it is natural to suppose that it is often the subject of embolism. There is no doubt that abscess of the kidney often results from this condition. Where a large branch of the artery is obstructed a general nephritis might result, or infarctions take place. The etiology of embolism of the renal arteries is, of course, the same as that of embolism occurring in other organs: acute endocarditis, atheromatous degeneration of the endocardium or of the valves, or vegetative detachments, might be the cause.

Thrombosis is generally the result of injury, atheroma, or invasion of the arteries by inflammatory conditions of other organs. Thrombosis of the renal veins is likely to occur from injuries, such as blows, falls, penetrating wounds, from the compression of abdominal tumors, or from inflammation extending from other organs. One result, however, that is likely to follow thrombosis of the veins is passive congestion of the kidneys. If the other causes that produce passive congestion of the kidneys can be eliminated, it will be fair to suspect thrombosis.

CHAPTER VIII.

URINE.

URINE, the secretion of the kidney, consists normally of a solution of substances, organic and inorganic, the result of tissue-metamorphosis. It is a transparent fluid, of a pale lemon-yellow color, of acid reaction, having a specific gravity ranging from 1015 to 1025, and is passed in quantities averaging from forty to fifty ounces a day. Each of these characteristics is, however, subject to variation both in health and during the progress of disease. The principal organic constituents are urea, uric acid, xanthin,

kreatin, kreatinine, oxalic acid, oxaluric acid, hippuric acid, etc. The inorganic constituents comprise sulphuric, hydrochloric, and phosphoric acids, sodium, potassium, ammonium, magnesium, calcium, etc.

Turbidity.—The urine may become turbid when the amount secreted is small in quantity and from the presence of urates, the earthy phosphates of calcium and magnesium, or the mixed urates of sodium, potassium, calcium, and magnesium. In the female it is often cloudy from admixture with vaginal secretions. None of the above conditions are of necessity abnormal, although the persistent presence of phosphates may indicate an excessive alkalinity which may require treatment. The turbidity may be caused by admixture with the urine of blood, pus, mucus, or fat, or may be the result of a decomposition of the urine in the bladder. Sarcinæ are occasionally found in the urine, rendering it turbid when voided, and settling as a whitish flocculent deposit. The urine may contain neither pus nor mucus, the turbidity being due entirely to the sarcinæ. They probably find their way into the urinary tract by means of unclean catheters.

Color.—The color of the normal urine varies from the nearly colorless urine that follows the ingestion of a great quantity of liquid (*urina potus*), to the dark wine-yellow of the concentrated urine passed in the morning, or by such as have an excessive action of the skin or in whom the respiratory exhalations are greater, thus relieving the blood of much of the watery excretion which is usually passed by way of the kidney. The normal coloring-matter of the blood is urobilin, which is formed indirectly in the liver from hæmoglobin. The urine undergoes change in color following the use of certain drugs: *e.g.*, rhubarb, a deep yellow; santonin, golden yellow; senna, brownish; carbolic acid, tar, or creasote, brown or black. Blood will

color the urine red, or, where it is disintegrated, give it a brownish or porter-colored appearance. In jaundice the biliary matters give rise to various tints, from dark yellow to brown or green. Pus or fat will impart to it a creamy color. Diabetic urine has a characteristic light greenish color.

Reaction.—The reaction of normal urine is acid, caused by the presence of the acid phosphate of sodium. Some time after being voided the contained mucus and organic constituents decompose, and, acting upon the urea as a ferment, cause the production of carbonate of ammonium, which gives to the urine an alkaline reaction and an ammoniacal odor. It is important to discriminate between urine rendered alkaline by decomposition after being voided and that which decomposes in the bladder.

The vegetable and mineral acids will make the urine more acid. The urine voided several hours after meals is often found to be alkaline, for which circumstance several theories have been advanced, the most probable of which is that of Roberts, who believes that it is due to an admixture with the blood of the alkaline elements of food, which are largely in excess of other elements.

Specific Gravity.—The specific gravity varies in health from 1015 to 1025. It may in *urina potus* be as low as 1005, or less, in healthy persons, while in warm weather and when there is a free action of the skin it may be as high as 1028, or even 1030, in which case the urine will be small in amount. It will depend greatly upon the amount of fluid ingested, heart-pressure, mental emotion, condition of the stomach, or activity of the bowels. The specific gravity of the urine is of great importance, both for the diagnosis and for the prognosis in disease of the kidney. We may look for a pathological condition when the specific gravity is low and the urine small in amount, as in

tubulitis, or when it is high and the amount voided is large, as in diabetes mellitus.

To make the specific gravity of value in diagnosis, it will be necessary to take that of a specimen from a collection of urine for the whole twenty-four hours.

Quantity.—The average amount of urine passed in twenty-four hours is about fifty ounces, but varies with the activity of the skin and bowels and the amount of fluid ingested. Pathologically, the amount of urine is generally increased in diabetes, in hysterical or other nervous conditions, in waxy and cirrhotic kidney, and in cardiac hypertrophy, which increases the blood-pressure. The quantity is also increased by diuretic substances, as urea, sugar, and certain other salts. Towards the close of nearly every case of nephritis there is diminished secretion; and when the diminution in amount is accompanied with a low specific gravity, it means a diminished excretion of urea.

Odor.—The odor, which has been described as sweetish or aromatic, varies in intensity with the amount of concentration of the urine. When decomposed it has an ammoniacal odor. Certain drugs impart to the urine characteristic odors, as do also certain vegetables. Turpentine gives it the odor of violets; cubebs, copaiba, and sandal-wood oil impart to it the odor peculiar to themselves, as does also asparagus.

CHEMICAL COMPOSITION.

The following table, copied from Hoffman and Ultzmann, gives the principal solid constituents of normal urine and the average quantity excreted:

	Grammes.	Per Cent.
Solids	60 —70	4.3 —4.6
Urea	30 —40	2.5 —3.2
Uric acid	.4— .8	.03 — .05
Chlorides	10 —13	.7 — .8
Kreatinine	.5 — 1.0	.036 — .062
Hippuric acid	.3— 1.	.02 — .06
Earthy phosphates	.9— 1.3	.07 — .08
Phosphoric acid	2.5 — 3.5	.09 — .22
Sulphuric acid	1.5— 2.5	.16 — .17

From the above table we see that the most important of the solids—that is, those excreted in greatest quantity—are urea and chlorides, the others being so small in quantity that their presence or absence has but little effect upon the specific gravity of the urine.

ORGANIC CONSTITUENTS.

Urea is the most important, being passed in largest amount of any of the solids, and its absence indicating grave disturbance of the general economy. The amount of urea passed in twenty-four hours varies, according to exercise, food, occupation, etc., from two hundred and fifty to five hundred and fifty grains. Depending as it does upon the activity of the liver and the amount of tissue-waste, it will vary with the amount of nitrogenous food ingested.

It is increased—

1. When much nitrogenous food is taken.

2. In conditions of the liver in which there is increased activity.

3. In the early stages of diseases in which there is increased activity of cells.

4. Where hard muscular work is performed.

5. Fevers. (It is a question whether in cases of fevers it is due to increased metamorphosis, or to changes in the food from failure to assimilate at so high a temperature).

6. In diabetes mellitus and diabetes insipidus.

Diminution.—Two causes operate in bringing about failure to produce the normal amount of urea: either there is diminished formation in the liver, or there is diminished excretion in the kidney.

1. Where the patient is at rest, on milk diet, or fasting.

2. Where there is a sluggish condition or a functional disturbance of the liver.

3. Where there is disease of the kidney interfering with excretion.

Bright's disease could not be diagnosed from the amount of urea excreted, but, knowing the disease to be present, a diminished excretion of urea would corroborate the diagnosis, and the amount excreted would give some idea of the extent of kidney involved. If you know that the liver and other tissues are healthy and find the normal amount of urea present, you may be certain that the disease of the kidney is not very extensive.

4. In chronic diseases where tissue-change is impaired.

5. In chlorosis and other anæmias.

Of late the subject of the absolute and relative amount of urea and chlorides present in the urine in cancer of the stomach has received considerable attention. There has not been a sufficient number of examinations as yet to establish a rule for diagnosis; but it would seem according to Bouveret that the urea is increased and the chlorides are diminished in cancer of the stomach.

Considering the normal proportion of urea to the chlorides to be as 2 to 1, Bouveret of Lyons found in cancer of the stomach the relative ratio to be 23 to 1; that is, 55 parts of urea to 2.4 parts of chlorides; but Rommelorâire of Brussels, who has given the subject considerable attention, assumes the normal amount of urea to be twenty-five grammes, and finds that when it is reduced to ten grammes

per diem in a case of gastric disease it may be safely considered cancerous. It will probably be found to depend upon the amount of vomiting. When this is excessive the chlorides will naturally be diminished. The subject deserves careful study.

Uric Acid and Urates.—Any increase in the amount present of these constituents is usually due to the same condition that causes a diminution of urea. They are simply urea imperfectly oxygenized. Uric acid is rarely excreted free, being generally in combination with potassium, sodium, and ammonium, and also with magnesium and calcium, forming what are known as the mixed urates. We find an increase in uric acid or urates from increased ingestion of nitrogenous food, where too much work is thrown on the digestive system, the food being poorly digested in the stomach and the liver being unable to perform its work. In other words, it means an imperfect oxidation of nitrogenous food. We find this in gouty patients, in chronic bronchitis, where there is obstruction to the venous system and passive congestion of the liver, in heart-disease, and where cutaneous respiration is diminished, also in the insane.

Besides the above constituents the urine contains small quantities of hippuric acid, which is formed in the body from proteids; kreatinine, derived from muscle-kreatin, increased in fevers, pneumonia, etc., and diminished in anæmia and wasting diseases; and xanthin: all of which are simply less completely oxidized products of tissue-changes than urea.

INORGANIC CONSTITUENTS.

Of the inorganic constituents the most important are—

1. *The Chlorides.*—The chlorides in human urine consist almost exclusively of chloride of sodium with a very

small amount of chloride of potassium. Chloride of sodium forms about one-fourth of the total solids of healthy urine and gives the salt taste to the secretion.

It is increased in Bright's disease, in diabetes, and either before or after paroxysms of fever. It is diminished when the body is at rest, and in pneumonia and acute febrile diseases, especially those accompanied by serous exudations or watery passages.

2. *The Phosphates* are of two varieties, the earthy and the alkaline phosphates. The earthy phosphates are those of calcium and magnesium. In acid urine the phosphates are held in solution, but they are deposited as sediment from an alkaline urine.

A diminution of the earthy phosphates is observed in diseases of the kidneys. They are increased in diseases of bone, osteomalacia and rickets, in chronic rheumatic arthritis, in diseases of the nerve-centres, and after great mental strain. Food and drink, the latter especially, increase the phosphates.

The alkaline phosphates are represented principally by acid phosphate of sodium and acid phosphate of potassium. The former is the supposed cause of acid reaction of the urine. The amount is influenced chiefly by the food, whence they are for the most part derived, a small part being doubtless derived from the disintegration of nervous and muscular tissues, so that inflammation, fevers, or any increased activity of the vital processes would favor the elimination of a greater amount.

The other inorganic constituents are of so little clinical importance that we shall consume no further time in their consideration, referring you to the works of Beale, Tyson, Roberts, and others upon the subject.

URINARY DEPOSITS OR SEDIMENTS.

Urinary deposits are divided into two classes, the *inorganic* and the *organic*. The *inorganic* deposits are those elements which form part of the normal urinary constituents, but which by reason of some change in the urine, or of an excessive increase in their quantity, become insoluble and are precipitated. The *organic* deposits consist of organic substances which under normal conditions do not exist in the urine, and which when present there are merely held in suspension.

The following table, quoted from Tyson, embraces both varieties:

Inorganic Deposits.

I. Uric acid (crystalline).

II. Uric acid compounds.
- *a.* Acid sodium urate (amorphous, occasionally crystalline).
- *b.* Acid potassium urate (amorphous).
- *c.* Acid calcium urate (amorphous).
- *d.* Acid ammonium urate (crystalline).

III. Oxalate of lime (crystalline).

IV. Earthy phosphates
- *a.* Ammonio-magnesium phosphate (crystalline).
- *b.* Calcium phosphate (amorphous and crystalline).

V. Calcium carbonate (crystalline).

VI. Calcium sulphate (crystalline).

VII. Leucin and tyrosin (crystalline).

VIII. Cystin (crystalline).

Organic Deposits.

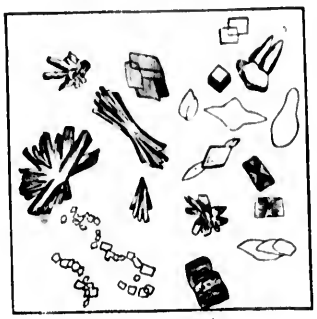
I. Mucus and pus.
II. Epithelium.
III. Blood.
IV. Casts.
V. Spermatozoids.
VI. Fungi and infusoria.
VII. Elements of morbid growth.
VIII. Entozoa.

INORGANIC DEPOSITS.

Uric Acid when deposited as a sediment takes the form of orange-red crystals. Unless deposited within a few hours after the voiding of the urine, it is of little clinical

significance, as healthy urine will deposit uric acid (Fig. 4) if allowed to reach the stage of acid fermentation. The disease in which its presence in large quantities is characteristic is gout; and of its relation to the subject now under consideration I would say that the chief danger to be apprehended from its presence in large quantities is

FIG. 4.



Uric acid crystals.

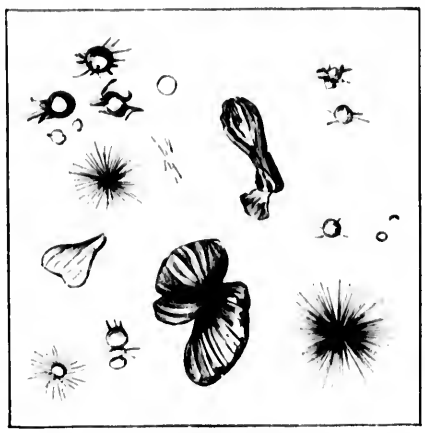
not so much in the amount excreted as in the effect of the retained crystals on the kidney-tissue, clogging up the tubules and producing irritation in the intertubular tissue, thus laying the foundation for a chronic interstitial nephritis. Therefore if we observe a very rapid deposit of uric acid we apprehend the same to be occurring in the kidney-tissue or some part of the urinary tract, either producing irritation or forming a nidus for urinary calculus.

Uric acid crystals are always of dark color, and have an infinite variety of form, the typical shapes being those of a four-sided rhomb and a six-sided plate. They also appear in aggregations as rosettes, in spear-, fan-, and comb-shapes, etc. The dumb-bells of uric acid may be distinguished from those of oxalate of lime by their dark color,

larger size, and ready solubility in alkalies. We often find in the diapers of new-born infants red, gritty deposits of uric acid and urates, the passage of which gives them much pain.

Uric Acid Compounds.—The urates of the alkalies are generally deposited in the urine as an amorphous powder, varying in color from the brick-dust or "lateritious" deposit to an almost white sediment, the color depending

FIG. 5.



Urate of sodium.

upon the density and color of the urine from which it is deposited. This sediment may be found in the urine of healthy persons, where it is of a high density, acid reaction, and low temperature, as after profuse sweating or in very cold weather. Pathologically we find the deposit occurring most frequently in febrile conditions.

Heat will dissipate any cloudiness or deposit of urates.

Under the microscope the urates appear as small granules.

Sodium urate occurs in granular, sometimes crystalline, deposits, or may assume a larger size, forming spherules with or without spicule.

Potassium urate (acid) is amorphous, and appears with the mixed urates.

Calcium urate (acid) occurs seldom, and in small quantities, as a white amorphous powder.

Ammonium urate (acid) is found in connection with amorphous earthy phosphates and crystals of triple phosphates. It is the only urate found in alkaline urine. The ammonium urate is crystalline, and under the microscope presents itself in the shape of a smooth "thorn-apple" spherule.

Oxalate of Lime.—There are several theories regarding

Fig. 6.

Oxalate of lime crystals.

the formation of oxalate of lime. Of the truth of one of these theories there is no doubt,—viz., that the kidneys secrete oxalic acid, which, by its affinity for the lime contained in the urine, causes the formation of

oxalate of lime crystals. Other authors contend that oxalate of lime is derived from a decomposition of uric acid and urates.

Oxalate of lime crystals appear in acid urine only. Their shape is very characteristic. Two forms are met,—the octahedra and the dumb-bell crystals. The octahedra are flat, refract the light, and sometimes appear as mere points, while at other times they assume the envelope shape. The clinical significance of the oxalate of lime crystals is almost identical with that of the appearance of urates in the urine; but when the dumb-bell forms are met we should bear in mind the fact that they are inclined to accumulate in the tubuli uriniferi and form calculi.

Earthy Phosphates.—The amorphous earthy phosphates are frequently found in urine that is alkaline, or that has undergone ammoniacal decomposition, as a grayish-white

FIG. 7.

Ammonium phosphates.

sediment. Any cause which occasions alkalinity of the urine may produce this sediment. The crystallized phos-

phate of calcium is found in pale, faintly-acid urine, and has no special pathological significance.

Calcium Carbonate is a rare deposit in human urine, but is found abundantly in that of the horse.

Calcium Sulphate is also a rare urinary sediment, and of no special significance.

Leucin and *Tyrosin* are crystalline deposits found in urine which is loaded with biliary coloring-matters, and are indicative of grave diseases of the liver, as acute yellow atrophy and phosphorus poisoning.

Cystin is a rare urinary sediment, which develops an odor of sulphuretted hydrogen as well as of ammonia in decomposed urine.

ORGANIC DEPOSITS.

Mucus and Pus.—Mucus exists in very small quantity in healthy urine. It forms a faint flocculent cloud which settles toward the lower part of the fluid after the specimen has been allowed to stand some time, and is composed of epithelial cells, round granular bodies called mucus-corpuscles, and a fluid portion, the *liquor mucí*. When mucus is present in large amount it denotes some disturbance in the urinary tract, and when the degree of disturbance increases the character of the deposit changes, and pus will be present.

It is impossible in the transition-stage to distinguish between mucus-corpuscles and pus-corpuscles, but in the later stages the pus-corpuscles will be observed to be more abundantly supplied with nuclei than the mucus-corpuscles. So long, however, as urine containing mucus is without albumen, so long may pus be said to be absent, as mucus itself contains no albumen, while pus always does.

Urine containing pus is turbid and milky when voided, and after standing awhile deposits a dense yellowish-

white sediment. When the urine is alkaline the pus coheres into a viscid, tenacious mass which can be drawn out into long, tough strings. Beale mentions the fact that pus is frequently met with in the urine of persons past the middle period of life whose general health is good. It should not be forgotten that in females pus is apt to appear in the urine from leucorrhœa or other purulent discharge from the vagina.

Where the albumen contained in purulent urine is large in amount, it will be well to look closely for renal casts.

Blood.—Urine containing blood from any part of the urinary tract will always contain albumen. The urine is usually smoky when the blood is derived from the kidney, unless there is a free hemorrhage; when the blood is derived from the bladder the urine is often of a bright red color, or the blood comes in clots. When the hemorrhage is from the urethra, it either precedes or follows the flow of urine.

Blood is usually deposited from the urine as a reddish-brown sediment. The color of the globules differs according to the reaction of the urine, being of a brighter red when the urine is neutral or alkaline, and dark or brownish where it is acid. Examination by the microscope is the surest method of diagnosis; although in urine of low specific gravity and in ammoniacal urine the corpuscles disappear very rapidly. It will be seen that the corpuscles do not run into rouleaux, as they do when drawn directly from the blood-vessels, but appear distinct and separate. Where the urine is dilute, the corpuscles expand from imbibition and appear as delicate circles without visible contents; where it is more concentrated, they are small and preserve more of their biconcave contour, and at times are shrunken and misshapen.

Casts.—The subject of casts is fully discussed in the following chapter.

Spermatozoids frequently occur in the sediment of the urine of healthy men. When abundant they form a slight flocculent cloud in the urine, but generally there is nothing in the appearance of the urine which would lead to a suspicion of their presence, and they must be diagnosed by the microscope.

Fungi and Infusoria.—Most of the living organisms found in decomposing urine which were formerly looked upon as of animal origin are now acknowledged to be vegetable in their nature, and are usually fungi. The most frequent among them are bacteria, penicillum glaucum, and yeast-fungus. Sarcinæ are met with occasionally.

Elements of Morbid Growths.—These are seldom met in the urine. Cells or fragments of a growth may be found, but it must be remembered that almost every shape of cell may arise from the cells of the bladder during inflammation or irritation. Fragments of cancerous growth that find their way into the urine are generally of the villous variety, and may show the capillary vessels that make up the villus.

Entozoa.—Entozoa are seldom found in the urine in this climate. There have been several instances in which echinococcus cysts and hooklets were observed.

Dr. John Harley found in the urine of several patients suffering with the endemic hæmaturia of the Cape of Good Hope the eggs and ciliated embryos of the Bilharzia hæmatobium.

The filaria sanguinis hominis, the parasite which has been shown to have so intimate an association with chyluria, is sometimes found in the urine.

Distoma hæmatobium has been found in the bladder ureters, and pelvis of the kidney, especially in Egypt.

CHAPTER IX.

CASTS OF THE URINIFEROUS TUBULES.

THE presence of casts in the urine was first observed by Vogla in 1837–38; Simon of Berlin also described casts in his "Medical Chemistry" in 1842; Rayor mentions them as early as 1838; but none of these observers made any attempt to explain their origin, structure, or significance.

Heller appears to have been the first to offer an explanation of their origin, but he also failed to appreciate their import, a careful study of which is a matter of recent date.

Beale, Johnson, Dickinson, Gull, Grainger Stewart, and many French and German writers have given the origin and diagnostic value of urinary tube-casts careful attention, as also have Millard and other American writers.

Meyer says, "The casts are products of an albuminous exudation from the blood-vessels plus the swollen and destroyed epithelium."

Charcot is of opinion that some casts are composed of broken-down epithelial cells, and others of albuminous substance, while epithelial casts consist of epithelial cells more or less altered.

Cornil believes that casts are the result of a pathological secretion from the cells of the convoluted tubes, which obtain the material for exudation from the neighboring capillaries, and that the epithelium is desquamated in the straight tubes only.

Millard's theory, that casts are invariably an albuminous exudate into the tubules from the surrounding

capillaries which saturates, distends, and leads to partial or entire destruction of the epithelium, appears to me to be the one most worthy of acceptance.

Casts may originate in any part of the uriniferous tubules, and may even be found in the Malpighian bodies Some writers state that most casts are formed in the straight tubes; but, as the cast is an exudation from the blood-vessels, and as the cortical portion of the kidney is much more abundantly supplied with vessels than the pyramidal portion, it seems reasonable to suppose that the exudation is more likely to take place into the convoluted tubules of the cortex than into the straight tubes of the pyramids.

Casts range from $\frac{1}{1000}$ to $\frac{1}{1500}$ of an inch in diameter. Their shape is determined by the size and form of the tube from which they are derived.

They are the result of inflammatory exudation, with the exception of the blood-cast occasionally found in hyperæmia, either active or passive. It is usual to classify casts according to their structure; that is, epithelial, hyaline, granular, fatty, waxy, and blood casts.

Epithelial and blood casts occur in acute nephritis, and are the result of a fibrinous exudation containing a few blood-corpuscles, into the uriniferous tubules, desquamating and entangling their lining epithelium. Casts of coagulated blood sometimes occur in hyperæmia, either passive or active, and in hæmaturia.

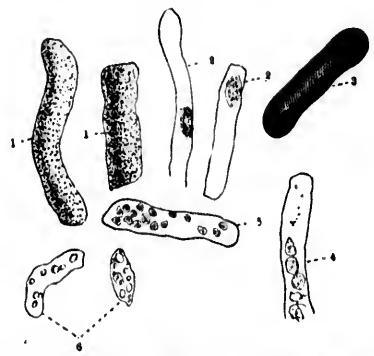
Hyaline casts are the result of an albuminous exudate into a tubule already devoid of epithelium.

The granular, hyaline, and waxy casts are more commonly found in intertubular and chronic tubular nephritis. A granular cast contains degenerated epithelium and blood-corpuscles. Fatty casts are simply the result of a further and fatty degeneration of the exudation and con-

tained epithelium, and may occur in either acute or chronic nephritis; while the waxy cast is a waxy or lardaceous degeneration of the same elements.

Robin is responsible for the statement that tube-casts are sometimes found in urine, the excretion of a perfectly

FIG. 8.



TUBE CASTS.—1, granular casts; 2, hyaline casts; 3, waxy casts; 4, epithelial casts; 5, blood casts; 6, fatty casts.

normal kidney. This view, however, is as doubtful as is the existence of physiological albuminuria.

CHAPTER X.

ALBUMEN.

As the presence of albumen in the urine is the characteristic feature of inflammatory diseases of the kidney, it will be well to refer briefly to it before proceeding to the consideration of those diseases. The views of the medical world as to the part that albumen plays as a symptom of

inflammatory disease of the kidneys have undergone much change of late years. After its discovery in dropsical diseases by Bright in 1825, it was thought to be pathognomonic of inflammation of the kidneys: but as the subject became better understood it was found that while albumen is nearly always present in the urine when the kidneys are inflamed, its presence may be detected under many circumstances that indicate merely functional derangement of the kidneys.

In fact, we now hear much on the subject of physiological albuminuria, but albumen in the urine is not considered physiological where it is in excess of one-thirtieth or one-fortieth of one per cent.

For myself, I do not believe that albumen ever exists in the urine with a perfectly normal condition of the kidneys and blood.

Albumen may, it is true, appear transiently after a hearty meal consisting of albuminous food,—eggs, for instance; after prolonged and excessive mental or physical exertion; in cases of overaction of the heart; during the prolonged severe chills of malarial fever; occasionally during the course of the acute infectious diseases; and it is not unusual in the course of an attack of pneumonia.

In any of these circumstances, however, it is not physiological albuminuria. The kidneys are probably in a hyperæmic condition, or the filtration of albumen may be due to a slight degeneration of the epithelia of the tuft or to a pathological condition of the blood; or, perchance, in some cases, albumen is secreted by the epithelium of the tubules. Now and then we meet with a patient who is enjoying apparently perfect health, but whose urine for years has never been long free from a trace of albumen. I have two such patients at the present time. It is impossible to say exactly upon what cause the presence of

albumen in these cases depends, but it does not require a very lively imagination to suppose that there is an abnormal or pathological condition of the epithelial lining of the tubules or tufts, or an abnormal condition of the blood or blood-vessels. I have known people to be in fairly good health for fifty years, with a pathological condition of the bronchial mucous membrane or a catarrhal cystitis. Many persons enjoy good health for years with atheromatous arteries.

Numerous theories have been advanced to explain the presence of albumen in the urine. Some believe that it is due entirely to a pathological condition of the blood; others attribute its presence to an altered condition of the vessel-walls or epithelium; while the theory of changes in the vascular tension as a cause has its adherents.

I believe, with Stewart, that normally the blood-pressure in the capillary loops and walls of the vessels, with their thin epithelial covering, is so balanced as to permit the transudation of fluid and yet prevent the passage of albumen.

Of the theories holding that albuminuria depends upon blood-changes, the most plausible is that which regards the excess of salts as the cause. Experiments have shown that when the salts in an albuminous solution are increased the albumen transudes more readily through animal membrane, and it is possible that this principle holds good as regards the blood also.

When the balance of pressure in the glomeruli is disturbed by increased heart-action, or when the vessel-walls or epithelium are diseased from inflammation or a pathological condition of the blood, as in scarlet fever, poisoning, venous stasis, blood glandular diseases, etc., we naturally expect the transudation of albumen to result.

In degeneration of the epithelium the presence of albumen in the urine is the result of two conditions.

First, here, as in other parts of the body, when inflammation is present there will be an albuminous exudate; secondly, as the result of desquamation of the epithelium and consequent changes in the basement membrane, there will be a free transudation of albumen from the vessels into the tubules.

TESTS FOR ALBUMEN.

In all instances where the urine to be tested is not perfectly clear, it should be filtered before applying the tests. This may be done in a few minutes by means of filtering-paper or absorbent cotton and a funnel. The most reliable tests for albumen are the heat test and the nitric acid test.

Heat Test.

A test-tube is filled to one-fourth or one-third of its depth with perfectly clear acid urine, and heat applied until boiling occurs. If turbidity results, it is due to the presence of albumen or of phosphates. If caused by the latter, the turbidity will disappear on the addition of a few drops of nitric or acetic acid; if by albumen, the turbidity will be permanent.

An excellent plan is to apply heat to the upper portion of the urine, when, by contrast with the clear urine below, the slightest cloudiness will become apparent.

Nitric Acid, or Heller's Test.

Upon a quantity of pure, colorless nitric acid in a small test-tube, allow to trickle down the sides of the tube, from a pipette, an equal amount of clear urine, which should overlie the acid, not mix with it. If albumen be present, at the point of contact between the urine and the nitric acid there will appear a sharply-defined white band or

zone, which will vary in thickness according to the quantity of albumen present. Urates or the resins might be mistaken for the white zone of albumen. The former is less distinct, with poorly-defined margins, resembling somewhat a cloud of smoke, and on examination will be seen to diffuse itself into the urine above. Heat will dissipate the cloud, while it will intensify the zone formed by albumen. If alcohol be added, the zone formed by the resins will disappear, while that of the albumen will become more marked.

FIG. 9.

Esbach's albumen meter.

Other tests in use are the pieric acid, sodium tungstate, potassio-mercuric iodide, etc., for further information concerning which I refer you to Tyson's, Beale's, Roberts's, and other excellent works on the practical examination of urine.

For the quantitative analysis of albumen the most convenient method, and a sufficiently accurate one, is that of Esbach. A tube graduated like that in Fig. 9 is to be employed. Dr. Esbach's test solution is prepared by dissolving ten grammes of pieric acid and twenty grammes of citric acid in nine hundred cubic centimetres of boiling distilled water, adding, when cold, sufficie .t water to make one litre.

The filtered acid urine is poured into the glass tube up to the mark *U*, and the reagent is added till the level of the liquid stands at *R*. Mix the liquids thoroughly, without shaking, by reversing the tube a dozen times; close with a cork, and allow it to stand twenty-four hours. The height at which the coagulum then stands, read off on the scale, will indicate the number of parts per thousand or grammes of albumen in

one litre. This divided by ten will give the percentage. If the amount of albumen be less than one-half gramme per litre, it cannot be accurately estimated by this method.

Pyuria—Pyoturia.

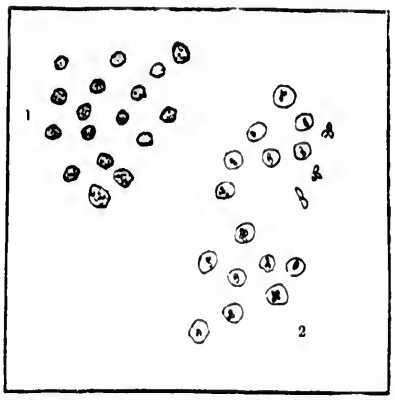
We use the term pyuria to indicate the presence of pus in the urine, regardless of the part of the urinary tract from which it is derived; just as we use the word hæmaturia to indicate the presence of blood in the urine. We have seen in studying the different diseases of the kidneys that pus appears in the urine under a great variety of conditions, and have considered the etiology and pathology of these conditions. Nevertheless, on account of the importance of the presence of pus in the urine as a matter of diagnosis and prognosis, it may be well for us now, under the head of pyuria, to epitomize the etiological circumstances and pathological conditions under which it appears.

Etiology.—In the kidney itself, pyelitis or ulceration, abscesses or tubercular kidney, and perinephritis where the abscess opens into the pelvis of the kidney, will cause pyuria. Ureteritis, cystitis, abscesses in the submucous tissue of the bladder, pericystitis or pelvic abscesses opening into the bladder, and urethritis, always give pus in the urine.

Diagnosis.—There will be no difficulty in diagnosing pus in the urine if the urine is alkaline from ammoniacal decomposition. Under such conditions the pus will cohere into a viscid, tenacious mass which can be drawn out in long strings. If the urine be acid, the pus-corpuscles will be distinct, and chemical and microscopical examinations will be necessary to determine the diagnosis. Urine that contains pus is always more or less turbid, the degree of turbidity depending upon the amount

of pus present. Absolutely clear urine does not contain pus. All turbid urine, however, does not necessarily contain pus. The turbidity may depend upon catarrhal mucus from the bladder or from the pelvis of the kidney; or it may be due to the presence of phosphates or urates. The turbidity caused by phosphates will disappear on the addition of an acid to the heated urine; that of urates will disappear on the application of heat alone. The turbidity of acid urine containing pus must increase on the application of heat alone, because of the coagulability of the albumen contained in the liquor puris.

FIG. 10.



1, Pus-corpuscles, fresh; 2, pus-corpuscles after the action of acetic acid.

Upon microscopical examination we detect the unmistakable presence of pus-corpuscles; but we must not forget, in examining urine for pus, that the pus-corpuscle is not always to be distinguished from the white blood-corpuscle or from the mucus-corpuscle. In catarrh of the bladder, however, no matter how numerous the mucus-

corpuscles are shown to be by the microscope, unless on chemical examination albumen, which is constantly present in liquor puris, is found, you may be certain that the urine contains no pus. Pus-serum differs in no respect from blood-serum, nor does pus-albumen differ from blood-albumen. Pus is never present in large quantity when due to pyelitis alone, and in this case the microscope may show the presence of epithelium peculiar to the pelvis of the kidney. There is not likely to be much enlargement or great tenderness, and there will be but slight fever.

In abscesses of the kidney or abscesses that have opened into the pelvis of the organ, unless they are quite small, pus is likely to be present in great quantity. In tubercular kidney, besides the enlargement and tenderness on pressure, there is almost a certainty of deposits in other organs, most probably the testicles, the bladder, or the lungs. The pus may be abundant, and yet may pass only intermittently with the urine, on account of the tubercular thickened ureter obstructing its continuous passage. In the mean time, the other kidney, if healthy, secretes normal urine. When tuberculosis of one kidney is suspected and the urine is clear, it should be examined for several consecutive days.

CHAPTER XI.

NEPHRITIS—BRIGHT'S DISEASE.

Before taking up the study of nephritis, Bright's disease, or so-called albuminuria, let us say a word about the nomenclature of inflammatory diseases of the kidneys.

The confusing nomenclature of the inflammatory dis-

cases of the kidneys is no doubt largely responsible for the hopelessly indefinite idea of the pathological condition which the term Bright's disease conveys.

On commencing the study of diseases of the kidneys the student usually finds himself entangled in the meshes of confusing terms,—such as desquamative nephritis, parenchymatous nephritis, tubular nephritis, tubulitis, tubal nephritis, glomerulo-nephritis, interstitial nephritis, intertubular nephritis, gouty kidney, cirrhosis, abscess of the kidney, amyloid degeneration, waxy kidney, lardaceous kidney, albuminuria, Bright's disease, renal disease, acute Bright's disease, chronic Bright's disease, catarrhal nephritis, croupous nephritis, morbus Brightii, acute diffuse nephritis, granular kidney, granular contracting kidney, diffuse interstitial nephritis, suppurative nephritis, nephritis vera, red granular atrophy, consecutive Bright's disease, etc.

It would be just as reasonable, and no more pernicious or confusing, to use the unqualified term lung fever for all diseases of the lungs, having no definite terms for bronchitis, capillary bronchitis, broncho-pneumonia, pneumonitis, or fibrous phthisis, as it would be to apply most of these terms indiscriminately to any and all inflammatory diseases of the kidneys.

We have a nephritis, as we have a pneumonitis, which involves in inflammation the entire organ, and in either case terminates in recovery, abscess, or chronic disease.

It is only necessary to bear in mind that for all practical purposes the kidneys are made up essentially of three tissues,—viz., blood-vessels, tubules, and interstitial or intertubular fibrous tissue. In one case the lesion is primarily and essentially an *interstitial nephritis*, whose pathological condition is the result of the hyperplasia of the fibrous interstitial tissue and its subsequent contraction.

Then there is the condition in which the primary lesion is in the tubules and tufts, and which is essentially a *tubulitis*; while *amyloid degeneration* is primarily a disease of the blood-vessels.

Thus, with an intelligent inquiry into the etiology and history of a case, a thorough examination of the other organs which necessarily become involved in each of these pathological conditions, and a careful analysis of the urine, we need have no more doubt about the pathological condition of the kidneys in any individual case of albuminuria than we have in any case of disease of the lungs after an exhaustive examination.

In the nomenclature of diseases of the kidneys, as in that of diseases of any other organ, it is best to use the term that will most nearly convey the pathological condition. In our study of inflammatory diseases of the kidneys we shall follow this course and confine ourselves to the terms *tubular nephritis*, acute, subacute, and chronic, to designate the inflammation that commences in, and primarily involves, the tubules and Malpighian corpuscles; *intertubular* or *interstitial nephritis* when the inflammation evidently begins in the interstitial or intertubular tissue; and *nephritis* when the whole organ is involved in the inflammation, just as we use the term pneumonitis when there is a hepatized condition of the lung.

For the disease which originates in the blood-vessels we shall use the ordinary designation of *amyloid degeneration*.

With this simple nomenclature, I am sure we shall be able to study and understand the inflammatory diseases of the kidneys, or so-called Bright's disease.

CHAPTER XII.

TUBULAR NEPHRITIS—TUBULITIS—TUBAL NEPHRITIS—DESQUAMATIVE — CATARRHAL — CROUPOUS — ACUTE — SUBACUTE—CHRONIC.

Acute tubular nephritis may be defined as an acute inflammation of the tubules and Malpighian corpuscles of the kidney.

Etiology.—Injuries, such as blows, falls, or wounds, are not infrequently the cause of acute tubular nephritis, as are also the acute infectious diseases, more particularly scarlet fever, diphtheria, cholera, and erysipelas. In addition to these, there is that mysterious etiological factor which operates we know not how,—viz., catching cold.

Suppression of the action of the skin is a frequent cause, as, for instance, lying on the cold ground after excessive physical exertion, or exposure to draughts while perspiring, as is the case with bakers, firemen, and moulders, and particularly in those addicted to the use of alcoholic liquors.

Pyæmia is responsible for some cases; and a constant source of acute tubular nephritis is pregnancy.

Inflammation may invade the kidney from other organs; for instance, the right kidney from hepatitis. Perinephritis may be the primary trouble, or a cystitis may involve the ureter and extend to the kidneys.

At times, when very hard pushed, we may be compelled to fall back on our old friend "idiopathic."

Age is a factor in the etiology. The great majority of cases occur between the ages of fifteen and forty. It is rare in children except as an accompaniment or sequela

of the acute infectious diseases, and is not frequent after forty, except in the intemperate or in septic conditions and erysipelas. Males are more subject to it than females, owing both to their habits and to their occupations. In impairment of the function of the liver the elimination of bile, biliary salts, and elements the result of incomplete tissue-metamorphosis not infrequently provokes a tubular nephritis. This may occur also where the kidney is called upon to eliminate sugar.

Acute tubular nephritis is met with in all climates, but more frequently in the cold, damp months of the year than in the warm summer months. Syphilis is responsible for some cases. Tyson has been quoted as saying that mental anxiety resulting from grief or from business or financial embarrassments may cause Bright's disease.

That any man broken down by cares and anxiety might develop Bright's disease is not surprising, nor is it unusual or strange that mental anxiety should be the remote cause of disease of any organ. The same cause will produce different diseases in different individuals according to their respective diatheses.

Only a few years ago Dr. Semmola, of Naples, advanced the theory that nephritis is a blood-disease, and that the primary cause of every case of albuminuria is in the blood. That it is the pathological chemical condition of the blood which irritates and inflames the tubules is true; but if this morbid condition is produced by the suppression of the functions of the skin or the liver, I do not see how the blood condition can be called the primary cause. I believe it was Dr. C. Letzerich who, several years ago, first described bacteriological nephritis. He had, one season, a large number of cases of nephritis in children, none of whom had had an acute infectious disease. They all exhibited similar symptoms, and in every case he found the

same bacteria in the urine. Dr. Letzerich, if I remember rightly, looked upon the disease in these cases as an endemic condition, the particular bacteria having gained access to the blood through the medium of drinking-water.

It has long been noticed that a slight amount of albumen often occurs in the urine during an attack of erysipelas; while in many instances it is accompanied by a more or less severe attack of acute tubular nephritis.

Moulin in his recent work on surgery instances Bright's disease as an etiological factor in erysipelas. To be sure, gouty people with cirrhosis of the kidney often contract erysipelas, but in the many combined cases of erysipelas and acute tubular nephritis that have come under my notice I have always considered the former the cause of the latter, either as the direct result of the presence of the *Streptococcus erysipelatosus* in the blood-vessels of the kidney, or indirectly from the chemical condition of the blood due to ptomaines. The bacteriological etiology of tubulitis, however, will, I am fully convinced, be found to apply equally well to the nephritic inflammation that accompanies or follows any of the other acute infectious diseases. Aside from the micro-organisms of the acute infectious diseases, whether special nephritic bacteria will ever be discovered is a matter for the future to decide.

The etiology of the tubular nephritis accompanying pregnancy is obscure. Some writers consider the pressure of the gravid uterus upon the kidney responsible for the trouble. I have seen nephritis and dropsy as early as the third or fourth month, certainly before the uterus had attained a size sufficient to exert any pressure upon the kidney, thus leaving us to look for other causes to account for the inflammation.

Other writers have suggested the possibility of the in-

flammation being the result of passive congestion from pressure of the gravid uterus on the renal veins, thus preventing the return of blood. Again, the theory has been advanced that pressure upon the ureters may be an etiological factor. Exactly how obstruction of the ureters could disarrange the kidney without producing nephrosis and great pain from pelvic distention it is difficult to comprehend.

A more plausible theory is the one which suggests that pressure upon the iliac arteries or the abdominal aorta, by producing an intense hyperæmia of the kidney, causes the albuminuria. We must not forget that in some cases of albuminuria during pregnancy there is a possibility of nephritis having been present before the women became pregnant; and this suggestion is, I believe, strengthened by the pathology, as we occasionally find in cases of women who have died in puerperal convulsions the small white kidney or the atrophied white kidney of chronic tubular nephritis.

It is not possible that the kidney could undergo such changes in so short a time; and hence it is almost certain that in these few cases, at least, the women had albuminuria before they became pregnant. If the women were not primiparæ they had probably had albumen with their previous pregnancies, and the kidneys had failed to recover themselves during the interim.

Though there is no absolute proof of the hypothesis, the strong probabilities are that puerperal nephritis is generally, if not always, the result of the profound blood-changes that occur during pregnancy, especially the increase of extractive matters with the general increased heart-pressure during this state.

Etiology of Subacute Tubular Nephritis.—The etiology of subacute tubular nephritis differs in no way from that of

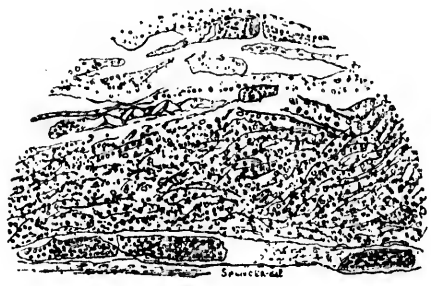
the acute form. It is only in the clinical history that we find a difference, it being more insidious in its invasion.

A large number of cases are associated with cirrhosis of the liver or with any form of chronic hepatic disease which disturbs the function of the liver.

Etiology of Chronic Tubular Nephritis.—Chronic tubulitis is simply the result of acute or subacute tubulitis.

Pathology.—In acute tubular nephritis we find a large, smooth kidney, in most cases red in color, the enlargement confined chiefly to the cortex. The capsule is easily detached. The microscope reveals the fact that the pathological change, except the hyperæmia and the serous exudation, is confined entirely to the epithelium lining the tubules and Malpighian corpuscles, with more or less involvement of the endothelium.

Fig. 11.



The epithelium will be cloudy and swollen, from the absorption of the exuded albuminous fluid, and may be granular, from the infiltration of oil-globules and detritus partly exuded from the blood-vessels and partly the result of destruction of the epithelial protoplasm itself.

In a more advanced stage the epithelium has a coarser,

more granular appearance, containing larger fat-globules; while in the later stages the protoplasm is entirely destroyed and its place occupied by the fat-globules.

The tubes are filled with casts of the epithelium in different stages of degeneration, while in more advanced cases some of the tubules will be found empty. The stroma is not involved, and the blood-vessels remain unchanged.

Subacute.—In subacute tubular nephritis we often have a light-colored or the so-called white kidney. The capsule strips easily. The epithelium is swollen and granular, and many tubes are empty.

Chronic.—The kidney of chronic tubular nephritis is very large, whence it is usually called the large white kidney. The capsule is easily detached, the cortex is much enlarged, the endothelial cells are swollen, and most of the epithelium is desquamated. The casts found in the tubes and urine are of the hyaline variety. An exception in size is apt to occur in the chronic tubular nephritis of the intemperate. The kidney is often small in size and red in color, the reduced size of the organ being the result of an atrophy, not of a contraction. Where the disease is of long duration there is a slight thickening of the interstitial tissue and of Bowman's capsule.

Symptoms.—Acute tubular nephritis is generally ushered in by a chill or recurrent chills, which may not be very severe, followed by fever, the temperature not likely to be over 102° or 103° F., and accompanied by heavy aching pains in the back, which extend around the groin and often down the ureters. There is frequent micturition, with the passage of a small quantity of urine. The urine is high-colored, of high specific gravity, and contains albumen, a lessened quantity of urea, and sometimes blood-corpuscles. The patient is usually troubled with

nausea and vomiting, and is seldom without severe headache. This condition may last for two or three days, when the urine increases in quantity, becomes of lower specific gravity, the blood disappears, the pains cease, the temperature falls to 100°, vomiting diminishes or ceases, and the headache subsides.

Vomiting is a frequent symptom in albuminuria, and its severity often seems to be in direct relation to the oliguria. This well-known tendency to vomiting in nephritis is often attributed by writers to reflex action. It is most probably due to one of two causes, or in some cases perhaps to both: first, to the fact that the gastric secretions are deficient especially in free hydrochloric acid, in consequence of which the food fails to be digested, and produces irritation, pain, and vomiting; secondly, to the elimination by the mucous membrane of the stomach and bowels of waste material which should be eliminated by the kidneys, just as in gout patients so frequently suffer from severe attacks of vomiting, diarrhœa, bronchitis, asthma, or cystorrhœa.

In the latter of these cases it is no doubt owing to the elimination of urate of sodium by the respective mucous membranes.

Anæmia, we have seen, is one of the characteristic features of acute tubular nephritis. Whether it depends upon deficiency of digestion and assimilation, or whether the diminished gastric secretion is owing to the anæmia, is a question of importance. The anæmia of acute tubular nephritis is probably a primary condition of the blood, and the diminished gastric secretion the result.

For some not very readily explained reason, we often have, accompanying these symptoms, œdema about the face, particularly under the eyes, and after a few days the œdema may also appear about the ankles.

In other cases, while the headache in a measure subsides and the vomiting ceases, the urine increases in quantity, becomes lower in specific gravity, and the blood disappears, but the albumen increases. The patient becomes rapidly anæmic, and there will be dropsy of the lower extremities. The condition may remain thus for several weeks or months, and disappear entirely, or the dropsy may steadily increase, the amount of albumen continuing about the same, while careful examination by the microscope will reveal tube-casts in abundance of the epithelial, granular, and fatty varieties. The patient becomes gradually more anæmic, or rather the blood may be said to be in a hydræmic condition.

With dropsy of the lower extremities there may be œdema of the whole cellular tissue, or general anasarca, with effusion or accumulation of fluid in the serous cavities, especially ascites.

At any stage of the disease when dropsy has become evident, a fatal termination may occur from œdema glottidis, œdema of the lungs, or effusion into the pleural cavity or the pericardium; and when so-called uræmic poisoning, convulsions, or coma occur in this form of Bright's disease, it may be due to œdema of the brain or effusion into the ventricles or subarachnoid.

There is seldom disturbance of vision, albuminoid retinitis, or epistaxis in this form of Bright's disease. In the few cases where dimness of vision occurs it is due to interference with the optic centres, and not to any lesion of the optic nerves or the retina.

On the other hand, the patients are very subject to pericarditis or endocarditis, and pneumonia.

Symptoms of Subacute Tubulitis.—The symptoms in what I propose to describe as subacute tubulitis differ from those of the acute form principally in the first stages; for in-

stance, it is not ushered in by chills, there is no fever, there are no aching pains about the loins, and there may be neither nausea nor vomiting for weeks. I have had several such patients, believing themselves perfectly well, who have presented themselves for examination for life-insurance. Upon examining the urine, a large quantity of albumen is found to be present. On careful inquiry one may elicit the fact, which the individual had not noticed, that micturition has been a little more frequent than formerly. If the microscope in such cases shows tube-casts, epithelial and granular, or if the quantity of albumen is too great to be accounted for by the so-called physiological albuminuria, these patients will, within from six to twelve months, become anæmic and dropsical. In fact, the later symptoms of acute tubular nephritis will become evident here.

Many of these patients consult the physician for headache, and perhaps for nausea or indigestion. They may tell him that they have consulted several physicians, whose prescriptions have failed to give them relief. If these symptoms are of several months' standing, the patient may also complain of some dyspnœa or weakness, and there will be more or less anorexia, but no complaint peculiar to the urinary organs.

Careful examination and inquiry may, in these cases, again elicit the fact which the patients had failed to notice, that micturition has been of late somewhat more frequent than usual, they probably getting up once during the night to empty the bladder. Such patients seldom, however, fail to exhibit a peculiar cachexia, which I have been in the habit of calling the "kidney expression." It is not the smoky, dusky look of pneumonia, nor the cyanotic appearance caused by valvular insufficiency, but a puffy, doughy appearance peculiar to these cases. The

urine, on examination, invariably shows the presence of a large amount of albumen, with the usual casts. In a few months, should the case progress unfavorably, there will be dropsy, anasarca, ascites, and perhaps œdema of the lungs or effusion into the pleural cavity, as we have already seen, differing in no way from the later stages of the acute form.

Symptoms of Chronic Tubular Nephritis.—There is no well-marked line of demarcation that enables us to determine when an acute or a subacute tubular nephritis becomes a chronic tubular nephritis. A large number of the acute cases either entirely recover or die within from three to six months. Those which are of five or six months' standing, and are still unaccompanied by extreme anasarca, I usually designate as cases of chronic tubular nephritis.

Many of these cases live for one or two years, and occasionally a case of evident tubular nephritis may live even longer. In such cases there is probably some intertubular involvement, and they might properly be called cases of peri-tubular nephritis. It is evident that these cases do not differ so much in their symptoms as in the duration of the attack.

Dropsy.—Dropsy is so constant a condition in the acute inflammatory diseases of the kidney that it deserves more than a passing notice.

When we have dropsy of the lower extremities and ascites from portal obstruction, as in cirrhosis or cancer of the liver, the dropsy is due to collateral blood-pressure in the veins, while the dropsy of Bright's disease is due rather to a pathogenic condition of the blood or blood-vessels brought about by the elimination of albumen or the retention of uric acid, etc.

The escape of serum from the blood-vessels into the

cellular tissue is a transudation, a mere physical or mechanical process, which takes place from the capillaries into the interstices of the cellular tissue faster than it can be taken up by the veins and lymphatics; differing entirely from the exudation of inflammation, which is a vital process, the escaped fluid being capable of organization.

Whatever the pathological condition of the blood, it is clearly not a mere anæmia or hydræmia.

Dropsy is often a symptom of diseases of nutrition and the blood glandular organs, but it is never present in the extreme degree in which we find it in these cases.

A peculiarity of the dropsy of Bright's disease is its tendency to shift about, a circumstance that is difficult to understand. With the exception of the peritoneal cavity, all the serous cavities are more likely to fill in Bright's than in any other disease.

Frequently, in Bright's, we find the dropsy depending apparently upon the secretion of urine. When the urine is scanty the dropsy develops more rapidly, disappearing in a measure when the kidneys act freely. However, at other times there may be extreme dropsy with a free secretion of urine.

The condition of the arteries in acute Bright's has not received from microscopists and histologists the attention the subject deserves.

No ambitious student of medicine need feel discouraged. There are plenty of discoveries yet to be made in every department of medicine, especially in the etiology and pathology of disease.

Prognosis.—Time was when the prognosis of albuminuria generally was held to be much more hopeless than at present. The name Bright's disease has a great terror for the laity. I am surprised, in the light of my

own experience, that so large a number of medical men should still take the same view of this disease.

I have not kept notes of every case of tubular nephritis, but I feel justified in making the assertion that more than fifty per cent. of such cases end in recovery, while many of those who die do so from complications, chief among which are pneumonia, endocarditis, and pericarditis. Of those whose death may be said to be the direct result of tubular nephritis, acute, subacute, or chronic, some die of œdema of the lungs or of the glottis, effusions into the serous cavities, so-called uræmic poisoning, or apparent exhaustion from the hydræmic condition of the blood.

TREATMENT.—When we are called upon to treat a case of acute tubular nephritis, the patient is found with fever, perhaps nausea and vomiting, pain, uneasiness, and distress in the lumbar region, with frequent and probably painful micturition. He may be voiding only a drachm or two of high-colored bloody urine of high specific gravity.

The indications, of course, would be to relieve the patient's distress and restore the functions of the kidney; but we have no specific in medicine that will accomplish this. We can, however, in a measure, relieve the patient's distress, and appeal to the skin and bowels to assist in doing the suspended work of the kidneys.

Absolute rest is to be enjoined, with the simplest diet, consisting of milk and water or rice-water. Dry-cups may be applied over the region of the kidneys, also hot or cold applications, whichever is more agreeable to the patient.

The bowels should be kept freely open by a saline cathartic, and diaphoresis should be insured.

As for restoring the functions of the kidneys, some advise diuretics, while others advocate the securing as nearly as possible of complete physiological rest for the kidneys.

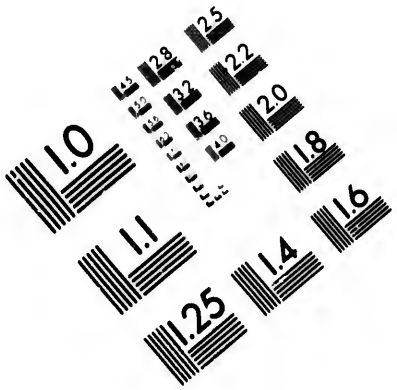
I believe the true course lies between these two extremes; that is, between stimulating the kidneys by diuretics on the one hand, and enforcing complete physiological rest on the other. I attempt to keep up some blood-pressure on the kidneys with as little irritation to the organs as possible, so that while I enjoin rest, enforce the strictest regimen as to diet, appeal to the bowels and skin, and take advantage of external applications to relieve congestion, I endeavor to keep up the blood-pressure in the kidneys by allowing the patient large quantities of cold water or rice-water.

As the lessened quantity of urine must depend in a measure on the obstruction of the tubules by casts and exudation, it would seem reasonable to suppose that blood-pressure kept up in the glomeruli, without irritation, would assist in clearing the tubules. If more agreeable, the patient may take carbonized or mild mineral water, such as Napa soda, Coronado, Bartlett, etc.

Here let me say, *par parenthèse*, that if practising on this coast, when you do use mineral water you should by all means give the preference to the springs of California, as their variety is legion.

In the majority of cases a few days will bring relief to the patient. The headache or vomiting, if present, begins to yield, and the quantity of urine soon increases. It no longer contains blood, but a large amount of albumen is still present, with lessened urea and abundant epithelial tube-casts. The diet may be gradually increased. The indications for appealing to the skin and bowels are less urgent, and we shall soon find our patient becoming anæmic, for we have already seen that where there is much albumen there is disintegration of red blood-corpuscles and a consequent hydræmic condition of the blood.

In this stage of the disease, that is, when the acute



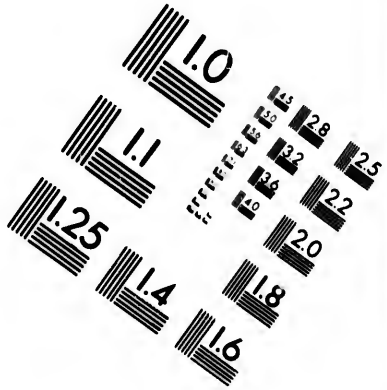
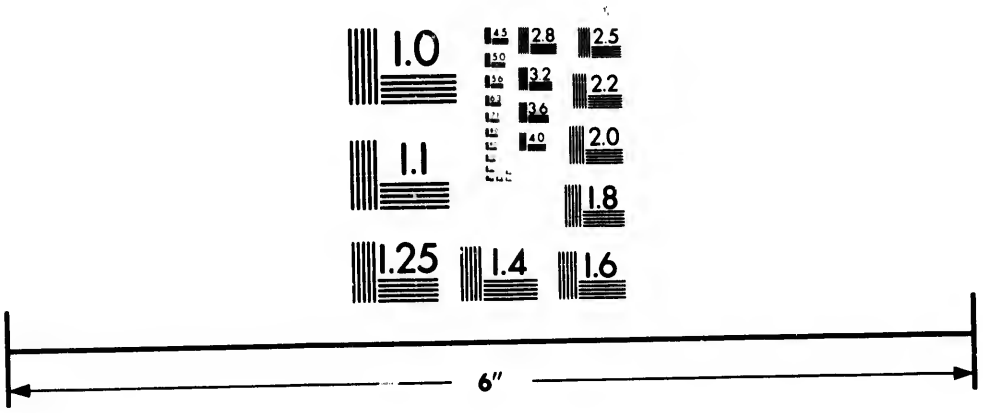
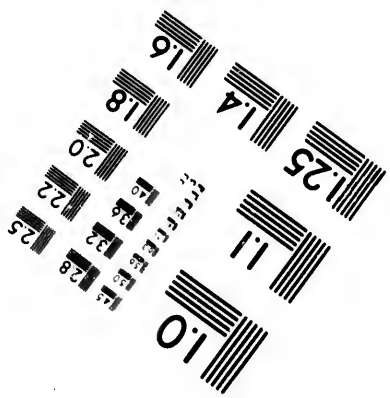
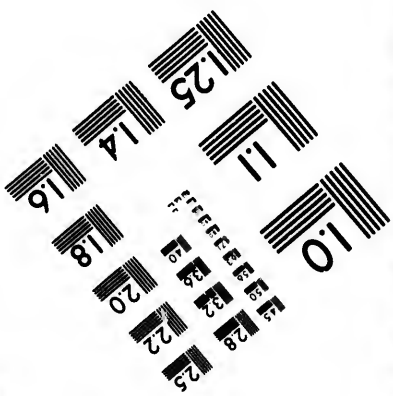


IMAGE EVALUATION TEST TARGET (MT-3)







Photographic Sciences Corporation

23 WEST MAIN STREET
WEBSTER, N.Y. 14580
(716) 872-4503

febrile symptoms have disappeared, or in subacute cases, mild diuretics, with or without preparations of iron, seem to lessen the quantity of albumen.

I have seen marked improvement, in lessening the quantity of albumen, restoring the appetite, and arresting the anæmia, from the administration of one or other of the following formulæ:

℞ Liq. arsenici chloridi, ʒi;
Tinct. ferri chloridi,
Spt. etheris nitrosi, āā ʒiv;
Glycerini ad ʒiv.—M.

Sig.—A teaspoonful in water after each meal, and at bedtime.

In some cases I prescribe only one-half drachm of the liquor arsenici chloridi, giving a teaspoonful in water every two hours during the day, occasionally either adding to this or substituting for the arsenic one-half grain of hydrargyri bichloridum, and sometimes I give the hydrargyri bichloridum alone in doses of one one-hundredth of a grain every hour or two.

In addition to its containing the iron which is so necessary, a great advantage of the tincture of chloride of iron is that it supplies the deficiency of free hydrochloric acid in the gastric secretions. The addition of the arsenic and bichloride of mercury prevents the decomposition of the food in the alimentary canal, and the offensive odor of the evacuations, so often present in Bright's, is completely obviated.

Another favorite prescription of mine, and one that will perhaps be more often of benefit than any other that I have tried, is the following:

℞ Sulphur. præcipitatum,
Ferri carbonatis,
Glycerini, āā ʒiv;
Aquæ cinnamomi, vel aquæ copaibæ, ʒiv.—M.

Sig.—A teaspoonful every two hours, or after meals and at bedtime.

The iron is indicated by the anæmia, but the beneficial results are not entirely due to the iron, as these patients do better when it is combined with the sulphur. It is possible that it acts beneficially on the mucous membrane of the bowels by the elimination of morbific material.

The following is another mixture which in subacute or chronic tubular nephritis is often given with benefit:

℞ Acidi arseniosi, gr. i;
Ferri carbonatis, ʒi;
Bals. copaibæ (in-p.), ʒi.—M.
Div. in capsulas no. xxx.
Sig.—One after each meal, and at bedtime.

There are, of course, many other combinations and preparations of iron. Where I have any suspicion of a syphilitic history, I always prefer the following, which has served an admirable purpose:

℞ Hydrarg. biniodidi, gr. ss;
Potassii iodidi, ʒss;
Syr. ferri iodidi, ʒii;
Aquæ destillatæ ad ʒiv.—M.
Sig.—A teaspoonful every two hours, in water.

In many cases, however, there are symptoms and complications which we must treat as occasion requires. The dropsy often becomes so urgent that it demands immediate relief. The general anasarca is extreme, while some one of the serous cavities may also contain a large amount of fluid. The more acute the case, the less likely are we to obtain diuresis, even if stimulation of the organs is justified. We have then to depend on elimination by the alimentary canal and the skin.

As for diuretics, only the mildest should ever be used in acute tubular nephritis. When the very acute symptoms have passed, I often prescribe the following pill:

℞ Massæ hydrarg.,
Pulv. digitalis,
Ext. colocynthidis,
Pulv. scillæ, āā gr. i.—M
Sig.—A pill every two, three, or four hours.

Should this fail to increase the secretion of urine, use small doses of the iodide or acetate of potassium, with or without digitalis, or balsam copaiba and iron combined.

Among the new diuretics from which much is expected is diuretin. Those who have experimented with it thus far and seem to admit its diuretic quality are not agreed as to its mode of action.

Some observers maintain that it is a heart tonic and increases the quantity of urine by means of increased blood-pressure.

If these measures fail to produce a free diuresis, and the symptoms become urgent, we may appeal to the skin by the hypodermic injection of pilocarpin or the hot-air bath, at the same time causing the bowels to act very freely with, perhaps, drachm doses of compound jalap powder every two to four hours, or resorting to Clutterbuck's elaterium in doses of one-twelfth to one-fifteenth of a grain, alone or combined with a little blue mass, every two to four hours. The administration should be continued until copious watery discharges are secured.

It has been my custom, each year, to introduce to the graduating class, while at the quiz in my office, my first bad case of acute tubular nephritis which entirely recovered. The gentleman is now and has been for years in perfect health. When he consulted me he had suffered from nephritis for four months. The attack began with slight chills, some fever, pains in the back, headache, and vomiting. The dropsy was extreme. The physician

whom he had previously consulted had made incisions in his feet and legs, to prevent, as he said, the skin from bursting.

He was very anæmic, had a very weak pulse, with great dyspnœa, and was, in fact, completely water-logged.

The urine when boiled in the tube showed two-thirds of its bulk solid.

I commenced the treatment by abdominal aspiration, taking away fourteen quarts of fluid, confining him to a milk diet, and giving him a combination of arsenic, iron, and balsam copaiba, with an occasional dose of compound jalap powder to secure watery discharges.

After aspiration the anasarca decreased to a considerable extent, but at the end of two weeks it was almost as bad as it had been before, while the abdominal cavity filled to such a degree that on my second aspiration I removed eight quarts of fluid.

After this tapping I continued the above mixture, as also the jalap once in two or three days, giving him every alternate day a hot-air bath, which relieved him each time of a great quantity of water.

Rice was added to his milk diet, with good mutton-broth once a day.

There was no more ascites. The anasarca soon disappeared, and in two or three months no trace of albumen was found in the urine. As I have said, this was my first bad case of acute tubulitis which recovered.

Pneumonia is a complication which we are frequently called upon to treat.

The pneumonia of Bright's is of a peculiar character. It is seldom that we find a characteristic lobar pneumonia ushered in by a severe chill or high fever and involving a whole lobe of the lung.

The patient is likely to have slight chills or rigors, fol-

lowed by a temperature of 102° or 103° F., with more of a broncho-pneumonia than a lobar pneumonia.

The lung becomes involved from different centres. Beyond the inflamed portions we find œdema, with its subcrepitations. The dyspnœa often becomes urgent, as not only does the portion of the lung not inflamed become œdematous, but the other lung as well. In examining these lungs post mortem we find that the inflammation is developed from different centres, as in lobular pneumonia. The lung is not solidly hepatized, as the exudation is not very fibrinous. In cutting into it the whole surface is bathed in blood, and we find the air-cells filled with blood, serum, mucus, and leucocytes; never the dry, firm, fibrinous exudation of a pneumonitis.

Only a few weeks ago my last patient who died of pneumonia while suffering from tubulitis had a succession of chilly sensations from day to day as the pneumonia kept invading the lung. It commenced at the left base, and progressed upward until almost the entire lung became involved. About the fourth day of the pneumonia œdema began in the right lung, with some hyperæmia. Although I appealed to the skin and bowels and the urine was not very scanty, I failed to arrest the œdema of the lungs. The dyspnœa became extreme, and death occurred in consequence.

As soon as the patient leaves the bed, in acute as well as in chronic cases, great care should be taken with the clothing. Heavy, warm underwear should be worn continuously, and an overcoat should always be at hand to insure the patient against the effects of sudden changes in temperature. It may be safely said that no disease is more benefited by a warm, equable climate than tubular nephritis.

Glomerulo-Nephritis.—Klebs was the first to call atten-

tion to this form of nephritis, occurring especially in scarlet fever. It is of more interest to the pathologist than to the clinician, as it would be impossible to determine in any case of nephritis whether the disease was confined to the glomeruli. We have already offered the suggestion that in so-called physiological albuminuria the disturbance is confined to the glomeruli.

CHAPTER XIII.

INTERTUBULAR NEPHRITIS — INTERSTITIAL NEPHRITIS — GRANULAR KIDNEY—GOUTY KIDNEY—CONTRACTED KIDNEY—CIRRHOTIC KIDNEY.

We shall use the term intertubular nephritis to designate that form of nephritis in which the primary inflammation commences in the intertubular or fibrous tissue.

Etiology.—The etiology of intertubular nephritis is limited. Its causes are less numerous than those of tubular nephritis.

Climate.—Like tubular nephritis, this condition is more common in the temperate than in the torrid or frigid zones. While climate can hardly be said to be an etiological factor in this form of Bright's disease as it is in tubular nephritis, cold, damp seasons are certainly responsible for exacerbations of the affection.

Age.—As a rule, intertubular or interstitial nephritis may be said to be almost exclusively confined to those who have passed middle life. We have already seen that tubulitis is more frequent in childhood and early life. Where occasionally we find intertubular nephritis in childhood or early adult life it is generally in a case of hereditary gout or strong gouty diathesis. Of course

lead-poisoning or acute nephritis might bring about this condition in the comparatively young.

Sex.—Males are much more subject to this disease than females: gout being much more frequent in males than in females, and men, by reason of their habits and occupations, being more exposed to unfavorable influences.

It is very seldom the result of injury or acute tubular nephritis, and it is barely possible that it is occasionally the result of hyperæmia.

Alcohol is supposed to produce this condition: when it does, it probably follows alcoholic hyperæmia. Some of the cases are attributed to chronic malaria; a few are credited to syphilis.

It is a question whether the excessive use of very strong tea may not be a factor in producing a hyperplasia of fibrous tissue in the kidney.

It is not an infrequent occurrence for workers in lead-mines, painters, or those who are constantly inhaling or absorbing lead, to suffer with this form of Bright's disease (saturnine poisoning).

But the experience of all observers is that the principal cause of intertubular nephritis, granular kidney, is *gout*. We may even find this condition in people of gouty diathesis who have never exhibited any of the ordinary symptoms of gout.

Pathology.—Unless the patient dies from some intercurrent disease, we do not have an opportunity of examining the kidneys in the earlier stages of intertubular nephritis. When such an opportunity does offer, we find them enlarged from the proliferation and increase of fibrous tissue, just as the liver is in the early stage of cirrhosis of that organ. We generally see the kidneys when they are small in size, irregularly contracted, and nodular by reason of the contraction of the new fibrous tissue

(see Fig. 12). At times they no longer preserve the shape of a kidney, often exhibiting a large number of cysts from the size of a pea to that of a walnut. The capsule is

FIG. 12.

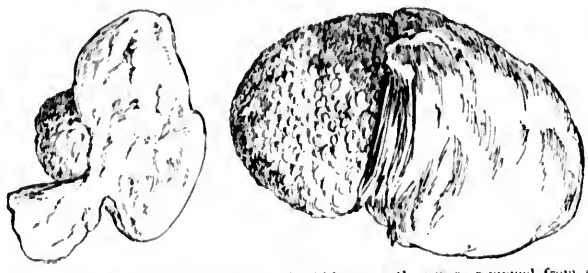


Fig. 12 represents the exact size of the kidneys as they were removed from a woman twenty-six years old. They are excellent illustrations of extremely contracted, granular, or cirrhotic kidneys. The larger kidney shows well the granular surface from which the capsule has been stripped. These very small and greatly contracted kidneys are generally found in gouty subjects, their primary pathological condition being an interstitial nephritis. These, however, are the result of acute nephritis (*vera diffusa*) following scarlet fever when the subject was eleven years old. She lived fifteen years afterwards, dying at the age of twenty-six. Her health during this time was very indifferent, albumen being always present in the urine, but varying greatly in quantity. She had three attacks of amaurea, and finally died in uræmic convulsions the result of taking a cold bath. This case occurred in the practice of Dr. J. H. Stallard in San Francisco.

closely adherent, and in our efforts to remove it the granular tissue of the kidney is often torn. This forms a complete contrast to the smooth shining surface and easily-stripped capsule of tubular nephritis. A section of this kidney under the microscope shows great increase of fibrous tissue, with compression and atrophy or destruction of many of the Malpighian corpuscles as well as tubules. (See Fig. 13.) Small cysts are often found scattered through the cortical portion of the kidney, and are the result of dilatation of the Malpighian tufts in consequence of obstruction of its tubules by new fibrous tissue.

Bowman's capsule and the walls of the blood-vessels are thickened, and many of the tubules are denuded of their epithelium.

FIG. 13.

CHRONIC INTERTUBULAR NEPHRITIS FROM A GOUTY SUBJECT. (Mounted by J. H. Stallard and photographed by J. C. Spencer.)—*a*, *b*, vertical and longitudinal section of an artery showing vaso-renal changes; *c*, clusters of Malpighian corpuscles and proliferated intertubular fibrous tissue,—complete absence of tubules.

SYMPTOMS.—As we have already seen from the etiology, the patient is probably a male, past middle life, and in many cases the subject of gout. In the early stages of the disease the symptoms, as a rule, are not sufficiently marked to attract the attention of either patient or physician. The disease is very slow and insidious. In some cases, however, there is sufficient hyperæmia to produce

aching pain about the back and loins, with frequent micturition, while occasionally we meet with hemorrhage in the earliest stages of gouty kidney.

As the disease advances, the symptoms become sufficiently defined to attract the attention of the patient. We shall usually find an increased quantity of urine, of light specific gravity and color, containing a small quantity of albumen (we are here referring particularly to gouty kidney), with very few tube-casts, which latter are of the hyaline variety. Analysis will show a deficiency in the amount of urea excreted.

This condition of things may go on for months or years, the disease being very chronic, and the patient may consult the physician for complications or intercurrent diseases as they arise. Vomiting may become troublesome, or severe headaches may develop; not infrequently the patient consults the physician on account of loss of sight, and learns for the first time that he has chronic Bright's disease. The disease of the eye most common is retinitis; and its characteristics are so marked that oculists frequently make a diagnosis of chronic Bright's disease from the appearance of the retina.

Another complication which these patients rarely escape is hypertrophy of the left heart. Various theories have been advanced to explain this condition. Bright, himself, attributed the cardiac hypertrophy to chemical changes in the blood, or, as he expresses it, an impure state of the blood which stimulated the heart to excessive activity, or by reason of its altered quality required more force to propel it through the capillaries.

Traube was of opinion that the increased action of the heart was due entirely to an obliteration or contraction of a large number of renal arterioles. This theory, however, has been shown to be untenable.

George Johnson at first advanced the idea that the hypertrophy was owing to a high blood-pressure caused by a thickening of the muscular walls of the renal arterioles, but subsequently found that the thickening was not confined to the arterioles of the kidney.

Sir William Gull and Sutton confirmed the opinion of Johnson in regard to the thickening of the walls of the arterioles. Johnson maintained that the muscular coat of the vessels was thickened, while Gull and Sutton showed that the muscular coat is really atrophied, it being the inner and external coats which are thickened, and that the real pathological condition is a general arterio-capillary fibrosis, with a lessening of the lumina of the vessels, thus forcing a compensatory exertion upon the heart.

A large number of patients suffering from intertubular nephritis sooner or later develop an atheromatous condition of the arteries, and this, combined with the extra force from the hypertrophied heart, often results in hemorrhages from various arteries, and particularly in cerebral apoplexy, many dying in this way. No doubt the hemorrhages from the kidney in the later stages are also the result of this double cause,—viz., hypertrophied heart and atheromatous arteries.

Another frequent symptom, the result of the above causes, and rarely occurring in tubular nephritis, is epistaxis. I have had several patients with intertubular nephritis who have been the subjects of attacks of hæmatemesis independent of cirrhosis of the liver or ulceration of the stomach.

It is in this form of Bright's disease that we most frequently find uræmic poisoning, manifested either by convulsions or by coma; while, on the other hand, we seldom meet with what is nearly always present in tubular nephritis,—namely, *dropsy*. Thus, as you will observe, the

clinical history is markedly different in these two forms of nephritis, as are also the etiology and pathology. Of course in the few cases of intertubular nephritis resulting from tubular nephritis the symptoms are those of a chronic or prolonged condition of tubular nephritis, rather than those presented during the insidious progress of an intertubular nephritis.

Intertubular nephritis the result of lead-poisoning is not so chronic nor so likely to be accompanied by cardiac hypertrophy or retinitis; but symptoms of chronic lead-poisoning will be present.

Intertubular nephritis the result of chronic malaria is usually accompanied by more or less enlargement of the spleen and liver and derangement of the latter viscus.

Prognosis.—The prognosis of intertubular nephritis depends largely upon the stage of the disease in which we find the patient. In the earlier stages the prognosis is favorable so far as any immediate danger is concerned; but the kidney never regains its physiological condition, and the disease steadily progresses. Later, we must be very guarded in our prognosis, as an atheromatous artery may give way at any time, producing cerebral apoplexy, or hemorrhage from the lungs or the stomach; or the patient's life may be cut off summarily by uræmic convulsions or coma, by a severe attack of gout, or by pneumonia or capillary bronchitis, to which subjects of this disease are very liable. Pericarditis or endocarditis may terminate the case.

Treatment. — We have no specific for intertubular nephritis; no way of restoring the kidney to its normal condition. We can do much, however, both to prolong the patient's life and to make it more comfortable by strict attention to diet and hygienic surroundings.

The diet should be nourishing, but not excessive or

stimulating, and should be largely non-nitrogenous, consisting of rice, milk, vegetables, fish, and fowl, with a limited amount of other meat. Clothing should receive special attention. The patient should be completely clothed in wool. As to climate, there are few diseases, not even excepting those of the lungs, which are more benefited by a mild, equable climate than is intertubular nephritis. In other words, the function of the skin must be carefully watched, the flannel clothing assisted by the warm climate encouraging an equable and active condition of the skin. As for medication, it is largely a matter of treating symptoms; and the symptoms which arise during an intertubular nephritis are in many cases the results of derangement of organs other than the kidneys themselves. The patient, perhaps, has vomiting, which must be controlled by appropriate treatment; or he may complain of headache, or there may be epistaxis, which demands our attention.

Frequently we are called upon to treat an attack of gout or uræmic symptoms; while few of these patients get on without more or less chronic bronchitis. The treatment of any of these complications, even to that of apoplexy, must be conducted largely on general medical principles.

The kidneys themselves, however, often exhibit symptoms that require attention. They may become hyperæmic or the subject of hemorrhage, while occasionally they suffer from attacks of tubulitis; that is, during the course of this disease we often find the urine growing less in quantity, of higher specific gravity, and containing a larger amount of albumen, œdema of the extremities being simultaneously present. We immediately enforce absolute rest, and resort to the remedies that have already been referred to in describing the treatment of subacute or chronic tubular nephritis.

Tubular Nephritis.		Nephritis (Vera).	Interstitial Nephritis.
Acute.	*Subacute.*		
Chill not severe.	No chill.	Severe chill.	No chill.
Fever, temperature 100°–103° F.	No fever.	Fever, temp. 102°–105° F.	No fever.
Aching pains.	No pain.	Pain more severe.	No pain.
Headache frequent.	Not so frequent.	Headache severe and constant.	Occasionally.
Nausea quite frequent.	Not so frequent.	Nausea more frequent.	Occasionally.
Œdema present.	Œdema present.	Œdema present.	Œdema infrequent.
Childhood and early life.	Childhood and early adult.	Childhood and early adult.	After middle life.
Either sex.	Either sex.	Either sex.	Male most frequent.
Frequent micturition.	Less frequent.	Very frequent.	Not frequent.
Urine high-colored.	Urine normal.	Urine high-colored.	Pale urine.
Diminished in quantity.	Less diminished.	Very much diminished.	Increased quantity.
High spec. gravity, 1017–1030.	Low specific gravity.	Very high specific gravity.	Low specific gravity, 1010.
Albumen abundant.	Less abundant.	More abundant.	Very slight amount of albumen
Urea lessened.	Lessened.	Very much diminished.	Lessened per ounce. Normal per diem.
Blood-corpuscles usually present.	Not present.	Present.	Not present. Sometimes hæmaturia.
Urates, phosphates, oxalates, rare.	None.		Oxalate of lime always present.
Epithelial, granular, and blood casts.	Epithelial and granular casts.	Epithelial and blood casts.	Hyaline casts.
Eye-trouble, occasionally functional.	Same.	Functional eye-trouble sometimes.	Organic lesions. Chronic retinitis, cataract.
			Epistaxis and apoplexy.
Acute endocarditis, pericarditis.	Same.		Arterio-fibrosis, cardiac hypertrophy, atheroma.
Uræmia.	Uræmia.	Uræmia more frequent.	Most frequent.

CHAPTER XIV.

NEPHRITIS—DIFFUSE NEPHRITIS—NEPHRITIS VERA—PARENCHYMATOUS NEPHRITIS.

By the unqualified term nephritis is understood an acute inflammation of the kidney which involves all the tissues, and corresponds to that condition of the lungs which we designate as pneumonitis or hepatized lung.

Etiology.—There is no cause that produces a tubulitis which may not produce a complete nephritis. For instance, a nephritis accompanying scarlet fever or diphtheria may be tubular, acute, or subacute, or a nephritis proper involving the entire structure of the kidney, the difference in the inflammation in these cases being one of degree; so it may also be when resulting from severe cold, sudden suppression of the perspiration, pregnancy, severe injury, or any of the blood-poisons that produce tubular nephritis. We shall find that the difference is pathological and clinical rather than etiological.

Pathology.—It may not be possible to distinguish by the naked eye the large red kidney of tubular nephritis from the large red kidney of a recent case of diffuse nephritis, as in the early stage of the latter the kidney in its gross appearance will be practically the same as in a tubulitis.

Cutting into these large kidneys, we shall find them hyperæmic in both cases, with an oozing of blood on the cut surfaces, and the Malpighian bodies distended. Later in the disease the cortex is pale, and often œdematous, contrasting strongly with the dark congested pyramids.

A microscopical section of the kidney of nephritis will show a more complete fibrinous exudation into the intertubular spaces than occurs in tubulitis.

FIG. 14.

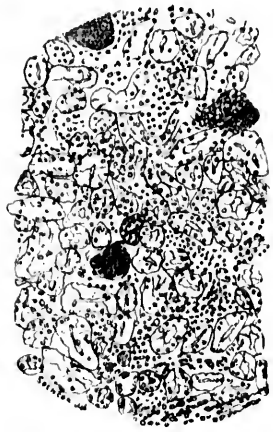


Fig. 14 shows acute nephritis [diffuse, vera]. Some of the tubes are filled with exudation and show the epithelium swollen, and an irregular compression from the swelling of and exudation into the intertubular tissue.

The epithelial cells are in a condition of granular degeneration, and the intertubular tissue is swollen, œdematous, and infiltrated with new cells. The cells covering the tuft and lining Bowman's capsule seem swollen and increased in number, and sometimes compress the glomerulus. Infarctions are more likely to be found in diffuse than in tubular nephritis. Pathologically it corresponds to the hepatized lung of pneumonitis, while in the tubular variety of nephritis the exudation simulates more closely that of a broncho-pneumonia. In other words, in tubular nephritis the intertubular spaces are not so thoroughly distended with exudation from the blood-vessels, nor is the fibrous tissue so swollen, as they are in nephritis proper. The epithelium of the tubules suffers alike in both cases.

It is evident from this pathological condition that the suppression of urine would be much more complete in nephritis proper than in tubular nephritis, because of the compression of the blood-vessels by the exudation; and for the same reason this form of nephritis may, like pneumonitis, end in abscess.

Symptoms.—This is altogether the severest form of acute inflammation of the kidneys. It is ushered in by a severer chill and higher fever than is the early stage of tubular nephritis, and is accompanied by severe headache, nearly always by vomiting, suppression of urine,—in fact, anuria,—with more or less pain and distress in the back. There is very frequent and painful micturition, with the passage of only a few drops of bloody urine, of high specific gravity and containing blood-corpuscles and tube-casts. On boiling, the urine becomes almost solid in the tube. The œdema about the eyes is very noticeable, and is soon followed by dropsy.

This is the form of acute inflammation of the kidney that is most likely to terminate rapidly in death, often proving fatal in a few days.

If, however, the case goes on, and the urine is not voided in greater quantity, still containing blood-capsules and no less albumen, the disease may terminate in abscess; or, if all the symptoms improve, headache and nausea becoming less, the urine increasing in quantity, and fever subsiding,—the kidney may soon become of the large white variety and the case terminate in recovery, in chronic tubular nephritis, or possibly in intertubular nephritis, just as pneumonia may occasionally end in cirrhosis of the lung.

About three years ago I was called to see a patient, a stevedore, who, while working very hard in the hold of a ship, and wearing but little clothing and perspiring freely, had come up on deck and stood for a few minutes in a cold, damp wind. He was almost immediately seized with a severe chill, accompanied by vomiting. His fellow-workmen sent him home in a carriage, and I saw him a few hours later. His temperature was 104° F. He complained of severe headache, constant vomiting, great

pain about the back and down the groin, and a most peculiar dyspnœa. He was constantly endeavoring to urinate, and at each effort passed about a half-teaspoonful of bloody urine. The next day he still complained of headache and nausea, his temperature continued high, and there was very little increase in the amount of urine, which still contained blood.

Notwithstanding the fact that I appealed to the skin and bowels to assist the kidneys, cupped him over the loins, and made every effort to relieve his headache and nausea, the symptoms were very little mitigated. Dropsy appeared, and he died on the fifth day.

On post-mortem, the kidneys were found very large and red, the capsule stripping easily, and a free oozing of blood on the cut surfaces. The fibrous tissue was swollen, and the Malpighian bodies could be seen with the naked eye. There was a complete exudation into the tubules and intertubular spaces. In other words, the case was one of a thoroughly hepatized kidney.

Prognosis.—We have already seen that cases may terminate in death, abscess, or chronic tubular nephritis: nevertheless I have attended cases in which, from the symptoms exhibited, I had every reason to believe the affection to be nephritis rather than tubulitis, yet which ended in perfect recovery in from four to twelve or sixteen weeks.

Treatment.—The treatment of this form of kidney-inflammation is the same as that which has been directed for acute tubular nephritis. In fact, we can do nothing more than has been already advised in tubulitis,—namely, enforcement of rest, attention to diet, cupping, and appealing to the bowels and the skin.

CHAPTER XV.

SUPPURATIVE KIDNEY—ABSCESS—SURGICAL KIDNEY.

As I have already said, not every case of nephritis (diffuse nephritis) ends in abscess; but any case may do so; nor are all abscesses the result of diffuse nephritis. Many are the result of a circumscribed inflammation which is due to various causes,—injury or wounds, infarctions, the result of diseased arteries or hyperæmic inflammations, gravel, deposits in the tubules, embolisms, pyæmia, suppurative pyelitis or cystitis with or without stricture of the urethra, tuberculosis, and scrofulous kidney. One or both kidneys may be involved.

The abscesses may be very small and numerous, confined more particularly to the cortical portion, or they may coalesce, converting nearly the whole kidney into one purulent mass.

The tubercular kidney, while riddled with abscesses, differs in its etiology, pathology, symptoms, and prognosis. When the abscesses are small and scattered, the other portions of the kidney are likely to present the characteristics of tubulitis or intertubular nephritis.

DIAGNOSIS.—It is not possible to diagnose small scattered abscesses in the kidney while there is no pus escaping with the urine; and when there is pus in the urine it is sometimes difficult to say whether it does or does not come from a pyelitis or a cystitis.

As a rule, however, a correct diagnosis can be made from the history of the case, the condition of the patient, a careful examination of the bladder, bimanual examination of the kidney, and analysis of the urine.

Symptoms.—There will be recurrent chills with fever, the movements of the body causing pain which extends along the line of the ureter to the groin or the testicle. Vomiting and headache may be present. The urine will be irregular in quantity, containing pus and blood-corpuscles. The kidneys are often enlarged and always tender, while the general condition is likely to be much worse than in a pyelitis. It is necessary to remember that when only one kidney is involved pus may appear in the urine paroxysmally.

Prognosis.—A small abscess may be converted into a calcareous mass, or may open into the pelvis and heal.

I have found post-mortem evidence of abscesses having healed in this way, leaving the kidney healthy.

Abscesses may open into the abdominal cavity and cause death, or into the cellular tissue and result in extensive perinephritis; or the whole kidney may be destroyed, the patient dying from exhaustion or pyæmic poisoning.

Treatment.—For the management of abscess of the kidney, see the chapter on Surgical Kidney.

CHAPTER XVI.

TUBERCULAR KIDNEY—NEPHROPHTHISIS—TUBERCULOSIS.

Inasmuch as the urine in this form of kidney contains pus, the product of the cheesy tubercular infiltration of the organ, it is proper to consider it here in connection with suppurating kidney.

It is seldom that we meet with a primary tuberculosis of the kidney; nor is it very often that the kidney suffers from a tubercular deposit in a general acute miliary tu-

berculosis. The greater number of the cases are secondary, or at least accompany a tubercular condition of the ureters, bladder, seminal vesicles, and testicles; while a few may be clearly considered secondary to pulmonary tuberculosis, the urinary tract not being otherwise involved.

The etiology and pathology of tuberculosis are certainly at present in a very unsettled condition; and the pathology of so-called tubercular kidney has never been satisfactory.

Many writers look upon the disease as a scrofulous inflammation, with perhaps a tubercular deposit as secondary.

It is much more frequent in males than in females, and when it occurs in females is much less likely than in males to involve the urinary tract.

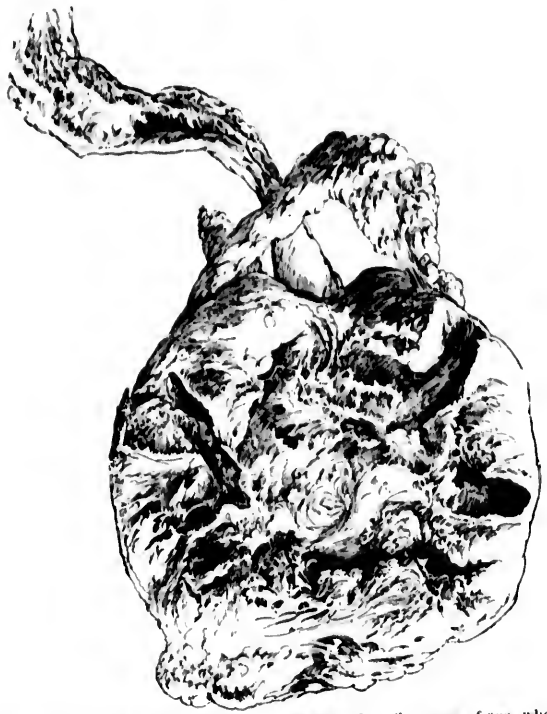
It occurs oftenest in middle life, certainly later than what might be considered the pulmonary tubercular age. This tubercular kidney shown in Fig. 15 is large, nodular, and riddled with excavations completely or partly filled with cheesy, tubercular-looking pus. The ureter is three times the normal size, and as irregular and tubercular-looking as the kidney itself.

One or both kidneys may be involved. The testicles or the bladder may be attacked first, and the disease spread upward, or the kidney may be attacked first, and the disease progress downward.

Symptoms.—In a case of primary tuberculosis of the kidney there would certainly be no way of diagnosing the condition, especially before the breaking down of the kidney. The organ would probably be enlarged, painful, and tender on pressure; there would perhaps be hæmaturia, but it would be impossible to make a differential diagnosis of the hemorrhage from that of inflammation, cancer, or other new growth.

In the secondary deposit, when the patient is suffering from pulmonary tuberculosis, although the urinary tract

FIG 15.



Tubercular kidney removed from a man about forty five years of age, who had also tuberculosis of the testicles The other kidney was normal. Death resulted from tuberculosis of the lungs as a secondary condition. (From author's collection.)

is not otherwise implicated, we shall certainly be justified in suspecting tuberculosis of the kidney if the organ is

large, painful, and tender on pressure, with perhaps hæmaturia as the first symptom. But until it becomes infiltrated and broken down, with pus evident in the urine, we cannot be certain of the diagnosis of tubercular kidney. If, with this condition, the bladder, the seminal vesicles, or the testicles become infiltrated, there will, of course, no longer be any doubt about the diagnosis. The cases, however, with which we most frequently meet are cases of a tubercular condition of the testicles, perhaps also of the seminal vesicles, with subsequent tuberculosis of the kidney.

This condition of things could hardly be mistaken for any other disease except cancer. We should not expect a scrofulous inflammation without tuberculosis to implicate the organs in this way. Where only one kidney is involved, the urine may be perfectly clear, as we have already seen in speaking of suppurating kidney, the pus appearing in the urine perhaps only every two or three days.

This is more likely to occur in tubercular kidney than in suppurating, non-tubercular kidney, since the lumen of the ureter is not so likely to be lessened as in the tubercular variety, where it seldom escapes, having the same tubercular character as the kidney and its pelvis. The lessened calibre of the ureter prevents the escape of pus until the urine and pus accumulate in quantity sufficient to force the pus through to the bladder. Where the glandular structure is largely destroyed, several days or a week may elapse before any urine from the diseased kidney reaches the bladder.

Diagnosis.—We have already seen under what circumstances it may be impossible to make a differential diagnosis in the earlier stages. Many cases of broken-down, disorganized kidney in scrofulous patients pass for cases of tuberculosis. When the disease is confined to the kid-

ney, not even passing down or implicating the ureter, it is not likely to be tuberculosis. In the strumous cases the disorganization proceeds from a pyelitis or a pyonephrosis, while the tubercular deposits are primarily into the cortical portion of the kidney or secondary to tubercular deposits elsewhere.

In the later stages tubercular kidney is not likely to be mistaken for anything but suppurating kidney or cancer.

For the diagnosis of suppurating non-tubercular kidney we should have to depend on the history of the case, and largely on the condition of the patient, if we found no evidence of tubercle in any other part of the body.

The non-existence of general tuberculosis would also be an element in the diagnosis of cancer, while emaciation and cancerous cachexia would assist in confirming it.

It is barely possible in some cases to discover tubercle-bacilli in the urine. This fact cannot be depended upon as of much diagnostic value. It has been suggested that animals might be inoculated with the suspected urine, which, if bacilli were present, would develop tuberculosis.

Prognosis.—Unless the tubercular condition is confined to one kidney, the prognosis will, of course, be bad. In case you are fortunate enough to make the diagnosis while the disease is primary and while only one kidney is involved, the removal of the kidney would of course make the prognosis more favorable.

Treatment.—Where the disease is confined to one kidney, removal is the only remedy. The conditions for such removal we shall become acquainted with in the lecture on surgical kidney.

Where other organs are involved to such an extent as to make an operation unjustifiable, we must content ourselves with treating the symptoms as they arise.

As a matter of interest to the pathologist rather than to the clinician, I may remark that in many cases of pulmonary phthisis the kidneys are found slightly enlarged, the capsules thickened and loose, and the epithelium in a state of fatty degeneration. The only symptom of disease that these cases manifest during life is a slight trace of albumen in the urine, with perhaps some tenderness on pressure.

CHAPTER XVII.

URÆMIA.

Uræmia is a term applied to a condition, supposed to be caused by diseases of the kidneys, in which those organs fail to perform their normal function of elimination, and allow material to be eliminated which should be retained in the blood. It is characterized by dyspnœa, headache, dizziness, vomiting, diarrhœa, convulsions, and coma, the symptoms varying in individual cases.

Etiology.—The etiology of uræmic poisoning is obscure, but certainly in some cases, at least, the symptoms are due to the non-elimination of excrementitious materials by the kidneys. Symptoms are but the expressions of pathological conditions, and many poisons taken into the blood or generated there manifest their morbid effects through the brain and the spinal cord.

Many theories have been advanced as to the primary cause of this condition. It was asserted that an excess of urea in the blood produced uræmia; but urea injected into the blood was found to act only as a diuretic. It was also maintained that urea was decomposed in the blood, setting free carbonate of ammonium, which acted as the

toxic agent. This also has been disproved. The theory has been advanced that the condition is autogenous,—that is, that the poison is absorbed from the alimentary canal. The mechanical theory, that uræmia is the result of œdema of the brain, has still many adherents. However, the difficulty may lie in the fact that in the diseases giving rise to this condition the desquamation of the epithelium in the tubules prevents the manufacture of urea from the various waste products, and that the uræmia arises not so much from the retention of urea as from lack of its production. Most prominent among these retained products are creatin and creatinin.

The strong probability is that the uræmic condition or convulsion is sometimes the result of a chemical condition of the blood, and at other times depends upon œdema of the brain or effusion: the effusion may be ventricular or arachnoid.

We have all seen how the œdema will shift about: one morning, in a case of Bright's, we find œdema perhaps of the arm, while the next day it may be in the glottis or be confined entirely to the lungs. I have not the slightest doubt that some of the cases of so-called uræmic convulsions are the result of œdema or effusion.

This theory has been supplemented by Hughlings Jackson and Rosenstein, who have suggested that the initial change is spasm of the cerebral blood-vessels, leading to convulsions by cutting off the blood-supply, and followed by effusion into the lymph-spaces of the brain.

While it is possible that some cases of so-called uræmic convulsions are due to œdema of the brain or subarachnoid effusion, it must not be forgotten that nephritic diseases often produce nutritive disturbances either of the brain or the membranes or of both, and that the convulsions may be due to these nutritive lesions. In fact, I

believe it may be broadly stated that, with the exception of the kidney itself, no organ is more likely than the brain to suffer nutritive lesions during the course of nephritic diseases; and it is folly to attribute every case of convulsions that occurs in these diseases to a pathological chemical condition of the blood.

Not long since I was called in consultation to see a young man, a medical student, who was in violent convulsions. His attending physician said that he had had a severe chill two days before, which ushered in a pneumonia. On inquiry as to the condition of the kidneys, I was told that there was no albumen nor any indication of nephritis. I soon learned from the young man's mother that he had suffered with an attack of meningitis a year and a half before, from which his father, who was a physician, thought he had never entirely recovered.

His convulsions were controlled only for the time by chloroform, and he soon died. I obtained a post-mortem, at which the meninges were found to be congested and infiltrated with serum and pus, with adhesions about the middle of the longitudinal fissure, the brain showing a granular roughened condition corresponding to that produced by calcareous deposits at the base of the falx cerebri.

Had this case been one of nephritis instead of pneumonia, the convulsions would undoubtedly have been called uræmic, a post-mortem would have been considered unnecessary, and the brain-lesion would never have been discovered.

It has occurred to me that it is possible for at least some of the cases of so-called uræmia to be the result of poisonous animal alkaloids,—viz., ptomaines or leucomaines. These poisonous chemical substances have been shown to consist of decomposed albuminoid matter.

The study of these poisons is only in its infancy, and is,

no doubt, destined to explain many not yet well-understood septic conditions. It is probable that some of the ptomaines are the indirect result of microbes, the albuminoid decomposition being set up by their presence; while the leucomaines are the result of the albuminoid decomposition set up by the presence in the blood of chemical materials due to the metamorphosis of tissue. This physiological process of tissue-waste is, of course, incessant, and keeps up the generation of products that should be eliminated,—products whose retention has been shown to set up albuminoid decomposition, producing material of a highly poisonous nature.

It can easily be seen how even functional derangement of an important eliminative organ may produce the most serious results, and that organic disease of the organ must eventually prove fatal.

In sudden suppression of the function of elimination by the skin or by that great eliminative organ, the liver, we have examples every day of poisonous accumulations in the blood, no doubt the result of albuminoid decomposition due to the presence of retained metamorphic material.

Patients with tubular nephritis become anæmic very rapidly, and the disintegration of the red blood-corpuscles may in some cases manifest its deleterious effects on the nervous system by uræmic symptoms.

Symptoms.—You will find in some of your text-books a great variety of symptoms attributed to uræmic poisoning. Many of these symptoms, however, are the result of the anæmia and other diseased conditions rather than of the uræmia, while some are no doubt the direct result of the uræmic poisoning.

The so-called uræmic convulsions are epileptoid in their character, and in fact in some cases it would be impossi-

ble to distinguish them from epileptic attacks. As a rule, the patients in uræmic convulsions are not so profoundly unconscious as those in epilepsy. They will often injure their tongues, and simulate very closely an epileptic attack. If a history of the case could be obtained, it would be of great assistance in diagnosis. Other cases of uræmic convulsions very closely resemble attacks of apoplexy, even to the producing of a partial paralysis of one side. In apoplexy the patient will almost always turn the head with convulsive twitchings to the side of the hemorrhage, and in many cases the temperature will rise to 104°–105° F., both of which symptoms are not present in uræmic convulsions. I have never seen a patient live more than a few hours when the temperature rose to 105° immediately after the apoplexy.

We often observe a dropsical condition of the patient, which would indicate uræmic poisoning rather than apoplexy; and on drawing the urine in doubtful cases the indication would be strengthened if we found albumen. In some cases of uræmic poisoning which resemble cases of epilepsy or apoplexy the patient may have no œdema, and albumen may be absent, or be present in only a very small quantity, the cases being those of interstitial or gouty nephritis.

Hysteria is another condition from which uræmic convulsions must be differentiated. In hysteria the pupils, pulse, and temperature remain normal, and the patient is always conscious, while the irregular, jerky movements, the spasmodic respiration, and the choking sensation so often present in hysteria are absent in uræmic convulsions.

Again, the uræmic poisoning may assume a comatose form, and closely resemble opium-poisoning. If nothing is known of the history of the case, we may judge par-

tially from the condition of the pupils, which are firmly contracted in opium-poisoning (I have, however, seen them thus contracted in uræmia), by the slow respiration, and by drawing the urine from the bladder and examining it for albumen and casts.

Of the other symptoms often attributed to uræmic poisoning, such as severe attacks of diarrhœa, vomiting, asthma, amblyopia, intense headache, and extreme restlessness and nervousness, it is very hard to say exactly how much is due to absolute uræmic poisoning, and how much to the circulation of other retained or absorbed matters in the blood. The headache may be due to anæmia, or to organic lesions, and the vomiting, as well as the diarrhœa, to gastralgia produced by indigestion or other causes.

Treatment.—The indications for treatment when the symptoms are not very urgent are to remove the cause. In very urgent cases, attended by convulsions and coma, the relief of the symptoms demands our first attention.

For the relief of the spasm, chloroform or ether given by inhalation is usually more prompt and in some cases safer than the hypodermic injection of morphine. There is a general impression in the profession, the result of experience, that patients laboring under albuminuria are extremely sensitive to opium and its alkaloids.

Having allayed the spasm by means of chloroform, ether, or the hypodermic injection of morphine, the prompt evacuation of the bowels is the surest method of securing more than temporary relief. In fact, the relief frequently obtained from the evacuation of the bowels, even where no great dropsy exists, would seem to indicate that the poison was being absorbed from the alimentary tract, or was readily eliminated through that channel.

In our effort to induce the kidneys, in this disease, to

eliminate the poison, we are too often disappointed in the action of diuretics; but we should never fail, in addition to the use of cathartic medicine, to appeal to the skin, either by the hypodermic use of pilocarpine or by other active diaphoretics. Hot air is usually quite safe, and is always a sure means of producing active diaphoresis. The patient can be placed in a cane-bottomed chair, surrounded by blankets, and by means of an alcohol lamp or by the cruder method of burning alcohol in a saucer, called in common parlance "rum sweat," the desired effect can be produced. The ordinary hot-air apparatus is the most convenient and efficient if we have it at hand. Of the catharties, the salines serve the best purpose, except where coma is present, in which case, the patient being unable to swallow, we resort to a few drops of croton oil placed on the tongue, or to grain doses of calomel administered every half-hour in the same manner.

It may, in addition, be necessary to resort to stimulants, which should be alcoholic rather than preparations of ammonia. While I am by no means sure that ammonia is detrimental, still, as we have no definite knowledge that it is not one of the ingredients of the toxic agent, it is well to avoid its administration.

Having relieved the patient by these means, the very strictest diet is necessary, milk, rice, etc., and the eliminating organs—viz., the bowels, the skin, and the kidneys—must be kept in the best possible condition, relying principally upon the bowels and the skin when diuretics are contra-indicated or when they fail to stimulate the kidneys to activity.

CHAPTER XVIII.

DEGENERATIONS—AMYLOID DEGENERATION—LARDACEOUS OR WAXY KIDNEY.

If we wished to classify as inflammatory all the diseases of the kidney which give constant albuminuria, we should be obliged to include amyloid degeneration; and there are writers who consider amyloid degeneration an inflammation.

Dickinson considers under the head of albuminuria all the diseases which give constant albumen. However, in this connection we shall confine the inflammatory diseases to one section, and consider amyloid and fatty kidney as degenerations.

Etiology.—The etiology of amyloid degeneration is, in a measure, limited,—most cases being the result of chronic suppuration,—from tuberculosis of the lungs, from diseased bones or cartilages, from old sinuses, from long-discharging empyemas, or from chronic ulcerations of whatever nature. Syphilis is also an etiological factor, and perhaps some of the blood glandular diseases are causes of it.

The excessive use of mercury may also give rise to it; while occasionally in chronic tubular nephritis we find slight amyloid exudation.

Pathology.—Amyloid degeneration always begins in the blood-vessels, and is first noticeable in the vessels of the Malpighian tufts. The chemical nature of this exudation is not definitely known, but it receives its name from its peculiar reaction with iodine and sulphuric acid, which is identical with that of starch. It is called "waxy"

because of its peculiar appearance when cut. Amyloid degeneration is not often, perhaps is never, strictly confined to the kidney, but involves other organs, especially the liver, the lymphatic glands, and the blood-vessels of the mucous membrane of the stomach and bowels.

We find the kidneys much enlarged, and, when cut into, presenting a waxy or lardaceous appearance, rather dry, with very little blood on the surface.

Upon the application of iodine and sulphuric acid to the cut surface the characteristic reaction appears; with the former, the deposit assumes a reddish maroon color, and with both, a violet appearance.

The epithelium lining the tubules suffers less than in any of the inflammatory conditions of the kidney.

Symptoms.—As amyloid degeneration is not confined to the kidneys and is secondary to other chronic diseases, the general exhausted condition of the patient cannot be attributed to this disease of the kidneys. The special symptom exhibited by the kidneys is their enlargement with some tenderness; but the characteristic feature is an excessive quantity of urine containing albumen in large quantities. When we find a patient who is the subject of chronic suppuration or has a history of syphilis with enlargement of the liver and kidney and who is making a large quantity of albuminous urine, we may be sure that we are dealing with a case of amyloid degeneration.

Diagnosis.—The diagnosis of this form of albuminuria depends upon the implication of other organs and the history of the case to distinguish it from other forms of enlargement of the kidney or polyuria.

Prognosis.—The prognosis depends greatly upon the stage of the disease. When the amyloid deposits in the kidneys, lungs, and other organs are no longer recent, and the patient is much weakened by the chronic disease,

the prognosis is very unfavorable; nevertheless, in some quite advanced cases of syphilitic origin the patient may entirely recover under specific treatment. Even in old cases caused by suppuration, where the diseased bone or other suppurative cause can be removed, the amyloid deposits may be absorbed and the patient recover.

Treatment.—The indications for treatment are for the removal of the cause of the disease,—viz., specific treatment in syphilitic cases, and the removal of necrosed bone or cartilage where possible. The patient should be placed under the best hygienic conditions, with general tonic treatment,—iron, quinine, stimulants, etc. In chronic suppuration of the lungs or other irremediable disease the treatment must be largely symptomatic, in the hope of prolonging the life of the patient.

FATTY DEGENERATION.

The kidneys are subject to fatty degeneration when their nutrition is interfered with by disease of the blood-vessels, or by pressure upon the vessels by new growths or exudations; in short, anything which produces a permanent anæmia of the organ will be likely to cause a fatty metamorphosis. Certain poisons taken into the blood, and certain pathological conditions of the blood, are capable of bringing about fatty kidney.

Among the poisons giving rise to fatty kidney are phosphorus, arsenic, antimony, and alcohol; among the diseases causing it are phthisis pulmonalis, scarlet fever, small-pox, and puerperal fever.

Especially when the epithelium is in an advanced stage of degeneration will we find albumen,—not, however, in such quantities as in amyloid degeneration or tubulitis. It is very probable that in many cases of slight albuminuria in pregnancy or in the acute infectious diseases, or

resulting from the administration of poison where there is no dropsy, it is due to degeneration,—that is, a nutritive disease of the epithelium. When the cause of the nutritive disturbance is removed, the degeneration, as a rule, is soon repaired.

CHAPTER XIX.

ATROPHY AND HYPERTROPHY.

Atrophy of the kidney may be congenital or acquired. When congenital it is likely to be unilateral, with enlargement or hypertrophy of the other kidney. Acquired atrophy is the result of a nutritive disturbance.

Etiology.—Anything which disturbs the nutrition of the kidney may produce atrophy. Such would be the case where tumors of the abdomen press upon or involve the renal artery; embolism, thrombosis, or other disease of the vessels sufficient to deprive the kidney of its proper nourishment may cause its atrophy; while in chronic tubular nephritis we often find nutritive disturbance and consequent shrinkage of the organ.

These two kidneys which I now show you do not weigh more than two and a half ounces each, the patient having died of chronic tubular nephritis, the result of excessive use of alcohol for two or three years. I desire to call your attention to the fact that both kidneys are equally atrophied, and that the atrophy is at the expense of the cortical portion.

When the atrophy is the result of pressure of abdominal tumors it is generally unilateral.

We occasionally find old age acting as an etiological

factor, the kidneys of old people being often quite small and partaking in a measure of the general atrophy of other organs.

Pathology.—In very old people we frequently find the kidneys small or atrophied without their being diseased otherwise than in having suffered some fatty degeneration. In congenital cases I have seen one small and one large kidney, neither being diseased.

We have already considered the pathology of the atrophy of chronic tubular nephritis under its proper heading, but it might be well to remark here that the small granular kidney of interstitial nephritis is not, properly speaking, an atrophied kidney, inasmuch as its reduction in size depends not upon a general atrophy of the organ, but upon contraction of the new fibrous tissue.

Symptoms.—There are no subjective symptoms which would assist us in diagnosing this condition during life; but by careful bimanual examination in very spare persons with relaxed abdominal walls it is sometimes possible.

Prognosis.—If diagnosed, the prognosis must depend largely on the cause of the atrophy. In chronic tubular nephritis, or where the renal artery is implicated in a cancerous growth, it is bad; where only one kidney is atrophied, unless the disease which causes the atrophy interferes with the patient's health, the prognosis is favorable, as persons can live very well with one kidney. The atrophy of old people is not likely to interfere with their longevity.

HYPERTROPHY.

We usually recognize a congenital and an acquired hypertrophy of the kidney. As a rule, congenital hypertrophy is unilateral, and the other kidney is atrophied or absent.

It is a well-known fact that where one kidney is removed or becomes atrophied the other hypertrophies, and in many cases can be recognized by bimanual examination.

CHAPTER XX.

TUMORS AND NEW GROWTHS.

TUMOR, as applied to the kidneys, is often a rather indefinite expression.

All the enlargements of the kidney are usually placed in this classification. Under this heading we shall consider malignant and non-malignant growths, as well as cysts and parasites.

MALIGNANT GROWTHS.

Carcinoma.—There may be said to exist three peculiarities about cancer of the kidneys,—viz.:

1. The kidney is comparatively exempt from cancer.

2. When it is the subject of cancer it is frequently met with in young children, and less frequently at the usual cancer age. When cancer is present in young children, the kidney is more often attacked than any other organ. It is, however, probable that many of the so-called cancers of the kidney in children are sarcomatous.

3. The medullary variety is of most frequent occurrence.

ETIOLOGY.—We know no more of the cause of carcinoma of the kidney than we do of the cause of carcinoma of other organs, nor have we any satisfactory explanation of its frequent occurrence in young children. It is fair to suppose that heredity plays about the same part in cancer of this organ that it does in others. It may be primary or secondary. When primary, it is usually confined

to one kidney. When secondary, both organs are likely to be involved, except where the disease is the result of direct extension from another organ.

In adult life males are much oftener attacked than females. In children sex plays no part.

Pathology.—It is probable that cancer of the kidney does not always originate in the same structure. In some cases the cancer-cells originate in the epithelium of the tubules, while some pathologists maintain that the cancerous growth begins in the cellular tissue around the Malpighian bodies. Schroeder thinks that cancer often originates in the endothelium of the blood-vessels.

Symptoms.—In secondary cancerous deposit in the kidney the symptoms are seldom well marked; in fact, post-mortem examination often reveals cancerous deposits where they were not even suspected during life. At other times the patient may complain of pain, and on examination enlargement of one or both kidneys be found. Where both kidneys are involved, a diagnosis is a matter of less practical importance, as there may be deposits in other organs, and nothing is to be hoped for from treatment.

In primary cancer of the kidney we generally have four prominent symptoms, one or more of which are always to be found,—viz., hemorrhage, pain, tumor or enlargement, and cancerous cachexia. Hemorrhage is present in about one-half the cases, being sometimes the first symptom which attracts the attention of the patient or physician. In other cases hematuria may occur at very irregular intervals during the course of the disease. When hemorrhage occurs as a very early symptom, before the appearance of any tumor or cancerous cachexia, it is not possible to make a diagnosis, as the hemorrhage might be from hyperæmia or stone.

Pain is not always present, nor often severe, and never produces the severe attacks of renal colic that are associated with the passage of renal calculi. Occasionally severe pain may result from the presence of blood-clots in the ureters. When such is the case, long strings or clots of blood will be found in the urine. The pain is, as a rule, dull and aching in character, situated about the back and loins, often passing down the legs or into the bladder, but it is seldom severe in the testicle, as is frequently the case in gravel.

A careful bimanual examination will always detect any considerable tumor between the lower rib and the iliac crest. The tumor, unless very large, generally retains somewhat the shape of the kidney. It is usually fixed, and does not move with the act of respiration. The growth may involve the inferior vena cava and produce engorgement of the abdominal veins, with dropsy of the feet and legs.

On the right side the hepatic duct may be involved and jaundice result, or the portal circulation may be interfered with, when, besides œdema of the feet and legs, ascites will supervene.

The cachexia in cancer of the kidney is quite characteristic, the patient assuming a bronzed rather than the blanched anæmic hue. My last patient who died of renal cancer had hemorrhage as an early symptom, and subsequently had a fixed kidney-shaped tumor, pain, severe headache, anorexia, and vomiting. For months before death there was steady emaciation, as also extreme irritability of the bladder, with oliguria.

Primary cancer of the kidney in young children grows very rapidly, often producing enormous distention of the abdomen. It is not associated with much wasting or attended by severe pain. There may be hæmaturia, but

this occurs more frequently when the subject is an old person. As the case progresses, secondary nodules may be found in the other kidney or in the lungs, emaciation will appear, and the patient will present the usual cachexia.

Treatment.—The treatment consists in attempting to prolong life by nourishment and tonics, and in giving relief from pain by the use of opiates on the one hand and removal of the kidney on the other.

When the disease is primary and unilateral and an early diagnosis can be made, removal of the kidney—nephrectomy—is indicated. (See chapter on Surgery of the Kidney.)

NON-MALIGNANT OR BENIGN GROWTHS.

Non-malignant growths of the kidney are extremely rare. We do, however, occasionally find a fibroma, lipoma, angioma, or adenoma.

These growths have no well-marked clinical characteristics that would enable us to diagnose them.

Although extremely interesting to the pathologist, they hardly demand much attention from the clinician.

When a fibroma does occur, it develops in small nodules, and generally in the pyramidal portion of the kidney. The nodules do not often grow to a large size. Fibroma, like any other new growth in the kidney, may give rise to hæmaturia.

Lipomata, or fatty growths, have been thought to commence in the fatty cellular tissue outside the kidney, whence they invade the kidney, destroying the renal tissue, producing atrophy, and converting the organ into a mass of fat. There is no possible means by which this condition can be diagnosed during life.

Adenoid deposits have been found in the kidney accompanying leucocythæmia and lymphadenoma.

Cases of glioma have been reported from time to time as small tumors developed in the cortex of the kidney.

CYSTS OF THE KIDNEY.

Cysts of the kidney are divided into simple, congenital, cystic degeneration, and hydatid cysts.

Etiology.—Simple cysts may be dilatations of tubules or Malpighian capsules, and be the result either of obstruction in the lumina of the tubules or of their obliteration by compression.

Congenital cysts probably originate in the same way. Virchow ascribes the congenital cysts to obstruction of the uriniferous tubules by inflammation during fœtal life. The organ is found at birth to be in a state of cystic degeneration; in other words, being a mass of cysts in which the proper secreting structure is lost, and attaining such a size, at times, as to be an impediment to the birth of the child.

Some pathologists doubt the existence of cystic degeneration,—that is, that cysts originate from enlargement of the secreting cells of the kidney.

The kidney is not the subject of hydatid disease as often as the liver and the lungs. Exactly how the parasite finds its way from the digestive organs to the kidney has always been a matter of speculation.

Pathology.—In the condition of simple cyst, the kidney may be normal in appearance or irregular, with the outlines of cysts from a minute size up to that of a walnut plainly visible under the capsule.

In cutting open a kidney of tubular nephritis a great number of small cysts may be found. It is in this pathological condition that we find the cysts, as dilated tubules or Malpighian capsules, the result of obstruction of the tubules by blood, pus, concretion, or fibrinous exudation.

On the contrary, the cysts found in interstitial nephritis are the result of obliteration of the tubules by the contraction of the new fibrous tissue.

Cystic degeneration shows an enlargement of secreting cells and consequent compression of the structure of the kidney, causing degeneration of its tissues, resembling in a measure the ovarian cyst. (See Fig. 16.)

Hydatid cysts are formed by the encapsulation and proliferation of the parasite tænia echinococcus.

Symptoms.—The kidney may contain a large number of small cysts scattered throughout its cortical portion both in chronic tubular and in interstitial nephritis, and give no indication of their existence. Should the cysts be very large and directly under the capsule, they might be recognized by physical examination. I have seen hæmaturia where such cysts were found, but we as often have hæmaturia in chronic tubular or interstitial nephritis where no cysts are present.

Hydatid cysts, usually unilateral, are likely to soon acquire so large a size as to be easily recognized by inspection or physical examination; in fact, they may fill the whole side of the abdomen, and may be mistaken on the left side for cystic disease of the spleen or ovary, and on the right side for hydatids of the liver.

Laparotomies have been made for the removal of ovarian tumors where the operators found they had to deal with hydatids of the kidney. When they are smaller they might be mistaken for a hydronephrosis. In any case aspiration ought to establish the differential diagnosis between ovarian fluid, urine, and hydatid fluid containing portions of the hyaline walls of the daughter cysts of the echinococcus. Hydatid cysts may rupture into the pelvis of the kidney and the fluid escape with the urine, in which it can be recognized. The passage of this fluid through

FIG. 16.

Cystic degeneration of kidney.

the ureter and urethra is sometimes accompanied by much pain.

Prognosis.—The simple cysts of either tubular or interstitial nephritis probably interfere little, if at all, with the progress of the disease. Large cystic degeneration may completely destroy the renal tissue. In hydatids the prognosis is certainly unfavorable. The cyst may open into the abdominal cavity or the cellular tissue surrounding the kidney, but in favorable cases the kidney may be removed and the patient recover.

Treatment.—There is no medical treatment applicable to the cysts of interstitial or tubular nephritis.

Where unilateral and congenital, the indication is to remove the kidney. (See chapter on Surgery.)

Occasionally hydatid cysts have been aspirated, iodine injected, and the case reported as cured.

SECTION III.

DISEASES OF THE PELVIS.

CHAPTER I.

RENAL CALCULUS, STONE, STONY CONCRETIONS—RENAL COLIC — NEPHRO-LITHIASIS — PYELITIS CALCULOSA — CALCULI RENALIA.

In considering the diseases of the pelvis of the kidney, we shall take up stone as one of the most important.

The term renal calculus is generally understood to mean stone in the pelvis of the kidney, but there may be deposits also, either congenital or acquired, in the tubules or in the kidney proper. These tubular deposits are often designated "concretions" or "gravel."

Whether concretions in the tubules or calculus in the pelvis, these deposits, as a rule, partake of the nature of the salts of the urine,—uric acid, the phosphates, lime, etc.

Etiology.—The cause of stone, concretions, or gravel, whether in the kidney proper, in its pelvis, or in the bladder, is obscure.

To say that they are the result of defective digestion and assimilation gives us no exact knowledge on the subject, as the nature of the fault in the digestion or assimilation which produces the stone has never been satisfactorily explained.

Among the many theories on the subject may be mentioned one which ascribes the deposit to the inability of the urine to hold its salts in suspension.

This, however, is faulty, as it assigns no exact chemical reason for the failure of the urine to hold its salts in solution.

Mickel maintains that the formation of precipitates is not requisite for the production of a urinary calculus, but that it depends upon a specific catarrh of the urinary passages, called by him "stone-forming catarrh."

In this condition the mucous membrane is supposed to secrete a tough adhesive mucus which has a tendency to acid fermentation, during which the oxalate of lime appears. He holds that almost all stones consist primarily of oxalate of lime, to which more is added from the decomposed urine. If the urine becomes alkaline, he maintains, the oxalate of lime in the stone is displaced at first by uric acid and urate of ammonium and afterward by the phosphates, thus converting an oxalic into a phosphatic calculus.

Whatever the chemical causes are, there is no doubt that heredity plays an important part. There is in certain families a strong hereditary tendency to the formation of urinary calculi; in other words, some persons possess a stone diathesis.

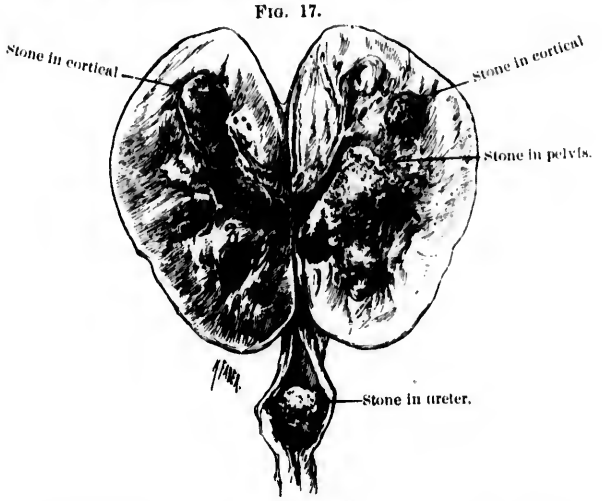
In this connection I may mention that there seems to be an intimate relation between the gouty diathesis and the urinary calculus diathesis. We not infrequently see in the same family some members who are the subjects of urinary calculi, while others are victims of gout; and it often happens that persons who have had attacks of renal colic or stone in the bladder in early life develop gout later.

Climate can hardly be said to be an etiological factor in this disease, while locality has a very decided influence. It is found to be particularly prevalent in lime districts, where the drinking-water contains lime in ex-

cess; for instance, in the eastern section of England urinary calculi are much more prevalent than in the western. Norway and Sweden are notably exempt, not, however, on account of their cold climate, for stone is of frequent occurrence in Iceland. On the other hand, India, with a hot climate, contributes a goodly quota of cases.

Age.—That renal stone is more frequent in young adults than in the aged seems to be the prevailing idea of most writers. My own experience, however, points in the

FIG. 17.



Nephro-lithiasis.

opposite direction. I have collected a large number of renal calculi, all of which are from cases occurring in my own practice, and not one of them is from a person under the age of twenty.

The concretions spoken of as occurring in the tubules, however, are no doubt oftener found in children than in older persons. Males are much more frequently subject to this condition than females.

Fig. 17 gives a beautiful illustration of the mode of formation of renal calculi in the pelvis and the substance of the kidney. The largest stone completely fills the pelvis, while there are three other stones in the body of the kidney. The stone in the ureter must have become detached from the pelvic stone and found its way into the ureter, where it became impacted, or it may have made its way into the ureter from the pelvis before the formation of the large pelvic stone.

The stones in the body were, of course, primarily deposits in the tubules.

The patient, a native of France, thirty-nine years of age, consulted Dr. L. Bazet, of this city, in November, 1891, complaining of severe cough, great emaciation, and irritable bladder. He had contracted a urethritis in his twenty-second year, and had since had several attacks.

His family history was good. In 1888 he was treated in Paris by Prof. Guyon for cystitis.

He came to California in 1889, in fair health. When admitted to the Polyclinic Ward of the City and County Hospital in December, 1891, he was much emaciated, very feeble, had a severe cough, and complained of pain over the pubes radiating to the right lumbar region, with frequent micturition of muco-purulent urine. There was a cavity in the apex of the right lung, and hepatization in the [illegible] base. Hectic fever was present; tubercle-bacilli abounded in the sputa.

To relieve the irritability of the bladder Dr. Bazet performed cystotomy. The patient died fourteen days afterward, of pulmonary complications. He had never

complained of pain in the region of the kidney. Notwithstanding the large stone impacted in the ureter, there was no history of renal colic.

The irritability of the bladder and the muco-purulent urine were attributed to tubercular cystitis, which the post-mortem examination showed to be absent.

Pathological Anatomy.—Three varieties only of calculus are common,—namely, uric acid and its compounds, oxalate of lime, and the mixed phosphates.

Calculi of large size are seldom of the same composition throughout, being usually arranged in concentric layers about a nucleus, which may be of uric acid, oxalate of lime, blood-clots, or foreign bodies, but is very rarely one of the phosphates.

Uric acid calculi are the most common. They are of reddish color, and generally smooth, but may be tuberculated.

Oxalate of lime calculi are of a dark-brown or gray color, and usually tuberculated, whence the name "mulberry calculi" often applied to them. Occasionally they are small and smooth, constituting the so-called "hempseed calculi."

Calculi of the *mixed phosphates* are composed of phosphate of lime and triple phosphate of ammonium and magnesium. The phosphates often make up the external layers of calculi of various composition, but seldom constitute the nucleus of a calculus.

Calculi have sometimes been found composed of carbonate of lime, xanthin, cystin, and urostealith.

Symptoms.—We shall take up the symptoms under two heads,—namely, renal calculus and renal colic.

The first includes the symptoms that result from the presence of stone in the pelvis of the kidney or from tubular concretions; the latter, the symptoms attending

the passage of the stone from the pelvis of the kidney through the ureter to the bladder.

Calculi sometimes produce no pain, but, as a rule, either tubular concretions or the presence of stone in the pelvis will be attended by more or less pain, of a dull, aching character, either constant or intermittent, aggravated by movements of the body, and sometimes following the course of the ureter to the groin or the testicle. It may continue for months and be accompanied by tenderness on pressure. In perhaps half the cases there is hæmaturia, which is subject to no rule as to the frequency of its occurrence. Sometimes there will be but a slight hemorrhage; at other times the attacks will be quite persistent, and perhaps accompanied by pyelitis; while in still other cases the stone may be retained apparently for a great length of time in the pelvis without producing inflammation.

In infants, deposits of urates or phosphates are often found in the diapers. These probably have their origin in the tubules, and their passage through the ureters causes considerable pain.

RENAL COLIC.

The first indication of renal colic is generally a sudden onslaught of pain as the stone enters the ureter. This seldom occurs while the person is walking or sitting upright, but takes place when he is stooping, bending over, or lying down, as the body is then in a more favorable position for the stone to enter the ureter.

The suffering is sometimes so severe as to cause fainting, the patient falling into a collapsed condition, soon, however, rallying to realize the intensity of his pain.

At first the pain is so great as to make it difficult of exact location, the patient in his agony referring it to the

entire abdomen; and it is only by the closest questioning and attention on the part of the physician that it will be located in one or the other kidney.

As the stone passes down the ureter the pain becomes less general, confining itself principally to the course of the ureter, being annoying in the region of the bladder, and severe in the groin and often in the testicle; and when the calculus arrives at the base of the bladder it frequently produces intense pain in the head of the penis, with tenesmus.

The extreme agony which the patient suffers often makes it impossible for him to remain more than a few moments in any fixed position. He rolls over the bed, and even on the floor, and will occasionally find relief by getting on his knees and pressing one or both hands into the abdomen over the affected ureter.

The pains are almost always accompanied by severe vomiting and retching, which add greatly to the distress of the patient. Some complain also of intense headache. There is usually great mental depression, together with pallor, cold feet and hands, and profuse cold sweating.

These attacks may be of a few hours' duration, or may continue for days. In one of my earliest cases the attack lasted nearly ten days, the patient barely surviving the passage of the stone.

The stone may become impacted, converting the case into one of hydronephrosis, or it may ulcerate through the ureter, death ensuing in this event from the entrance of the retained urine into the abdominal cavity. During attacks of renal colic I have sometimes known the pain to intermit, giving the patient immunity for a few minutes or even half an hour: in such cases the cessation of pain is probably the result of the escape of the urine past the stone.

Differential Diagnosis.—Renal colic ought not to be mistaken for enteralgia, except, perhaps, at the commencement of the attack, when in both cases the pain seems to be distributed equally over the abdomen.

On the right side it might be possible to mistake the pain of renal colic for that of gall-stone, but in a few hours the pain of the former passes down the ureter, while that of gall-stone is confined to the epigastrium and the region of the liver. Both may be accompanied by excessive vomiting, retching, sweating, pallor, and exhaustion. Later, in gall-stone, jaundice supervenes. The passage through the ureter of clots of blood, hydatids, or muco-purulent matter may produce severe pain, but is nothing like what is experienced in any ordinary attack of renal colic. I once had a patient in whom a large concretion was impacted in the upper part of the descending colon, giving rise to great pain, and simulating closely left renal colic. Soon, however, the bowels became greatly distended, and the presence of obstruction was evident.

Prognosis.—As a rule, the prognosis is favorable. The patient, in a few days after the passage of the stone, will have entirely recovered.

Occasionally a stone becomes impacted, and death may result from ulceration or rupture of the pelvis of the kidney; hydronephrosis or pyelitis may follow, and result in destruction of the kidney.

Treatment.—The treatment of renal concretions and stone in the pelvis of the kidney will of necessity be more or less symptomatic, and usually consists in allaying pain, if intolerable, with attempts to dissolve the concretions or stone by solvents. The success of solvent medicines will depend largely on the character of the stone. The most sanguine therapeutist would hardly expect to dissolve an oxalate of lime calculus. Many, however, have

asserted their ability to dissolve, both in the pelvis of the kidney and in the bladder, stones formed of urates and phosphates.

Of remedies intended for clearing the tubes of their concretions and possibly dissolving calculi, Roberts, who has given more attention to this subject than perhaps any other authority, thinks most highly of the citrate and acetate of potassium. These salts should be given in from one-half to one drachm doses, well diluted with water, every three or four hours. Their administration may be continued for weeks, and even in some cases for months, without detriment to the digestive organs.

When it becomes evident that there is a stone in the pelvis of the kidney, and its presence is unbearable either from pain or in consequence of the production of disease, and solvent remedies have failed, the kidney must be removed by surgical procedure. (See chapter on Surgery of the Kidney.)

Renal Colic.—In cases of collapse, where the pulse is extremely weak, the countenance pale, and the feet and hands cold, the indications are to apply heat, and give stimulants with opiates until reaction is established. Where there is no collapse the indication is to administer opiates in sufficient quantity to make the pain endurable during the passage of the stone.

You will find that many writers recommend hot baths in addition to opiates, with the view of relaxing the ureter; but hot baths or the application of heat sufficient to keep up a constant and excessive sweating, while they may give some relief, will retard rather than facilitate the passage of the stone.

The calculus never passes through the ureter by reason of its relaxation, but is forced through by the pressure of the urine behind it. So long as there is excessive action

of the skin the action of the kidneys will be insufficient to force, with any degree of rapidity, the passage of the stone. This is especially the case as the extreme vomiting often makes it impossible to retain fluids in the stomach.

My own method of treating renal colic is to give opiates, generally morphine hypodermically, unless there is much collapse, in which case I use the tinctura opii. I insist upon the patient's drinking freely of water, carbonized or mineral, weak tea, or whatever bland liquid he prefers, in the hope that some will be retained.

When possible, I keep the patient on his feet, walking about the room, to give him the benefit of the action of gravity, which is considerable where the stone is near the bladder and the ureter is filled with urine.

Where the vomiting is so excessive that it seems impossible for fluids to be retained long enough to be absorbed, I have thought that it might be well to use large enemata of warm water, thus supplying urine to force along the stone. I have not yet tried this plan, however.

Because of the vomiting, it is usually necessary to administer opiates either hypodermically or per rectum. I seldom use less than one-half grain of morphine for the first injection, followed every hour or two by one-eighth or one-quarter of a grain, as the case may require.

Laudanum may be injected into the rectum in drachm doses every hour or two until the pain is bearable. An excellent suppository, when that method of medication is resorted to, is one consisting of morphine one-half grain, hyoscyamus five grains, and a sufficient quantity of oil of theobroma.

When there is an idiosyncrasy against morphine or opium, the next best remedy is chloroform or ether administered by inhalation.

Should the attack continue for several days, as sometimes happens, the patient's strength must be maintained by rectal nourishment. In one of my first cases, already mentioned as lasting ten days, the patient barely survived the passage of the stone, although he received nourishment by the bowels regularly; and it may be well to say here that the duration of the attack was probably owing to the treatment rather than to the size of the stone. The consulting physicians in the case were men of ability and experience. I was a youngster then, and carried out the instructions of my elders, which were to give opiates rather sparingly, and constant baths as hot as the patient could endure them. His vomiting was very distressing, and, there being but little fluid secreted by the kidneys, the passage of the stone was delayed.

PROPHYLACTIC TREATMENT OF RENAL CALCULI.

A patient who has experienced a severe attack of renal colic is anxious to escape a recurrence of the terrible pain, and he naturally asks, "What can I do to prevent such suffering in the future?"

While much can often be done to ward off subsequent attacks, physicians who have had any considerable experience with these cases are obliged to acknowledge their frequent failure to prevent such attacks.

In many cases there seems to be a strong stone-making diathesis, and when we have done all that lies in our power, seconded by the conscientious efforts of the patient, the formation of renal calculi still continues. Such failures, however, must not discourage us and prevent us from holding out hopes to the patient that he may still get relief from his malady.

We have every reason to believe that the primary trouble is with the digestive organs. The diet should receive our

first attention. We must impress upon our patient the importance of exercising great care in regard to his food.

The quantity of food should be moderate and regulated with reference to the habits of the individual, whether active or sedentary.

If the patient is living a very active life, or from some individual peculiarity requires more than an ordinary amount of food, let him eat four or five times a day, rather than overload his stomach by taking two or three too hearty meals.

The quality of the food is as important as the quantity, if not even more so. Nourishing and easily-digested food is what we should advise; and in doing so we must remember that doctors often make mistakes in being too arbitrary with other people's stomachs. Most digestive organs have their peculiarities. As a rule, meat should not be too freely indulged in, but should be partaken of sparingly twice a day at most. The meat should be varied, the patient being warned against too frequent indulgence in beef.

Fish is usually allowed, but I have doubts as to its propriety where the stones are phosphatic.

The manner of eating food, no less than the quantity and the quality, is of great importance. When the stomach digests food well, the patient should eat slowly; when it does not, he should eat very slowly.

Let the non-nitrogenous foods prevail in the stone-making and gouty diatheses, limiting the vegetables which are richest in phosphates when the calculi passed are phosphatic, and avoiding those which abound in oxalates when oxalate of lime predominates in the calculi.

Rice is an excellent article of diet in most of these cases, and a taste for it should be cultivated.

Pork, veal, hashes, highly-seasoned gravies and dress-

ings, with rich desserts, must be absolutely eschewed. The preparation of the food is an important factor. Meats should be broiled or roasted, rather than stewed, fried, or baked. The very best food can be rendered indigestible in its preparation.

Next in importance to regulation of the food in the prevention of stone are the quantity and variety of liquids. Individual physicians differ about the variety, in regard to stimulants, for instance. But there can be no question that a person with a stone-making diathesis should take more than the ordinary amount of fluid.

In individual cases mineral waters are no doubt beneficial. Springs containing different salts are highly recommended by various authorities and apparently in the same class of cases. Patients, too, are often loud in their praises of certain springs to which they happen to have been recommended. I strongly suspect, however, that the benefit derived from a sojourn at Carlsbad, for instance, is often due more to what the patient did not take while there than to the therapeutic effect of the mineral waters.

I have great confidence in distilled water or carbonized distilled water taken freely; nevertheless patients will often take mineral water with more relish and in greater quantity than they will distilled water. I once had prepared for a patient of mine, in whom everything else had failed to prevent the production of stone, distilled water charged with oxygen gas, without benefit, however. In some cases where what is really needed is rest, with less food and less whiskey, we may often prevail on the patients to try the springs when every other means to secure rest and the most stringent restriction in diet have proved of no avail.

Besides the great number of the springs of California with every variety of water at every temperature, we have

the advantage over the mineral springs of all other countries, in climate: we have springs at the cool sea-side, in the hot valleys, and at all altitudes. We are thus offered as great a variety in temperature and climate as in the composition of the mineral waters.

I do not believe that there is one per cent. of these cases that the use of tobacco will not injure; and the same may be said of the use of alcoholic liquors.

A healthy action of the skin should be insured by regular bathing, exercise, and the wearing of warm flannel underclothing summer and winter.

As to the administration of medicines, let me say that there is no specific that will prevent the formation of renal calculi. We are forcibly reminded by this stone diathesis that the science of medicine is not an exact science. Until we possess a more exact knowledge of the etiology of renal calculi we must grope about in the dark for a remedy to prevent their formation.

Medicines are of use in keeping the bowels soluble and in maintaining the secretions and digestion in as good condition as possible: Henry's magnesia and rhubarb answer well for this purpose. I am in the habit of prescribing a mineral acid in combination with a vegetable tonic when the tendency is to oxalate-of-lime deposit, and the iodide, citrate, or acetate of potassium with calumba or quassia when the phosphates or urates prevail, adding wine of colchicum in gouty cases; citrate of lithia often seems to be efficacious. It is very difficult to determine the beneficial results of any special course of treatment, for the reason that in some cases of renal calculus without treatment there is no recurrence of the trouble, while in other cases there is a constant repetition despite any method of treatment employed.

There is a possibility that the new remedy piperazin,

which is now being tried for the condition called by Sir William Roberts urastosis, will prove efficacious in preventing the formation of stone composed of urates.

CHAPTER II.

PYELITIS.

Pyelitis is an inflammation of the mucous membrane lining the pelvis of the kidney.

Etiology.—This is rarely a primary disease, that is, a disease arising from taking cold, from injury, or from some so-called idiopathic cause.

Secondarily, however, it frequently occurs as an accompaniment or a sequel of some one of the acute infectious diseases,—particularly scarlet fever, diphtheria, cholera, and typhoid fever. I have had several cases of pyelitis accompanying or following la grippe. Occasionally the pelvis is said to be the seat of a true diphtheritic exudation.

Renal calculi are the most constant causes of inflammation in the pelvis, while pyelitis is found in every case of tubercular kidney, as well as in most cases of renal abscess.

Again, we constantly meet with secondary inflammation of the pelvis extending from long-standing stricture of the urethra with cystitis, and from inflammations of other abdominal organs. Thus we see that age, sex, and climate have little to do, directly, with the etiology of pyelitis.

Pathology.—I have spoken in previous chapters of pyelitis produced by urinary calculus, as well as of the pyelitis of tuberculosis.

When the pyelitis follows or accompanies one of the

acute infectious diseases, or is the result of extension from the bladder, we expect the inflammation while it is confined to the mucous membrane to give a true catarrhal condition the pathology of which differs in no way from that of inflammation of the mucous membrane in any other organ.

Symptoms.—We have discussed the symptoms of stone in the pelvis; the pain, etc., being the result of the stone rather than of inflammation. Catarrhal inflammations secondary to the acute infectious diseases or to cystitis are not likely to be ushered in by a distinct chill, though the patient may experience chilly sensations. There will not be much fever while the inflammation is confined to the mucous membrane.

We usually find tenderness over the region of the kidney, soreness and lameness upon movements of the body, and perhaps dull aching pain following the course of the ureter and occasionally felt in the testicle or bladder. Micturition is frequent, but not urgent, and the urine is very turbid from the presence of mucus. The microscope may show pus-cells, an occasional blood-corpuscle, and possibly the epithelium characteristic of the pelvis of the kidney. When there is pus there will, of course, be a slight trace of albumen.

Prognosis.—The prognosis must be determined entirely by the cause of the pyelitis and the condition of the patient. It is seldom that pyelitis adds much to the gravity of the case, whether it be stricture of the urethra and cystitis, or one of the acute infectious diseases. The pyelitis, however, may involve the kidney, in which event the prognosis will be serious.

Treatment.—The indication for treatment, as a rule, is rather to remove the cause than to treat the disease. This is particularly the case in stricture, cystitis, and

renal calculi. Nor does the catarrhal inflammation following the acute infectious diseases call for active treatment. Enjoin rest, quiet, light nourishing diet, perhaps a little counter-irritation or a flannel belt, addressing the treatment to the general condition of the patient, who is probably convalescing from an acute infectious disease. Small doses of copaiba will often affect the mucous membrane of the pelvis of the kidney as beneficially as it does that of the bladder and urethra. I have found that a combination of chloride of iron and spirit of nitrous ether with glycerin has a happy effect in such cases. The remedy which I most frequently use when the patient is anæmic is the following:

℞ Sulphur. præcip.,
Ferri carb.,
Glycerini, ää ℥ss;
Aquæ ad ℥iv.—M.
Sig.—A teaspoonful every two to four hours.

Cod-liver oil is very beneficial, especially in weak delicate children convalescing from acute infectious diseases.

CHAPTER III.

PYO-NEPHROSIS (NEPHRO-PYOSIS—PYELO-NEPHROSIS).

The term pyo-nephrosis designates dilatation of the pelvis of the kidney with pus.

Etiology.—This condition is liable to arise during any of the suppurative inflammations of the kidney or of the mucous membrane of the pelvis.

The pathology must differ according to the cause. The

pelvis will be distended with pus whenever its escape is prevented by obstruction in the ureter.

Symptoms.—The symptoms we have already detailed under the heads of the various causes of the disease.

The characteristic diagnostic feature in this condition is the pyuria, provided the ureter be pervious. When both kidneys are involved, the pus in the urine is constant. When only one kidney is diseased, the urine may be voided from the healthy kidney and be perfectly free from pus for days, the pus that accumulates in the diseased kidney escaping intermittently into the bladder.

The urine secreted is sometimes very small in amount, just enough to drive the pus through the diseased ureter once or twice a week. Should the ureter become completely obstructed the pyo-nephrosis might form a considerable tumor, in which case its diagnosis would be best made by aspiration.

As a rule, in pyuria there is no great difficulty in making the differential diagnosis between pus from the kidney and pus from the bladder. The pain and tenderness over the region of the bladder, with frequent and painful micturition, on the one hand, and the pain and enlargement of the kidney on the other hand, will generally be sufficient to enable us to make a diagnosis.

Treatment.—The treatment is essentially surgical.

CHAPTER IV.

HYDRO-NEPHROSIS (HYDROPS RENALIS—HYDRO-NEPHRON).

Hydro-nephrosis, or an accumulation of urine in the pelvis of the kidney, is the result of obstruction of the ureter, and is generally unilateral.

ETIOLOGY.—Obstruction of the ureter from any cause while the kidney is in a condition to secrete urine will produce dilatation of the pelvis, or hydro-nephrosis. Impacted stone and stricture of the ureter the result of inflammation are frequent causes. Stricture of the urethra, or growths in the bladder obstructing the ureteral openings, will give rise to a bilateral hydro-nephrosis. Inflammations in the pelvis producing contraction and obliteration of the ureter, or cancer in the abdominal cavity, may involve the ureter; and sometimes large abdominal tumors press upon and obstruct it. In other words, the obstruction may be in the canal of the ureter, may be caused by disease of its walls, or may be the result of pressure exerted externally to it, of growths at the base of the bladder, of hypertrophy of the prostate, or even of phimosis.

PATHOLOGY.—Whatever the cause of the obstruction, the accumulation of urine in the pelvis distends it to a greater or less extent, and presses upon the papillæ, causing their flattening and induration, and atrophy of the kidney tissue. The calices are obliterated, and nothing may be left of the kidney but a cortical shell. This internal pressure soon stops the secretion of urine, and hence prevents any increase in the size of the tumor. Some pathologists are of the opinion that after the secretion of urine ceases the tumor increases slowly in size from secretion by the mucous membrane.

SYMPTOMS.—The general history of the symptoms is that of disease of the bladder, abdominal tumors, or impaction of a renal calculus, which causes the obstruction, and the fluctuating tumor of hydro-nephrosis is the pathognomonic symptom.

DIAGNOSIS.—The differential diagnosis is determined by aspiration.

PROGNOSIS.—The prognosis is generally serious, both from the fact of the disintegration of the kidney, and on account of the cause producing the condition.

TREATMENT.—Remove the cause where possible. (See chapter on Surgery.)

CHAPTER V.

PERINEPHRITIS.

PERINEPHRITIS is an inflammation of the cellular tissue and adipose capsule surrounding the kidney.

ETIOLOGY.—It may be caused by injuries, such as falls, blows, wounds, etc., but is usually the result of suppurative inflammation of the kidney or its pelvis, or of pelvic stones which have caused ulceration or perforation.

Tubercular kidney is often accompanied by perinephritis, and inflammation may spread from other organs to the adipose capsule of the kidney, as sometimes happens in perityphlitis or lumbar abscess.

SYMPTOMS.—This condition is usually ushered in by a chill or recurrent chills, followed by rise of temperature, with pain, swelling, and tenderness over the region of the kidney. Any motion of the body aggravates the pain.

There is likely to be frequent micturition; but the condition of the urine depends upon the state of the kidney rather than upon the perinephritis.

Suppuration will soon take place, and often an abscess can be distinctly felt and easily diagnosed.

At times, however, the pus escapes along the psoas muscle and presents itself under Poupart's ligament. It may find its way into the pelvis of the kidney and escape

with the urine, and it has occasionally been known to perforate the diaphragm and escape through the lungs or open into the bowels or the abdominal cavity.

Prognosis.—The prognosis is serious unless the disease is the result of injury. The very fact that it is so often secondary to suppuration of the kidney makes the prognosis unfavorable.

Treatment.—The indications for treatment depend entirely upon the cause. In cases of injury, cupping or leeching, followed by hot or cold applications, may be found necessary. The pain may necessitate opiates, and the fever antipyretics. As soon as suppuration is apparent, nephrotomy is indicated; and when the perinephritis is preceded by suppurative nephritis, nephrectomy becomes not only justifiable but even imperative. (See chapter on Surgical Kidney.) The strictest diet must be enjoined, especially in injuries involving the kidney.

CHAPTER VI.

URETERS.

Ureteritis is probably never primary, but the result of inflammation spreading from the bladder, from the pelvis of the kidney, or from the abdominal organs, or of the passage of renal calculi. There are no symptoms, subjective or objective, by which we can diagnose a special inflammation of the ureters.

They are probably always more or less involved in the above-named conditions.

Obstruction of the Ureters.—One of the most common causes of obstruction of the ureters is the impaction of a

stone in its passage from the pelvis of the kidney; or the obstruction may be caused by a stricture of the ureter the result of inflammation produced by the passage of a calculus. In tuberculosis of the kidney or of the bladder the walls of the ureters are thickened and irregular, sometimes causing temporary obstruction. New growths in the bladder may obstruct the orifice of the ureters, and tumors in the abdomen or pelvis cause obstruction from pressure, while cancer may invade the ureter and close it. The ureters are occasionally accidentally enclosed in ligatures during hysterectomy and operations for ovarian or other pelvic tumors. The symptoms resulting from obstruction of the passage of urine would be pain from distention of the tube, and hydro-nephrosis, or, in some cases, rupture of the ureter and escape of urine into the abdominal cavity.

Dilatation can result only from obstruction. The ureters are sometimes enormously dilated and tortuous.

Perforation.—Perforation is most likely to be the result of cancerous involvement or of ulceration from impacted stone. Occasionally the ureter is accidentally opened during operations. In any case the urine escapes into the abdominal cavity or the cellular tissue, producing serious results, if not death.

Hypertrophy and Atrophy.—In tubercular disease of the kidney we find the ureter greatly enlarged and thickened, which condition, of course, is not a true hypertrophy. It is doubtful whether we ever meet with a true hypertrophy of the ureters; though it is barely possible that the condition might occur in diabetes or partial obstruction.

The ureters are often atrophied, and sometimes completely obliterated, through disease.

Malformations.—Occasionally in the dissecting-room or at post-mortems malformations of the ureters are met with.

They have been found, one or both, impervious at birth. One kidney may have two ureters, or there may be two from one kidney which unite before entering the bladder. They are of no practical importance, except when impervious, and in abdominal surgery.

CHAPTER VII.

SURGICAL TREATMENT OF THE KIDNEYS.

The operations for the surgical treatment of the kidneys may be designated as follows: aspiration, nephrorrhaphy, nephrotomy, nephro-lithotomy, and nephrectomy.

ASPIRATION.

Aspiration is resorted to in cases of simple or hydatid cysts, or of hydro-nephrosis. Cures have been effected, in these diseases, by aspiration alone, or in conjunction with iodine injections. Where aspiration fails, nephrotomy is usually resorted to. Should this prove ineffectual, the final radical means still remains to us,—namely, nephrectomy. As a means of diagnosis or to procure temporary relief, we use aspiration in cases of abscess, pyo-nephrosis, or tubercular kidney. It is certainly of great importance as a method of diagnosis, enabling us to differentiate between hydro-nephrosis, pyo-nephrosis, and simple or hydatid cysts. The small cysts of chronic tubular or intertubular nephritis are not to be aspirated. In fact, as we have seen, it is impossible to diagnose their existence.

Method of Aspiration.—It is almost superfluous to say that the skin where the puncture is to be made, and the needle to be used, must be absolutely aseptic.

I prefer a trocar needle and the bottle or Allen aspirator except for diagnostic or exploratory purposes. In introducing the needle one must be careful to keep outside of the peritoneum; otherwise the intestines may be injured, or when the needle is withdrawn the cyst may drain into the abdominal cavity. We must remember that the left kidney is a little higher than the right, and that the needle should be introduced lower on the right side to avoid the liver. No very great harm, however, would be likely to result from piercing the lower margin of the liver. I frequently aspirate the liver for hyperæmia, with very satisfactory results. In many cases of cysts, pyonephrosis, or abscess there is a prominent soft fluctuating point which readily indicates where it is best to introduce the needle. Morris advises entering the needle just anterior to the last intercostal space for the left kidney, but lower and farther back for the right kidney.

"If there be no indication for operating elsewhere, the best spot to select when the tumor is of the right kidney is one half-way between the last rib and the crest of the ilium, between two inches and two inches and a half behind the anterior superior spine of the ilium. This spot is on a level with the front of the bodies of the lumbar vertebræ, and a needle here passed horizontally inwards will be altogether in front of the normal kidney, and will either transfix or pass in front of the ascending colon when in its usual place. It may, however, with safety be conjectured that in any case of hydro-nephrosis of the right side requiring to be tapped, if the trocar be inserted at the place I propose, and directed somewhat forwards, the peritoneum and colon will be sufficiently in front to escape injury, the liver will be safely out of reach above, and the kidney behind, while the dilated pelvis of the kidney will be tapped at its anterior and lower part."

Having selected the spot at which to introduce the needle, it is best to use first a hypodermic injection of cocaine and incise the skin with a bistoury, after which the needle can be pushed easily through the soft tissues without danger of plunging it farther than is necessary. It is often necessary to make repeated aspirations in cases of hydro-nephrosis before a cure is effected or before resorting to nephrotomy and drainage or nephrectomy.

NEPHRORRHAPHY.

The surgical operation for the fixation of a movable kidney is called nephrorrhaphy. The etiology, symptoms, and diagnosis of movable kidney, as well as the morphological difference between it and floating kidney, have already been studied in the chapter on Anomalies of the Kidney.

There can be no doubt about the propriety of resorting to nephrorrhaphy when the pain and discomfort of the movable kidney become very great, when the mental anxiety is telling seriously on the general condition of the patient, when life is in danger, or when relief is not afforded by the use of bandages and pads as already advised.

The operation, however, is not unattended by danger, which makes an intelligent trial of all other appliances for relief of greater importance. The operation is a comparatively new one. Hahn of Berlin, in 1881, was probably the first to perform nephrorrhaphy. Many surgeons, both in Europe and in America, have since performed this operation.

Professor Keen, of Philadelphia, reports four cases operated on by himself, and gives a synopsis of one hundred and thirty other cases operated upon in this country and in Europe.

Tait reports three cases of nephrorrhaphy in the *British Medical Journal* for 1889. One patient died, and the other two were not benefited. Tait has expressed himself as thoroughly disgusted with the operation.

METHOD.—Since Hahn's first operation, individual operators have modified his method in accordance with their own views.

The operation of nephrorrhaphy is neither very difficult nor attended with much danger. With ordinary care the only accident likely to happen is that of opening into the peritoneal cavity, which in itself would not be a very serious matter. It will scarcely be possible to mistake the liver for the kidney, as the lighter color of the latter will be recognized. When there is any doubt it will only be necessary to follow with the finger the outline of the organ in question.

The patient should lie on his sound side, over a pillow or support, in order to make the distance between the crest of the ilium and the last rib as great as possible. He should also be in such a position that a good light will fall into the opening.

A competent assistant should stand on the side opposite the operator and confine himself entirely to pressing the movable kidney toward the incision.

The following is quoted from Prof. Keen's excellent monograph on the subject:

"An oblique incision is made between the last rib and crest of the ilium, beginning over the outer border of the quadratus lumborum. Rarely, if ever, will a rib have to be resected to gain room. The edge of the muscle being recognized, the perinephric fat is found immediately at its outer border. This fat having been cut or torn through, the kidney may be seen at once.

"If it is a movable kidney, but not displaced too far

from its normal position, the movement will be seen to be synchronous with the respiration, and may be very wide in extent. But if the kidney be far away from its normal position, it will not be seen when the perinephric fat is torn through, but must be sought for, not only by the finger in the wound, but also either by the hand of the operator or the assistant, on the anterior abdominal wall, in order to push the kidney back toward its normal place."

When the kidney is not easily reached and cannot be pressed up into the incision by the assistant, it may be hooked by a tenaculum or drawn up by a volsellum. Having drawn the kidney into the incision, it is fixed by sutures, catgut or silk.

The sutures may be passed through the adipose capsule alone, as Hahn did in his first operation, through the fibrous capsule or the cortical portion of the kidney, while some operators have incised the capsule, stripped it off, and passed the sutures through the cortex.

The kidney should be fixed as nearly as possible in its normal position. Both the lower and the upper end should be secured, which will make it less likely to move with the respirations or the other movements of the body. From three to six sutures are usually employed. In passing the sutures through the edges of the incision they should include a firm hold on the muscular tissue.

Some operators have passed the sutures around the lower rib, a plan that is certainly not advisable. In the matter of sutures, silk will probably give the most satisfaction.

"The question has arisen whether the sutures shall remain temporarily in place, or whether they shall be left permanently. I have little doubt as to the desirability of leaving them permanently, but in doing so we must re-

member the large number of silk ligatures that have given rise to subsequent trouble, especially in abdominal surgery. It is important, I think, that the silk should be as fine as possible, but thick enough to be strong." (Keen.)

Some operators leave tubes for drainage in the wound, while others close the wound with sutures, but the most satisfactory method is to leave the wound open and dress it with gauze.

The after-treatment does not differ in any way from the usual methods observed in all wounds of like character. The patient should be kept quiet for from four to six weeks; and it is usual to apply an accurately-fitting bandage, to be worn for several months after the patient is on his feet.

NEPHROTOMY.

Nephrotomy, or incising the kidney for the purpose of evacuating pus in suppuration of the organ or of opening cysts, is resorted to under the following conditions: pyonephrosis, nephro-pyosis or abscess, obstruction of the ureter by a calculus, tubercular kidney, and such cases of simple cysts, hydatid cysts, or hydro-nephrosis as have not been cured by aspiration. Cutting down upon the kidney, but not into it, is necessary in perinephritis.

Where an operation is required, either for suppurative disease or for cystic conditions, we may find the fluid so near the surface that the indications for incision are apparent. Where no such indications exist, we should place the patient in the same position and make our incision in the same manner as directed for nephrorrhaphy. Always bear in mind when making the incision that drainage will be necessary, the tubes to be placed in the most dependent portion.

When the cyst-wall is not firmly adherent to the renal tissues it may be necessary to bring the cut surfaces of the

walls to the margin of the opening, to which they should be attached. If more than one abscess is found, the smaller ones may be punctured with a needle, the openings dilated, and a drainage-tube placed in each. The great object is to secure a free evacuation of the pus and at the same time afford the means of antiseptic irrigation.

After reaching the abscesses there will not probably be much hemorrhage, except in cases of tubercular kidney, when the remnant of renal cortex is very vascular and had better be torn with the finger than cut with the knife.

Small circumscribed abscesses are generally reached by exposing the capsule and puncturing with a fine aspirating needle until pus is found: the punctured opening may then be dilated and the cavity washed out and drained.

NEPHRO-LITHOTOMY.

Nephro-lithotomy is the term applied to the operation for the removal of a calculus from the kidney, its pelvis, or its calices.

This is probably the oldest operation made upon the kidney. It was recommended by Hippocrates; but it is doubtful whether in his time the operation was undertaken for the removal of stone except where pus was present.

Nephro-lithotomy is indicated in cases of troublesome hæmaturia or great pain and distress in the region of the kidney which can be relieved only temporarily by medical treatment and which are believed to be caused by the presence of a stone in the pelvis of the kidney.

At best the diagnosis cannot be positive. The hæmaturia and pain may depend, as we have already seen, upon other conditions. When these symptoms are present and the patient has had previous attacks of renal colic and passed gravel, or where small particles of gravel are constantly passing from the bladder, as we sometimes see

when there is a calculus in the bladder or in the pelvis of the kidney, the diagnosis is at least sufficiently certain to warrant the operation.

METHOD.—The kidney is exposed by the lumbar incision

FIG. 18.

Renal calculus.

and carefully examined with the finger for circumscribed indurated spots, either in the cortex or in the pelvis, that might indicate the presence of a stone.

The kidney can be pressed up to the finger of the operator by an assistant, as in nephrorrhaphy. If examination by the finger affords no indication of the stone, the kidney may be punctured by a fine needle; or if the finger discovers an indurated spot, the needle may be used also.

In many cases, however, the stone will produce suppuration and be embedded in an abscess, which can be easily detected with the finger. Unless several punctures are made, stones will often escape detection.

When the stone is found it must be cut down upon, and removed, either with a scoop or with the finger, through the incision, or it may be seized by a pair of forceps.

Where the stone is very large it may be broken and removed in pieces. The wound should be dealt with as in nephrectomy and nephrotomy. The urine usually escapes for a time through the wound, but should cease to do so in a few weeks. The specimen represented in Fig. 18 weighed when removed fourteen ounces,—the largest stone I have ever seen. It was removed by my confrère, Prof. R. A. McLean. The man was suffering a great deal of pain in the region of his kidney, and had pus in the urine. The kidney was enlarged. On account of the great size of the stone, it was broken during its removal. The man was completely exhausted by the disease, and consequently failed to react after the operation.

NEPHRECTOMY.

Nephrectomy is the term which designates the operation for the removal of the kidney from the living body.

This operation is also comparatively new. Simon of Heidelberg first intentionally removed the kidney for disease, in 1869. The kidney had before been several times unintentionally removed, the operators not sup-

posing at the time that they were removing it. These operations were made by abdominal section. Simon seems to have been the first to make the lumbar operation.

The cases in which the operation is indicated are the following: 1, movable kidney in which nephrorrhaphy has failed to retain the kidney in the incision; 2, where nephrorrhaphy is impracticable because of the diseased condition of the kidney; 3, movable kidney where nephrorrhaphy is inadmissible, as the kidney cannot be pressed up to or near its normal position and is either diseased or gives rise to so much pain as to render its removal imperative; 4, floating kidney that requires an operation either for disease or for pain; 5, simple cysts, hydatid cysts, abscesses, or hydro-nephrosis which aspiration and nephrotomy have failed to cure; 6, tubercular kidney when the conditions of other organs will allow of an operation,—that is, when tuberculosis is not present or is not too far advanced in other organs, such as the bladder, the testicles, or the lungs, or when both kidneys are not involved; 7, primary cancer, sarcoma, or non-malignant tumors; 8, nephro-lithiasis when nephrolithotomy has failed to afford relief on account of the disorganized condition of the kidney; 9, very severe wounds or injuries of the kidney, when to leave the kidney would be dangerous to life; 10, pyelitis or ureteral urinary fistulæ.

Nephrectomy should never be performed unless the operator is reasonably certain that the patient has another kidney and that it is not diseased. It is not always an easy matter to diagnose positively which kidney is diseased or that only one is diseased.

I assisted at a nephrectomy not long ago; the operation was done most skilfully, and the removed kidney was very much disorganized. The patient died three days

after the operation, when a post-mortem revealed the fact that the remaining kidney was in a much worse condition than the one that had been removed. This, unfortunately, is not the only instance of the kind. The cases in which the differential diagnosis is found to be the most difficult are those of pyuria where the pus is evidently from the kidney and where neither kidney is enlarged nor one much more tender than the other. Several methods have been suggested for discovering from which ureter the pus is escaping into the bladder.

Catheterizing the ureters has been resorted to,—a procedure that may occasionally be adopted, but which will never be of much practical value, from the difficulty of its accomplishment. It has also been proposed to open the bladder by the supra-pubic operation and either catheterize the ureters or observe the outflow of pus. Again, the endoscope has been brought into requisition and has sometimes yielded valuable information, but, like catheterization, it will probably never come into general use for this purpose.

The kidney can be cut down upon, exposed, and examined, but as a diagnostic measure this may be said to be heroic; and should the kidney be found to be diseased there is a possibility of the other one being in a worse condition. There must always be a small percentage of cases in which it is impossible to be absolutely positive which kidney to remove.

It is somewhat surprising to find Morris making the statement that nephrectomy for cancer will probably be abandoned. For secondary cancer, of course, it should not be attempted; but for primary cancer, except in young children, the operation will probably become more appreciated and will be oftener resorted to in the near future.

Method.—The kidney is usually removed by one of two methods,—viz., lumbar nephrectomy and abdominal nephrectomy. The former method is the one usually adopted, and has many advantages over the latter: 1, the peritoneum need not be opened; 2, drainage from the incision is easily maintained; 3, the mortality is less; 4, the possibility of abdominal hernia is obviated; 5, hemorrhage into the abdominal cavity is avoided, both primary and secondary.

The operation need not differ from that for nephrorrhaphy or nephrotomy. Individual operators, however, have varied the incision from Simon's first longitudinal one. Klineberg made a curved incision. As satisfactory a method as any is the following. Place the patient in the position directed for nephrorrhaphy. Commence the incision about half an inch below the lower rib, running obliquely for about four inches, and expose the kidney: a second longitudinal incision can be made, if necessary, whenever it will offer the greatest facility to the operator.

The kidney having been reached, it is readily enucleated by the finger when there has been little or no perinephritis. The adipose capsule in such circumstances is very easily separated by the finger, with little or no hemorrhage. In many cases, however, where there has been much inflammation, the tissues are entirely agglutinated, separated with great difficulty, and their separation accompanied by considerable hemorrhage.

In ligating the pedicle, using silk for the ligature, it is customary to pass the ligature between the ureter and the blood-vessels, ligating them separately. The difficulty of this procedure usually depends upon the amount of adhesions and disorganization of the tissues. Passing a double ligature by means of an aneurismal needle and tying one each way is the quickest and easiest method.

Where no adhesions exist, the kidney is without difficulty drawn up sufficiently to allow the ligature to be pressed well down upon the pedicle, so that on removing the kidney enough of the pedicle will remain to prevent the ligature from slipping off. A second ligature can be thrown over the entire pedicle, which will add to its security. The pedicle should then be divided and the kidney removed. The wound must be drawn well open, and, with the aid of a good light thrown into the bottom of the incision, every bleeding artery must be ligated with fine silk or catgut. The inferior renal artery is likely to be the most troublesome.

The ligatures are cut close, the wound is washed out with an antiseptic solution, drained by means of tubes, and the incision packed with antiseptic gauze or its edges brought together by sutures. The patient should be kept perfectly quiet, and a bandage or pad applied when he commences to walk about, as recommended in cases of nephrorrhaphy and nephrotomy.

Where there is great difficulty in applying the ligatures, a strong haemostatic forceps with a well-curved handle might obviate the necessity for a ligature, just as we use the long-jawed forceps in hysterectomy without resorting to a ligature.

Abdominal nephrectomy is not often performed at present, and is to be preferred in very few cases, one of which is for the removal of floating kidney. It presents one advantage in the fact that the other kidney can be examined before the removal of the one desired. The usual incision in the median line can be adopted, or, what is more common, the incision along the outer border of the rectus muscle on the side from which the kidney is to be removed. The operation in this case is to be conducted on the same principles as any other laparotomy.

SECTION IV.

DISEASES OF THE BLADDER.

CHAPTER I.

ANATOMY OF THE BLADDER.

Before commencing the study of the pathological conditions of this organ it will be well to review its principal anatomical features.

The bladder is a musculo-membranous sac, situated in the pelvis between the pubes and rectum in the male and between the pubes and vagina and uterus in the female, its shape, position, and relations being influenced by age, sex, and degree of distention of the organ. In infancy and childhood it is conical in shape, the vertical diameter being the longer. In the female it has a greater lateral than vertical diameter. In old age the vertical diameter again becomes the longer, while in adult life when quite empty and contracted it is triangular in shape, placed deeply in the pelvis, flattened from before backward, and reaching as high as the upper border of the symphysis pubis.

When slightly distended it is rounded in form and still remains in the pelvic cavity, but when greatly distended it becomes ovoid and rises into the abdominal cavity, often as high as the umbilicus.

When moderately distended it measures about five inches in length and three inches across, and ordinarily it contains about a pint.

The bladder for convenience of description may be divided into summit, body, base, and neck.

The summit, or apex, is rounded and directed forward and upward. It is connected with the umbilicus by the urachus and the obliterated portions of the hypogastric arteries. That portion of the summit which lies behind the urachus is covered by peritoneum, which is wanting on the portion anterior to it which rests against the abdominal wall.

The body of the bladder is that portion which lies between the apex and the vesical openings of the ureters. It is not covered in front by peritoneum, and is in relation here with the triangular ligament, the posterior surface of the symphysis pubis, the internal obturator muscles, and, when distended, with the abdominal wall. The posterior surface is completely covered by peritoneum, and is in relation with the rectum in the male and with the uterus in the female, some convolutions of small intestine being interposed.

The base, or fundus, is directed downward and backward, and is that part which lies below the plane which marks the level of the body. In the male it rests upon the second portion of the rectum, and is partially covered by peritoneum, which is reflected upon the rectum, forming the recto-vesical fold. In the female it is in relation with the lower part of the cervix uteri, and is adherent to the anterior wall of the vagina, a fold of peritoneum intervening between it and the upper part of the anterior surface of the cervix. The most important portions of the body are that portion which lies between the vesical openings of the ureters behind and the vesical orifice of the urethra in front, which is known as the vesical triangle, or trigone, and that portion of the base which lies just behind the ureteric openings, called the bas-fond.

The cervix, or neck, is that constricted portion of the apex of the trigone which is continuous with the urethra. In the male it is surrounded by the prostate gland.

According to some authors, the bladder is composed of three coats; Gray, however, names four,—serous (which is but partial), muscular, submucous, and mucous. The serous or peritoneal coat covers the posterior surface from opposite the opening of the ureters to the summit, and is reflected on the pelvic and abdominal walls, forming the false ligaments.

The muscular coat consists of several layers,—an external layer, in which the fibres are arranged longitudinally, a middle layer, in which they are arranged in a circular manner, and an internal layer, in which they again have a general longitudinal arrangement. The fibres of these layers interlace so closely that practically they may be considered as one layer. Toward the lower part of the bladder the circular fibres are closely aggregated, forming the sphincter vesicæ, which in the male is continuous with the prostate gland.

Two bands of oblique fibres, known as the muscles of the ureters, take their origin just behind the ureters, and converge to the back part of the prostate gland, where they are inserted. They were formerly supposed to prevent the reflux of urine into the ureters, but probably they have little if any special action.

The submucous coat consists of a layer of areolar tissue connecting the muscular and mucous coats, and very adherent to the latter.

The mucous coat is thin and continuous with that of the ureters and the urethra. It consists of a basement-membrane supporting several layers of epithelium, in some parts squamous and in others cylindrical. It is loosely

attached to the muscular coat, except at the trigone, at the neck, and about the orifices of the ureters.

It is provided with mucous glands and follicles, not very numerous except about the vesical neck. On account of the looseness of the attachment of the mucous coat, when the bladder is not distended it is thrown into folds except at the points of close attachment. Projecting from the lower anterior part of the bladder into the orifice of the urethra is a slight elevation of mucous membrane, called the uvula vesicæ, which is but little developed in the female. The arteries supplying the bladder are the superior, middle, and inferior vesical in the male, with additional branches from the uterine and vaginal in the female. These are all derived from the anterior trunk of the internal iliac. The anastomosis is very free, the obturator and sciatic arteries also supplying small branches. The veins, after forming a complicated plexus about the neck, sides, and base of the bladder, terminate in the internal iliac vein.

The nerves of the bladder are derived from two sources, the sympathetic and the spinal.

The sympathetic are branches from the hypogastric plexus, which also supplies the vagina, uterus, and rectum; while the spinal are derived from the fourth sacral, occasionally the third, and rarely the second.

The nerve-supply is particularly rich to the small triangular space known as the trigone, which is the most sensitive part of the bladder.

The bladder is retained in place by ligaments, which are divided into true and false, there being five of each. Of the true ligaments the two anterior extend from the back of the pubes, one on each side of the symphysis, to the front of the neck of the bladder; the lateral are attached to the sides of the base of the bladder and the

lateral parts of the prostate; and the urachus, a fibro-muscular cord, extends between the summit and the umbilicus.

The false ligaments, composed of reflections of the peritoneum, are the two posterior, which pass forward from the sides of the rectum in the male and of the uterus in the female to the posterior and lateral aspect of the bladder, and contain the obliterated hypogastric arteries and ureters, together with vessels and nerves; the two lateral, from the iliac fossa to the sides of the bladder; and the superior fold of peritoneum, extending from the summit to the umbilicus and covering the urachus and the obliterated hypogastric arteries.

CHAPTER II.

CYSTALGIA.

The bladder, like the other hollow viscera of the body, is subject to diseases and to disturbances of both its motor and its sensory nerves. We will first take up the subject of its nerve-disturbances, beginning with cystalgia, or neuralgia of the bladder.

Etiology.—In many cases neuralgia of the bladder is produced by stone, concretion, or other foreign body. Sometimes it is the result of the chemical condition of the urine, that secretion being alkaline or perhaps excessively acid. We often find patients having severe neuralgia of the bladder which is purely reflex, the disease being of the rectum,—fissure especially,—or of the urethra. Stricture in the male and caruncles in the female are the most frequent urethral causes. I have seen people of

gouty diathesis suffer from violent attacks of cystalgia. Such attacks are presumably the result of an excessive acidity of the urine, or they may arise from the same cause that creates disturbances in the other hollow viscera of such subjects.

It is not infrequent for one who is the subject of gout to have violent attacks of asthma, gastralgia, or enteralgia, with diarrhœa or cystalgia. Perhaps in all these cases the respective mucous membrane involved eliminates urate of sodium.

Occasionally a person suffering from sciatica will have a violent attack of cystalgia accompanying or alternating with the sciatica, owing, no doubt, to the fact that a visceral branch is given off from the third sacral nerve to the bladder.

Cystalgia may be the result of ulceration of the mucous membrane of the bladder, just as gastralgia is caused by a chronic irritable ulcer of the stomach. I know of no reason why the bladder should not occasionally suffer from malarial neuralgia, as does every other organ of the body. I feel quite sure that whenever a case of severe cystalgia presents itself, if the practitioner will keep well in mind its etiology and carefully examine for one of these causes, he will very seldom be obliged to call it idiopathic.

Pathology.—It is quite apparent that the pathological condition of the bladder must depend upon the etiology; that is, the pathology may be in the urine itself, or it may be in the urethra or in the rectum, or stone may be present.

Symptoms.—Pain is the pathognomonic symptom of neuralgia, whatever organ or nerve be involved. In cystalgia the pain may be constant or paroxysmal and accompanied by violent spasms, in which case it is usually designated by the term cystospasmus rather than cystalgia.

With the cystalgia there is likely to be a constant desire to micturate or an inability to retain the urine.

Treatment.—The indications for treatment are to allay the pain and remove the cause: removing stones or foreign bodies as the case may be; treating the gout or malaria, also the rectum or urethra where the affection is reflex, or the ulceration of the bladder when that condition is present; examining carefully the chemical condition of the urine and correcting it, if abnormal, by acids or alkalies as indicated. For the relief of pain, I have found opium and hyoscyamus the two most reliable drugs, and their administration in the form of rectal suppositories the most satisfactory method. For the immediate relief of severe cystalgia, I am in the habit of ordering suppositories containing one-half grain of morphine and five grains of extract of hyoscyamus, with heat applied over the bladder.

CHAPTER III.

HYPERÆSTHESIA (IRRITABLE BLADDER).

This is another affection of the sensory nerves of the bladder.

Etiology.—The etiology of hyperæsthesia of the bladder is sometimes very apparent, at other times it is obscure.

It may be either the result of irritation of the peripheral extremities of the sensory nerves of the bladder, or entirely reflex.

The immediate irritation is often caused by concretions, foreign bodies, or growths in the bladder, which simply produce irritation without inflammation.

At other times the hyperæsthesia seems to depend upon an abnormal condition of the urine, which may be concentrated and highly acid or else exceedingly alkaline.

The urine of diabetic patients is sometimes extremely irritating, as is also that which contains oxalate-of-lime crystals. Patients of gouty diathesis are liable to this condition, which is probably caused by the highly acid urine.

Patients with hypertrophied prostatic glands are constant sufferers.

We not infrequently find the source of irritation in the spine or the brain.

Pregnancy, especially during the first few months, and uterine disease, are frequent sources of irritation without inflammation.

Of the reflex irritations, hemorrhoidal disease seems to play the most prominent part, while many patients who are subjects of stricture, caruncles, or inflammation of the urethra suffer great annoyance from a purely irritable bladder. In boys, phimosis is a frequent cause.

In portal obstruction, in malarial liver, or in passive or active congestion or organic disease of this organ, the vessels of the bladder become turgid, impinge upon the nerves, and produce much irritation.

Symptoms.—The pathognomonic symptom of hyperæsthesia is of course the intolerance of the bladder for urine, when there is neither inflammation nor ulceration present. The patient has no fever and little or no pain, but suffers the great inconvenience of constant desire to micturate. Unless prostatic enlargement or stricture is present, there is no straining and little tenesmus.

Treatment.—The indication for treatment, after being satisfied that no inflammation is present, is to render the bladder tolerant of its contents. This we can do only

after careful inquiry into the etiology. If the condition is caused by chemical changes in the urine, these must be obviated.

In case of concentrated highly acid urine, mild diuretic alkalies would be likely to meet the indication, which is to increase the quantity of urine and change its quality. This form of irritable bladder is more often than any other successfully treated by the administration of alkaline mineral waters. In Europe such patients are sent to Carlsbad, Vichy, or some other noted watering-place, but here in California we have the best of waters at our own door,—Napa Soda, Bartlett, Ætna, Coronado, Vichy, Shasta, and many others. As a substitute for mineral water, the following mixture will often act like a charm:

℞ Potassii acetatis, ʒvi-viii;
Spt. ætheris nitrosi, ʒiv;
Tinct. hyoscyami, ʒi;
Syr. cardei, ʒi;
Aquæ chloroformi ad ʒi.—M.
Sig.—ʒi every two hours, well diluted.

Bicarbonate of potassium or bicarbonate of sodium may be substituted for the acetate, and infusion of belladonna or fluid extract of triticum repens for the hyoscyamus.

For the irritation accompanying pregnancy I have been in the habit of prescribing the following:

℞ Spt. ætheris nitrosi,
Tinct. hyoscyami,
Glycerini, āā ʒi.—M.
Sig.—ʒi every two hours.

This last prescription, with a few directions as to diet, will in most cases allay the irritation of pregnancy. In other cases it may be necessary to give a suppository of

hyoscyamus and morphine at bedtime, or the prescription containing acetate of potassium already mentioned, while some derive great benefit from hot vaginal douches or hot rectal enemata. Cream of tartar tea—that is, a saturated solution of cream of tartar in hot water, allowed to cool and made pleasant to the taste with a little sugar—is a favorite prescription of mine for the irritable bladder of pregnancy.

Triticum repens tea will often answer the purpose admirably; but a remedy which must never be forgotten in irritable bladder, no matter what the cause of the irritation, consists in small doses of chloral hydrate, two or three grains every two to four hours. This seems to anæsthetize the irritated extremities of the nerves.

In irritable bladder from cerebral or spinal disease, bromide of potassium, with or without chloral hydrate, is an excellent remedy. Here, however, it is the primary lesion in the brain or spinal cord with which we have to contend. When there are diseases of the urethra or of the rectum they must be removed when possible. For the immediate relief of irritation resulting from rectal diseases the most prompt and efficient remedy is a suppository containing from one-quarter to one-half grain each of morphine and cocaine and from three to five grains of hyoscyamus.

In the irritable bladder of gouty patients I have often found the most permanent relief from a combination of carbonate of magnesium, powdered rhubarb, and colchicum, as follows:

℞ Magnesii carb. (Henry's),
Pulv. rhei (Turk.), āā ʒii;
Vini colchici, ʒiii;
Syr. aurantii corticis, ʒi;
Aquæ menthæ piperitæ ad ʒiv.—M.
Sig.—ʒii every two or three hours.

m

This is to be continued until it operates freely on the bowels, when the irritation usually subsides, partly from the chemical change in the urine produced by the alkali, but probably in still greater degree from the relief afforded the portal circulation. I must not omit to mention that we often get excellent results in this irritable condition of the bladder from very small doses of balsam of copaiba.

When it is evident that the hyperæsthesia of the bladder depends upon some congested condition of the liver, the exhibition of any of the above-named sedatives must be preceded or accompanied by such cathartics as will thoroughly unload the portal circulation. Saline cathartics may be used for this purpose, or the magnesia mixture already mentioned.

In the dietetic management of diseases of the bladder we cannot exercise too much care.

The avoidance of nitrogenous foods in irritable bladder and cystitis must be strictly enforced.

The articles of diet best adapted to these conditions are milk, bread, and rice. Those to be avoided particularly are nitrogenous foods, and very acid fruits, unless the urine be alkaline, when the latter are often beneficial.

The same may be said of the mineral acids.

CHAPTER IV.

ANÆSTHESIA (ATONY).

ANÆSTHESIA is an affection of the sensory nerves of the bladder, consisting in an entire loss of nervous sensation.

ETIOLOGY.—This condition is due in most cases to dis-

case of the spine or of the brain, causing, as it were, a paresis of the sensory nerves of the bladder. Aside from cases in which it is due to diseases of the spine or of the brain, we shall probably seldom meet with anæsthesia of the bladder except from pressure on the organ during parturition or occasionally following over-distention.

Ten or fifteen years ago, when I conducted a large obstetric practice, I for a time administered chloral hydrate in the first stage of labor, to quiet primary pain and facilitate dilatation of the os; and in a large number of these cases I was obliged to use a catheter on account of anæsthesia of the bladder. I availed myself of this action of chloral in treating hyperæsthesia of the bladder.

Symptoms.—In this condition the presence of urine in the bladder fails to produce the usual sensation of fulness of the organ. The bladder will become distended and yet the patient have no desire to empty it of its contents, and it is not until the distention becomes very great that he has any sensation of its fulness. The bladder will often overflow of itself when, in the absence of pain, even the physician may think there is no possibility of the organ's being full of urine. I have one patient who, though he has no well-marked disease of the spine, has, nevertheless, anæsthesia of the bladder. He is a very methodical man, who never trusts to his memory, but consults his memorandum-book for all engagements. To insure the proper evacuation of his bladder, I have had him enter in his memorandum-book against certain hours, "*Urinate.*" This entirely precludes the possibility of over-distention.

Treatment.—The proper treatment of these cases of anæsthesia is a matter of very great importance, as paralysis of the bladder, as well as inflammation, is often the result of failure to properly evacuate the organ in this condition. Inflammation does not so frequently result from paralysis

and anæsthesia as formerly, on account of the great improvement in catheters.

The indication for treatment so far as the bladder is concerned in anæsthesia where there is also paralysis is to evacuate the bladder at regular and not too long intervals with a soft and absolutely clean catheter.

When you instruct the patient or nurse in the use of the soft catheter, give the most careful directions to secure its cleanliness. It is not sufficient merely to wash the catheter in water; you must see to it that it is placed in an antiseptic solution until used again, or at least for a sufficient time to insure disinfection. Very often, in anæsthesia, when the bladder is emptied it contracts quickly and normally, showing no implication whatever of the motor nerves. This is especially true of many of the cases of so-called paralysis of the bladder after parturition. I am satisfied that in the majority of these cases we have to deal simply with an anæsthesia; but the bladder is evacuated probably only twice every twenty-four hours by the physician, and hence becomes greatly distended, which produces partial paralysis. This may continue for weeks; while if the catheter had been used from four to six times in the twenty-four hours the bladder would have recovered its normal sensation in a few days and shown no disposition whatever to paralysis.

CHAPTER V.

CYSTOSPASMUS (VESICAL SPASM—SPASM OF THE BLADDER—CYSTOSPASM—SPASMUS VESICÆ—ISCHURIA SPASMODICA—CYSTOSPASTICUS—HYPERCINESIS).

In cystospasmus there is a disturbance of both the sensory and the motor nerves of the bladder; that is, there is spasmodic contraction of the bladder, with pain.

Etiology.—Cystospasmus is occasionally dependent on disease of the brain or of the spinal cord, but is usually caused by foreign bodies in the bladder or by inflammation of the organ, or is reflex from some rectal disturbance. The most frequent cause is stone. Acute cystitis, when the muscular structure of the wall is involved, is usually accompanied by severe spasms and tenesmus. Stricture of the urethra, or urethritis, will produce it only when the neck of the bladder is involved. In highly nervous patients the introduction of a catheter will provoke a spasm of the sphincter vesicæ, and in hysterical patients this condition may be the result solely of the general nervous condition.

Irritation of the uterus, fissures and a hemorrhoidal condition of the rectum, are sometimes responsible for these attacks. One of the worst cases I ever attended was caused by a pericystitis, which, however, in this instance was the result of a gonorrhœal cystitis, the cystospasmus or cystospastic condition not manifesting itself until the inflammation had spread beyond the walls of the bladder.

Symptoms.—There is generally great intolerance of the bladder to the urine, with severe spasms attending the efforts at micturition, and tenesmus that is as painful as the tenesmus of dysentery. The bladder contracts into a hard ball. When the spasm is the result of urethritis or

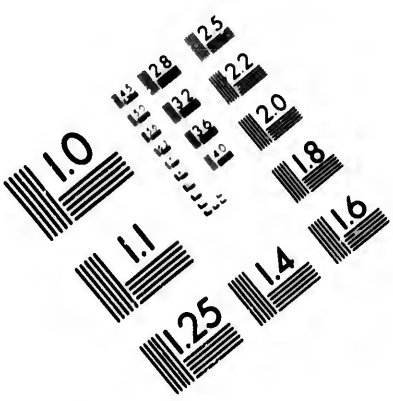
cystitis, there will be fever. When caused by stone, it is not likely to be very severe unless cystitis is present. There are few diseases that are more distressing than acute cystitis accompanied by cystospasmus.

Treatment.—The indication is to allay the vesical irritation by removing the cause, if possible. This can usually be done when stone or foreign bodies are present in the bladder, or when there is a diseased condition of the rectum, such as fissure, hemorrhoids, etc. When it accompanies acute cystitis it may take some time to quiet the irritation.

It will be advisable first to dilute the urine well, by the administration of considerable quantities of mineral water or rice-water, milk, or fluid extract of triticum repens.

Hot sitz-baths or hot applications across the lower part of the abdomen, with rectal suppositories of morphine, will frequently quiet the bladder for a few hours.

Tincture of hyoscyamus with morphine and Hoffmann's anodyne or spirit of nitrous ether, by the mouth, are sometimes successful in allaying the irritation. Occasionally, in spite of heat, sitz-baths, sedatives, or suppositories, we are obliged to resort to filling the bladder with warm water. Hot rectal enemata are useful in many cases. Great benefit often results from chloral hydrate in doses of from ten to fifteen grains every two to four hours. In the spasms occurring from cerebral or spinal irritation, relief is generally obtained from the administration of bromide and chloral combined.



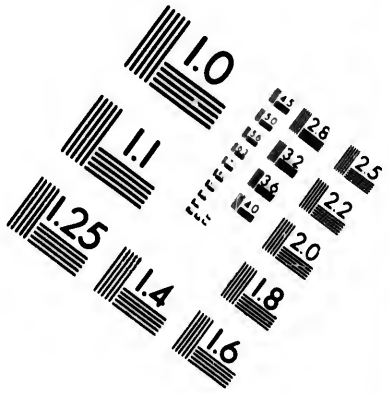
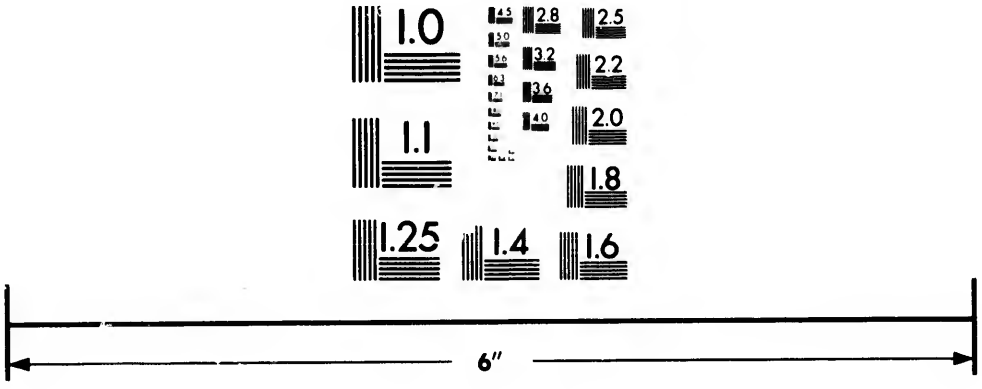
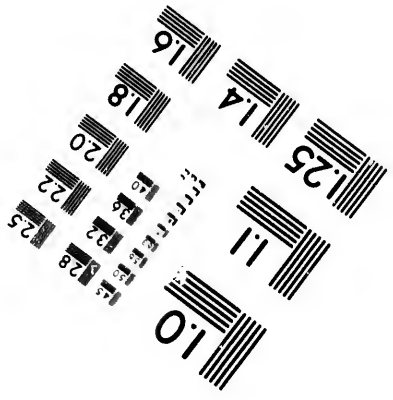
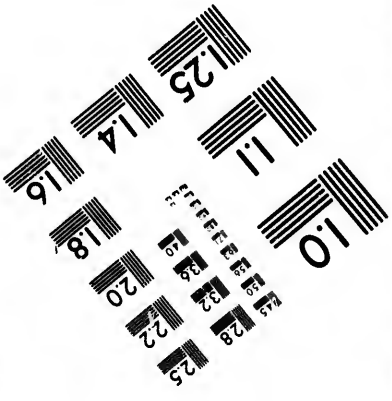


IMAGE EVALUATION TEST TARGET (MT-3)







Photographic Sciences Corporation

23 WEST MAIN STREET
WEBSTER, N.Y. 14580
(716) 872-4503

CHAPTER VI.

CYSTOPLEGIA (PARALYSIS OF THE BLADDER—ACINESIS—VESICAL PALSY).

THIS is a purely motor neurosis, and, as a rule, depends upon cerebral or spinal disease, there being but few cases of paraplegia which are not accompanied by paralysis of the bladder. Over-distention of the bladder, independently of the cause of retention, will leave the organ paralyzed. It might be a retroverted pregnant uterus or an enlargement or acute inflammation of the prostate gland. Let me repeat, it is not the cause of the retention that produces the paralysis, but the over-distention. Pressure upon the organ by the child's head during parturition will sometimes leave the bladder in a paralyzed condition: here, however, it is more often an anæsthesia or a retention of urine from a swelling of the urethra, caused by the pressure of the head, rather than a true paralysis of the bladder.

Fatty degeneration and atrophy of the muscular walls of the bladder constitute a cause of paralysis of this organ in old women. In fevers of a severe type the power of nerve-conduction is often either lost or impaired.

SYMPTOMS.—We often find a large round tumor in the lower part of the abdomen, rising up behind the pubes, usually central and painful, when the distention is the result of mechanical retention.

It is often unaccompanied by pain when the result of a central nerve lesion, and, though the viscus may be greatly distended, the patient and sometimes even the physician may be deceived as to the nature of the tumor, owing to the fact that in many of these cases there is a constant dribbling of urine, while in some of them, in consequence of

the almost complete paralysis of the sphincter muscles, the bladder is not over-distended, the distention being relieved by the overflow. Aside from the symptoms confined to the bladder, there are often other complications resulting from the efforts on the part of the patient to empty a paralyzed or partially-paralyzed bladder.

Hemorrhoids and prolapsus of the rectum are the most common of the distressing conditions that arise; but I have seen the constant straining produce bronchial and emphysematous conditions, and acute cystitis arise from the decomposition of the retained urine.

Treatment.—In the treatment of paralysis dependent on spinal or cerebral disease the most that can be done is to use the soft catheter at regular intervals. Strychnine, electricity, friction, cantharides, are all likely to prove useless unless the central lesion be improved by the remedies employed. In paralysis caused by over-distention of the organ resulting from some mechanical obstruction, the bladder is likely soon to recover if the obstruction is removed and the urine is properly evacuated at regular intervals. In the paralysis following parturition the rapidity of the recovery will depend largely upon whether or not the urine is drawn from the bladder sufficiently often. It is the habit of many medical men, in these circumstances, to use the catheter only twice a day, thus allowing the bladder to be constantly distended, so that perhaps weeks may elapse before it returns to its normal condition; while, if the urine were drawn more frequently, over-distention being provided against, the condition would disappear in a few days.

This precaution of frequently emptying the bladder is requisite in any other case of paralysis caused by over-distention.

Most of these cases recover without the aid of medica-

tion. When it becomes necessary, electricity, massage, and strychnine are the best remedies.

I frequently give a combination of tincture of nux vomica and spirit of nitrous ether, and find it answers an admirable purpose. Here let me again call attention to the importance of keeping catheters absolutely clean, using for that purpose salt, carbolized, or bichloride solution.

CHAPTER VII.

VESICAL CALCULI (CYSTO-LITHIASIS).

ETIOLOGY.—What has been already said of the etiology of renal calculi applies equally to vesical calculi. While age, sex, and location as etiological factors play about the same part here, catarrhal inflammations are responsible for more vesical than renal calculi. A calculus in the pelvis of the kidney will undoubtedly produce pyelitis, and a calculus in the bladder almost invariably produces cystitis; but in a large number of cases of stone the catarrh of the bladder precedes the stone and is responsible for it. There may be special stone-making catarrhs, as Mickle suggests. As to the nature of the vesical calculi, they correspond with what we have already seen in renal calculi.

SYMPTOMS.—Stone in the bladder generally indicates its existence by one or more of the following symptoms: irritation of the bladder, cystitis, cystorrhagia, and pain in the bladder, following the course of the urethra and often referred to the head of the penis. Cystospasmus is occasionally present. The patient will sometimes find that in the act of urinating the stream is suddenly cut

off before the bladder is emptied, probably caused by the stone rolling against the outlet of the bladder. The only thoroughly reliable means of diagnosis, however, is the demonstration of stone in the bladder by means of the sound, which should always be used in suspicious cases. When the stone is saeculated, it is difficult to discover its presence even with the sound. When the bladder is irritable and painful, and a satisfactory examination cannot be made by means of the local use of cocaine, it is better to anæsthetize the patient and determine absolutely whether or not stone is present; nor must we forget that, inasmuch as cystitis is frequently the cause of stone, it is necessary where a cystitis is of long duration to examine the bladder carefully from time to time, say at least every three months. I have known a patient suffering from cystitis to have been carefully examined for stone with negative results, and yet after some months, he having passed in the mean time into the hands of another physician or surgeon, an examination revealed the presence of a stone, when both surgeon and patient seemed perfectly satisfied that the former examiner was incompetent. It never occurred to them that the stone had formed since the previous examination.

Treatment.—The removal of vesical calculi belongs to the domain of surgery, unless the physician for some cases sees fit to try what is usually known as Roberts's solvent treatment, which consists in both the administration of, and local treatment by, medicines calculated to dissolve the stone. We have seen in the chapter on renal calculi that the oxalate-of-lime or mulberry stone resists all solvents.

CHAPTER VIII.

CYSTORRHAGIA (VESICAL HÆMATURIA—HEMORRHAGE FROM THE BLADDER).

ETIOLOGY.—There are various causes which give rise to hemorrhage from the bladder.

Injuries, either from blows or from penetrating wounds, are responsible for some cases. Occasionally such diseases as purpura hæmorrhagica and scorbutus produce it.

Stone in the bladder is a frequent cause, as is also ulceration, simple, syphilitic, or tubercular.

Growths in the bladder, malignant or benign, seldom fail to give rise to intercurrent hemorrhage, cancer and the mucous polyp being most frequently attended by this symptom.

Acute cystitis now and then gives a slight amount of fresh red blood in the urine, while a passive congestion of the vesical veins from cancer, or cirrhosis of the liver or other obstruction to the portal circulation, must be remembered as a possible source. We have already stated in the etiology of hæmaturia that parasites may lodge in the mucous membrane of the bladder and produce hemorrhage.

SYMPTOMS.—For the differential diagnosis from hemorrhage derived from other portions of the urinary tract, see the chapter on hæmaturia.

TREATMENT.—The rules as regards rest and diet which we have already given in the chapter on hæmaturia apply equally whether the hemorrhage comes from the bladder or from the kidney, and the same may be said of the administration of medicines. In addition, however, we have the advantage of local application of remedies.

When the hemorrhage is obstinate, whether from ulceration or from the presence of neoplasms, we may wash out the bladder with astringent lotions and thus sometimes will succeed in arresting the hemorrhage when systemic remedies have failed. Of the astringent washes, those of gallic acid and tannic acid are the safest and most efficient. Other astringents when properly diluted can be used without detriment to the bladder. When the hemorrhage depends upon a new growth, or upon calculus, the treatment must be surgical.

CHAPTER IX.

CYSTITIS—ACUTE, SUBACUTE, AND CHRONIC.

We designate the inflammations of the bladder as acute, subacute, or chronic cystitis.

Etiology of Acute and Subacute Cystitis.—*Age.*—Cystitis occurs at all ages. In children, however, the disease is usually of a mild, subacute character, except where produced by vesical calculi or following the acute infectious diseases.

Sex.—In childhood both sexes are equally subject to cystitis. In early adult life young men suffer oftener than young women, because of their more frequent attacks of gonorrhœa and liability to stricture.

Women during the child-bearing period are very subject to catarrh of the bladder, owing to the vesical hyperæmia caused by pregnancy and to the injuries incurred by the bladder and neighboring tissues during delivery.

In old age, say after sixty, men are far more subject to cystitis than women, from their tendency to prostatic disease.

Injuries, direct blows, falls, or penetrating wounds are etiological factors, as well as vesical calculi or other foreign bodies in the bladder. Cystitis is often caused secondarily by invasions of the bladder from a urethritis, specific or otherwise, diseases of the kidneys or ureters, peritonitis, pelvic cellulitis, and inflammations of the pelvic organs or the prostate gland. It not infrequently happens that from some obstruction interfering with the complete emptying of the bladder, as in enlarged prostate, phimosis, paralysis, etc., decomposition of the urine takes place and produces inflammation.

Another source of cystitis, which fortunately is not so frequent as formerly, is the use of unclean catheters; and cystitis occasionally results from the mere passing of a sound or a catheter. Any of the acute infectious diseases, as also pyæmia, may be accompanied or followed by cystitis, with or without inflammation of the kidneys. Occasionally we encounter a diphtheritic cystitis, which is usually secondary, with or without pyelitis.

In dealing with inflammation of the bladder we must never forget that ill-defined etiological factor, catching cold,—especially getting the feet wet; and if perchance we find a case that we can trace to no known cause, we must satisfy our patient's curiosity, if not our own intelligence, by designating it as of idiopathic origin. I have more than once been assured by physicians that a certain disease was idiopathic, the dictum being uttered with such an air of wisdom and dignity that I could not but believe that the word conveyed to them some idea of definite etiological information. The word may be convenient for lazy physicians, but it is the cause of incalculable mischief.

Men with gouty diathesis have a greater tendency than others to cystitis; and the mucous membrane of the

bladder, like any other mucous membrane, may inflame and ulcerate during the course of syphilis. I have seen a cystitis the only apparent cause of which was phimosis. New growths in the bladder generally produce irritation and catarrh. The incautious or too long continued use of certain medicines will sometimes set up an inflammation of the bladder, this being especially the case with turpentine, copaiba, and cantharides.

Etiology of Chronic Cystitis.—Every case of chronic cystitis is the result of an acute or a subacute attack; the subacute attack, however mild, may finally result in a severe chronic inflammation.

Pathology.—The pathology of acute cystitis depends upon the severity of the case and upon the tissues involved.

While it is simply catarrhal, that is, while the mucous membrane alone is involved, there is hyperæmia; the membrane is red, relaxed, and œdematous, and its surface becomes denuded of its epithelium and is covered with mucus. There is a proliferation of young cell-growths, the urine being turbid and loaded with mucus and pus-corpuscles. Cystitis, like all other inflammations of mucous membranes, may terminate in resolution, ulceration, or chronic inflammation.

In an attack of acute cystitis which involves the submucous and muscular coats, the whole wall of the bladder becomes thickened, owing to an exudation and proliferation of cells that take place in the submucous and muscular structures.

In chronic cystitis the mucous membrane is no longer red and relaxed, but is of a grayish color, irregularly thickened, and covered with a purulent-looking secretion of mucus and pus. The submucous and muscular structures become much thickened and hypertrophied, partly from exudation and partly from contraction. The urine

is turbid, often alkaline, and sometimes ammoniacal. The more chronic the disease, the less likely is it to terminate in recovery, and the more likely to result in ulceration, perforation, or submucous abscess, and to produce more or less hypertrophy and contraction of the bladder.

Symptoms.—The symptoms of acute cystitis depend upon the extent of involvement of the bladder-wall. When only the mucous membrane is involved, no matter how acute the attack, the fever is very inconsiderable, the temperature not often rising above 100° or 101°. There is not likely to be any distinct, or rather defined, chill, although there are often recurrent chilly sensations. Intolerance of the bladder to the urine will be present, especially when walking, and there will be some tenderness over the bladder above the pubes. Micturition is frequent and painful, the pain being most severe at the close of the effort and located in the perineum. The urine is turbid, and when settled shows a large amount of cloudy mucus at the bottom of the glass. When the whole bladder-wall is involved in the inflammation the symptoms are very severe. This form of cystitis, whether originating in the peritoneal covering of the bladder and thence involving the whole bladder-wall, or commencing in the mucous membrane and involving the muscular and peritoneal coats, is likely to be ushered in by a distinct and often severe chill, followed by high fever, great pain in the hypogastric region, extreme intolerance of the bladder to the urine, and almost constant micturition, the pain during micturition being almost beyond human endurance and accompanied by agonizing tenesmus and cystospasmus, often more unendurable even than the spasms and tenesmus of the severest rectitis. I have several times seen, in cases of severe acute gonorrhœal cystitis, retention of urine, owing, probably, partially to

the clonic contraction of the sphincter vesicæ and partially to the œdematous and swollen condition of the urethra. In these cases the use of the catheter becomes a necessity.

I never saw a human being suffer greater agony than did a young man of strumous diathesis who died in collapse on the seventh day of an acute cystitis and about the twelfth day of a gonorrhœa.

The urine in a few hours becomes turbid with mucous sediment, may contain some blood, and soon deposits pus-corpuscles.

There is another variety of acute cystitis which is quite characteristic. It occurs in paralysis of the bladder or in old men with enlarged prostates. The bladder is not thoroughly emptied, and the retained urine (perhaps on account of bacilli carried into the bladder by unclean catheters) decomposes, and ammoniacal, irritating, alkaline urine is the result, which often sets up a suppurative cystitis that may in a few days end fatally, the patient dying in collapse. A large percentage of the urine in these cases settles as a stringy, tenacious muco-purulent sediment.

Subacute Cystitis.—Subacute cystitis is always catarrhal, the mucous membrane alone being involved. The subjective symptoms are often negative; there is no fever, little or no pain, and the bladder shows scarcely any intolerance of its contents, except when excessively distended, when pain develops and it becomes impossible to retain the urine.

The characteristic features or objective symptoms of these subacute catarrhs are that the urine is voided somewhat more frequently than normal, is turbid, and when allowed to settle a great quantity of cloudy mucus is seen at the bottom of the glass,—not decomposed, ropy, stringy mucus, nor flocculent mucus. The urine is nearly always very phosphatic. Some of these cases finally terminate in a chronic inflammation.

Chronic Cystitis.—There is no well-defined line of demarcation between a subacute cystitis that becomes chronic and an acute case that passes into a chronic condition. When an acute case of cystitis has continued for weeks, perhaps months, and the acute symptoms—that is, the fever and most of the pain—have in a measure subsided, but the frequent micturition continues and there is a muco-purulent sediment in the urine, the case may be considered to have become chronic. As the chronic inflammation continues, the bladder contracts from the too frequent evacuation, and the case becomes one of concentric hypertrophy, with perhaps ulceration.

When blood-corpuscles are present in the sediment we may be sure that there is ulceration. Sometimes there is very free hemorrhage, or the ulcer may perforate the wall, producing pericystitis, abscess, etc. Patients who are the subjects of chronic cystitis are pretty sure sooner or later to lose their appetite, and become anæmic, weak, and emaciated. Sleep is disturbed and broken from the necessity for constant micturition; the skin has a dry, harsh feel; the patient ages fast, and looks haggard. Occasionally the inflammation spreads up the ureters, and pyelitis and tubulitis result.

Prognosis.—Most cases of subacute cystitis, with proper diet and treatment, get well, as do also a large number of the most acute cases. It is not often that an acute case terminates fatally, but it frequently ends in chronic inflammation, which when it becomes of long standing is seldom cured.

Treatment.—While the methods of treatment of acute, subacute, and chronic cystitis differ entirely, the rules in regard to diet apply equally to them all, and the same may be said in regard to clothing and rest.

As to diet, the indication is to render the urine as non-

irritating to the mucous membrane of the bladder as possible; and in order to accomplish this it is of course necessary to avoid highly seasoned and spiced foods, as well as highly nitrogenous foods.

Milk, rice, bread, and potatoes are suitable in every case, while the amount of meat allowed the patient must depend upon the severity of the disease. Alcohol and tobacco are to be absolutely forbidden. We can always allow a reasonable amount of meat in subacute cystitis unaccompanied by much hyperæsthesia, provided that liquids in sufficient quantity and of non-irritating quality are also taken,—such as milk, cocoa, weak tea, coffee of moderate strength, hot milk, and, as a rule, plenty of mineral water. As we have already said, it is not only unnecessary to use the imported mineral waters, but absolutely impossible to get waters of any country superior to those of California.

As to the clothing in cystitis, it is essential to be warmly clad. I have found great benefit in subacute and chronic cystitis from the use of chamois shirts, which keep the abdomen and pelvis well protected from the cold. Rest is equally beneficial in all cases of disease of the bladder.

There are some forms of exercise to be avoided, particularly horseback-riding, riding in carriages over rough streets, and, for women, the use of the sewing-machine. Too much walking, of course, is injurious. With strict attention to diet and clothing, and ordinary care as to exercise, a large number of cases of subacute cystitis will get well without medicine. Others, again, require some medical assistance; and among the most efficient remedies I have found are cubebs and copaiba. I often prescribe two grains of the extract or powdered cubebs with three or four grains of the inspissated balsam of copaiba in capsule form every two or three hours. Sometimes uva ursi answers an excellent purpose, as does also buchu. Where

there is some hyperæsthesia or irritability I have found equal parts of tincture of hyoscyamus, spirit of nitrous ether, glycerin, and syrup of codeine, a drachm every two hours, to answer an admirable purpose. To this I sometimes add acetate of potassium four to six drachms to the four-ounce mixture.

Sedatives, however, are not often necessary in subacute cystitis. I have made a syrup of turpentine from an old French formula that has given me much satisfaction, and in cases where anæmia is present I have found say four drachms each of precipitated sulphur, carbonate of iron, water, and glycerin, with chloroform or peppermint-water sufficient to make a four-ounce mixture, answer equally well in subacute and chronic cystitis.

In the treatment of all varieties it is well to keep the skin active by warm or steam baths, while in cases that seem disinclined to yield to treatment the patients should spend a few weeks at one of our springs, where, if they be careful of their diet, take hot mineral baths, and drink from four to six pints of mineral water daily, they will often get well in a short time.

Acute Cystitis.—The treatment of acute cystitis depends entirely on the amount of bladder-involvement. When the inflammation is confined to the mucous membrane there is little fever to be combated, and the pain is not usually severe. With attention to the rules already laid down as to diet and rest, hot applications over the region of the bladder, plenty of warm demulcent drinks, warm rice- or barley-water, flaxseed tea, or decoction of triticum repens, and the twentieth of a grain each of sulphate of morphine and tartrate of antimony every hour or two, or five grains of Dover's powder every two hours, or tincture of hyoscyamus, spirit of nitrous ether, and syrup of morphia, of each a drachm, in water every hour or two, will

often be all the medication that is necessary. Sometimes great relief is obtained from a mixture of ten to fifteen grains of bromide of potassium and five grains of chloral hydrate every two or three hours.

Where the muscular structure and perhaps the peritoneal membrane as well are involved, as has already been stated, the pain is very severe, fever often high, cystospasmus present, and the tenesmus of the bladder extreme. Hypodermic injections of morphine are often necessary in these cases. Large rectal enemata of hot water sometimes assist in giving relief, and it is usually necessary to resort to suppositories. I often give in that form morphine one-half grain with extract of hyoscyamus five grains every three or four hours, at the same time applying heat to the sacrum and over the bladder. Occasionally there is retention of the urine, when it will be necessary to use the catheter. In all these severe cases opium is the medicine that gives relief most speedily. I have found, however, that chloral hydrate in ten- or fifteen-grain doses, with one-eighth of a grain of morphine, will often act admirably. In some of the very worst cases a few days of this treatment will bring relief, when the hot applications may be suspended and the amount of opiates lessened. When any of these cases become chronic the treatment must be changed. The fever will have disappeared and the pain largely subsided. The bladder, however, still remains irritable, may be quite contracted, and pus and mucus still be observed in the urine.

The balsams here are often of benefit,—balsam of copaiba, balsam of Peru, and turpentine. I have found their efficacy assisted by combination with creasote.

Creasote alone often acts well in chronic cystitis, especially where there is a tendency to fermentation and decomposition of the urine.

Another remedy found beneficial in chronic cystitis is benzoic acid.

Salol I have lately tried with benefit. I have also had assistance from salicylate of sodium, and have found saccharin, as recommended by Dr. Little, of Dublin, to prove beneficial. In a large number of cases of chronic cystitis more benefit has been derived from local applications and washing out the bladder than from the internal administration of medicines. Borate of sodium makes a good preparation for washing out the bladder, as does also a weak solution of boracic acid.

Weak solutions of chloral hydrate answer a good purpose, and few things are better than a solution of common salt, a drachm to the quart of water.

Nitrate of silver and nitric acid have also been recommended, but it will be best first to try almost any of the other remedies.

In obstinate cases in women it is sometimes necessary to establish a vesico-vaginal fistula, by which means the bladder is kept constantly drained and the inflammation removed.

When there is contraction or concentric hypertrophy, dilatation of the bladder is necessary, the directions for accomplishing which are given under the treatment of that condition.

It is hardly necessary to say that while pursuing this course of treatment, either by the administration of medicines or by local applications, the dietary rules cannot be too strictly enforced, and the patient must abstain from alcoholic beverages of all kinds and from tobacco. In spite of all our efforts we are sometimes disappointed with the results, there being few diseases less amenable to treatment than chronic inflammation of the bladder. As has been said in the prognosis, very few patients ever get en-

tirely well. It is wonderful, however, how some of the very worst cases of chronic cystitis, which have resisted all our efforts to cure, will be improved by a few weeks' or months' sojourn at the Harbin, Bartlett, Zeigler, Paraiso, Highland, Napa Soda, or any other of our California mineral springs.

CHAPTER X.

PERICYSTITIS.

Etiology.—Ulcers sometimes perforate the bladder-wall and give rise to pericystitis, and occasionally an acute cystitis without ulceration extends through the bladder-wall and involves the surrounding cellular tissue.

In chronic cystitis there is often some pericystitis. About four years ago I had a male patient in whom gonorrhœa extended to the bladder, the cystitis being very acute and culminating in a severe attack of pericystitis. It may also occur from inflammation of other organs, such as the rectum or the uterus, or of the peritoneum. A year ago, I had a female patient with pelvic peritonitis accompanied by a pericystitis.

Pericystitis may follow any of the acute infectious diseases. I have had in my practice a case of pericystitis following typhoid fever. Septicæmia is an etiological factor that must be borne in mind.

Symptoms.—The symptoms of pericystitis occurring during a cystitis are great increase of pain over the bladder, usually retention of urine, recurrent chills, increase of fever, and generally the formation of abscesses, which can be felt through the vagina or rectum or above the pubes. The abscesses may open into the bladder, the

rectum, or the peritoneal cavity, or through the perineum.

In the pericystitis accompanying chronic cystitis the surrounding cellular tissue is often indurated and adherent to the adjacent parts.

TREATMENT.—The medication must be directed to the alleviation of the increased severity of the symptoms. Opiates are demanded, the catheter is likely to be necessary, and abscesses must be evacuated.

CHAPTER XI.

HYPERTROPHY OF THE BLADDER.

THE term hypertrophy of the bladder is used to designate thickening of the bladder-wall. The hypertrophies of the bladder are divided into two varieties,—namely, concentric and excentric. In concentric hypertrophy there is a thickened wall, with a diminution of the cavity; in excentric hypertrophy there is a thickened wall, with enlargement of the bladder-cavity. These two varieties differ in their etiology, anatomical appearance, symptoms, prognosis, and treatment.

ETIOLOGY.—*Concentric Hypertrophy.*—Concentric hypertrophy is caused by or accompanied with inflammation or hyperæsthesia of the bladder.

During a cystitis or a hyperæsthetic condition of the bladder the organ is very intolerant of its contents, and micturition is excessively frequent. The bladder is, of course, never distended with urine, and hence becomes contracted. This condition occurs irrespective of the cause of either the cystitis or the hyperæsthesia, there

being few cases of chronic cystitis that do not end in concentric hypertrophy. It is quite common to find concentric hypertrophy where there is a vesical calculus, whether the stone has caused much inflammation or simply hyperæsthesia.

Excentric Hypertrophy.—The etiology of excentric hypertrophy is entirely different. It comes from an obstruction to the evacuation of the contents of the bladder, where there is no hyperæsthesia.

In these cases the urine accumulates and distends the bladder-cavity, and it requires extra muscular exertion to empty the bladder of its contents. The muscular coat of the bladder-wall becomes hypertrophied under these circumstances upon the same principle as the heart hypertrophies to overcome extraordinary resistance, as in arteriosclerosis for instance; that is, the hypertrophy in both instances is compensatory. The obstruction is generally an enlarged prostate. It may, however, be stricture; but, as a rule, the obstruction of stricture is likely to be accompanied by more or less hyperæsthesia of the bladder, which in a measure prevents this distention, and in fact this form of obstruction might also produce concentric hypertrophy. I believe that a phimosis might be responsible for hypertrophy, either concentric or excentric, though I have never met with a case of this kind. Diabetic patients are frequently the subjects of hypertrophied bladder of either variety. Those diabetic patients who have concentric hypertrophy are persons in whose clinical history there is not the symptom of great thirst. They take very little fluid, and complain generally of great muscular exhaustion. The urine, not being increased in quantity, is of high specific gravity, and contains a large amount of sugar, which is very irritating to the bladder. It is the constant micturition that prevents distention

and causes consequent concentric hypertrophy. In diabetic patients, in whom thirst is a characteristic feature of the symptoms, and who imbibe enormous quantities of water and secrete a great amount of urine, the bladder, when not hyperæsthetic, becomes distended, and its efforts to expel so great a quantity frequently cause a true excentric hypertrophy.

Anatomical Appearances.—In concentric hypertrophy resulting from chronic cystitis the surface of the mucous membrane is very irregular, the membrane is much thickened, and the blood-vessels are dilated and tortuous. There is desquamation of the epithelium, and very often ulceration. The bladder-wall is sometimes enormously thickened. I have seen it about one inch in thickness. Still, in this concentric variety the thickening is not due entirely to muscular hypertrophy, as is usually stated. There is an increase in growth of the fibrous tissue surrounding the muscular fasciculi, and in inflammatory cases there is also a great increase in the growth of the areolar or fibrous tissue of the mucous membrane as well as of the submucous coat. The subsequent contraction of this newly-formed tissue adds very much to the thickening of the wall, so that concentric hypertrophy, as it is called, is hardly a true hypertrophy; much of the thickening is no doubt due to the contraction of the wall, just as thickening of the stomach-wall results from contraction where there exists, for instance, a stricture of the œsophagus. This thickening of the stomach is clearly not an hypertrophy.

In excentric hypertrophy there is very little if any thickening of the mucous membrane, nor is its surface irregular or ulcerated.

The cavity is large and the wall is thick, but it is the muscular coat alone that is thickened; in other words,

there is a true hypertrophy, brought about, as we have already seen, by the efforts of the muscular wall of the bladder to expel the contents of the organ.

Symptoms.—In concentric hypertrophy the usual symptoms are those of chronic cystitis. Upon physical examination, by the bimanual method, we find the thickened contracted bladder, feeling like a hard ball, behind the pubes. When the concentric hypertrophy is due to hyperæsthesia, the symptoms of chronic cystitis are lacking.

In excentric hypertrophy, except in diabetes, we have the clinical history of the obstruction which caused the dilatation, and find on examination a large hard tumor in the hypogastric region. Sometimes the hypertrophied bladder extends up to the umbilicus. There generally is, also, hypertrophy of the muscles of the abdominal wall, from the efforts of these muscles to assist the bladder in expelling its contents. The straining to expel the urine often causes prolapse of the rectum, and sometimes emphysema and bronchitis.

Prognosis.—The prognosis depends upon the etiology and pathology in the individual case.

In diabetes, when the patient is cured of the primary disease the hypertrophy disappears. The excentric hypertrophy due to enlarged prostate will often disappear under the proper use of the catheter. The prognosis in the concentric hypertrophy which accompanies chronic cystitis is bad, as it is also when the kidney is involved.

Treatment.—In excentric hypertrophy due to prostatic enlargement the constant use of a soft perfectly clean catheter entirely relieves the patient of everything but the enlarged gland. A few years ago I was called to see a gentleman whose condition was wretched indeed. He was unable to leave his bed, the prostate was very large, the hypertrophied bladder (excentric) formed a large hard

tumor that extended to the umbilicus, and the abdominal muscles were much thickened. Any effort to pass water caused prolapse of the rectum, and, in addition, he was emphysematous and had bronchitis. A few months' constant use of the soft catheter at regular intervals entirely cured him of his distressing symptoms, except the prostatic enlargement and the emphysema, and he resumed his usual occupation.

In concentric hypertrophy the contracted bladder must be dilated with water, as hot as can be borne, with either a fountain or a bulb syringe. The water can be medicated according to the pathological condition of the mucous membrane.

The inflammation of the bladder must be treated as already suggested, and the cause removed if possible; but the only treatment for the contraction is dilatation. I have pursued this course for eighteen years, with a greater degree of success than any other treatment offered. When there is cystitis or ulceration and the bladder is to be washed as well as distended, I use a soft double rubber catheter.

CHAPTER XII.

NEW GROWTHS AND FOREIGN BODIES IN THE BLADDER.

While the treatment of new growths and foreign bodies is essentially surgical, it is, nevertheless, necessary as a matter of diagnosis or differential diagnosis that the physician should understand their etiology and symptoms.

Growths are divided into two great classes,—benign and malignant.

Neither are so common in the bladder as elsewhere in

mucous membranes, which is doubtless owing to the fact that in the bladder, except, it may be, in the vicinity of the neck, the mucous membrane is poor in secreting glands, some authors asserting their inability to find any. But, however less frequently these growths occur in this membrane, we find the same variety.

The benign growths comprise myxoma, fibroma, myoma, myo-fibroma, and tubercle.

The varieties of the malignant are, as in other organs, epithelioma, encephaloid, scirrhus, etc.

We know as little of the etiology of these new growths in the bladder as we do of the new growths in other mucous membranes.

The symptoms referable to the bladder differ but little whether the growth is benign or malignant, the pain and irritation being due to the location and size of the growth rather than to its character. Constitutional symptoms, however, are much more marked in the malignant than in the benign variety. Cancer of the bladder produces the usual characteristic cachexia, while the profound anæmia often present is owing to the loss of blood which occurs in either variety. The symptoms, then, of new growths in the bladder are pain, not constant nor necessarily present in every case, which may also be said in regard to the irritability of the bladder, frequent micturition, and hæmaturia.

The point to be determined by the physician is whether the above symptoms are due to new growths, parasites, ulceration, or foreign bodies. In the female the diagnosis is much more easily made than in the male. We can often determine the presence of a tumor or foreign body by a bimanual examination, one or two fingers in the vagina at the base of the bladder and the other hand pressing on the abdomen above the pubes, or by a careful exploration

with the sound either in the male or in the female; while growths can often be diagnosed with certainty by means of the endoscope. The nature of the growth can in many cases be determined by removing a bit of tissue and examining it under the microscope.

There is no rule as to the severity of the cystorrhagia from either the benign or the malignant tumors. There may be a free hemorrhage filling the bladder with clots, or a simple oozing from the distended veins.

As we have already said, the treatment of these growths is essentially surgical.

FOREIGN BODIES IN THE BLADDER.

We may discover in the bladder foreign bodies which have found their way into the cavity through its wall, from the ureters, or by way of the urethra. Of the first there is a great variety: dermoid tumors or fœtal bones from extra-uterine pregnancy, gall-stones or contents of the intestines, all of which may adhere to and ulcerate through the walls.

Gunshot wounds may carry bullets, spiculæ of bones, or bits of clothing into the bladder.

Gravel-concretions from the kidneys, entering the bladder by way of the ureters, may become the nuclei of large stones, or hydatids may enter it from the kidney.

Of the foreign bodies found in the bladder, the vesical calculus is the type, the etiology and varieties of which we have already dealt with. The foreign bodies that enter the bladder by way of the urethra are various, and seem to be limited only by the genius of the individual: lead-pencils, clay-pipe stems, seeds of fruit, hair-pins, and many other curious articles have been found.

The means of diagnosis are the bimanual examination, the sound, and the endoscope.

The treatment is, of course, surgical.

TUBERCULOSIS OF THE BLADDER.

Tuberculosis of the bladder is probably very seldom a primary disease. In the male it is usually associated with tuberculosis of the testicle, the kidney, and occasionally the lungs; while in the female it is generally accompanied by tuberculosis of the kidney or the lungs.

There is nearly always hæmaturia at some period in the course of the disease, either from the bladder or the kidney or from both, while the ulceration and thickening are likely to involve the whole length of the ureters.

We have already given a detailed account of the pathology and symptoms in tuberculosis of the kidney. An examination with the cystoscope will show extensive ulceration, and the urine will be found loaded with purulent matter and occasionally to contain blood. Bimanual examination by the rectum or vagina shows a thickened, irregular, and tender condition of the bladder.

Pathology.—Tuberculosis of the bladder commences in the submucous tissue, giving the mucous membrane an irregular appearance. The deposit is at first gelatinous, but soon becomes opaque and cheesy. As the cheesy deposit softens it involves the mucous membrane, producing characteristic tubercular ulceration, the urine containing pus, blood, and disintegrated tissue.

Treatment is palliative, washing out of the bladder, etc., being governed by the complications.

CHAPTER XIII.

ENURESIS NOCTURNA (NOCTURNAL INCONTINENCE).

The etiology and pathology of this condition are as yet very obscure, nor is it possible to explain why it is almost entirely confined to children. When it occurs in adults it is generally the result of medicines or narcotics; in fact, it is not a very unusual thing for men who go to bed drunk to have the contents of their bladders escape involuntarily. There are many theories advanced as to the actual cause of this condition, but none of them are satisfactory. If the contents of the bladder escape because of paralysis of the sphincters, why is there no paralysis during the day? On the other hand, if it is purely a sensory neurosis, why does the disturbance occur only at night?

It has been suggested that with children thus affected sleep is unusually profound; but I do not see that this affords a satisfactory explanation of the incontinence. There is, in my opinion, a disturbed rather than a profound sleep, for the reason that reflex disturbances often play an important part in this condition, such as pinworms in the rectum, undigested food in the bowels, elongated, adherent, or irritated prepuce, stone in the bladder, or undue excitement during the day which would cause the child to dream and be restless. The successful treatment by sedatives seems also to point to its being a restless rather than a profound sleep. My own belief is that it does not depend upon an anæsthesia; on the con-

trary, I hold that they feel the desire to urinate, and empty the bladder under the same mental condition in which they might walk or talk in their sleep,—that it is a normal voluntary act, the result of an unconscious cerebration.

TREATMENT.—Many of these children can be cured by strict attention to hygiene; that is, care as to their diet, avoiding too much drink in the latter part of the day, and guarding against over-excitement or exertion at any time. They should not be allowed to go to the circus or Wild West shows in the evening. When there is an adherent, elongated, or irritable prepuce, circumcision is not only justifiable, but even necessary.

The rectum should be examined for pin-worms; in short, in this condition, as in all other diseases, careful inquiry should be made into the etiology before prescribing. Many of these children require general tonic treatment, iron, quinine, cod-liver oil, etc., with moderate out-door exercise and change of climate. The special remedy that seems to be of most use in my hands is belladonna, about five drops of the tincture given at three or four in the afternoon and repeated at bedtime. When this fails, I have occasionally succeeded by combining the belladonna with fluid extract of ergot, ♏xv–xx, and I have sometimes found ergot alone to answer an excellent purpose.

Tincture of hyoscyamus, with or without spirit of nitrous ether, has been found efficient with some children; while in very nervous children bromide combined with chloral hydrate has succeeded, showing that in these cases, at least, there was present a hyperæsthesia rather than an anæsthesia. Another excellent remedy is codeine.

If these children are watched, it will be found that most of them sleep in the dorsal position; and it is while lying

on the back that the evacuation takes place. A means employed by many mothers, which often proves efficacious, is to tie a towel about the child with the knot behind, which when he turns on his back either awakens him or causes him to change his position.

SECTION V.

CHAPTER I.

DIABETES.

History.—The first clear description of a case of diabetes met with in medical literature is in the writings of Celsus. He calls attention to patients who complain of great weakness, excessive thirst, extreme emaciation, and the passage of large quantities of urine.

Aretæus is credited with having first used the term *diabetes*, referring to the disease as follows: "Diabetes is a wonderful affection, not very frequent among men, being a melting down of the flesh and limbs into urine: . . . the patients never stop making water, but the flow is incessant as if from the opening of aqueducts." Galen also makes mention of the disease.

Little or no advance was made in the knowledge of the disease until the time of Willis, in 1674. He ascribed the sweet taste and smell of the urine to the presence of sugar. Soon after this suggestion by Willis, sugar was separated from diabetic urine by chemical analysis, and all doubt was thus removed.

It is about one hundred years since Rollo observed that vegetable food increased the quantity of sugar in the urine and in consequence advocated a purely animal diet. Not until 1823 was it discovered by Tiedemann and Gmelin that starchy food was converted into sugar during the process of digestion. Soon after this sugar was demon-

strated to be present in the blood. Claude Bernard was the first to demonstrate that sugar is constantly present in the blood of the right side of the heart, while it is almost entirely absent on the left side, and that it enters the inferior cava by the hepatic vein. He also found but a trace of sugar in the portal vein, thus showing that the liver is the great sugar-producing org.

Bernard further taught that the liver had two sugar functions,—namely, that of converting sugar into glycogen, or its glycogenetic function, and that of converting glycogen into sugar, or its glycogenic function. Bernard's theories have never been unanimously accepted by physiological chemists.

We usually make a division of diabetes into two classes, —diabetes mellitus and diabetes insipidus.

CHAPTER II.

DIABETES MELLITUS (MELLITURIA — GLYCOSURIA — GLUCOSURIA).

DIABETES MELLITUS is a disease whose etiology and pathology are obscure, but whose pathognomonic symptom is the presence of sugar in the urine.

ETIOLOGY.—While it is impossible to state the exact cause of diabetes mellitus, we have learned from observation many of the conditions which seem to act as etiological factors.

Climate.—This has probably little or nothing to do with the production of diabetes, although it is often stated that Russia, Brazil, and the Antilles possess a peculiar exemption from this disease. I imagine, however, that in coun-

tries sparsely settled and with few medical men, the infrequency of its reported occurrence can be attributed to lack of careful examination of the urine. We all know that busy country practitioners are not so exact in their examinations of urine as the physicians who do office practice in large cities, nor are country-people, as a rule, so prompt about consulting a physician as are those who reside in cities.

Climate, therefore, is not an etiological factor of any prominence.

The same may be said of seasons.

Race.—Many writers on diabetes state that the Jewish race is particularly liable to this disease and that the African race is peculiarly exempt. Neither of these statements is correct. In the case of the Hebrew, his liability to diabetes is no doubt the result of his habits, occupation, etc., rather than of his race; while in that of the African, there are no data to warrant the assertion of his exemption, and his habits are not such as would form a predisposing cause.

Sex.—In adults males are more subject to diabetes than females. In children sex is not an etiological factor.

Age.—No age is exempt. The ages that furnish the largest percentage of cases are, in males, from thirty to sixty years, and in females from ten to thirty years.

Habits.—Habits of life and occupation, no doubt, play an important part in the production of this disease. It is a well-established fact that sedentary habits and high living predispose to diabetes; and I believe that these two factors account for the unusual proportion of Hebrews in our large cities who suffer from this condition.

Heredity.—Diabetes is not a well-marked hereditary disease, although we do meet with cases in which the family history points strongly to hereditary predisposition.

Pregnancy.—It is not uncommon to find sugar in the urine during pregnancy, nor is it unusual to find the sugar disappear after labor, without treatment.

Sugar often appears temporarily in the urine after an excessive quantity of sugar has been taken into the system, after blows or shocks, after periods of excessive study or of strong mental emotion, and after epileptic fits.

Diabetes attacks two very different types,—namely, the stout, obese, muscular person of gouty habit and the thin, nervous, neuralgic subject.

There are many substances which when taken into the system in excess produce diabetes, at least temporarily; for instance, hydrocyanic acid, carbonic acid gas, morphine, mercury, etc.

Pathology.—We have already observed that the pathology of diabetes is obscure. While it is a fact that in no case of death from diabetes is every organ in the body found to be normal, it is equally true that there is no one organ that is always found in a pathological condition.

When a post-mortem does reveal a pathological condition of an organ it is impossible to say whether the diseased organ caused the sugar to appear in the urine or whether the sugar in the blood produced the organic change. In other words, there is no pathological anatomy characteristic of diabetes.

Liver.—It is not infrequent to find the liver quite normal in appearance. Oftener, however, it is enlarged and hyperæmic, the capillaries being much distended and the hepatic cells swollen. Occasionally there is an incipient cirrhosis or a fatty degeneration; but there is no evidence that the cirrhosis is the result of the sugar.

Pancreas.—It is doubtful whether any one organ is more often found diseased in diabetes than the pancreas. In one case it may be hypertrophied, in another it may

be atrophied or cystic. Concretions obstructing the duct have been found, and fatty degeneration is not a rare condition.

Lungs.—These organs are often found diseased in diabetes, the pathological conditions being chronic bronchitis, fibrous phthisis, or tuberculosis. While there is nothing peculiar in these conditions to indicate that they are the direct result of the sugar in the blood, it is possible that in these cases the sugar has produced the disease.

Spleen.—The spleen has been found hypertrophied in some cases and atrophied in others.

Kidneys.—The kidneys are very often, but not invariably, enlarged. The enlargement, when present, is more likely to be due to hyperæmia than to organic disease. Ehrlich asserts that the epithelium of Henle's loop is always degenerated in diabetes, and that it is a glycogenic degeneration; that is, the protoplasm of the cells always contains glycogen. It is probable that there is no specific glycogenic degeneration, but that the hyperæmia of the kidney produces a cellular nutritive necrosis or degeneration and that the cells absorb glycogen from the urine.

When tubular or intertubular nephritis is present, it is impossible to determine its relation to diabetes.

Bladder.—The bladder is often greatly hypertrophied, the result of functional activity. The hypertrophy may be either concentric or excentric, the former occurring when the sugar produces hyperæsthesia and frequent micturition; the latter, when the quantity of urine is very great and hyperæsthesia is not present.

Stomach.—The appearance of the stomach and intestines on post-mortem furnishes no explanation of the ravenous appetite and insatiable thirst so often complained of, beyond, perhaps, some enlargement or hyper-

trophy of the stomach which is the result of the necessary functional activity.

Blood.—The blood normally contains a small amount of sugar, and it is only when this quantity has been considerably increased that we designate the condition as glykæmia and the consequent presence of sugar in the urine as glycosuria.

Symptoms.—There are no subjective symptoms pathognomonic of diabetes, and there is but one objective symptom,—namely, excess of sugar in the blood as evidenced by its appearance in the urine. There are few patients, however, who do not complain of excessive weakness, muscular debility being seldom absent.

Urine.—As sugar in the urine is the pathognomonic symptom of diabetes, it will be well first to consider the symptoms exhibited by the urinary organs. Patients seldom complain of pain over the region of the kidneys, but often experience a dull, heavy, dragging sensation about the loins. Nor do they often complain of pain in the bladder. Occasionally they exhibit great irritability of the bladder, the hyperæsthesia being, no doubt, produced by the irritating quality of the urine. At times there will be a catarrhal cystitis, with some pain on micturition. In other cases there will be well-marked hypertrophy of the bladder.

Occasionally we find phimosis, with an irritable and excoriated condition of the prepuce, while in the female pruritus vulvæ is often an extremely annoying symptom.

Diabetic patients usually void an excessive quantity of urine, some micturating frequently, being disturbed often at night, and making in the twenty-four hours a gallon or more of light-greenish or straw-colored urine.

The amount, of course, varies with the amount of liquid ingested, although some experimenters maintain that the

urine voided is often in excess of the quantity of fluid taken into the stomach.

The rapid absorption of the fluid from the alimentary canal by the blood-vessels takes place in accordance with the well-known physical law of osmosis.

The urine has a sweet, sickening odor and a sweetish taste. Its specific gravity ranges from 1020 to 1050, being generally about 1030. The amount of sugar varies from two to nine per cent., or from two or three grains to twenty-five grains to the ounce. While the amount of urea to the ounce of urine is usually decreased, the quantity secreted in twenty-four hours remains about the same as in health. It is only in cases where no thirst is experienced that the quantity of urine passed is less than normal.

Digestion.—The majority of diabetic patients have ravenous appetites, accompanied by insatiable thirst. They complain of a parched and dry mouth and throat, and are continually craving more drink. The teeth, especially in young persons, decay rapidly, owing probably to an acid fermentation of the secretions of the mouth.

In many cases, notwithstanding the great amount of fluid and food taken into the stomach, the patients complain very little of indigestion; while others, who take but little food, often vomit, and are constantly distressed by gas in the stomach and bowels, fats especially being difficult for them to digest. This condition might well be anticipated from the fact that diabetic patients are so often the subjects of a pathological condition of the pancreas and liver.

Circulatory Organs.—Beyond the weak pulse from a degenerated and atrophied condition of the heart and dilatation of the cerebral vessels, there are no striking or constant symptoms connected with the circulation.

Lungs.—Many diabetic patients die of phthisis, either tubercular or fibrous, while a large number are the subjects of chronic bronchitis. There is nothing characteristic in the pulmonary symptoms of diabetic patients.

Nervous System.—While headache is not a constant symptom, it is by no means infrequent, some patients being the subjects of intense hemicrania. Neuralgia of other nerves is often a cause of distress, and dizziness and vertigo are occasionally troublesome. Many patients become extremely irritable, while others are given to melancholia. The dizziness, vertigo, irritability, or melancholia could be anticipated from the fact that pathological conditions of the cerebral circulation are often present.

Skin.—The skin is often very dry, harsh, and scaly, and seldom is there much perspiration.

In older persons, carbuncles should always be considered an indication for an examination of the urine for sugar, as in a large number of cases the two are associated.

The most frequent skin disease in female patients, however, is the eczema that results from the pruritus labialis. The excoriations about the vulva and thighs are excessively annoying and exceedingly intractable.

Eczemas appear on other portions of the body, often disappearing as the sugar diminishes under treatment, and recurring with the reappearance of the sugar.

Occasionally in elderly gouty patients there is gangrene, resembling senile gangrene in its course.

Zona, or herpes zoster, is often associated with diabetes, especially in the gouty. Whether or not there is any relation between the two it is difficult to say, as we often have herpes in the gouty without sugar.

Sight.—Cataract and amblyopia are frequently associated with a diabetic condition. Some authors maintain that there is an impairment of the ciliary muscle.

The œdema which is frequently present is probably the result of debility, as in other forms of anæmia.

Emaciation is sometimes extreme, and occurs generally in those patients who are neuralgic or phthisical and of spare habit, and in whom the appetite is ravenous and the thirst very great. In other cases, not accompanied by emaciation, there may be neither increased appetite nor excessive thirst.

The temperature is usually subnormal, the patient often complaining of feeling chilly.

Acetonæmia.—Petters first observed diabetic coma. Attention was directed to the acetone-like smell of the urine in 1857, and it was supposed to be due to the presence of acetone in the blood. The symptoms usually described as indicating acetonæmia frequently manifest themselves either throughout or late in the course of the disease.

The symptoms vary, but are often manifested in three distinct stages,—namely, a stage of excitement, one of great restlessness, uneasiness, and dyspnœa, and one of coma. During these stages the sugar is found in much smaller amount in the urine, or may even be absent. It was for this reason that acetone was supposed to accumulate in the blood, whence the name acetonæmia. It has also been proposed to designate the condition as hyperglykæmia. The consensus of opinion of experimenters seems at present to be that acetone is the product of the fermentation of grape sugar.

The symptoms in many cases are similar to those of so-called uræmic poisoning; the stage of excitement in the latter is more likely to be accompanied by convulsive contractions of the muscles, while in the former (acetonæmia) it manifests itself by great disquietude, with incoherence and indistinctness of speech, frequently interspersed with attacks of dyspnœa, reminding one of

cardiac asthma. Finally the patient sinks into a comatose condition, often dying in a few hours.

To sum up, then, there are two distinct classes of diabetic patients. One class will consult the physician, perhaps, on account of weakness. A man between fifty and sixty years of age, of large frame, carrying considerable adipose tissue, of gouty diathesis, perhaps, but who has until now been well and possessed of much energy, may come complaining that he can no longer walk, even a few blocks, without becoming utterly fatigued. This may be the only symptom. He has no thirst, no increase of urine, no loss of appetite.

Under such circumstances the physician should never fail to examine the urine before prescribing for the patient.

Generally it will be found to have a specific gravity of 1030 or 1040 and sugar will be present in abundance.

Some of these patients complain, when closely questioned, of other symptoms, which they had at first thought too trivial to mention,—perhaps some pruritus, eczema, or a tendency to boils. (Always examine the urine when people over fifty complain of skin-diseases, such as pruritus, eczema, boils, etc.) Others may, in addition to their weakness, complain of disturbance of sight, rapid decay of the teeth, constipation, or loss of sexual power.

Another class of patients will come to the physician complaining of great thirst, a ravenous appetite, and loss of strength and weight. These patients usually void a large quantity of urine. They are nervous and excitable, and suffer more or less with headache. The skin is rough, dry, and scaly; the color sallow. Any of the complications may be present, or may develop later, in these cases. Emaciation is often the prominent feature, and becomes extreme.

Prognosis.—The prognosis depends greatly upon the age of the patient and the freedom from complications.

We must always be guarded in our prognosis, as phthisis, bronchitis, pneumonia, carbuncles, gangrene, nephritis, or cerebral trouble may supervene, or the case end in insanity.

The younger the patient, the more rapidly does the disease run its course, children and young adults often dying in a few months, while in elderly people it frequently becomes chronic, sugar being constantly found in the urine during a period of from ten to twenty years.

Treatment.—Before commencing the treatment of a diabetic patient, it will be well for us to call to mind that we know little or nothing of the etiology of the disease, and that we have been unable to discover its pathology; that is, we have been unable to establish the fact that any one organ is invariably found in a pathological condition.

At the same time we must remember that it is seldom that some one or more organs are not in a pathological condition. This being the case, and there being no specific for diabetes, we must reconcile ourselves to treating symptoms only.

As a matter of convenience, the treatment may be divided into hygienic, dietetic, and medicinal. Of these, it is generally stated by authors that the dietetic is by far the most important. This, however, is the fact only in regard to the treatment of the pathognomonic symptom,—namely, the glycosuria.

Hygienic.—As diabetic patients have usually a subnormal temperature, chill easily, and complain of cold, it is important to look well to their clothing, as well as to their atmospheric surroundings.

Send them to a warm climate, where possible, and always dress them in flannel. You will find that many

of these patients are wearing by advice very heavy flannels. I have always been in the habit of directing a medium-weight woollen or silk-and-woollen suit, with an extra woollen or chamois vest. This method of dressing keeps the body well protected and warm, and is less irksome and binding than a single heavy woollen vest would be. When the patient perspires, the outer vest absorbs the moisture, while the inner keeps warm and dry.

Every diabetic patient should be provided with a heavy overcoat to protect himself against changes in the weather. The feet should be protected from dampness by wearing thick shoes and thin cotton or silk socks under woollen ones.

As we have already seen, these patients are likely to have dry, harsh, scaly skins, so that frequent warm bathing with occasional steam or hot-air baths is likely to prove highly beneficial.

Next to the dietetic treatment in beneficial results is exercise in the open air; and of all forms of exercise, that which seems to be of the most benefit to diabetic patients is walking.

No matter how weak they are or how much they complain of debility or fatigue on exertion, you must make it a rule that they shall walk each day as much as they can without extreme fatigue. If it is two blocks at first, they will soon be able to make three or four. Let them increase the distance until they can walk from six to eight miles every day. They must not house themselves for a little rain or cold.

Medicinal.—For the treatment of the pathognomonic symptom, the glycosuria, there are few medicines of much value. Those that have proved beneficial in my hands are opium and its alkaloids, particularly codeia and svapnia, bromide of arsenic prescribed as Clemens'

solution, or arsenic in the form of Fowler's solution, valerian, quinine, nitrate of silver, and mineral water.

Remedies that have been highly extolled by some writers have failed entirely in the hands of others, owing no doubt to the fact that many of the cases have been cases of transient glycosuria.

Among the medicines thus recommended are bromide of potassium, small doses of calomel, phosphorus, strychnine, iodoform, iodol, sulfonal, sulphur, salicylate of sodium or salicylate of bismuth, and the alkalies, especially the carbonate of lithia and many others. Under this head would come, of course, treatment by alkaline mineral waters. In Europe, Carlsbad and Vichy are the most favored. In California we have many excellent alkaline waters, our Vichy being very similar to that of France.

In prescribing codeia it is well to commence with a half-grain three or four times a day, either alone or in combination with valerian and quinine. A favorite prescription with me is—

℞ Codeiæ, gr. ss;
Ext. valerianæ,
Quin. sulph., āā gr. ii.—M.
Sig.—Three to five times in twenty-four hours.

Some of these patients are very tolerant of opium, and will take two- to three-grain doses three or four times daily with the effect of lessening the sugar, polyuria, and polydypsia.

It is usual to prescribe the bromide of arsenic as Clemens' solution, commencing with three drops after each meal and increasing the dose to six or eight drops. This remedy in my hands has proved second only to opium and its alkaloids.

Sulphur, alone or in combination with iron, answers

well in cases that do not yield readily to opium or arsenic. It probably owes its efficiency in this disease to its action upon the mucous membrane of the alimentary canal and the skin, the sweat-glands being deficient in almost all diabetics.

For patients who live in malarial climates or are the subjects of chronic malaria, the following prescription will often prove serviceable in lessening the prominent symptoms:

℞ Acidi arseniosi, gr. i;
Ext. valerianæ,
Quin. sulph., āā ʒi;
M. et div. in pil. no. xxx.

Sig.—One pill from three to six times daily, with an occasional mercurial laxative.

Other medicines will often have to be administered in this disease for such complications as may be found in the particular case. This can easily be anticipated from the variety of pathological conditions found in diabetes.

Diet.—The object to be attained by diet is to reduce glykæmia and thus reduce the glycosuria. While we do not know how many of the pathological conditions found post mortem are produced by the excessive quantity of sugar in the blood, experience teaches us that if we lessen the quantity of sugar the patient immediately begins to regain his strength. We accomplish this object, namely, the reduction of sugar, by eliminating from the diet all saccharine matter, as well as such foods as contain starch. The annexed list will serve as a guide to the proper diet of such patients.

The diabetic patient may eat: almond rusks, almond biscuits, gluten bread, gluten biscuit, stale bread (toasted), sparingly; bacon, butter, cheese, eggs, beef-tea and thin soups, beef, mutton, game and poultry: fish, oysters;

cabbage, lettuce, string-beans, green peas, tomatoes, spinach, greens, olives, artichokes, asparagus; custards without sugar, jellies unsweetened; tea, coffee, cocoa without sugar, water, mineral waters, claret, milk, buttermilk; acid fruits, lemons, cherries, currants, strawberries, nuts.

The following articles must be forbidden: peas, beans, lentils, potatoes, sweet potatoes, carrots, beets, rice, maize, wheat flour, oatmeal, macaroni, liver, made dishes, arrowroot, buckwheat, sago, tapioca, puddings and pastry generally; apples, bananas, and sweet fruits generally, including raisins; sugar, chocolate, ales, sweet wines.

My own experience is that patients do better on the mixed diet indicated by the above list than on a too exclusive diet as has been often recommended. Some writers, for instance, recommend the restriction of the patient to a meat diet exclusively. Dr. Donkin a few years ago advised a diet consisting only of skimmed milk. Both of these I have tried upon more than one occasion, with signal failure.

The diet of diabetics must be strictly supervised, as many of them have ravenous appetites, are always thirsty, and eat and drink to excess.

CHAPTER III.

DIABETES INSIPIDUS (POLYURIA—USOZENIA—HYOSURIA).

DIABETES INSIPIDUS is a condition characterized by a persistent increase in the quantity of urine, which contains neither albumen nor sugar, and usually accompanied by polydypsia.

In Galen's time the term diabetes included all cases of polyuria. It was not until chemical analysis of the urine demonstrated sugar in some cases that the differential diagnosis was established.

Etiology.—We are absolutely ignorant of the etiology of this condition, and, as is the case with all diseases whose causes are unknown, many theories as to its origin have been evolved.

Though in many cases the kidneys have been found diseased, it is very probable that this disease is not of renal origin. Yet it is possible that in some cases, at least, it has its origin in a nutritive derangement or degeneration of the tuft-wall or its cellular lining. The Malpighian vessels themselves may suffer degeneration. The degeneration and perhaps desquamation of the nucleated lining may not only allow the more rapid filtration of urine, but also weaken the tuft-wall and allow the dilatation of the vessels of the tuft, or the vessels may dilate in consequence of degeneration of their walls. It seems to me possible to have dilatation of the tuft-vessels independently of vaso-motor paralysis. The degenerative changes could well be owing to chemical changes in the blood. Inosite, for instance, has been found in the urine in some cases of this disease, and it is possible that an abnormal material may yet be found in the urine which shall be as pathognomonic of diabetes insipidus as sugar is of diabetes mellitus.

The consensus of opinion, however, appears to be that this disease is a neurosis and has its origin in the dilatation of the renal arteries from paralysis or irritation of their vaso-motor nerves. It seems to me that for polyuria to be produced it is not absolutely necessary that there be either dilatation of the renal arteries or extra blood-pressure. It is very probable that there are special secretory

nerve-fibres for the kidney, and that these fibres are distributed almost exclusively to the tubules. The differences in the calibre of the tubules in their convoluted and tortuous course can only be for the purpose of retarding the too rapid escape of the filtered urine. Now, let us suppose that the special secreting nerve-fibres are paralyzed and hence the tube offers little or no vital resistance to the escape of urine, the result will be polyuria without dilatation of the blood-vessels or extra blood-pressure. This appears to me as rational an explanation of hydruria as that which attributes it to dilatation of the renal blood-vessels. In the latter case the resistance of the blood-vessels would still have to be overcome, and certainly the blood-pressure from mere dilatation of the vessels of the tuft could not be very greatly increased.

The fact that injuries to the cervical sympathetic or spinal cord or irritation of the floor of the fourth ventricle near Bernard's sugar-centre produce polyuria is strong evidence of the neurotic origin of this form of polyuria. Until it can be demonstrated that the renal function is presided over by special secretory nerve-fibres, it will scarcely be possible to establish the exact nervous origin of diabetes insipidus.

Sex.—This condition seems to be much more frequent in men than in women, the proportion being about the same as that in diabetes mellitus,—about three to one.

Age.—No age is exempt from diabetes insipidus. Taking all the cases up to sixty years of age, the thirty years from twenty to fifty produce about two-thirds of the cases, the ten years from twenty to thirty being the decade in which most cases occur.

Heredity.—Heredity is evidently not a very active etiological factor.

Exciting Causes.—Injuries to the nervous system, such

as falls, jars, concussions, or blows on the head, or on the spine, undoubtedly play an active part. Tumors, apoplexy, and hemorrhages and inflammations of the brain are among the causes; so also are excessive mental emotions.

The abuse of alcohol, of diuretics, or of ice-water has sometimes been followed by this condition; and occasionally it occurs as one of the sequelæ of the acute infectious diseases.

Pathology.—Diabetes insipidus, like diabetes mellitus, has no fixed pathology. Though as yet there has been no one organ invariably found diseased, there are few cases in which some one or more organs are not found in a pathological condition.

To be sure, the kidneys have been oftener found diseased than in diabetes mellitus, sometimes in a condition of degeneration; again, a great number of abscesses have been found. At other times a hyperæmia or dilatation of the blood-vessels will be present; while in some cases the kidneys have been in an apparently normal state. In many instances the brain has been found in about the same diseased condition as in diabetes mellitus; that is, tumors, tubercular masses, and degenerative changes in the blood-vessels in the floor of the fourth ventricle or in the medulla oblongata have been observed.

Symptoms.—The constant hypersecretion of urine is the characteristic symptom of diabetes insipidus. Most of the other symptoms, as thirst, emaciation, and dryness of the skin, are probably due to the enormous amount of water voided. Patients not infrequently pass from two to four gallons daily. As a rule, these patients make a greater quantity of water than do those with diabetes mellitus. The urine is light in color and weight, the specific gravity varying from 1003 to 1010. It is usually

very slightly acid and decomposes quickly. The solids may be increased, especially urea and the phosphates. Inosite is occasionally detected, as is also hippuric acid.

These patients are not so likely to suffer from carbuncles and boils as the subjects of diabetes mellitus; eczema and pruritus are not so apt to appear, nor is the appetite so often increased, as in that disease.

Many more symptoms of this disease are enumerated by writers, but they are only expressive of the different pathological conditions that we have already seen to exist. One patient, in addition to hydruria and thirst, may have a tumor of the brain; another, degeneration of the medulla, or tuberculosis, or syphilis. The symptoms vary accordingly; for instance, in one there will be a disturbance of sensibility, in another a disturbance of motion, while a third may suffer from headache or convulsions. While the thirst is often quite as great as in diabetes mellitus, the boulimia is rarely present.

Diagnosis.—The term diabetes insipidus is used for polyuria just as we use the term neuralgia for pain. When pain is the result of organic lesion, such as cancer or inflammation, tumors or ulcers, we are not in the habit of designating it as neuralgia. When one is suffering pain for which we cannot find a cause, we say the patient has an attack of neuralgia. When a patient has hydruria, passing, say, over a hundred ounces of urine per diem, and we find no organic lesion to account for it, we designate the case as one of diabetes insipidus. I was called in consultation not long since to see what was supposed to be a case of diabetes insipidus. The patient was a young man of twenty-five, who passed one hundred and fifty ounces of urine daily. I found a typical case of amyloid degeneration. This, then, was not a case of diabetes insipidus.

A few months ago I was consulted by a medical practitioner, aged sixty-five, for diabetes insipidus. He made about one hundred ounces of urine daily. He presented, with the exception of albumen and casts, a well-defined case of intertubular nephritis,—gouty diathesis, atheroma of valves and arteries, and hypertrophy of the left heart,—and had had an attack of hæmaturia two years before. He considered his case one of diabetes insipidus because he had found no albumen nor casts.

PROGNOSIS.—As we know nothing of the etiology, and as the pathological condition found after death varies from abscesses of the kidney to tumors of the brain, the prognosis must of course vary according to the individual case. Age is not so important a factor as it is in diabetes mellitus.

Some cases run a rapid course, lasting but a few months, in spite of all treatment, while others are very chronic, the patient living for years in comparatively good health and without treatment. It is a very curious fact, often setting at defiance the most skilful prognosis, that in some of the most acute cases, where the emaciation and debility have been extreme and the polyuria excessive, no pathological condition can be found after death to account for the symptoms. As a rule, cases following injury, as well as those that commence suddenly, are likely to be acute, while many of the chronic cases die of intercurrent disease.

TREATMENT.—We have no specific for diabetes insipidus, and it is necessary to remember that it is the patient and not the disease that is to be treated.

We may follow the same general plan of treatment as in diabetes mellitus,—that is, hygienic, dietetic, and medicinal. The dietetic treatment in this disease is much less successful in alleviating the characteristic symptoms than it is in diabetes mellitus.

In point of fact, restricting the fluids and food has not given encouraging results, serving only to increase the emaciation and debility.

Medicinal.—The therapeutic effects of any one drug in a disease of this nature are necessarily as inconstant and disappointing as the pathology of the disease is irregular. Nevertheless we find certain medicines extolled by writers of reputation.

That a medicine may be found to relieve a symptom in a certain number of cases of this disease is to be expected; but that any one medicine should be recommended as a cure for diabetes insipidus seems the height of absurdity.

Valerian, camphor, opium, or electricity may relieve the symptoms in neurotic patients, while the preparations of iron, strychnine, or quinine often prove useful in cases of anæmia and debility. Astringents, such as lead and tannin, sometimes lessen the quantity of urine. Mercury and iodide of potassium should be administered when the patient has or is suspected of having syphilis. Diuretics have had their advocates, but, of course, could be beneficial only in certain cases with kidney lesions.

CHAPTER IV.

ANAZOTURIA—OLIGURIA—AZOTURIA.

ANAZOTURIA is a condition characterized by the secretion of a normal amount of urine which is deficient in urea. The specific gravity ranges from 1002 to 1008, and neither albumen nor casts are present.

Sir Andrew Clark first described these cases in 1883, as renal inadequacy, and, having had an opportunity to

make a post-mortem, found no disease of the kidney. The kidneys seem incapable of excreting a greater quantity, notwithstanding the patient may partake of a large amount of fluid. The general character of the disease, is very similar to that of diabetes mellitus. The patients complain of weakness, emaciation, headache, nausea, and chilly sensations. They bear surgical operations badly, and often die of intercurrent disease.

Treatment seems to fail to restore the function of the kidneys.

OLIGURIA AND AZOTURIA.

It is a fact that many people make much less than the average forty to sixty ounces of urine per diem, with increase of specific gravity and of the amount of urea per ounce, and yet are free from disease of the kidneys. A friend of mine, a medical man of ability, informs me that about ten years ago his attention was called to the small quantity of urine that he was passing. He made an examination of the urine, and also had it examined by several medical friends. He states that, regardless of the quantity of solid or liquid nourishment he has taken, or of medication, he has not during the past ten years made thirty ounces of urine in any twenty-four consecutive hours.

INDEX.

D.

K.

O.

P.

THE END.

A LIST OF BOOKS

SELECTED FROM THE

Catalogue

OF

J. B. LIPPINCOTT COMPANY

Complete Catalogue Sent on Application.

Medical.

D. Hayes Agnew, M.D., LL.D.

The Principles and Practice of Surgery. A Treatise on Surgical Diseases and Injuries. Profusely Illustrated. Complete in 3 vols. 8vo. Cloth, per vol., $7.50; sheep, $8.50.

Hand-Book of Practical Anatomy. With Illustrations. *Second Edition, Revised.* 12mo. Cloth, $2.00.

J. M. Da Costa, M.D., L.L.D.

Medical Diagnosis, with Special Reference to Practical Medicine. *Seventh Edition, Revised and Enlarged.* Fully Illustrated. 8vo. Cloth, $6.00; sheep, $7.00.

Harvey and his Discovery. 12mo. Cloth, 75 cents.

J. E. Garretson, A.M., M.D., D.D.S.

A System of Oral Surgery. Being a Consideration of the Diseases and Surgery of the Mouth, Jaws, and Associate Parts. *Fifth Revised and Enlarged Edition.* Illustrated. 8vo. Cloth, $9.00; sheep, $10.00.

Professor Roberts Bartholow, A.M., M.D.

Manual of Hypodermatic Medication. *New Edition*, with Illustrations. 12mo. Cloth, $3.00.

Practical Lessons in Nursing.

Each 12mo. Cloth, $1.00.

I.—The Nursing and Care of the Nervous and the Insane. By CHAS. K. MILLS, M.D.

II.—Maternity; Infancy; Childhood. The Hygiene of Pregnancy; the Nursing and Weaning of Infants; the Care of Children in Health and Disease. By JOHN M. KEATING, M.D.

III.—Outlines for the Management of Diet; or, the Regulation of Food to the Requirements of Health and the Treatment of Disease. E. T. BRUEN, M.D.

IV.—Fever-Nursing. Designed for the Use of Professional and Other Nurses, and especially as a Text-Book for Nurses in Training. By J. C. WILSON, A.M., M.D., Visiting Physician to the Philadelphia Hospital and to the Hospital of the Jefferson College; Fellow of the College of Physicians, Philadelphia; Member of the American Association of Physicians, etc.

V.—Diseases and Injuries of the Ear: Their Prevention and Cure. By CHARLES H. BURNETT, A.M., M.D., Aural Surgeon to the Presbyterian Hospital, and one of the Consulting Aurists to the Pennsylvania Institution for the Deaf and Dumb, Philadelphia; Lecturer on Otology, Women's Medical College of Pennsylvania, etc.

H. C. Wood, M.D., LL.D.

Nervous Diseases and their Diagnosis. A Treatise Upon the Phenomena Produced by Diseases of the Nervous System, with Especial Reference to the Recognition of their Causes. 8vo. Cloth, $4.00; sheep, $4.50.

Therapeutics (A Treatise on). Comprising Materia Medica and Toxicology, with Especial Reference to the Application of the Physiological Action of Drugs to Clinical Medicine. *Eighth Edition, Revised, with Important Additions.* 8vo. Cloth, $6.00; sheep, $6.50.

Fever. A Study in Morbid and Normal Physiology. Large 8vo. Extra cloth, $2.50.

Thermic Fever or Sunstroke. 12mo. Cloth, $1.25.

Physician's Visiting List and Vade Mecum. 16mo. Roan, with flaps and pencil, $1.25.

Laurence Turnbull, M.D., Ph.G.

Clinical Manual of Diseases of the Ear. *Second Revised Edition.* With 114 Illustrations. 8vo. Cloth, $4.00.

Imperfect Hearing and the Hygiene of the Ear. *Third Edition.* With Illustrations. Large 8vo. Cloth, $2.50.

Edwin Morris, M.D.

A Practical Treatise on Shock after Surgical Operations and Injuries. 12mo. Cloth, $1.25.

Remington's Practice of Pharmacy.

With over 1300 Pages and 630 Illustrations. A Treatise on the Modes of Making and Dispensing Officinal, Unofficinal, and Extemporaneous Preparations, with Descriptions of their Properties, Uses, and Doses. By JOSEPH P. REMINGTON, Ph.M., F.C.S. Intended as a Hand-Book for Pharmacists and Physicians, and a Text-Book for Students. *Second Eattion, Thoroughly Revised and Enlarged.* 8vo. Cloth, $6.00; sheep, $6.50.

Wormley's Micro-Chemistry of Poisons.

Including their Physiological, Pathological, and Legal Relations. With an Appendix on the Detection and Microscopic Discrimination of the Blood. Adapted to the Use of the Medical Jurist, Physician, and General Chemist. By THEODORE G. WORMLEY, M.D., Ph.D., LL.D. *A New, Revised, and Enlarged Edition.* With new Illustrations. 8vo. Cloth, $7.50; sheep, $8.50.

Louis A. Duhring, M.D.

Atlas of Skin Diseases. Complete in one volume. Quarto. Half morocco, $25.00.

A Practical Treatise on Diseases of the Skin. *Thoroughly Revised and Improved.* Illustrated. 8vo. Cloth, $6.00; sheep, $7.00.

Epitome of Diseases of the Skin. 18mo. Cloth, 60 cents.

S. Weir Mitchell, M.D.

Injuries to the Nerves, and their Consequences. 8vo. Cloth, $3.00.

Fat and Blood, and How to make Them. *Revised and Enlarged.* 16mo. Cloth, $1.50.

Nurse and Patient, and Camp Cure. Two Essays. 18mo. Cloth, 50 cents.

Wear and Tear; or, Hints for the Overworked. *Fifth Edition, Revised and Enlarged.* 16mo. Cloth, $1.00.

Doctor and Patient. 12mo. Cloth, $1.50.

F. H. Gerrish.

Prescription Writing. 18mo. Cloth, 50 cents.

Wm. A. Hammond, M.D.

Lectures on Venereal Diseases. 8vo. Cloth, $2.00.
Sleep and its Derangements. 12mo. Cloth, $1.50.
Physiological Essays. 8vo. Cloth, $2.00.

Hand-Book of Nursing.

For Family and General Use. 12mo. Cloth, $1.25.
School Edition. Cloth, flexible, $1.00.

Rudolf Leuckart.

The Parasites of Man, and the Diseases which proceed from Them. A Text-Book for Students and Practitioners. Translated from the German, with the co-operation of the author, by WILLIAM E. HOYLE, M.A. (Oxon.), M.R.C.S., F.R.S.E. Large 8vo. Illustrated with over 400 figures. Extra cloth, $9.00.

Rudolph von Jaksch.

A Text-Book of Clinical Diagnosis. The Chemical, Microscopical, and Bacteriological Evidence of Disease. By DR. RUDOLPH VON JAKSCH, of the University of Prague. Translated from the *Second Edition* by JAMES CAGNEY, M.A., M.D. With Additions by WM. STIRLING, M.D., Sc.D., Professor of Physiology, Owens College, Manchester. With numerous Illustrations in color. Medium 8vo. Cloth, $6.50.

Horatio G. Bigelow.

Gynæcological Electro-Therapeutics. Illustrated. 8vo. Cloth, $3.00.

Franklin D. Clum, M.D.

Inebriety: Its Causes, Its Results, Its Remedy. 12mo. $1.25.

Leidy's Anatomy.

An Elementary Treatise on Human Anatomy. By JOSEPH LEIDY, M.D., Late Professor of Anatomy in the University of Pennsylvania, etc. *New (second) Edition, Rewritten and Enlarged.* Containing 495 Illustrations. 8vo. Extra cloth, $4.00; sheep, $5.00.

Addison P. Dutcher, M.D.

Pulmonary Tuberculosis. Crown 8vo. Cloth, $3.00.

Howard F. Damon, M.D.

The Neuroses of the Skin. 8vo. Cloth, $2.00.

The Structural Lesions of the Skin. Illustrated. 8vo. Cloth, $3.00.

G. E. Davis, F.R.M.S.

Practical Microscopy. Illustrated. 8vo. Cloth, $2.50.

Nathaniel Edward Davies.

Foods for the Fat. A Treatise on Corpulency and a Dietary for its Cure. 12mo. Cloth, 75 cents.

Geo. B. Wood, M.D.

A Treatise on Therapeutics and Pharmacology or Materia Medica. *Third Edition.* 2 vols. 8vo. Cloth, $9.00; sheep, $10.00.

Practice of Medicine. *Sixth Edition, Enlarged.* 2 vols. 8vo. Cloth, $5.00.

P. H. Chavasse, M.D.

Advice to a Wife, and Advice and Counsel to a Mother. Advice to a Wife on the Management of her own Health, and on the Treatment of some of the Complaints incident to Pregnancy, Labor, and Suckling. Advice to a Mother on the Management of her Children, and on the Treatment of some of their more Pressing Illnesses and Accidents, etc. Three volumes in one. *New Edition.* 12mo. Cloth, $2.00.

John H. Packard, M.D.

Hand-Book of Operative Surgery. Illustrated. 8vo. Cloth, $5.00; sheep, $5.75.

B. Howard Rand, M.D.

Elements of Medical Chemistry. *New Edition, Revised and Enlarged.* Illustrated. 12mo. Cloth, $2.00; sheep, $2.50.

P. H. Maclaren, M.D., F.R.C.S.E.

Atlas of Venereal Diseases. 4to. Half Russia, $25.00.

Pliny Earle, A.M., M.D.

The Curability of Insanity. A Series of Studies. Crown 8vo. Cloth, $2.00.

E. Landolt, M.D.

The Refraction and Accommodation of the Eye and their Anomalies. Translated by C. M. CULVER, M. A. With 147 Illustrations. 8vo. Cloth, $7.50.

Philip Schech, M.D.

Diseases of the Mouth, Throat, and Nose. Including Rhinoscopy and the Methods of Local Treatment. Translated by R. H. BLAIKIE, M.D., F.R.C.S.E. With Illustrations. 8vo. Cloth, $3.00.

Elizabeth J. French, M.D.

A New Path in Electrical Therapeutics. An Account of the Author's Great Discovery of Electrical Cranial Diagnosis, and the Scientific Application of Different Currents of Electricity to the Cure of Disease. 12mo. Cloth, $2.00.

A Complete Manual of Electro-Therapeutics, and a Brief Treatise on Anatomy and Physiology. *Third Edition, Revised and Corrected.* Illustrated. Cloth, $5.00.

John Ashhurst, Jr., M.D.

Injuries of the Spine. 12mo. Cloth, $1.50.

Professor C. Schweigger.

Hand-Book of Ophthalmology. Translated by DR. PORTER FARLEY. Illustrated. 8vo. Cloth, $4.50.

Lewis A. Sayre, M.D.

Spinal Diseases and Spinal Curvature. Illustrated with Photographs from Nature. 12mo. Cloth, $4.00.

A Dictionary of Practical Surgery.

By Various British Hospital Surgeons. Edited by CHRISTOPHER HEATH, F.R.C.S. 2000 pages. 8vo. Cloth, $7.50; sheep, $8.50.

William Stirling, M.D.

A Text-Book of Practical Histology. With 30 Outline Plates, 1 Colored Plate, and 27 Wood-Engravings. 4to. Cloth, $4.50.

Renaud Suzor, M B., C.M.

Hydrophobia. An Account of M. Pasteur's System. Containing a Translation of all his Communications on the Subject, the Technique of his Method, and the Latest Statistical Results. 7 Illustrations. 12mo. Cloth, $1.50.

J. M. Keating, M.D.

A Cyclopædia of the Diseases of Children, Medical and Surgical. By American, British, and Canadian Authors. For sale only by Subscription. Illustrated. Complete in 4 Handsome Imperial Octavo Volumes.

Byron Bramwell, M.D., F.R.S.E.

Intracranial Tumors. 116 Illustrations. 270 pages. 8vo. Cloth, $4.50.

William Banting.

A Letter on Corpulence. 18mo. Paper cover, 25 cents.

James C. Wilson, M.D.

Clinical Charts. Designed for the Convenient, Accurate, and Permanent Daily Recording of Cases in Hospital and Private Practice. 50 Charts in tablet form. Size, 8½ x 11 inches Per block of 50 Charts, 50 cents, net.

Fever-Nursing. Designed for the use of Professional and other Nurses, and especially as a Text-Book for Nurses in Training. 12mo. Cloth, $1.00.

T. R. Buckham, A.M., M.D.

Insanity considered in its Medico-Legal Relations. Crown 8vo. Cloth, $2.00; sheep, $2.50.

W. B. Hopkins, M.D.

The Roller Bandage. With 73 Illustrations, and Full Directions for Various Methods of Bandaging. 12mo. Cloth, flexible, $1.25.

Thomas's New Medical Dictionary.

A Complete Pronouncing Medical Dictionary. Embracing the Terminology of Medicine and the Kindred Sciences, with their Signification, Etymology, and Pronunciation. With an Appendix, comprising an Explanation of the Latin Terms and Phrases occurring in Medicine, Anatomy, Pharmacy, etc., together with the Necessary Directions for Writing Latin Prescriptions, etc., etc. By Joseph Thomas, M.D., LL.D. Imperial 8vo. 844 pages. Extra cloth, $5.00; library sheep, $6.00.

United States Dispensatory.

Edited by H. C. Wood, M.D., LL.D., Joseph P. Remington, Ph.M., F.C.S., and Samuel P. Sadtler, Ph.D., F.C.S. *Sixteenth Edition, Thoroughly Revised, Enlarged, and Corrected.* Illustrated. 8vo. Cloth, $7.00; sheep, $8.00; half Russia, $9.00. Any of the above styles, with Denison's Patent Index, additional, 75 cents.

Thomas's Medical Dictionary.

A COMPLETE PRONOUNCING MEDICAL DICTIONARY. Embracing the Terminology of Medicine and the kindred Sciences, with their Signification, Etymology, and Pronunciation. With an Appendix, comprising an Explanation of the Latin Terms and Phrases Occurring in Medicine, Anatomy, Pharmacy, etc.; together with the Necessary Directions for writing Latin Prescriptions, etc., etc. By JOSEPH THOMAS, M.D., LL.D., Author of the System of Pronunciation in Lippincott's "Pronouncing Gazetteer of the World" and "Pronouncing Dictionary of Biography and Mythology." On the basis of Thomas's "Comprehensive Pronouncing Medical Dictionary."

Imperial 8vo. 844 pages. Extra cloth, $5.00; sheep, $6.00.

"I have examined it with especial reference to the materia medica and therapeutics, and find it greatly in advance of anything of the kind we have had for a number of years. In fact, a need existed for just such a book, and I will certainly recommend it to my class as the best of its kind. Its unquestioned merits will soon supplant all others."—PROF. J. A. MCCORKLE, *Long Island College Hospital, Brooklyn, N. Y.*

"It is just the book for a medical or any other student, and it should be in the office of every physician. This dictionary supplies a place that has never been filled. I have looked it through and find all the new words that I have sought."—PROF. A. F. PATTON, *College of Physicians and Surgeons, Boston, Mass.*

"No better testimonial to the value of the work can be given than the following from Dr. J. Gibbon Hunt, the distinguished microscopist: 'To me the work is invaluable. I am astonished at its fulness of all recent words which the modern advance of medical science has introduced. Of course I cannot conceive the learning and great labor which could edit such a complete, thorough, and admirable volume.' We can add nothing further save that the book should be in the hands of every physician and every student in the land."—*St. Joseph Medical Herald.*

*** *For sale by all Booksellers, or will be sent by the Publishers, free of expense, on receipt of the price.*

J. B. LIPPINCOTT COMPANY.

715-717 MARKET STREET,

PHILADELPHIA, PA.