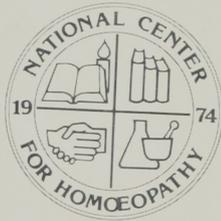


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RENAL THERAPEUTICS

INCLUDING ALSO

A STUDY OF THE ETIOLOGY, PATHOLOGY,
DIAGNOSIS AND MEDICAL TREATMENT OF
DISEASES OF THE URINARY TRACT

BY

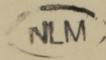
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PHILADELPHIA
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PREFACE.

THIS book, as its name implies, is primarily a therapeutic one, but at the same time the essentials of etiology, pathology and diagnosis of diseases of the urinary tract are included. By dividing the work into numerous chapters and by free use of heavy-faced type for the paragraphs of the chapter the writer has attempted to make the book one in which the practitioner can find what he wants without wading through what he does not want. The medical student will find in it quizzes and chart-like summaries which are designed for his special benefit.

C. M.

70 STATE STREET,
September, 1898.

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RENAL THERAPEUTICS.

CHAPTER I.

ANATOMY OF THE KIDNEYS.

THE kidneys are two in number, and are glandular organs intended for the excretion of urine. From the arrangement of the tubules the kidney is classified among the *compound tubular glands*.

Location.—At the upper and back part of the abdominal cavity, on either side of the spinal column, behind the peritoneum. The upper border corresponds with the space between the eleventh and twelfth ribs, the lower border with the middle of the third lumbar vertebra. They rest against the crura of the diaphragm and the anterior lamella of the posterior aponeurosis of the transversalis muscle, and to a slight extent on the psoas muscle.

The right kidney is usually a little lower than the left, owing to the liver above it crowding it down.

Fig. 1 shows the location of the kidneys with reference to the viscera, vertebræ, and ribs.

Topography.—Anteriorly:—A horizontal line passing through the umbilicus lies just below the lower borders of both kidneys. A vertical line drawn perpendicularly from the middle of Poupart's ligament upward to the costal arch passes directly over the kidney a little external to its median line.

Posteriorly:—A line parallel with the spinal column and one inch from it, extending from the lower edge of the tip

of the spinous process of the eleventh dorsal vertebra to the lower edge of the spinous process of the third lumbar vertebra, would fall just inside the inner border of the

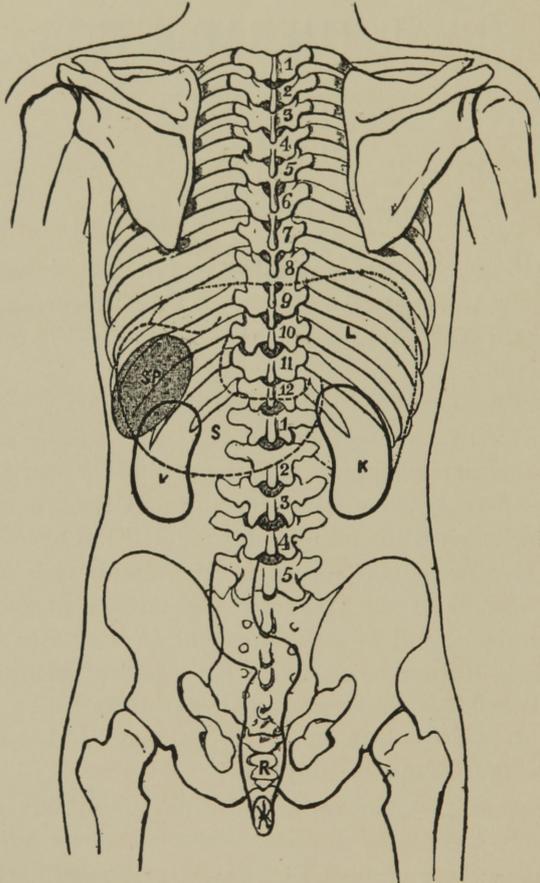


FIG. 1.—Diagram showing relation of the viscera to the parietes (posterior view). S, stomach; L, liver; K, kidney; SP, spleen; R, rectum.—(TREVES.)

kidney. If two lines be drawn from the ends of the line above described horizontally outward for two and three-fourths inches, and the outer ends of these two lines joined

by a perpendicular line, the whole kidney will normally lie within the four lines so drawn.

Position of Surfaces.—The anterior surfaces look obliquely outward and forward from either side of the bodies of the vertebræ. The posterior surfaces, which are rather more flattened than the anterior, look obliquely backward and inward toward the spines of the vertebræ. The upper end of the kidney is nearer the spinal column, and is slightly more posterior in position than the lower end. The inner border of the kidney at its upper part is about an inch from the middle line of the body, while the outer border at its lower part is three and three-fourths inches from the middle line. The outer or convex border of the kidney looks obliquely upward, while the concave or inner border looks obliquely downward and forward.

Relations of the Left Kidney.—Anteriorly the left kidney has the stomach in front of its upper third, the splenic artery and pancreas in front of its middle third, and the descending colon in front of its lower third. Posteriorly its relations are the same as those of the right kidney. Exteriorly the left kidney lies against the spleen for the upper two-thirds or three-quarters of its extent.

Incisions for reaching the kidney if carried too high may open into the pleural cavity, the parietal reflection of which is represented by a line crossing the neck of the twelfth rib and the outer end of the eleventh.

Relations of the Right Kidney.—Anteriorly the right kidney is crossed in its upper half by the right lobe of the liver, in its lower half by the ascending colon and descending duodenum where they are uncovered by the peritoneum, the duodenum covering the inner quarter of the lower half. The suprarenal capsule at its upper end touches the liver. The peritoneum covers it anteriorly near the upper end, the tunica adiposa intervening.

Posteriorly the kidneys rest upon the crura of the dia-

phragm in front of the eleventh and twelfth ribs, the quadratus lumborum, and psoas muscles, from which they are separated by the diaphragmatic fascia from the first, the anterior layer of the lumbar fascia from the second, and by the ilio-psoas fascia from the third. Behind it pass the twelfth dorsal, iliohypogastric, and ilio-inguinal nerves. Ex-

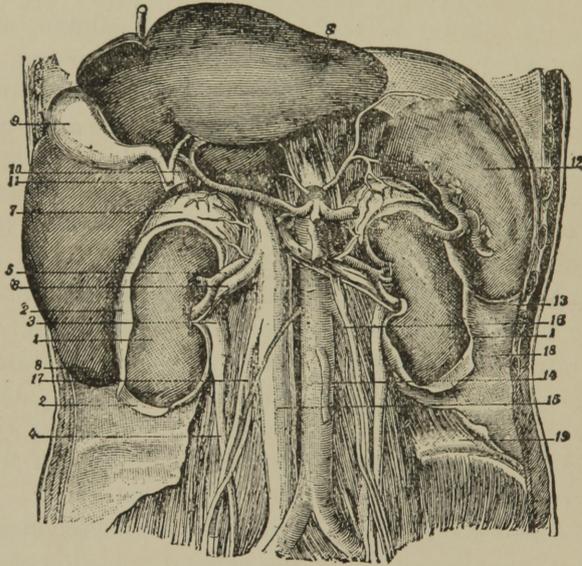


FIG. 2.—Relations of the kidneys. 1-1, the two kidneys; 2-2, fibrous capsules; 3, pelvis of the kidney; 4, ureter; 5, renal artery; 6, renal vein; 7, suprarenal body; 8-8, liver, raised to show relations of its lower surface to right kidney; 9, gall-bladder; 10, terminus of portal vein; 11, origin of common bile-duct; 12, spleen, turned outward to show relations with left kidney; 13, semicircular pouch on which the lower end of the spleen rests; 14, abdominal aorta; 15, vena cava inferior; 16, left spermatic vein and artery; 17, right spermatic vein, opening into vena cava inferior; 18, subperitoneal fibrous layer or fascia propria, dividing to form renal sheaths; 19, lower end of quadratus lumborum muscle.—(SAPPEY.)

teriorly the right kidney lies against the liver for its upper three-quarters. On the inner side are the arteries, veins, and exit of ureters. The superior extremity is in contact with its suprarenal capsule, which rests on the upper and inner margin.

The relations of the kidneys are shown by Figs. 2 and 3.

Support.—Adipose and connective tissue (*tunica adiposa*) form the support of the kidneys, and, together with the blood-vessels, nerves, lymphatics, and ureters, hold them in position. The *tunica adiposa* itself is a thick layer of fat contained in the meshes of a loose areolar tissue, completely investing everywhere the fibrous capsule of the kidneys, but thicker and more abundant posteriorly than anteriorly.

Dimensions.—The long axis of the kidney is vertical

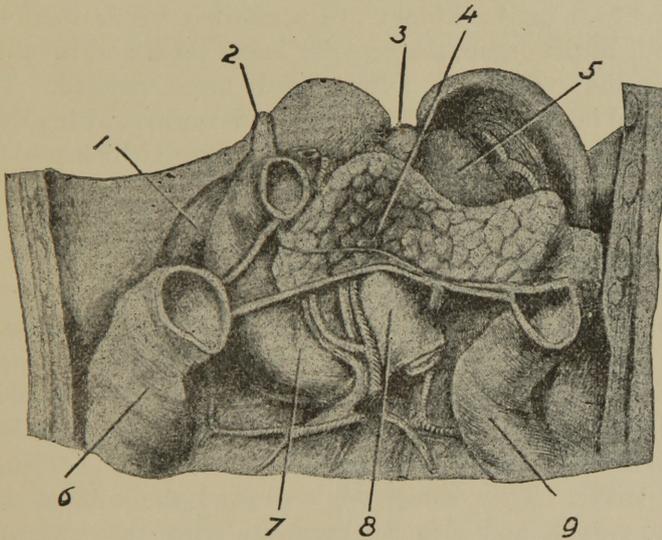


FIG. 3.—Relations of viscera (anterior view). 1, right kidney; 5, left kidney; 2 and 3, suprarenal capsules; 4, pancreas; 6 and 9, ascending and descending colon; 7, duodenum; 8, its junction with the jejunum.—(QUAIN.)

and in length about four inches (10 centimeters), the width is about two and one-half inches, and the thickness one and one-quarter inches, varying in individual cases. The left kidney is usually slightly longer and narrower than the right.

Weight.—Each kidney weighs from four and a half to six ounces (125 to 168 grammes) in the male and two or three drachms less in the female. The left kidney in both sexes weighs about 100 grains (6.5 gm.) more than the

right. The specific gravity of the renal substance is 1050, and it contains about 83 per cent. of water. In the child the kidney is $\frac{1}{80}$ the body-weight; in youths and adults $\frac{1}{240}$.

Form.—The form of the kidney is that of a haricot or kidney-bean, compressed from either side, presenting an anterior and a posterior surface, both of which are slightly convex, the anterior more so. The superior and inferior extremities of the kidney are somewhat wider than the middle of the organ, the superior being thick and rounded, while the inferior is thinner and more pointed. The external border is convex; the internal concave, with a deep notch in the centre called the *hilum*, through which pass the vessels, nerves, lymphatics, and ureter. The hilum is the perceptible notch, but the cavity in the substance of the gland is called the *sinus renalis*.

Color.—The color of the kidney is red brown.

Derivation of Vessels, Nerves, and Lymphatics.—The arteries are derived from the aorta, the veins empty into the rena cava, the lymphatics into the receptaculum chyli. The kidney is plentifully supplied with nerves from the solar plexus, the semilunar ganglion, and the splanchnic nerves. They completely surround the tubules and blood-vessels, and also communicate with the spermatic plexus. Dr. M. Holbrook has shown that every epithelium is in connection with a nerve-fibre, indirectly, through the inter-epithelial filaments of living matter.

As to the lymphatics, very little is known. In the capsule of the kidney there is a regular lymphatic system, and in the hilum several large lymph-vessels are found which are supplied with valves.

The Tunica Adiposa.—This has already been described under SUPPORT. The amount of fat in it varies according to the individual. In thin persons so much of the fat may be absorbed that the tunica adiposa becomes loose, and its

connections with the kidney and surrounding parts so relaxed that the kidneys acquire no little mobility. In fat persons the size of the tunica adiposa may lead to erroneous conclusions as to the size of the kidneys themselves.

The fat-capsule is continuous with the subperitoneal fat-tissue—a matter of importance, as we shall learn further on.

The Capsule.—By this term is understood the fibrous capsule of the kidney, which lies everywhere under the fat-capsule (*tunica adiposa*), and from which the blood-vessels penetrate the kidney tissue. It is thin, firm, smooth, and closely fitting. Its composition is of numerous firm, elastic fibres, which may be stretched or contracted to a considerable degree by the state of vascular tension of the kidney. It is connected with the organ by fine fibrillated connective tissue and minute blood-vessels. In the healthy state the capsule can be readily separated from the kidney.

In chronic interstitial nephritis, however, the connecting fibres undergo inflammatory thickening and increase in number, causing adhesion of the capsule to the kidney. The capsule follows the notch or hilum in the renal substance, passes into the sinus of the kidney, and becomes continuous, around the bases of the papillæ of the pyramids, with the stronger external fibres and elastic tissues of the calyces and pelvis.

The Kidney Itself consists of two portions, the *cortical* and the *medullary*. The thickness of the cortex, compared with the medulla, is as one to three. Fig. 4 shows the gross anatomy of a section of the kidney.

The Cortical Portion of the Kidney.—This lies directly under the capsule, and is the more vascular. It is about 6.25 mm. (about one-quarter of an inch) in thickness, and sends prolongations between the pyramids, whose bases it surmounts, as far as the sinus.

These inter-pyramidal portions of the cortex are known as the *Columns of Bertini*, and mark the original divisions of

the kidneys into lobules. That portion of the cortical substance which stretches from one column of Bertini to another, and which surrounds the base of the pyramids, is called the *cortical arch*. The columns and arches together form the *Labyrinth of Ludwig*.

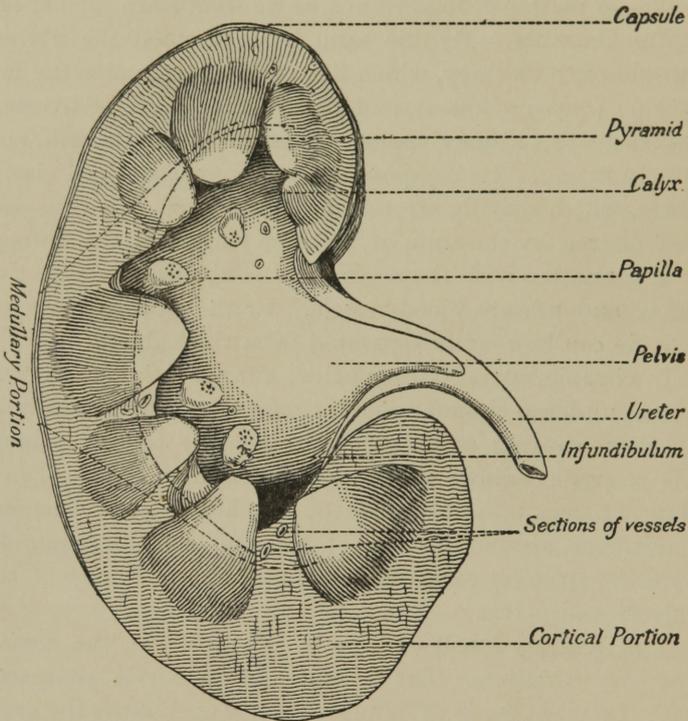


FIG. 4.—Section of the kidney showing gross anatomy.

The Medullary Portion.—This is divided into two parts—the boundary or intermediate zone or margin, and the papillary zone—and consists of from eight to eighteen conical masses, called Pyramids of Malpighi, whose bases rest on the cortical portion and whose apices converge toward the centre, where they form what are known as papillæ, which

project into the calyces, which are the ultimate divisions of the pelvis. (The calyces are from seven to thirteen in number, and converge to form the three primary divisions of the pelvis called infundibula.)

The pyramids (Figs. 5 and 7) are plainly striated, these striations always being straight in the healthy kidney. They consist of (a) diverging blood-vessels, and (b) straight or collecting uriniferous tubules. The striations are prolonged into the cortex, where they are more prominent than in the pyramids, owing to the greater paleness of the epithelium. The red

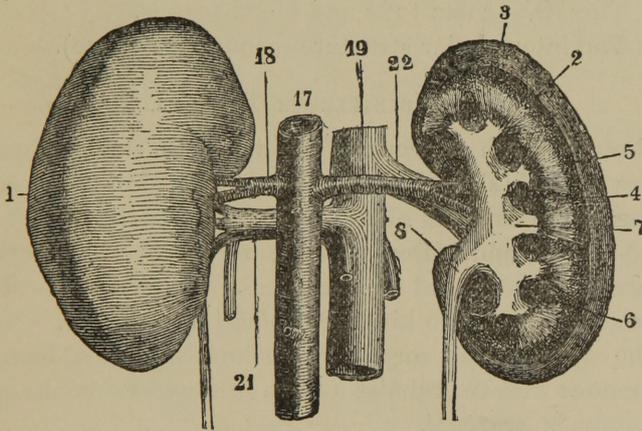


FIG. 5 shows a posterior view of the kidneys. The numbers represent the following: 1, left kidney; 2, section of the right kidney; 3, cortical substance; 4, columns of Bertini; 5, pyramid of Malpighi; 6, vessels; 7, calyces; 8, pelvis; 17, aorta; 18, renal artery (left); 19, inferior vena cava; 21, renal vein (left); 22, renal vein (right).—(LITTRÉ.)

lines indicate the position of the blood-vessels, and the pale lines that of the uriniferous tubules, which, prolonged into the cortex, are known as the *Pyramids of Ferrein*, or *medullary rays*.

These alternating colors are known as the *markings of the cortex*. If they are straight, the kidney is healthy or the lesion confined to the epithelia only; if wavy or tortuous, a lesion involving the interstitial tissue is indicated, contraction having caused the vessels to deviate from a straight course.

CHAPTER II.

TISSUES OF THE KIDNEYS.

THE tissues which concern us are three in number, namely:

1. The uriniferous tubules.
2. The Malpighian tufts and blood-vessels.
3. The intertubular structure (connective tissue).

THE URINIFEROUS TUBULES.

These begin in the cortical substance in small spherical bodies called Malpighian corpuscles (tufts, glomeruli), originating in the capsules of the tufts opposite the site of the blood-vessels, and, after uniting, terminate, considerably reduced in number, at the papilla of the pyramid. They are essentially of two kinds, *convoluted* and *straight*.

The capsule of the corpuscle (Bowman's capsule) becomes continuous with the tubules known as *convoluted tubules of the first order, or proximal*.

Convoluted tubules.—At the juncture of the capsule with the tubule there is a slightly narrowed funnel-shaped *neck*, and, after repeated convolutions within the labyrinth, the tubule tends toward the medullary ray. Here it becomes (to varying depths) *narrow*, often exhibiting *spiral windings* before decreasing in calibre, and represents the *descending branch* of the loop, or Henle's tubule. This enters the pyramidal substance, producing a distinct, angular divergence at the dividing zone between cortex and pyramid, in order to reach the bundles of the vasa recta. (See BLOOD-VESSELS.) After reaching certain depths in the pyramidal substance, the narrow tubule produces a *loop* (the loop of

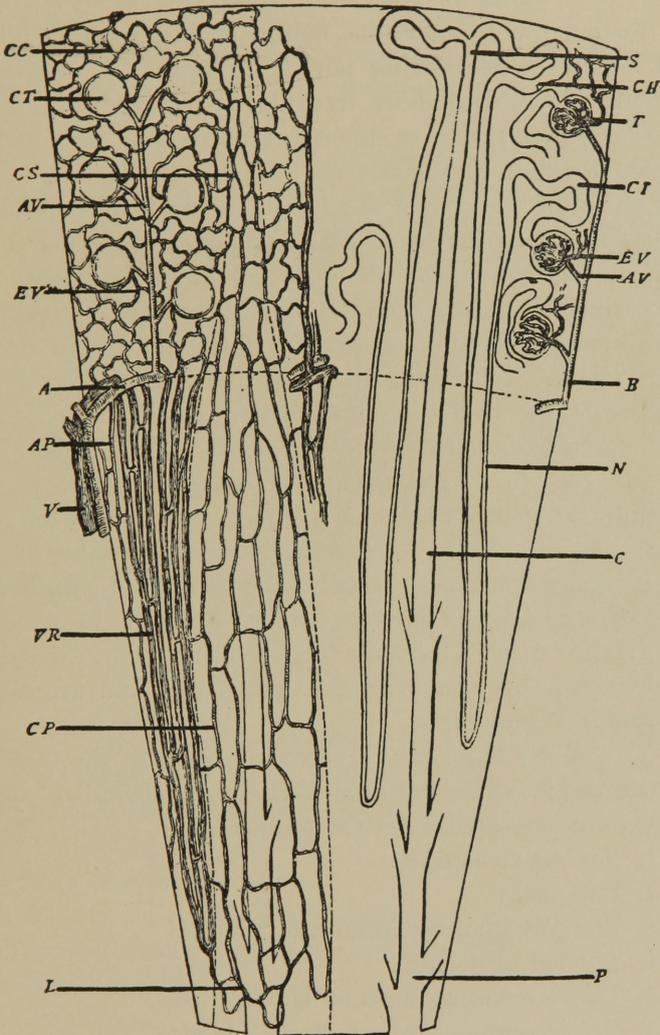


FIG. 6.—Diagram of the kidney. *A*, renal artery; *V*, renal vein; *T*, tuft; *CT*, capsule of tuft; *AV*, afferent vessel; *EV*, efferent vessel; *CC*, capillaries of convoluted tubules; *CS*, capillaries of straight tubules; *B*, arterial branch to the cortical substance; *AP*, arterial branch to the pyramidal substance; *VR*, vasa recta; *CP*, capillaries of the first order; *L*, capillaries of the papilla; *CI*, convoluted tubule of the second order; *S*, straight collecting tubule in the medullary ray of the cortical substance; *C*, straight collecting tubule in the pyramidal substance; *P*, the same at the papilla.—(HERZMANN.)

Henle), and takes an upward course as the *ascending branch* of the narrow tubule, this being, on the whole, slightly wider than the descending portion. Again, the ascending branch widens, with short, irregular curves and angles (*the irregular portion*), and at the most peripheral part of the cortex, in which there exist no tufts, it resumes the width and aspect of the convoluted tubule, being in this situation termed the *convoluted tubule of the second order* (*distal convoluted tubule or the intercalated tubule*), which inosculates with *the straight collecting tubule*. By the union of several intercalated and collecting tubules *arches* are formed. Henle insists upon the arched arrangement of the collecting tubules themselves, to which the intercalated tubules are joined. *The collecting tubule* occupies the centre of the medullary ray in the cortex. The groups of collecting tubes in the pyramid are situated between groups of the narrow tubules, decreasing in number, by continuous union at acute angles of analogous formations, until, lastly, a limited number of *wide collecting tubules* (eight to fifteen) open at the point of the pyramid—the papilla—which protrudes into the calyx. Their mouths are visible to the naked eye, and are called the foramina papillaria.

Fig. 6 shows the course and arrangement of the tubules.

Summary.—The essential things to remember about the uriniferous tubules are the following:

1. Bowman's capsule.
2. The neck.
3. The proximal convoluted tubules.
4. The spiral portion.
5. The descending limb of Henle's loop.
6. The ascending limb of Henle's loop.
7. The irregular tubules.
8. The distal convoluted portion.
9. The arched collecting tubules.
10. The straight collecting tubules.
11. The ducts of Bertini (wide collecting tubules).

Situation of the Tubules.—*The convoluted tubules of the first order* occupy the portion around the ascending branches of the renal artery, and their sum total is termed the labyrinth of Ludwig.

The convoluted tubules of the second order fill the most external portion of the cortex, in which there are no tufts.

The straight tubules, both narrow (loop-tubules) and collecting, produce the medullary rays between the labyrinths in the cortex, while in the pyramids they run in separate bundles according to the following arrangement: first, the narrow tubules, together with the vasa recta (see BLOOD-VESSELS), in the imaginary prolongations of the labyrinth, and then the collecting tubules as direct prolongations of the medullary rays of the cortex.

The labyrinth, the medullary rays, and medullary portion of the kidneys, contain the following, respectively:

The Labyrinth contains:

1. The Malpighian bodies.
2. The constricted necks of the tubules.
3. The proximal convoluted tubules.
4. The irregular tubules.
5. The distal convoluted tubules.
6. The arched collecting tubules.

The Medullary Ray contains:

1. The spiral tubules.
2. The ascending limbs.
3. The straight collecting tubules.

The Medulla of the Kidney contains:

1. The descending limbs.
2. The loops.
3. The ascending limbs.
4. The collecting tubules.

Epithelium of the Tubules.—In a general way the epithelium is *cuboidal* in the convoluted tubules, *flat* in the narrow tubules, and *columnar* in the collecting tubules.

In the polyhedral epithelia of the convoluted tubules is a rod-like structure (Rods of Heidenhain). The striations and rod-like markings are most prominent in the irregular tubules.

Considered with reference to epithelia, we find the following:

Flat epithelia: capsule, neck, descending limb.

Polyhedral epithelia: proximal convoluted tubules, spiral tubules, ascending limb, distal convoluted tubules.

Very angular and markedly striated epithelia: irregular tubules.

Columnar epithelia: straight collecting tubules.

The polyhedral epithelia in the proximal convoluted tubules are somewhat triangular in character; in the ascending limb cuboidal.

Charles Heitzmann describes the tubules and their epithelia as follows:

“The *convoluted tubules* of the first order, having an average diameter of 0.0045 mm., are lined by polyhedral epithelia, the cement-substance between them often being ill-defined, or, especially in kidneys of children, absent. In these epithelia R. Heidenhain discovered a rod-like structure similar to that observed in the epithelia of the ducts of salivary glands. The ascending and descending portions of the *narrow tubules* have a diameter of 0.0020 to 0.0025 mm., and are lined by cuboidal epithelia, which also exhibit the rod-like structure; this peculiarity is particularly well marked in the irregular portions of the tubules. The descending portion gradually becomes narrow, and its epithelium passes by degrees into the flat variety, while the ascending portion often appears abruptly widened close above the loop, or in the depth of the loop itself. Along the course of the ascending tubule within the cortical substance the epithelium again may become flat, corresponding to a narrowing of the caliber. The narrow portions have

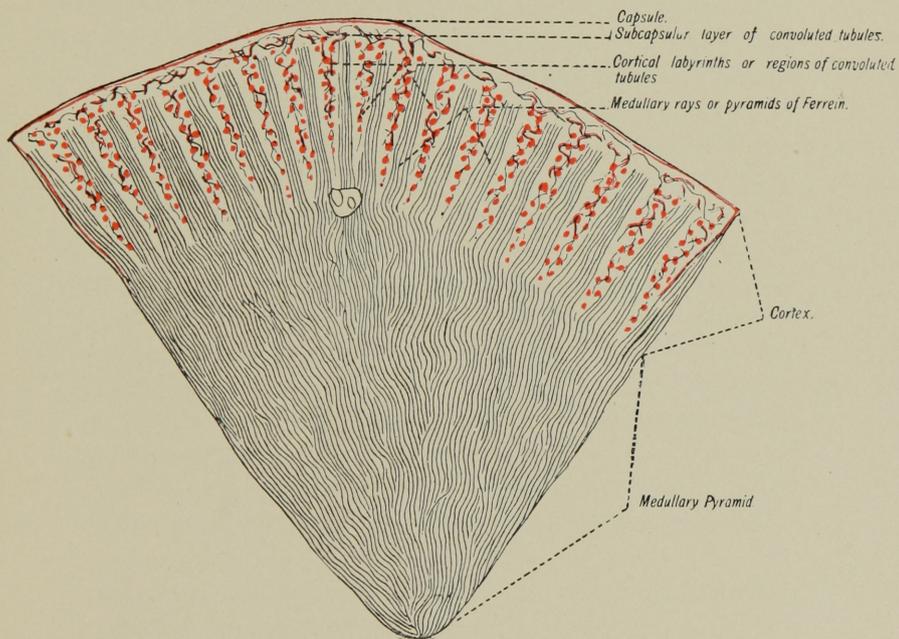


FIG. 7.—Diagrammatically exaggerated representation of the cut surface of a reniculus (medullary pyramid and corresponding cortical arch).—(From HEKTOEN.)

a diameter of 0.0014; their caliber is comparatively wide, and the flat epithelia are finely granular and supplied with a distinct nucleus. In edge-view these epithelia appear spindle-shaped, closely resembling the endothelia of capillaries. The convoluted tubules of the second order have only a few convolutions; their caliber is somewhat wider than that of the convoluted tubules of the first order, their epithelia, however, being identical with those of the latter. In the irregularly-winding portions the epithelia show slight differences in their depths. The collecting tubules have the widest caliber, their diameter being, at the apex of the medullary ray, the same as that of the convoluted tubules, while in their course toward the papilla they gradually assume a diameter of 0.020 to 0.030 mm. Their epithelia are at first cuboidal, but with increasing caliber the epithelia become distinctly columnar, being finely granular and obliquely arranged in the lower portions, after the manner of shingles on a roof. According to C. Ludwig, the membrana propria near the papillæ is fused with the surrounding connective tissue.

“All tubular formations of the kidney are ensheathed by delicate connective tissue, which carries the blood-vessels and nerves.”

Considered with reference to urine forming and urine conducting, we find the following:

1. In the urine-forming tubes the epithelia have a well-marked network, a delicate investing membrane, and are readily changed by disease.
2. In the tubes through which the urine is conducted the epithelia have a less developed network, a firm investing membrane, and are less frequently affected by disease.

CHAPTER III.

THE MALPIGHIAN TUFTS AND BLOOD-VESSELS.

EACH uriniferous tube begins in a glomerulus (Malpighian corpuscle or tuft).

The Malpighian corpuscles are small spherical bodies, regularly arranged in rows in the edges of the pyramids of Ferrein in the cortical arches, and also irregularly scattered throughout the columns of Bertini. They vary from 0.25 mm. to 0.32 mm. in diameter, and are composed (1) of a connective-tissue *capsule*, rich in elastic fibres, lined with flat epithelia, and formed by an expansion of the basement membrane of the tubes, and (2) of *a network* of capillary vessels. The capsule is known as Bowman's, Müller's, or the Malpighian, and is reflected over the glomerulus, and often dips in between the individual blood-vessels.

The capillary network is formed by a small *afferent* artery (Fig. 8), piercing the capsule of Bowman and dividing into a number of convoluted loops, which unite to form an *efferent* vessel smaller than the afferent, and piercing the capsule very near the afferent. These capillaries differ from ordinary capillaries in that their walls are thicker, they are not lined by a continuous layer of endothelium, and their outer surfaces are completely covered by a layer of flat epithelia.

The convolutions of the capillary blood-vessels are arranged in two main lobes; hence the glomerulus is a bilobate formation of capillaries. (Fig. 9.)

The efferent vessel contains arterial blood, though the muscle-coat is very imperfect, or absent.

Distribution of Blood-vessels.—The renal artery is the largest, in proportion to the size of the organ supplied, of

any in the body. On entering the pelvis of the kidney it divides into several branches, which are termed arteriæ propriæ renales. These traverse the columns of Bertini, supply in part the medullary pyramids and afferent vessels of the Malpighian bodies in that region, and divide at the base of the pyramids into two sets of branches for the

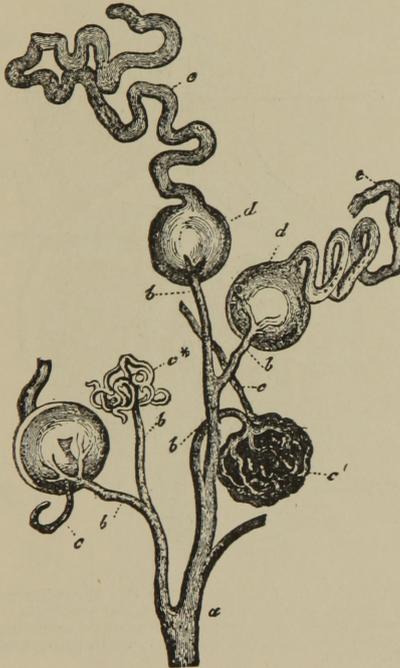


FIG 8.—From the cortical portion of the human kidney. *a*, arterial twig giving off the afferent blood-vessel (*b*) of the glomerulus (*c**, *c'*); *c*, efferent vessel of the latter; *d*, capsule of *Bowman* opening into a convoluted uriniferous tube of the cortex *e*.—(FREY.)

further supply of the kidney—namely, the interlobular arteries and the arteriolæ rectæ.

The interlobular arteries pass directly outward between the pyramids of Ferrein and terminate in the capillary network 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 correspond to the arterial divisions. From the Malpighian corpuscle the efferent vessel divides into a network of capillaries, which surround the tubules of the cortical substance forming the intertubular plexuses, which, as they approach the cortex, form small veins. Those

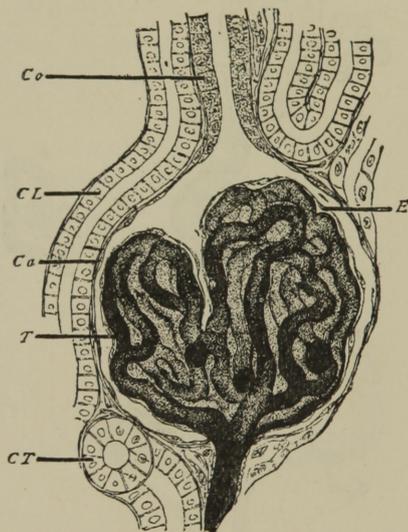


FIG. 9.—Tuft from the kidney of a dog. Injected. *T*, capillary loops of the tuft, in connection with the afferent artery, covered by *E*, flat epithelia; *Ca*, capsule, covered with flat epithelia, in communication with *Co*, the convoluted tubule; *CL*, convoluted tubule in longitudinal section; *CT*, convoluted tubule in transverse section. Magnified 350 diameters.—(HEITZMANN.)

beneath the capsule are stellate in arrangement, and are called the *stellated veins* or *Stars of Verheyen*. They 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 venæ propriae renales. The venæ propriae renales accompany the arteriæ propriae renales between the pyramids, receiving in their

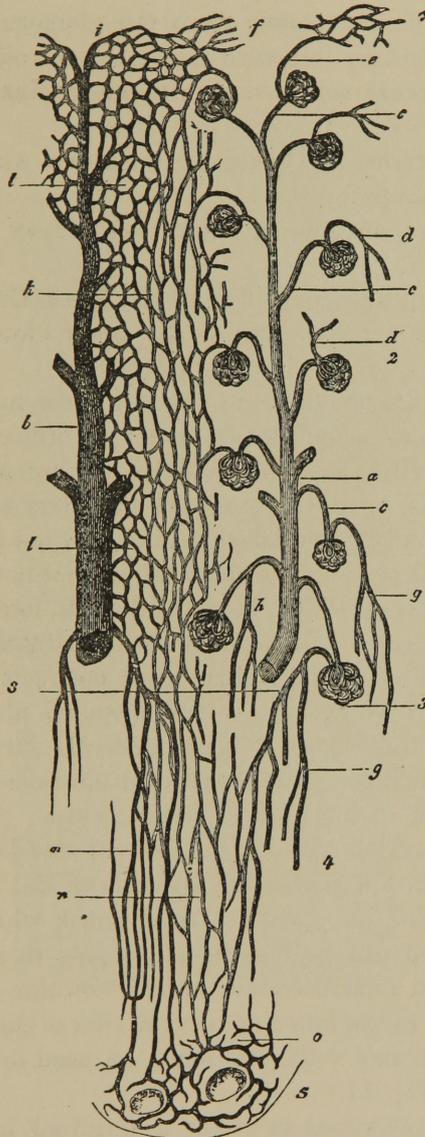


FIG. 10.—Plan of the circulation of the kidney (much shortened). 1, external portion of cortex; 2, cortex; 3, boundary layer; 4, medulla; 5, apex of papilla; a, arterial twig; b, vein; c, vas afferens; d, vas efferens; e, vas efferens and f, capillary network of the surface; g, the vas efferens of a deeper-seated glomerulus; h, arteriola recta; i, venous radicle of the surface; k, capillaries of the medullary process; l, of the convoluted tubes; m, venula recta; n, medullary capillaries; o, network around the openings of the uriniferous tubes.—(FREY.)

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, which ultimately joins the inferior vena cava.

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

The plan of the circulation of the kidney is shown by Fig. 10.

Heitzmann's Description of the Renal Circulation.—

Heitzmann's description of the renal circulation is as follows:

The *renal artery* enters the organ in two main branches (Hyrtl), each of which, by a number of bifurcations dividing into smaller ramules, supplies an independent half. These vessels, upon reaching the boundary-zone between the cortical and pyramidal substance, deviate in an oblique direction, and produce the so-called arterial bows or arches, the convexities of which, if marked at all, look toward the cortical substance. Each artery in this situation is accompanied by a vein, the veins being connected by lateral branches, and producing a sort of a venous plexus.

From the arches arise at short intervals straight arterial branches, which penetrate the cortical substance in a straight direction and divide at very acute angles; these arteries produce transverse ramules, the afferent vessels which go to form the tuft. A successful injection of the blood-vessels of the human kidney is quite exceptional, while the dog's kidney, which can be had in a perfectly fresh condition, allows a plain demonstration of the vascular supply. As the relations in the latter are very similar to those of human kidneys, they may with preference be used for demonstration. (See Fig. 11.)

The afferent vessel is either a terminal branch of the renal artery or a lateral offshoot of such a branch, which is given off without any regularity. Not infrequently the

afferent vessel assumes a backward course, especially near the region lying between cortex and pyramid, in human as

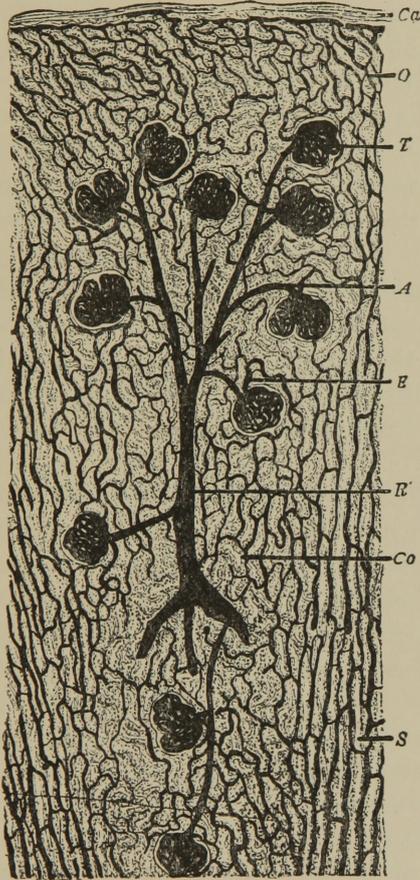


FIG. 11.—Cortical substance of the kidney of a dog. Blood-vessels injected. *Ca*, capsule; *O*, outer zone, devoid of tufts; *T*, tuft; *A*, afferent vessel; *E*, efferent vessel; *R*, branch of renal artery; *Co*, zone of convoluted tubules; *S*, zone of straight tubules (medullary ray). Magnified 100 diameters.—(HEITZMANN.)

well as in dogs' kidneys. The ultimate terminations of the arteries and their tufts never reach the outermost portion of the cortical substance, which is supplied with capillaries only.

The afferent artery invariably exhibits a distinct middle or muscle coat, and splits abruptly into a number of capillaries, which contain arterial blood, and, by being convoluted and turned upon themselves, produce the tuft. According to C. Ludwig, the formation of the tuft is easily understood by assuming that the arterial bed of the afferent vessel is abruptly widened and at the same time split into a number of very narrow (capillary) canals, which again unite into the efferent vessel: bring the surface of the opposite parts together, so that the afferent and efferent vessels are in proximity, and the tuft is complete. The formation can be readily demonstrated with a handkerchief, the two compressed ends of which are held in the two hands, one representing the afferent, the other the efferent vessel, and the whole turned upon itself, the two hands joining, while the middle, broad portion, spread and folded, represents the tuft.

The efferent vessel (which contains arterial blood), as mentioned before, soon after having left the tuft divides freely into capillaries for the supply of the cortical as well as the pyramidal substance. So extensive is this division that the kidney-tissue proper has no other capillaries than those derived from the efferent vessels, the pyramidal substance being, besides, supplied with capillaries from a few independent arterioles. The capillary meshes are circular in the region of the convoluted tubules, and elongated squares in that of the straight tubules.

The arterial arches send a few small arterial branches downward into the pyramidal substance. The main supply of this portion, however, is capillary and of two kinds: first, the few elongated square meshes around the straight collecting tubules; and, second, the bundles of very wide capillaries accompanying the narrow tubules. The latter are the so-called *vasa recta* of the pyramidal substance.

We overcome all difficulties concerning the origin of the

vasa recta by considering them as considerably widened capillary blood-vessels, which are prolongations of the narrow capillaries of the cortical substance—a fact which is easily demonstrated in the injected kidney of the dog.

The ascending branches of the arterial arches which give rise to the afferent vessels are, by most authors, termed interlobular arteries. This name should be abandoned, for the reason that they occupy the centre of a cortical lobule (Ludwig's labyrinth). The capillaries of the cortical substance are usually considered to be of two kinds—those rising directly from the efferent vessels, for the supply of the medullary rays, and those of the labyrinth, which are prolongations of the former. This conception is, however, misleading, inasmuch as the efferent vessels produce the capillaries of the labyrinth and the medullary rays, both directly and indirectly, and there is no necessity for speaking of arterial and venous capillaries. Fig. 11 shows the distribution of the capillaries from the efferent vessels, some running first to the labyrinth, others first to the medullary rays.

The *veins* arise from the capillaries of the cortical substance, especially those of the labyrinth, and their confluence is often marked on the surface of the kidney in the form of stars (*stellulæ Verheyenii*). As the medullary rays are lost near the surface of the kidney, and the outermost portion of the cortex has no tufts, obviously the veins arise from the capillary system surrounding the convoluted tubules. The veins accompany the arteries, and empty into the venous plexus at the boundary-zone between the cortex and the pyramis. The latter furnishes veins derived both from the capillaries of the collecting tubules and from the vasa recta, the ascending loops of which empty directly into the inter-zonal venous plexus.

According to C. Ludwig, the capillaries of the capsule and of the surrounding fat-tissue of the kidney, which

arise partly from small branches of the renal artery before it reaches the boundary-zone, are united directly to the capillaries of the kidney-tissue, chiefly the ascending branches, and of the collecting tubules, all of which are fewer in number and of a less marked character the nearer the surface of the kidney, the main bulk of which is occupied by convoluted tubules. Sagittal sections of the pyramidal substance are characterized by bundles of the vasa recta arranged together with transverse sections of the narrow tubules, both the ascending, descending and looped portion, around which are grouped the transverse sections of the collecting tubules. The narrow tubules become fewer and the collecting tubules wider the nearer they approach the papilla.

THE INTERTUBULAR TISSUE.

This is made up of a variety of connective-tissue elements. The fibres are most numerous in the vicinity of the blood-vessels and around the Malpighian corpuscles. They are more marked in the cortical portion than in the medullary, but occur in abundance near the apices of the papillæ.

The capillaries of the glomeruli are covered with fine delicate connective tissue, and the capsule is completely enveloped in it.

The loose connective tissue between the pyramids carries the larger blood- and lymph-vessels and the principal nerves.

The blood-vessels and uriniferous tubes are held together by a delicate fibrous connective tissue rich in elastic substance.

The capsule of the kidney is of dense fibrous connective tissue.

SYNONYMES.

Considerable confusion is occasioned by the number of synonymous terms used in the anatomy of the kidney. A recapitulation of them will not be without value.

Glomerulus.—The words tuft and Malpighian corpuscle are used synonymously with glomerulus. Some writers use the term Malpighian body or corpuscle, and confine the term glomerulus to the capillary network within Bowman's capsule.

Medullary Rays.—Also called pyramids of Ferrein, pyramidal prolongations and lobules.

Labyrinth.—The region of the convoluted tubules, also known as the Labyrinth of Ludwig.

Bowman's Capsule.—Also called Müller's or the Malpighian capsule.

Stellated Veins.—Stars of Verheyen.

Convoluted Tubes of the First Order.—Proximal convoluted tubes.

Convoluted Tubes of the Second Order.—Junctional tubes, intercalated tubes, distal convoluted tubes.

Spiral Tubes.—Called also the spiral tubes of Schachowa.

CHAPTER IV.

PHYSIOLOGY OF THE KIDNEYS, TOGETHER WITH CERTAIN PATHOLOGICAL CONSIDERATIONS.

THE normal functions of the kidneys are to remove from the body excrementitious substances and water. The most important excrementitious substances are those containing *nitrogen*, namely, urea, uric acid, and the urates. How this is done has been the subject of much investigation and discussion.

Theories of Secretion.—There are two principal theories regarding the secretion of urine by the kidneys, as follows:

I. The Bowman-Heidenhain theory, according to which the secretion of urine is due to the activity of two sets of epithelia. The flat epithelia covering the glomeruli take up water and salts from the blood and transfer them to the beginning of the uriniferous tubules. Their activity chiefly depends on the activity of the circulation of the blood through the capillaries. But they may be also excited to active secretion by the presence of certain urinary constituents in the blood, as water and salts, or possibly diuretics, like caffeine. The rodged cells of the convoluted tubules and ascending loop of Henle secrete specific urinary constituents, as urea and uric acid, and a certain amount of water; also certain abnormal constituents of the blood, as indigo-carmin. Their activity depends on the amount of urea and uric acid in the blood.

II. The modified Ludwig theory, which holds that the secretion of urine is a mixture of physical and physiological processes. In the glomerulus a physical process takes

place, namely, a transudation of watery and crystalloid constituents (including urea) of the blood plasma. The extent and nature of this transudation is determined :

1. By the pressure in the capillaries of the glomerulus.
2. By the velocity of the flow through the capillaries.
3. By the permeability of the capillary wall and the glomerular epithelium.

This watery transudate is concentrated and altered on its way through the tubules in consequence of absorption of water, and probably of certain of its crystalloid constituents. This absorption must be due to the active intervention of the epithelia, since the osmotic pressure of the urine is considerably higher than that of the blood-pressure.

Diuretics may act in two ways. Salines increase the pressure and velocity of the blood in (?) the glomerular capsules not only by increasing the volume of the circulating fluid, but also, probably, by direct dilator action on the afferent vessels of the glomerulus. Caffeine and theobromine have this action, and probably also paralyze the absorbing mechanism of the kidneys, that is the epithelia of the convoluted tubules, so that the glomerular transudate may undergo little change in its way to the ureters and bladder.

Influence of the Nervous System.—The distribution of nerve-endings to the tubules suggests the possibility that the central nervous system may control the secretion of urine directly apart from its influence on the renal circulation.

Important Parts of the Kidneys.—These, from a pathological standpoint, are the capsules, including the fat capsule (*tunica adiposa*), the tubules, the glomeruli, the blood-vessels and the interstitial tissue, the pelvis, and calyces.

Morbid Changes in the Kidneys.—The fat capsule is often the seat of abscess.

The fibrous capsule, normally easily separated, becomes strongly adherent in certain lesions, notably chronic interstitial nephritis.

The tubes and glomeruli become the seat of inflammation or degeneration in the various forms of nephritis.

The arteries are very often changed by disease. There is either thickening of one or of all of their coats, or they are the seat of waxy degeneration.

The interstitial tissue is often infiltrated with cells, or irregularly thickened by a new growth of connective tissue.

The pelves and calyces are lined with mucous membrane which may become inflamed, and they themselves may be dilated.

Disturbances of the Functions of the Kidneys.—

These are brought about by :

1. Rapid or slow changes in the tissues of the kidneys.
2. Changes in the quantity, the composition, and the rapidity of circulation of the blood.
3. Nervous influences affecting the quantity of the urine.
4. Diseases of the urethra, bladder, ureters, and pelves of the kidneys.
5. Diseases of the lungs, heart, liver, stomach, and intestines.

CHAPTER V.

A SHORT QUIZ ON THE ANATOMY, HISTOLOGY, PHYSIOLOGY, AND
PATHOLOGY OF THE KIDNEYS.

The following questions, with answers, will be found especially useful by those who are preparing themselves for examinations in these subjects :

1. How many kidneys are there?
2. What kind of organs are they? Glandular.
3. For what intended? For secretion of urine.
4. In what cavity are they? Abdominal.
5. In what part of it? Upper and back.
6. What is their position with reference to the peritonæum? Behind it.
7. What is their position with reference to the ribs? Their upper border corresponds to the space between the eleventh and twelfth ribs.
8. With reference to the vertebræ? Lower border corresponds to the middle of the third lumbar vertebra.
9. Which kidney is the lower? The right.
10. Why? The liver crowds it down.
11. Which end of the kidney is nearer the spinal column? The upper.
12. Which end is the more posterior in position?
13. How far from the middle line of the body is the inner border of the kidney at its upper part? An inch.
14. How far is the outer border at its lowest part? Three and three-quarter inches.
15. Which kidney is in anatomical relation to the stomach? The left.
16. Where? Anteriorly, in front of its upper third.
17. What lies in front of the middle third of the left kidney? The splenic artery and pancreas.
18. What is the relation of the colon to the left kidney? The descending colon is in front of its lower third.
19. In what direction are the relations of both kidneys the same? Posteriorly.
20. Against what organ does the left kidney lie exteriorly? The spleen, for the upper two-thirds or three-quarters of its (the kidney's) extent.
21. With which kidney is the liver in relation? With the right.
22. In what ways? Anteriorly and exteriorly.
23. How anteriorly? Crossed in its upper half by the right lobe of the liver.
24. How exteriorly? Lies against the liver for its upper three-quarters.

25. What is the relation of the colon to the right kidney? The latter is anteriorly crossed in its lower half by the ascending colon.

26. What is the relation of the duodenum to the right kidney? The latter is anteriorly crossed in its lower half by the descending duodenum, which crosses the inner quarter of the lower half.

27. Does the peritoneum lie between the right kidney and the colon and duodenum? No; the colon and duodenum are uncovered by peritonæum where they cross the right kidney.

28. Where does the peritonæum cover the right kidney? Anteriorly, near the upper end.

29. What is between the peritonæum and right kidney here? The tunica adiposa or fat capsule of the kidney.

30. What is the position of the right suprarenal capsule with reference to the liver? Touches it at its upper end.

31. On what does the suprarenal capsule rest? On the upper and inner margin of the kidney.

32. Upon what do both kidneys rest posteriorly? On the diaphragm (in front of the eleventh and twelfth ribs) and on certain muscles.

33. What are the muscles which are in relation with both kidneys posteriorly? The quadratus lumborum and psoas muscles.

34. By what are the kidneys separated from these muscles? By various fascia.

35. What nerves pass behind the kidneys? The twelfth dorsal, iliohypogastric, and ilio-inguinal.

36. What do we find on the inner side of each kidney? The notch called the hilum, through which pass the arteries, veins, and ureter.

37. What is the relation of these vessels to one another? From above downwards: artery, vein, ureter; AVU. From before backward: vein, artery, ureter; VAU. This arrangement varies occasionally.

38. By what are the kidneys supported and held in position? Adipose and connective tissue, together with blood-vessels, nerves, lymphatics, and ureters.

39. What is the tunica adiposa? A thick layer of fat completely investing the fibrous capsule of the kidneys.

40. What holds the fat together? Meshes of a loose areolar tissue.

41. Where is the tunica adiposa thickest and most abundant? With reference to the kidney, posteriorly.

42. What is the direction of the long axis of the kidney? Vertical.

43. What is its length? About four inches, or ten centimeters.

44. What is the width of the kidney? Two and one-half inches.

45. The thickness? One and one-quarter inches.

46. Are these dimensions always the same? No; they vary in individual cases.

47. Which is the longer and narrower kidney? The left.

48. What is the weight of each kidney in health? From four and a half to six ounces, or 125 to 168 grammes, in the male.

49. What is the weight in the female? 120 to 180 grains less.

50. Which is the heavier kidney? The left, by about 100 grains.
51. What is the form of the kidney? That of a haricot or kidney-bean, wider at the top and bottom than in the middle.
52. Which surfaces are convex? The anterior and the posterior, the former the more so.
53. Which extremity is thick and rounded? The superior.
54. Which is thinner and more pointed? The inferior.
55. Which border is convex? The external.
56. Which concave? The internal.
57. What is the hilum? The deep notch in the centre of the internal border through which pass the vessels, nerves, lymphatics, and ureter.
58. What is the sinus renalis? The deep fossa in the kidney proper in which the pelvis joins the renal substance.
59. What is the distinction between the hilum and the sinus renalis? The hilum is the perceptible notch, the sinus is deep in the gland proper.
60. From what are the renal arteries derived? From the aorta.
61. The veins? Empty into the inferior vena cava.
62. Into what do the lymphatics empty? The receptaculum chyli.
63. Whence are the nerves derived? From the solar and aortic plexuses.
64. How much fat does the tunica adiposa contain? Varies according to the adipose of the individual. In fat persons is very abundant.
65. What is understood by the term capsule of the kidney? The fibrous capsule lying everywhere underneath the fat capsule.
66. What is the character of the capsule? Thin, firm, smooth, closely fitting to the kidney.
67. What is its composition? Elastic fibres.
68. How is it connected with the kidney? By fine fibrillated connective tissue and minute blood-vessels.
69. Is it detachable? Readily so in the healthy kidney.
70. With what is the capsule continuous? With the stronger external fibres and elastic tissues of the calyces and pelvis.
71. Which is the more vascular portion of the kidney? The cortex.
72. What is the location of the cortex? Immediately beneath the fibrous capsule, surmounting the bases of the pyramids of Malpighi, and sending prolongations between the pyramids as far as the sinus renalis.
73. What name is given the interpyramidal prolongations? The columns of Bertini.
74. What is meant by the terms cortical arch and labyrinth of Ludwig? The cortical arch is that portion of the cortex which stretches from one column of Bertini to another, and which surrounds the base of each pyramid. The labyrinth of Ludwig is formed by the columns of Bertini and the cortical arches taken together.
75. What and where are the pyramids of Malpighi? Eight to eighteen conical masses in the medullary portion, whose bases rest on the cortex and whose apices converge toward the centre, forming the papillæ.
76. What are the ultimate divisions of the renal pelvis? Calyces.

77. What project into the calyces? Papillæ.
78. What are the three primary divisions of the renal pelvis called? Infundibula.
79. What is the direction of the striations in the pyramids of healthy kidneys? Straight.
80. To what are the striations due? To blood-vessels and uriniferous tubules.
81. What are the markings of the cortex? A term applied to the alternating colors in the cortex due to the alternating reddish and grayish striations formed by (a) the labyrinths (convoluted tubules, part of loops of Henle, glomeruli, vessels,) and (b) the medullary rays (bundles of straight tubules of a clear, gray color).
82. What do we mean by the terms pyramids of Ferrein or medullary rays? The pale lines indicating the position in the cortex of the straight tubules, which are arranged in bundles of a pyramidal appearance.
83. What would be the effect of contraction of the kidney? To cause wavy or tortuous markings, due to deviation in the course of the vessel.
84. What are the three principal tissues of the kidney? The tubules, Malpighian tufts, and interstitial tissue.
85. In what do the uriniferous tubules begin? In the Malpighian corpuscle.
86. What is the capsule of the corpuscle called? Bowman's.
87. What are the essential things to remember about the tubules? Eleven in all: (1) Bowman's capsule; (2) the neck; (3) the proximal convoluted tubules; (4) the spiral portion; (5) the descending limb; (6) the ascending limb; (7) the irregular tubules; (8) the distal convoluted portion; (9) the arched collecting tubules; (10) the straight collecting tubules; (11) the tubes of Bellini.
88. How many of them does the labyrinth contain? Six. 1, 2, 3, 7, 8, 9.
89. How many does the medullary ray contain? Three. 4, 6, 10.
90. How many does the medulla of the kidney contain? Four. 5, the loop, 6, 10.
91. How many essentially different kinds of epithelia lining the tubules? Three. Flat, polyhedral, and columnar.
92. What portions of the tubules do the flat epithelia with oval nuclei line? Nos. 1, 2, 5, in 32.
93. What portions the polyhedral? 3, 4, 6, 7, 8.
94. What are the rods of Heidenhain? Name given to the striations of the polyhedral epithelia.
95. Where are the epithelia most angular and the striations most prominent? In the irregular tubes.
96. Where are the columnar epithelia? In the straight tubes.
97. Where are the polyhedral epithelia somewhat triangular? In the proximal convoluted tubes.
98. Where are the polyhedral epithelia cuboidal? In the ascending limb.
99. What are the two classes of uriniferous tubules? Urine-forming and urine conducting.

100. Which have epithelia with well-marked network? The urine-forming.

101. In which is the investing membrane the firmer? In the urine-conducting.

102. Which are more frequently affected by disease? The urine-forming.

103. Where do we find the Malpighian corpuscles? Regularly in rows in the edges of the pyramids of Ferrein in the cortical arches, and also irregularly scattered throughout the columns of Bertini. They are not found immediately underneath the surface of the kidney.

104. Of what does each corpuscle consist? Of a capsule (Bowman's) and a network of capillary vessels.

105. Of what does the capillary network consist? Of an efferent artery, a number of convoluted loops, and an efferent vein.

106. Wherein do these capillaries differ from ordinary capillaries? Their walls are thicker, their endothelial layer is not continuous, and their outer surfaces are completely covered by a layer of flat epithelia.

107. What are the arteries of the kidneys? The renal artery, divided into branches called *arteriæ propriæ renales*; and these, in turn, subdivided into interlobular arteries and *arteriolæ rectæ*.

108. Where does the renal artery enter the kidney? At the hilum.

109. Where does it divide into branches? In the pelvis of the kidney.

110. Course of the *arteriæ propriæ renales*? They traverse the columns of Bertini, supplying in part the medullary pyramids and afferent vessels of the Malpighian bodies in that region.

111. Where do the *arteriæ propriæ* divide? At the base of the pyramids.

112. From what arteries are the afferent vessels of the glomeruli of the cortical portion derived? From the interlobular.

113. What arteries supply the medullary pyramids? The *arteriolæ rectæ*.

114. What are the veins of the kidneys? The renal veins, the *venæ propriæ*, the *venæ rectæ*, and the stellated veins.

115. What vein does the renal vein ultimately join? The inferior vena cava.

116. Into what veins do the efferent vessels of the glomeruli empty? Into the *venæ propriæ renales*.

117. What is the course of the *venæ propriæ*? They accompany the *arteriæ propriæ*.

118. From what are the *venæ rectæ* derived? From the *venæ propriæ* and from the plexuses at the apices of the pyramids.

119. What veins join the *venæ rectæ* at the bases of the pyramids? Those from beneath the capsule which are stellate in arrangement and pass downward, receiving branches from the plexuses about the *tubuli contorti*.

120. By what are the tubules interlaced and completely surrounded? By arteries and veins.

121. Which is the larger—the renal artery or renal vein? The artery.

122. Why? Because a quart or two of liquid is removed from the artery daily.

123. Which is the larger—the afferent or efferent vessel? The afferent.
124. Why? For the same reason, relatively, as above.
125. Of what is the interstitial tissue of the kidney composed? Of connective-tissue elements.
126. Where are the fibres most numerous? Near the blood-vessels and around the Malpighian corpuscles.
127. What are the normal functions of the kidneys? To remove excrementitious matters and water from the blood.
128. What are the principal excrementitious matters? Urea, uric acid, and urates.
129. According to the Bowman-Heidenhain theory, to what is the secretion of urine due? To the activity of the flat and of the rodDED epithelia.
130. Which epithelia take up water and salts? The flat in the glomeruli.
131. Which epithelia secrete specific urinary constituents (urea, uric acid) and water? The rodDED in the convoluted tubules and ascending loops.
132. What is the modified Ludwig theory of the secretion of urine? That it is a mixture of physical and physiological processes.
133. What happens in the glomerulus, according to this theory? Transudation of watery and crystalloid constituents, including urea.
134. What happens to the transudate on its way through the tubules? Concentration and alteration from absorption.
135. To what is the absorption due? To active intervention of the epithelia.
136. What does the distribution of nerve-endings to the tubules suggest? Possibility that the central nervous system may control the secretion of urine directly, apart from its influence on the renal circulation.

MISCELLANEOUS PRACTICAL QUESTIONS.

The following questions, many of which will not be answered, require more or less reasoning from the facts brought out by the quiz:

137. Why is the right kidney slightly lower than the left? Because of the vicinity of the liver.
138. What is the probable reason of the constrictions in parts of the tubules? To arrest the too rapid onward flow of urine until the epithelia have performed their office.
139. Why are the renal arteries *relatively* the largest in the body? Because the kidneys remove a quart or more of fluid from them each day.
140. Does the efferent vessel contain venous or arterial blood? (See Heitzmann on Renal Circulation.)
141. Would the resistance encountered by the blood be greater in the glomerulus or in the vessels that flow directly into the capillaries?
142. Where, then, would hyperremia from heart-pressure be located?

143. What effect would this have on the volume of urine?
144. What forms the support of the kidney and holds it in position? Adipose and connective tissue, together with blood-vessels, nerves, lymphatics, and ureters.
145. Which kidney moves most with respiration? The right.
146. What is the position of the kidneys with reference to the peritonæum? They lie behind it.
147. What danger in making incisions for reaching the kidneys too high? Opening into the parietal reflection of the pleural cavity.
148. What would be the natural result on the renal veins of pressure, as of tumors, on the inferior vena cava? Venous stasis, because the renal veins empty into the vena cava.
149. What organ is particularly likely to press on the vena cava? The liver. Why? (See Anatomy of Liver.)
150. Why are thin persons subject to movable kidney? So much fat may be absorbed that the tunica adiposa becomes loose.
151. What effect on the fibrous capsule has the state of vascular tension of the kidney? Owing to elastic fibres the capsule may be stretched or contracted.
152. In what physiological condition is there likely to be hyperæmia in the kidney? Pregnancy.
153. Why?
154. Why is the fibrous capsule adherent in chronic interstitial nephritis?
155. What should we expect to see on section of a kidney affected by arterial congestion?
156. In venous congestion of the kidney what veins of the cortex should we expect to see prominent?
157. Why are the Malpighian corpuscles atrophied or destroyed in chronic fibrous (interstitial) nephritis?
158. "Small cysts are found in the cortical portion;" in what disease are these common? In chronic fibrous (interstitial) nephritis.
159. Of what are these the result? (Consider what effect the obstruction of tubules by new fibrous tissue would have on the Malpighian tufts.)
160. Granted that amyloid degeneration originates in and principally affects the blood-vessels, why do we find comparatively few tube-casts in this disease? (Consider the definition of the word tube-cast.)
161. Suppose a small calculus were imbedded deep in one of the calyces, should we be likely to find as much evidence of its presence in the urine as if it were loose in the pelvis?
162. In so-called physiological albuminuria few casts or none at all are found: if any part of the kidney is affected, is it likely to be the glomerulus or the tubules? (Consider definition of cast.)
163. Could nephritis and dropsy, seen as early as the third or fourth month of pregnancy, be accounted for by the answer to question 152?
164. Should we expect to find tube-casts numerous in a lesion affecting the epithelial lining of the tubules? (See Diffuse Nephritis.)

165. Could an aspirating needle be inserted anywhere between the eleventh and twelfth ribs without striking the kidney?

166. Why is it useful for diagnostic purposes to inflate the colon? (See questions on Anatomy, and also the chapter on Physical Examination of the Kidney.)

167. Why does percussion anteriorly reveal ordinarily little or nothing in regard to the kidneys? (See questions on Anatomy.)

168. What borders of the kidney can be percussed posteriorly? (See Percussion.)

169. Why is it that such small substances as those composing gravel may cause such exquisite pain to the patient? (See Derivation of Nerves.)

170. Why is there sympathy between the kidneys and testicles? (See same as above.)

171. What effect would separation of the kidney from the peritonæum (by any mechanical cause) be likely to have? To make it movable in the retro-peritoneal space.

172. What is the danger of long-protracted sea-sickness? (Consider diaphragm.)

173. Are the kidneys likely to be larger or smaller during the menstrual period?

174. Would you starve or fatten a person with movable kidney? (See Tunica Adiposa.)

175. What effect would violent contractions of the diaphragm be likely to have on emaciated subjects? (See Tunica Adiposa, and also question 172.)

176. Why is the fat capsule (tunica adiposa) of the kidney more liable to become the seat of extensive suppurative inflammation than the fibrous capsule? (Consider with what the fat capsule is continuous and the liability of inflammatory processes to extend.)

177. In post-mortem examinations why is the ratio of the thickness of the cortex to the medulla of more importance than the actual width of the cortex? (Consider the likelihood of variation in thickness in different individuals.)

178. Suppose that the ratio is not normal, what must be determined? Whether the cortex or the medullary portion is affected.

179. Why must the cortical markings be intently studied in post-mortem examinations? Because modifications in their normal appearance are usually present early in the course of the various lesions.

180. Which part of the cortex shows the more frequent alteration in color post-mortem? (Consider, first, which tubules—the urine-forming or the urine-conducting—are most liable to be diseased; second, what is the region of these tubules in the cortex; and, third, also what region depends for its color on the amount of blood.)

181. Suppose the glomeruli are found to be superficial, what is the inference? (Read the last part of the answer to question 103 and consider what change would be likely to bring them to the surface, *i. e.*, hypertrophy or atrophy.)

182. Suppose the markings of the cortex are wavy or tortuous, what inference? (Consider what process would be necessary to make the vessels deviate.)

183. Why are the striations more prominent in the cortex than in the medulla? (Consider in what portion the epithelium is the paler.)

184. Which part of the kidney would be likely to suffer more from the mechanical effects of excessive distention of the pelvis? From ascending changes? From infarctions?

185. In studying cut kidney surface what must be noted about the arteries? The degree of distention, their condition as regards wall thickness, and whether they are the seat of amyloid (waxy) degeneration.

186. On removing the fibrous capsule, post-mortem, what points to be noticed in regard to the external surface of the kidney? Color, smoothness or granulation, depressions and furrows, cysts, and dilated vessels.

187. In what animal do the kidneys so closely resemble those of man that sections of them are frequently made for purposes of study?

188. What gives the kidney tissue such a high degree of consistency? (Consider, first, what are the main constituents of the kidney; second, what they are held together by; and, third, what the latter is rich in.)

CHAPTER VI.

PHYSICAL EXAMINATION OF THE KIDNEYS.

THE chief points in the physical examination are as follows :

Palpation.—*Method 1.* To perform palpation the patient lies on his back, and the right hand of the physician is placed upon the arch of the ribs between the anterior axillary and the mammary line, while the left is placed under the twelfth rib. The patient is then instructed to take a deep breath, and, if the organs are palpable, they will be felt to move under the fingers during respiration, and their form, size, and consistency may be inferred. (Litten's method.)

Method 2. Place the patient upon the opposite side to the one to be examined, with the knees well-drawn up, so that all the viscera shall sink down; a deep cavity is thus formed in front of the quadratus lumborum, where the kidney is felt as the highest object. (Morris's method.)

Method 3. Place the patient on his back 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. The patient draws up his knees, and by making pressure steadily with the upper hand during expiration and keeping it firm and inactive during inspiration, and by continuing the pressure during the next few expirations, the kidney may in a few minutes be felt between the hands.

Dr. Senn examines the kidney as follows :

The bowels should be moved thoroughly beforehand,

either by cathartics or by a high enema. The patient is placed in the dorsal recumbent position with head and chest slightly raised, and the legs and thighs flexed. Breathing being natural, during respirations push the right hand in the direction of the lumbar region while firm pressure is made with the left against the lumbar region. If the kidney is enlarged it will be felt during inspiration between the two hands. If the attempt is unsuccessful, put the patient on the opposite side and try again. In some cases success may be achieved when the patient is sitting or standing.

In cases of renal tuberculosis complicated by perinephric abscess there is well-marked swelling, which is fixed, and fluctuation can be made out by palpation.

Practically a kidney which is palpable is either movable or enlarged.

Renal Ballottement.—Guyon's method is to place one hand under the back over the kidney, and with short and sudden movements to toss the kidney against the other hand, which is applied to the abdomen.

Percussion.—The patient should lie upon the abdomen across a rather hard pillow. Anteriorly percussion reveals little or nothing.

Posteriorly only the outer and lower margins can be made out, on account of the proximity of the neighboring organs. This border is found about 10 centimetres (four inches) from the spinous processes, but only when the colon is filled with gas; if full of fæces or over-distended with gas the attempt to percuss the outer border will be futile.

The area of kidney dulness is between the twelfth rib and the crest of the ilium. The space is about 5 centimetres (two inches) broad, and it must be percussed sharply in order to be appreciated.

Anteriorly the dulness is abruptly exchanged for tympanitic resonance as the intestines are approached.

Auscultatory Percussion.—By use of the phonendoscope (which is placed over the centre of the kidney or the tumor) and very gentle tapping of the abdominal wall with the finger-tips in a radiating direction from the instrument the outline of the body on which the phonendoscope rests can be made out with great precision by the impulse and pitch of the note conveyed to the ear.

Anterior auscultatory percussion as above is useful for confirmatory evidence in cases of tumors revealed by palpation.

Tenderness on Pressure.—This characteristic is of value in the diagnosis of the following conditions :

1. Acute nephritis. Perinephritis, especially noticeable.
2. Renal calculus, especially if inflammation result from it.
3. Hydronephrosis (usually).
4. Suppurative nephritis.
5. The writer found it in one case of renal hæmaturia in a hæmophilic patient. (Diagnosis verified by operation.)

Rectal Insufflation.—Procure a large rubber bag capable of holding four gallons of air, connect it with rubber tubing four to six feet long, and have a stop-cock near the bag itself. To the further end of the tubing attach the tip of an ordinary vaginal syringe, being careful to fasten it on securely. The patient assumes the dorsal recumbent position. The tip is inserted into the rectum, and one assistant presses the margins of the anus against the rectal tube to prevent the air from escaping. Another assistant sits on the bag filled with air and placed on a chair, and turns on the stop-cock. The inflation is to be made very slowly and without interruption. The hands being placed over the sigmoid flexure, it is possible to feel the entrance of the air into the bowel. Continue the inflation until the cæcum is well distended.

Dulness having been outlined beforehand by percussion,

the difference caused by inflation may be ascertained by repeating the percussion after inflation.

If the dulness disappears entirely after inflation the swelling is retro-peritoneal; if the dulness only partly disappears the tumor is intra-abdominal.

CLINICAL NOTES ON PHYSICAL EXAMINATION.

1. The kidneys cannot always be palpated; they are best made out in the case of thin persons with flabby abdominal walls.

2. In the male the kidney can only exceptionally be felt; in woman the normal left kidney may be palpated in about 30 per cent. of the cases, the right in 75 to 80 per cent.

3. Percussion is of service in two conditions: First, when the kidney is absent or dislocated; and, second, in large renal tumors. In the latter case a broad tympanitic strip will be found to run along the posterior or lateral portion of the tumor from adhesion of the ascending or descending colon. The dulness usually extends over the surface of the thorax.

4. It should not be forgotten that the kidneys lie behind the peritonæum, and that the right kidney moves with respiration.

5. A normal movable kidney is not perceptible upon anterior inspection, but if a tumor be present, the kidney may be perceptible in front.

6. Inflation of the colon is often advisable for diagnostic purposes, since the kidney, when enlarged by growths, usually pushes before it the ascending or descending colon against the anterior abdominal wall, which furnishes a tympanitic note.

7. The normal kidney is felt as a smooth, oval, and half-elastic organ; in the case of growths it may feel smooth, soft, fluctuant, dense, uneven, globular, or lobulated.

Physical Signs furnished by Pathological Conditions.

—A number of pathological conditions furnish certain physical signs of significance, as follows:

1. **Perinephritis with Perinephritic Abscess.**—A circular symmetrical swelling between the borders of the ribs and the brim of the pelvis, extending posteriorly toward the spine, with œdematous condition of the skin and tissues beneath it and tenderness on pressure.

2. **Movable Kidney.**—Palpation reveals movable kidney by its form, mobility, size, capability often of replacement, and occasional pulsation of the renal artery.

Movable left kidney is differentiated from movable spleen by palpation and percussion. Palpation reveals characteristic notches in the spleen, but pulsations of the renal artery by deep pressure at the hilum in the kidney.

3. **Large Formations.**—Carcinoma, sarcoma, hydronephrosis, pyonephrosis, perinephritis, and echinococcus are all plainly palpable.

4. **Echinococcus.**—A peculiar whiz known as the hydatid vibration is shown by quick, short, bimanual percussion-strokes.

5. **Respiratory Mobility.**—As the kidneys move but slightly with respiration, pronounced respiratory mobility, as a rule, excludes the kidney.

6. **Capability of Replacement.**—If the tumor is capable of replacement so that it disappears, it is thus proved to be renal.

Differential Diagnosis Between Renal Tumors and Those of Other Organs.—Renal tumors, according to Stillér, present the following characters:

1. Unilateral occupation of abdomen.
2. Spherical contour.
3. Downward growth. (Palpation reveals lower margin.)
4. Absence of any influence of the rhythmical movements of the diaphragm in breathing, when the tumor is fixed against the abdomen.

5. Relation to intestines : intestines lie over small tumors ; in larger ones, are pushed toward median side.
6. Presence or absence of tympany depending on amount of intestine covering the tumor.
7. Bulging posteriorly.

CHAPTER VII.

ANOMALIES OF THE KIDNEYS.

WE distinguish the following anomalies :

1. Anomalies of position.
2. Anomalies of form.
3. Anomalies of size.
4. Anomalies of number.

1. ANOMALIES OF POSITION.

These are three in number, namely :

1. Fixed.
2. Movable.
3. Floating.

FIXED MISPLACEMENTS.

These are either congenital or acquired. *The congenital displacement* is more frequent in men than in women, and affects more commonly the left kidney, being associated with an abnormal arrangement of renal vessels, ureter, and large intestine. The kidney is not only misplaced but frequently misshapen, and the suprarenal capsule only occasionally accompanies it, more frequently remaining in its natural position.

The two kidneys have been found on the same side, in which case they are usually located lower than normal.

Acquired misplacements result from various causes, among which we find :

1. Pressure from a tumor or an enlarged neighboring organ.
2. Tight lacing.
3. Sudden blows or jar, with subsequent inflammatory adhesions.

The other two misplacements (movable and floating) may be grouped under the heading

WANDERING KIDNEYS.

We distinguish two classes :

1. Movable: often very painful, and a source of great irritation.

2. Floating: often congenital, and one which may or may not give rise to symptoms.

Movable kidney is fifty times as common as floating kidney, but both may exist in the same person. The right kidney is oftener displaced than the left.

Synonymes.—Floating kidney, movable kidney, nephroptosis.

Etiology.—Trauma, loss of perirenal fat, childbirth and its accidents, alterations in intra-abdominal pressure, mal-assimilation and imperfect development, congenital defects of the peritonæum, pendulous abdomen, enteroptosis, heredity, presence of mesonephros. It is associated with displacement of the stomach or the intestine, of the liver, or of the uterus.

Movable kidney is due to increased laxity of its attachments, in turn due to a diminution in the amount of fat surrounding it, or to detachment of the peritonæum from the muscle. We find several classes of cases :

1. Those in which the fat capsule is large and loose, allowing movements of the kidney within it.

2. Those in which the fat capsule closely surrounds the kidney and moves with it.

3. Those in which the kidney moves within the fat capsule, and the capsule also moves about with the kidney behind the peritonæum.

The degree of mobility varies considerably and is always limited by the length of the renal vessels.

Floating kidney, on the other hand, depends on an irregularity of the disposition of the peritonæum (a fold of this membrane completely enveloping the kidney so as to form a mesonephros, allowing the organ to float about in the

abdominal cavity in any direction), or else on some abnormal arrangement associated with malposition of the colon, the kidney being left unsupported and free to move between diverging processes of the peritonæum.

The kidney may 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. A case is on record in which the kidney moved under the peritonæum, through a space described as a circle, with a diameter of eight or nine inches.

Occurrence.—According to some authorities, more frequently between the ages of twenty and twenty-five; according to others, between thirty and forty. More common in women. Children and infants not exempt. It occurs often in combination with nervous, digestive, and nutritive disturbances, especially in young persons of a chlorotic type.

Onset.—The condition may appear suddenly, but the majority of cases require months, or even years, for full development.

Clinical Features.—In the earlier stages the following :

1. Digestive disturbances.
2. General nervousness.
3. Epigastric pain to the left of the median line.
4. Cardiac palpitation.
5. Inability to sleep or to be comfortable on the left side.

In later stages as follows : pain prominent, due to chronic localized peritonitis or neuralgia of the lumbo-abdominal nerves; anorexia, nausea, sometimes vomiting, vertigo, anæmia, menstrual disturbances, occasionally renal or uterine hæmorrhages, despondency, occasionally icterus, and attacks like renal or biliary colic. Vomiting may occur without pains or nervous symptoms. A dislocated organ is extremely irritable, and the reflex and symptomatic phenomena are chiefly due to this irritation.

Movable kidney greatly aggravates a gouty condition, so

that treatment for the former often greatly helps the latter.

In general we find three clinical classes of movable kidney, namely: (1) painful, (2) dyspeptic, (3) neurasthenic.

Associated Maladies.—In women abdominal pelvic conditions usually co-exist with wandering kidney, as follows:

1. Displacements of the uterus.
2. Oöphoritis.
3. Salpingitis.
4. Inter-menstrual uterine hæmorrhage.
5. Prolonged and profuse menstruation.

6. Elongation of the blood-vessels of the kidneys, curved ureter, hydronephrosis and pyonephrosis, limited twists of the ureter and vessels, and adhesions to the transverse colon or liver may be found associated with movable kidney in either sex.

The Pain.—This is both chronic and acute. The *acute* pain resembles renal colic; *i. e.* intense pain referred to the epigastrium or to the umbilical region, to the left of the median line, with slow feeble pulse, much prostration, and face bathed in perspiration. Previous to the attack, and during it, the urine is diminished, but micturition may be frequent, with vesical tenesmus; there may be also vomiting and severe diarrhœa. The acute attacks come on at first only occasionally, then increase in frequency and severity.

The *chronic* pain is probably a neuralgia, and at times is as severe as that of first stage of labor in women, with the same restlessness, discomfort, and distress as then. Circulation and appetite are affected, urination is frequent and difficult, change of posture gives no relief.

Causes of the Pain and Disturbances.—The dilatation of the stomach is attributed to direct pressure of the kidney on the pylorus or duodenum. The hydronephrosis and

pyonephrosis may be produced by a twist of the ureter. The attacks of abdominal pain, etc., collapse, chills, fever, and the like, with scanty and possibly bloody urine, have been attributed (1) to circumscribed peritonitis from an incarceration of the kidney in the peritonæum surrounding it; (2) to acute hydronephrosis from compression or twist of the ureter; (3) a disturbance of circulation in the kidney caused by obstruction of the renal vessels, especially the vein, in consequence of a displacement or twist of the movable or floating kidney.

Effect on the Mind.—The mental state is one of irritation, despondency, chagrin, and melancholy over inability to work. Death from these and digestive disturbances occasionally takes place.

Dangers.—These are as follows:

1. Hydronephrosis.

2. Pyonephrosis.

These are constantly a source of danger; add also

3. General peritonitis—occasionally.

4. Destruction of the kidney eventually from degeneration (chronic fibrous nephritis) or malignant disease.

5. Various intercurrent diseases.

Physical Examination of Patient.—The patient lies on the back near the edge of the bed, the muscles being relaxed as thoroughly as possible, the knees being raised, if necessary, for this purpose. The finger-tips of the one hand should be pressed firmly against the right lumbar region while counter-pressure is applied from the front, the finger-tips being moved about. The hand which is to be pressed against the right lumbar region should be the left if the right kidney is being examined, and the right if the left kidney.

If the kidney is not at once felt as a circumscribed, smooth, rounded, and dense body, the patient is asked to draw a long breath, when the lower portion of the descending organ may make its presence known to the examiner.

The floating kidney, when found out of place, may lie as low as the brim of the pelvis, or on the opposite side of the median line, or directly beneath the anterior abdominal wall. As a rule, it is readily returned to its normal position.

Possible Errors in Diagnosis.—Wandering kidneys may be mistaken for tumors of the spleen, liver, omentum, and ovary.

The symptoms may suggest, at the crises, tabes dorsalis, pregnancy, intestinal obstruction, hysteria, uncomplicated neurasthenia, and poisoning.

The nervous symptoms may be mistaken for hysteria or hypochondriasis.

Differential Diagnosis.—The following conditions are most often to be differentiated:

1. Retained feces.
2. Dropsical gall-bladder.
3. Tongue-shaped appendage to the right lobe of the liver from constriction or growth.
4. Pedunculate tumors of uterus or ovary.
5. Cancer of the stomach or intestine.

The use of laxatives or the flushing of the colon will serve to distinguish the first.

The second, third, and fourth are distinguished by the inability to replace them in the region of the kidney. Moreover, in the case of tumors connected with the liver the location is more constantly superficial, and the degree of mobility more largely controlled by that of the diaphragm.

The severe digestive disturbances will soon differentiate cancer.

Prognosis.—As regards relief from permanent mobility the prognosis is favorable; the relief may be brought about as follows:

1. By accumulation of fat-tissue.
2. Owing to pregnancy.
3. The result of mechanical or surgical treatment.

As regards relief from the symptoms (chlorosis, neurasthenia, hypochondriasis, and mental distress), the prognosis depends on the ability of treatment to fix the kidney and that of the patient to appreciate intelligently the significance of movable kidney. If climacteric is present or approaching it is possible that the symptoms may disappear afterward.

Treatment.—Rest should first be tried, no muscular strain whatever being allowed. Occupations requiring an upright position not permitted, and bicycling particularly forbidden.

The physician should attempt to replace the kidney.

Place the patient on his back and gently push the kidney into place. If the kidney has been forced out of position by some strain, enforced rest in the recumbent position should be attempted. Next in order, bandaging should be tried.

The best bandage is made of silk elastic closely fitted to the whole abdomen, and prevented from riding up by means of straps of soft rubber tubing or other material, one on each side, passing from back to front between the legs. Over the position of the dislocated kidney is sewed on the inside of the bandage a round pocket of soft chamois-skin, left open above so that a pad can be pushed into it and changed on occasion. (Fitz.)

Lastly, if the above means are inefficacious, a surgical operation may be tried. Nephrorraphy (stitching) is said to be a permanent and complete cure in half the cases.

Fenwick thinks the diagnosis of movable kidney is too often made in obscure renal diseases, and that the kidneys are often stitched unnecessarily, even harmfully.

All that is necessary is to free the kidney from surrounding fat, and in aggravated cases to free the outer capsule itself posteriorly and superiorly, and to drain for a few days. Tough surface adhesions result and the kidney is fixed.

Nephrectomy is to be attempted only in very severe cases after stitching has been tried twice and failed.

The prognosis, after operation, depends upon the stage of the disease and on the integrity of the opposite kidney.

2. ANOMALIES OF FORM.

These may be either congenital or acquired, usually the former. A variety most frequently encountered is the so-

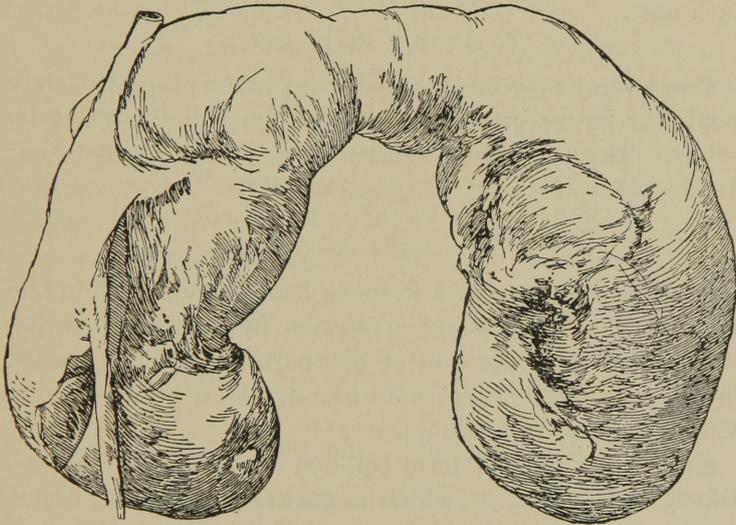


FIG. 12.—Horseshoe kidney.—(From McNUTT.)

called "*horseshoe*" kidney, (*ren unguiformis*), the two organs being united by a band of renal tissue, or of condensed fibrous tissue, passing over the vertebræ and connecting their inferior extremities. (Fig. 12.) The concavity is usually directed upward. The two halves are usually complete in themselves, each having a distinct pelvis and ureter, and most frequently the ureters descend in front of the transverse portion. The glands are usually situated lower than normal.

Lobulated Kidney occurs in which the lobulated appearance of the foetal kidney is preserved, suggesting an arrest of development in foetal life.

In some cases the organ may be divided into two or three indistinct irregular portions by shallow depressions on its surface.

In a few cases on record one or both kidneys have had two distinct pelves, in most instances uniting to form one single ureter, although four ureters have been found in one such case.

3. ANOMALIES OF SIZE.

One kidney may be large and the other proportionately small, the larger one being several times the bulk of its fellow. This condition probably arises from deficient development of one of the renal arteries.

4. ANOMALIES OF NUMBER.

In rare instances three kidneys have been found in one body, the third occupying a position in front of the vertebral column or at the side of the normally located glands. In one case four kidneys were found, all with their accompanying vessels and ureters.

Solitary kidney is a term applied to fusion of the two kidneys into one mass, which is always a congenital occurrence. Every conceivable variety of form and degree of fusion exists, from the ordinary horseshoe kidney (the lowest grade of fusion) to the completely united variety, resulting in a single disk-shaped mass with single or double pelvis. A case of S-shaped fusion of the kidneys is on record (ren sigmoideum) in which union took place by renal tissue between the lower end of the left kidney, in normal position, and the upper end of the right, which lay wholly to the left of the vertebral column.

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

Unsymmetrical kidney is a term applied to the case in which there is entire absence of the kidney (presumably from atrophy), the renal vessels and ureter being likewise wanting. It may be congenital or acquired. It occurred once in 318 sections made by Morris. In man the left kidney is usually the one absent; in woman the anomaly is frequent on both sides. It is about twice as frequent in men as in women. In women congenital absence of one kidney is often shown by unilateral abnormalities in the development of the sexual system.

In cases of unilateral absence of one kidney the other is usually but not always hypertrophied, and may even attain an enormous size, weighing several pounds. It is likely to be misplaced, and to be more or less abnormal in form.

Absence of both kidneys, together with ureters and bladder, has been found in still-born children, especially in acephalous monsters. There is one such case on record, of a girl, (who died at fourteen) in which the renal defect was associated with various defects in the genital organs. The urine, or a urine-like liquid, continually discharged from the umbilicus, which was misplaced.

CLINICAL NOTES.

1. Misshapen kidneys are usually misplaced.
2. When nephrectomy is contemplated the utmost care should be taken to examine the generative organs for defect, since the latter is often associated with anomalies of the kidney.
3. As long as the single kidney remains healthy there is no derangement of the urinary function; but should it become diseased, or its excretory duct obstructed, fatal uræmia rapidly supervenes.

CHAPTER VIII.

ABNORMALITIES OF SECRETION.

These may be arranged alphabetically as follows :

Albuminuria.—The voiding of urine containing albumin.

Albuminuria is probably due to delayed circulation in the glomeruli, and also to an altered state of the epithelium of the capillaries facilitating escape of the substance. In chronic albuminuria hydræmic state of the blood is also a factor.

Physiological Albuminuria.—Senator insists that albumin occurs physiologically in the urine. Uniting Ludwig's and Heidenhain's theories of the filtration of urine, he deems it a mixture of the transudation of the glomerular vessels, poor in albumin, and of the non-albuminous excretion of the urinary canaliculi. The incessant variation in the pressure and of the rapidity of the circulation in the vascular glomeruli and the variability of the excretion of the tubuli uriniferi suffices to explain the presence or absence of physiological albuminuria, according to time and period when the test is made.

Fürbringer thinks that at least a tenth part of all healthy persons excrete, at times, albumin with their urine.

The theory of physiological albuminuria has been vigorously contested, and there are those who strenuously insist that the presence of albumin in the urine is in every case a pathological symptom, even if only small pathological processes have taken place.

Albuminuria not due to any organic disease has been classified as cyclic (absent at night and while in bed), dietetic (following ingestion of certain kinds of food, as cheese, eggs, pastry), after exertion (severe and prolonged), and simple persistent, without other symptoms or known cause. (See writer's new Urinary Analysis for complete classification and description.)

Albumosuria.—The voiding of urine containing albumoses (formerly called peptone). Usually significant of disturbances of digestion or of pus absorption.

Persistent and excessive albumosuria has been shown by Fitz to occur in myxœdema, and by Shattuck in multiple bone tumors.

Acetonuria.—The voiding of urine containing acetone, as in diabetes mellitus and other disorders. Probably not of clinical importance in itself.

Alkaptonuria.—The voiding of urine which, normal when fresh, becomes dark or black on standing. Probably due to a variety of substances, and is of no diagnostic significance. In poisoning by salol, carbolic acid, resorcin, and uva ursi, the color is due to hydroquinone.

Chyluria.—The voiding of urine containing chyle. Due often to presence of parasites. When independent of them, may last for years without other ill-effect than painful micturition from presence of clots in bladder.

Cylindruria.—The voiding of urine containing cylinders (tube-casts) from the kidneys. Their presence signifies that an exudation is going on from the blood-vessels of the kidneys. Hyaline casts are found in most cases of albuminuria. One or two small hyaline casts are frequently found in normal urine when the centrifuge is used for sedimenting. When five or six are found in every drop examined the condition is probably pathological. The writer's statistics on mortality show greater percentage of death among those in whose urine hyaline casts are easily found than among those where they are absent. They occur without albumin, sometimes from no known cause, at other times during cholera, jaundice, and in poisoning by certain substances, as alcohol and sulphuric acid.

Other casts, as epithelial, blood, granular, waxy, or fatty, occur in various renal lesions and are referred to in connection with the various disorders.

Cystinuria.—The voiding of urine containing cystin. Of importance chiefly with reference to possible formation of calculus.

Diaceticaciduria.—The voiding of urine containing diacetic acid or acetoacetic acid. Of prognostic importance as significant of approaching coma in the case of adults. In the case of children of no importance.

Fibrinuria.—The voiding of fibrin in the urine. Occurs generally as clots in hæmaturia or chyluria, rarely as a component of spiral membranes in membranous ureteritis.

Globulinuria.—The voiding of globulin in the urine, which occurs usually, but not always, with albuminuria.

Glycosuria.—The voiding of sugar in the urine. Of importance chiefly as a symptom of diabetes mellitus, which see.

Hæmaturia.—The voiding of urine containing blood-corpuscles. Found in various affections of the urinary tract and considered in connection with them. The clinical features belong more properly to urinary analysis and are discussed in full in the writer's new book on that subject.

Hæmoglobinuria.—The voiding of urine containing blood-coloring matter with but few or no corpuscles. Occurs, as in infectious diseases, among the new-born or in others, and as a result of burns and poisoning. Its periodical occurrence is regarded as a disease, paroxysmal hæmoglobinuria. Styptics are of little value in treatment, which should be to remove the cause.

Paroxysmal hæmoglobinuria is dependent on syphilis and malaria. Prognosis is that of a chronic affection, long in continuance, but recovery may take place. Malarial hæmaturia or malarial hæmoglobinuria is said not to be helped by quinine. The treatment now in vogue is by morphine, Epsom salt, and turpentine. The latter in 10 minim doses in capsule.

Hæmatoporphyrinuria. The voiding of urine, red when passed, and becoming darker on standing, from presence of a derivative of hæmoglobin called hæmatoporphyrin. Found in excess in poisoning by sulphonal and trional

and in the urine of typhoid and certain nervous diseases where it is regarded as of bad prognostic significance.

Hydrothionuria.—The voiding of urine containing sulphuretted hydrogen. Suggests absorption of this substance from bowel and hence auto-intoxication; or else abnormal communication between the intestine and urinary tract.

Indicanuria.—The voiding of urine containing excess of indican. Occurs in various intestinal troubles, especially in those of the small intestine. The treatment is that of the cause.

Lactosuria.—The voiding of milk-sugar in the urine. Occurs in pregnancy or after childbirth.

Lipuria.—The voiding of fat in the urine. Usually of importance in connection with various renal lesions, diabetes, or cancer of the pancreas.

Lipaciduria.—The voiding of fatty acids in the urine. Probably of no clinical significance.

Lithuria.—The voiding of urine containing a brick-dust sediment of urates and uric acid.

Melanuria.—The voiding of urine, black when first passed, from presence of a black pigment, melanin; usually significant of melanotic cancer or sarcoma.

Melituria.—(See Glycosuria.)

Mucinuria.—(See Nucleoalbuminuria.)

Nucleoalbuminuria.—The voiding of urine rich in the substance formerly called mucin. Found in catarrhal affections of the urinary tract.

Oxaluria.—The voiding of urine containing crystals of oxalate of lime. (Calcium oxalate.)

Phosphaturia.—The voiding of urine containing a sediment of phosphates.

Peptonuria.—(See Albumosuria.)

Pyuria.—The voiding of urine containing pus. Found in various affections of the urinary tract and considered in connection with them.

Uraturia.—(See Lithuria.)

Urobilinuria.—The voiding of urine containing excess of urobilin. Of special importance in cases of concealed hæmorrhage, especially in ectopic gestation, indicating absorption of extravasated blood.

The means by which the various conditions above mentioned may be recognized are chemical or microscopical, and would take too much space to describe here. The reader will find methods for recognition of them described in full in the writer's new book on Urinary Analysis (Era Publishing Co., Chicago).

From a therapeutic standpoint few of them are of importance, but those few are of special importance and will be considered in connection with the various lesions in which they occur.

The therapeutics of albuminuria will receive attention under the heading of The Nephritis, and elsewhere.

Cylindruria will be described under the heading of the various renal lesions; diaceticaciduria under diabetes mellitus; glycosuria, ditto; hæmaturia under the heading of the various urinary lesions where it occurs; lithuria, phosphaturia and oxaluria in the chapter on calculous disorders; pyuria under various urinary lesions.

CHAPTER IX.

URÆMIA.

Definition.—A name given to a set of symptoms formerly believed to be the direct result of the accumulation of urea in the blood. We no longer believe that urea is the sole cause of the symptoms, various toxic substances being thought to play a part in the production of the phenomena, but the name is still retained.

Pathology.—In acute uræmic attacks increased arterial tension is regularly noticed, though not always present. The association is so frequent that it seems probable that the attacks are caused by contraction of the arteries. This belief is rendered still more probable by the fact that the symptoms usually disappear when the contraction of the arteries is stopped.

In chronic uræmia the arterial tension is not increased, but there may be an increased quantity of urea in the blood.

Symptoms of Acute Uræmia.—The symptoms of acute uræmia are the following: Intense frontal headache, puffiness of the face, drowsiness or sleeplessness, ringing in the ears or light before the eyes, dimness of vision, possibly sudden blindness of one or both eyes, dizziness, difficulty of breathing, especially on exertion, nausea, vomiting, involuntary twitchings, general prostration, delirium, hemiplegia, and voiding of urine, which as a rule is scanty and contains albumin; convulsions and coma may then ensue. In some cases, even after convulsions have begun, an abundance of urine may be passed; but it is pale, watery, and contains much albumin.

Uræmic Convulsions and Coma in Acute Uræmia.—

The characteristic features of uræmic convulsions are that they are equal on both sides of the body. The person is not paralyzed on one side of the body; he is not completely unconscious; his pupils tend to dilate; his appearance is pallid; his temperature is increased from the beginning of the convulsions and ranges from 100° to 102° ; pulse is increased, ninety to one hundred and twenty beats per minute; respirations may or may not be hastened; the breathing is of a peculiar, hissing character, the noise in breathing being made by the lips; the breath has a peculiar urinous odor. The convulsions are likely to recur.

Differential Diagnosis.—Uræmic convulsions or coma must be distinguished from the following:

1. Apoplexy. 2. Epilepsy. 3. Hysteria. 4. Opium poisoning.

In apoplexy there is paralysis of one side of the body following convulsions limited to one side of the body. The apoplectic patient almost always turns his head with convulsive twitchings to the paralyzed side, and in many cases there is very high temperature, 104° to 105° , and if the latter, death will take place in a few hours.

It is difficult always to distinguish uræmic convulsions from epileptic attacks, since patients in the former often injure their tongue and simulate very closely an epileptic seizure. But if there is history of previous epileptic attacks, and if the attack is preceded by a cry, epilepsy is the trouble. Moreover, uræmic convulsions are attended by greater pallor and are more marked than epileptic ones, being equal on both sides, while in epilepsy they are more marked on one side.

Hysterical spasms resemble uræmic convulsions somewhat, but the pupils, face and temperature are normal and the patient is conscious. A choking sensation is often observed in hysteria which is absent in uræmia.

The comatose stage of uræmia sometimes closely resembles opium coma. The contracted pupils, opium breath, slow breathing, purplish hue and ghastly expression of the opium victim will sometimes distinguish him from the uræmic sufferer.

Symptoms of Chronic Uræmia.—Chronic uræmia affects essentially the following:

1. The brain and nervous system.
2. The skin.
3. The breathing apparatus.
4. The heart and arteries.
5. The stomach and bowels.
6. The kidneys.

Among symptoms of prime importance is headache. While all headache is not due to uræmia, we find violent and persistent headaches often associated with this malady. Some of the most terrible headaches from which it has been my misfortune to see people suffer have occurred in cases of well-advanced uræmia, usually, however, when there was little or no dropsy, and little or no albumin in the urine. In the early stage of chronic Bright's, before albumin is easily found, this headache is in the back of the head and extends down into the nape of the neck.

Mental disturbances, melancholia, and even insanity, have been known to be due to uræmic poisoning. Whenever these come on suddenly the urine should not be forgotten. Other cerebral manifestations of uræmia are drowsiness, stupor or delirium, convulsions, and coma.

In acute Bright's disease following scarlet fever the child often complains of headache in the back of the head. It may extend, however, to the front part of the head. The headache is usually occipital in chronic uræmia, but, when the danger of acute uræmia is greatest, constant and intense frontal headache is observed. Insomnia, mental depression and loss of memory occur. The most amiable and san-

guine dispositions may become morbidly depressed. The person is peevish, suspicious, impatient, or he may feel dull or stupid, with attacks of drowsiness.

Insanity due to Bright's disease is of two forms, according to whether the person has insane heredity or tendency or not. If he has no such tendency, he suffers merely from a mild, quiet mania like dementia. If albumin disappears from the urine and he improves in general respects, his mania improves and he may get entirely well.

On the other hand, in those predisposed to insanity the kidney disease acts as an exciting cause; serious outbursts may be expected, and there is need of restraint in some institution, as suicidal tendencies may develop.

Delirium may occur, but is a rare symptom. It is usually preceded by headache, eye troubles, and mental confusion. It usually is of a quiet type, but violent mania with a high temperature (107°) has been known to follow uræmic convulsions. The delirium may be chronic, with hallucinations of sight, delusions of persecution, convulsions, and vomiting. A case is on record where the patient was furiously delirious for several months, and died from collapse.

The delirium of uræmia may show itself in the following manner: The person becomes restless and uneasy, the eyes vacant, staring or wild, hallucinations are present, and memory is for the time more or less completely lost. The person is, however, more or less rational, and can converse for a short time, or answer a few questions, but will repeatedly ask questions to which he has just received a reply, and when the attack passes off cannot recall anything which has happened. Severe headache may accompany these attacks, and the person is restless at night, tossing about and talking incessantly.

Peculiar attacks of numbness may occur in the course of chronic uræmia, limited sometimes to the face, but possibly including all of one side of the body. In the latter case the

numbness begins in one foot, usually the left, and extends up the side until the left side of the head, including the tongue, becomes affected. Motion is not impeded. The attack lasts from fifteen minutes to half an hour, when it disappears, leaving no disturbance behind.

Paralysis of one side of the body (hemiplegia) may sometimes occur, but is transient and not due to organic disease.

Among the most perplexing phenomena of uræmia is the sudden loss of speech which sometimes occurs. A patient coming under my observation, who had recovered from uræmic convulsions of severe type, woke up one night and found himself entirely speechless. A physician being summoned and eliminative treatment followed out, speech returned the next day.

Among minor nervous phenomena have been noticed cramps, tremor resembling shaking palsy, and spasm of the flexor of the forearm and posterior muscles of the neck.

There may be poisoning of the centres of sight and hearing. Sometimes the person notices that he has dimness of vision, perhaps only in one eye, and that when he tries to read, the letters blur. This is more common in the more insidious form of Bright's, without dropsy and with little albumin, than in the other. Again, cases occur in which the person is stricken blind without warning, and not until this has happened has any one thought it worth while to examine the urine. Sudden blindness is occasionally the first symptom of uræmia which may be noticed. In other cases the failure of vision may be gradual, or the blindness, if occurring, be confined to one eye. Fortunately, uræmic blindness, though terrifying, is transient in character.

Among other disturbances of vision, photopsia, or seeing flashes of light, may be observed.

There may be failure of hearing as well as sight, but in my experience this is not so commonly observed, and when it happens is due to paralysis of the auditory centre by the poison.

Blindness of one-half of the visual field may occur. The patient may see double, objects may be inverted, or there may be more or less indistinctness of vision.

The treatment is discussed under NEPHRITIS.

The effect of chronic uræmia on the *skin* is shown by itching, burning, deposit of crystals, various eruptions, erysipelas, eczema, and gangrene; on the *subcutaneous tissue* by dropsy; on the *breathing apparatus* by dyspnœa, asthmatic paroxysms, hydrothorax, and obstinate cough; on the *heart and arteries* by high tension, cardiac hypertrophy, hæmorrhages, and anæmia; on the stomach and bowels by loss of appetite, morning nausea, vomiting, constipation or diarrhœa; on the *museles* by loss of strength; in *pregnancy* by convulsions; *after surgical operations* by septicæmia, so-called; *after accidents* by deaths from shock, so-called.

CHAPTER X.

RENAL EMBOLUS.

Synonymes.—Infarction of the kidneys.

Definition.—Renal embolism consists of an impacted, non-irritating thrombus, formed somewhere in the circulatory system and carried to the kidney, where it blocks a terminal renal vessel.

Fat emboli in connection with those in the lungs, and in fractures, pyæmia, and surgical operations, occur. Pyæmic emboli are also known.

Etiology.—Endocarditis, especially left; valvular diseases of the heart; parietal thrombi in aorta. Emboli come from the cardiac valves, in form of detached fibrin or atheromatous material, or from arterial thrombi, aneurisms, or atheromatous patches. Infectious results occur when emboli contain bacteria.

Morbid Anatomy.—Macroscopically: An ischæmic wedge-shaped area of necrosis, in the region supplied by the obstructed vessels, of opaque gray-white or red-gray color surrounded by a dark-red zone. The dead portion is eventually absorbed and replaced by a scar adherent to the renal capsule, often containing blood-pigment. If pyogenic bacteria in embolus, then abscess.

Microscopically: Area of necrosis of tubular epithelia. Fat-drops eventually appear. Interstitial inflammation near infarct (embolic contraction) in certain cases.

Clinical Features.—Previous history of endocarditis. *Sudden* pain in the back, with vomiting and chills, especially if heart is weak. Sense of præcordial oppression or clogging, and frequently dyspnœa. Slight temperature. Some little collapse.

The Urine.—Abrupt change in the urine; decreased quantity, increased color, specific gravity, and acidity. Sudden appearance of albumin, blood, and casts. In from two to five days gradual improvement, until urine is normal again, in three or four weeks at most.

Prognosis.—Favorable.

Treatment.—Absolute rest in bed at uniform temperature. Warm clothing. Careful nursing. Milk diet. In case of feeble persons eggs and limited amount of small farinaceous or cereal foods.

RENAL THROMBOSIS.

Thrombosis of renal artery is rare. Thrombosis of renal vein is a cause of passive hyperæmia, which see.

RENAL ANEURISM.

The symptoms are tumor, loss of appetite, dyspeptic symptoms and wasting, with occasional attacks of pain. The tumor is smooth, elastic, and may be about the size of a fetal head, beneath left costal arch, extending from ribs to a hand's breadth below navel, apparently fixed in renal region. Diagnosis is difficult. If such a tumor develops rapidly after an injury or severe exertion in a patient with arterio-sclerosis, but without marked cachexia, it should suggest renal aneurism.

Treatment is solely operative.

CHAPTER XI.

RENAL HYPERÆMIAS.

THE first disorder we shall consider is

ACUTE HYPERÆMIA.

Synonymes.—Active hyperæmia, acute or active congestion.

Definition.—Abnormal influx of arterial blood into the kidneys.

Etiology.—

1. Temporarily after exposure to cold and excessive ingestion of fluids.

2. Due to extirpation of one kidney or surgical operations on the urinary tract.

Pathology.—*Kidneys.*—Macroscopically we find them normal or slightly enlarged. Moist.

Capsule.—Normal. Strips easily.

Renal Surface.—Smooth, dark-red in color.

Cut Surface.—Dark.

Renal Substance.—Soft; vessels engorged with blood.

Malpighian Tufts.—Congested; appear as dark-red points in cortex.

Epithelia.—Deeper in color than normal.

Blood-vessels.—Microscopically we find them distended with blood.

Location of Congestion.—Principally on arterial side and in capillary loops of glomerulus. In other words, the morbid process lies mainly in the renal arteries and the arteries of the Malpighian tufts. (Fig. 13.)

Clinical Features.—Aching in the loins as along course of ureters or radiating to hips. Tenderness over renal region on deep pressure. Nausea, vomiting, perhaps headache. If due to fevers, symptoms of pyrexia.

If due to poisons, as cantharides, turpentine, then frequency of micturition, together with, perhaps, pain, urgency, or vesical tenesmus.

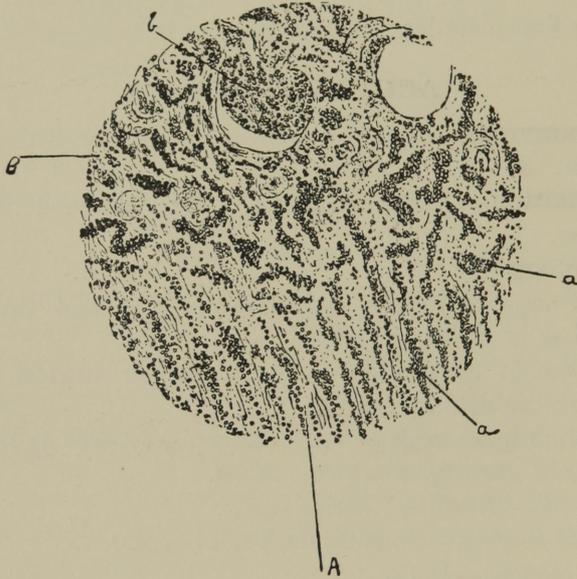


FIG 13.—Acute renal congestion with infarctions. *A*, pyramidal portion deeply congested; *B*, cortical portion deeply congested; *a*, occluded vessels; *b*, Malpighian corpuscle congested.—(PORTER.)

CLINICAL NOTES.

1. Acute hyperæmia may occur, temporarily, after exposure to cold or excessive ingestion of fluids; it may result from nervous polyuria or occur in diabetes.
2. It is frequently found after extirpation of one of the kidneys or following surgical operations on the urinary tract.
3. It may result from long-continued lithæmia or oxaluria.

4. It is caused sometimes by the blood-poisoning of certain diseases, as the eruptive fevers and inflammatory diseases; by poisoning with cantharides, turpentine, etc.

5. Protracted, active hyperæmia is likely to result in acute nephritis, which see. This condition always precedes acute inflammations of the kidneys.

6. It sometimes depends on hypertrophy of the heart, and occurs in exophthalmic goitre.

7. Temporary congestion of the kidney, according to Becquet, takes place at every menstrual period.

The Urine.—Blood the feature, the quantity of it ranging from a few scattering corpuscles, in mild cases, to very bloody urine in severe.

Albumin.—Small, or none. Rarely above 10 per cent. bulk.

Casts.—Few, small, hyaline, or none.

Epithelium.—Free, renal, often; not always found.

Quantity of Urine per twenty-four hours.—First, slight polyuria; later, volume deficient. Color and specific gravity increased.

Solids: Grains per ounce.—First, diminished; later, increased.

CLINICAL NOTES ON THE URINE.

1. In cantharides poisoning, clots of fibrin may appear in the urine.

2. Congestion with suppression may occur without either blood or albumin in the urine; as congestion subsides the first urine voided will be heavily loaded with urates; albumin and casts absent.

3. A sediment of urates is common in this disorder.

Differential Diagnosis.—From acute nephritis by absence of dropsy or anasarca. From passive congestion by absence of cardiac lesions, and absence of passive congestion of the liver.

In cases where repeated congestions of the kidneys occur

it is wise to suspect onset of renal tuberculosis and take precautions accordingly.

Prognosis.—Almost always favorable, depends on cause; if this is functional, disorder is transitory. In malarial poisoning, or that by irritating diuretics, suppression, uræmia, and death may occur. If the patient was previously nephritic, prognosis unfavorable. The hyperæmia which occurs after surgical operations may prove fatal if continuing long.

Dangers.—Suppression of urine, convulsions, coma.

Dietetics.—Prohibit nitrogenous food; keep patient on thin rice gruel. Avoid all stimulants,

Therapeutics.—Rest in bed. Hot foot-baths. Copious ingestion of hot water. Dry cups to back, with warm poultices. Enema, if there is constipation.

Medical Treatment.—Aconite, cantharis, rhus tox., jaborandi, digitalis. (See ACUTE DIFFUSE NEPHRITIS.) Removal of poison, if of toxic origin, or of irritant. Treatment of the fever and inflammatory disease on which it depends. For threatening suppression of urine, vigorous measures: cupping, active sweating, purging, and saline diuretics (potassium bitartrate; magnesium citrate). Rectal injection of one quart aseptic warm solution of common salt (0.6 per cent.).

If seen early the congestion may often be quickly relieved and function re-established by dry cups and diaphoresis. If the cups are to do good they must be large and must draw hard. A half-pint glass is none too big, and the edge should be coated with a little tincture of benzoin to make it stick. Two large cups to the back, one over each kidney, left on half an hour, will quiet the pulse, relieve pain and check convulsions with a promptness only equalled by venesection. Then, two quart bottles are filled with boiling water. A stocking is dipped in hot water and drawn over each bottle, and one placed on each side of the patient

in bed in a warm room. Hot lemonade or flaxseed tea is then given, and profuse perspiration soon follows and should be kept up for a number of hours, till the patient's mind is clear and appetite returning.

After cupping give eucalyptus, in drop doses of the oil, every two or three hours, or twelve minims of the oil in two drachms of Hoffman's anodyne, fifteen drops of the mixture every two hours. In some cases, mercurius dulcis in three five-grain doses, an hour apart, will prove beneficial.

THERAPEUTIC NOTES.

1. Stimulating diuretics in large doses like juniper, turpentine, and squills, should be avoided in acute hyperæmia.

2. Benzoate of lithia in five- to ten-grain doses in lemonade or water, three times daily, is recommended in gouty or lithæmic cases, with abstinence from sugar, starch, and alcoholic beverages.

3. To prevent recurrence of the attacks when there is albuminuria, glonoin $\frac{1}{100}$ grain, and chloride of gold and sodium $\frac{1}{50}$ grain, may be given.

4. In plethoric cases, where cupping fails to relieve convulsions, venesection or veratrum viride, hypodermically, may be tried as a last resort.

5. Codeine, nitroglycerin, and free use of hot salt-water in the rectum are advised in cases of suppression of urine after abdominal section.

6. Terebinthina is especially useful in acute congestion of the kidneys, when there is scanty, dark-colored urine containing blood and albumin. Use potencies.

CLINICAL NOTES.

Acute congestion of the kidneys is a very alarming and often a very sudden malady. The fibrous capsule of the kidney being unyielding, there is not only blood stasis but

pressure and arrest of function, partial or complete, which is soon followed by very grave symptoms. Dropsy may or may not be present, but nearly always there is headache, dyspnœa, scanty urine, deep-seated pain in the back over the kidneys, and certain nervous symptoms which may develop into delirium, coma, and convulsions. A specimen of the urine is tested, and if albumin is found we call the case Bright's disease or nephritis; but convulsions occur in many cases in which no albumin can be found, though the quantity of urine is much below normal. In such cases Rachford has found xanthin and paraxanthin in the urine.

CHRONIC OR PASSIVE HYPERÆMIA.

Synonymes.—Chronic congestion, venous stasis, passive congestion, cyanotic induration of the kidneys, engorged kidney.

Definition.—Engorgement of the renal veins, due to obstruction of the venous current preventing normal escape of blood from the kidneys. Since the renal veins have no valves, whenever cardiac or pulmonary obstruction to the circulation arises, the venous blood is dammed back through the inferior vena cava and renal veins into the kidneys.

Etiology.—Obstruction of the right heart; fatty degeneration and dilatation of the right heart; mitral stenosis or regurgitation; aortic aneurisms, fibrous phthisis; excessive pleuritic adhesions; emphysema; chronic interstitial pneumonia; chronic bronchitis. Seldom in phthisis.

Diseases of the mitral valves the commonest cause.—Less commonly we find it due to contraction or obstruction of the renal veins or of the vena cava below the inosculation of the renal veins; pressure from tumors, thrombi, cicatricial stenoses near by; tumors or fluid in abdominal cavity; thrombosis of inferior vena cava; the gravid uterus.

Morbid Anatomy.—I. *Recent Cases.*—Macroscopically the following:

Kidneys.—Usually enlarged.

Capsules.—About normal. Non-adherent.

Renal Surface.—Smooth congested, purple.

Cut Surface.—Appears succulent but is quite firm; turns deep crimson on exposure to air.

Renal Substance.—Very hard. India-rubber feel.

Cortex.—Slightly thickened, dark. Stellar veins of Verheyen very prominent.

Medulla.—Deeply congested, darker than cortex.

Malpighian Bodies.—Enlarged.

Interlobular Veins.—Prominent, distended.

Venæ Rectæ.—Especially congested and distended.

Pyramids.—Have striated appearance, due to congestion of venæ rectæ.

Summary.—The marked changes are in the medulla, the bases of the pyramids showing marked congestion, the deeply-congested vessels shining prominently between the bundles of uriniferous tubes, causing the tissue to look striated.

Microscopically we find:

Veins.—Much congested, especially the large ones and the interlobular plexuses.

Malpighian Bodies.—Very prominent, Bowman's capsule filled, sometimes distended. Possible rupture of tuft capillaries.

Epithelium.—But slightly altered, swollen, sometimes granular, rarely fatty.

II. *Older Cases.*—Macroscopically we find the following:

Kidneys.—Slightly smaller than normal; slight degree of granular atrophy.

Capsule.—Adherent to nodular surface.

Renal Surface.—Shows small, pale, wedge-shaped patches of dense tissue, inward along course of interlobular veins.

Renal Substance.—Feels almost fibroid.

Malpighian Bodies.—More or less atrophied within the patches.

Tubules.—More or less atrophied within the patches; microscopically we find the widened spaces between the more or less atrophied Malpighian bodies and tubules occupied by an increased amount of connective tissue; the epithelia are granular or fatty; the tubules contain casts and blood-pigment.

III. *Caused by Thrombosis.*—If thrombosis of the renal veins is the cause, we find kidneys greatly enlarged, engorged with blood, and, microscopically, necrosis of epithelium, *i. e.*, loss of granules and nuclei.

Clinical Features.—Dropsy of the feet and lower extremities, dyspnoea, hacking cough; in some cases general cyanosis; abdominal and other veins prominent; valvular murmurs; weak, thready pulse.

The Urine.—The feature is scanty, cloudy, reddish, acid urine of high specific gravity and with sediment of urates.

Albumin.—Small, seldom above second mark on Esbach.

Casts.—Few, small hyaline, with occasionally a few blood-corpuscles in them.

Sediment.—Contains mucus and urates; a few blood-corpuscles; uric acid crystals.

Solids.—Uric acid relatively increased.

Analysis of Urine in a Typical and Fatal Case.—

Volume of urine per twenty-four hours, 450 c.c. (15 fl. oz.)

Day urine and night equal.

Specific gravity 1021.

Urea 23 gm. per liter (11 grains per fl. oz.).

Urea 10 gm. total (160 grains total).

Phos. acid, 3.3 gm. per liter (1.55 grain per fl. oz.).

“ “ 1.48 gm. total (22 grains).

Uric acid, 0.9 gm. per liter (0.4 grain per fl. oz.).

“ “ 0.4 gm. total (6 grains).

Urea to uric acid, 26 to 1.

Albumin, trace.

Sediment: numerous hyaline casts, occasional granular casts. (See writer's new book on *Urinary Analysis*, for cuts.)

Patient male, 60 years of age, dropsical in lower extremities and afflicted with dyspnoea. Died in two months after

this analysis, but whether nephritic or not, at the time, is not known.

Differential Diagnosis.

PASSIVE HYPERÆMIA.	CHRONIC INTERSTITIAL NEPHRITIS.
Albumin, small.	Albumin, small.
Casts, few hyaline.	Casts, few hyaline.
Volume of urine, decreased.	Volume of urine, increased.
Color, dark.	Color, pale.
High specific gravity and grains per ounce of solids.	Low specific gravity and poor quality of urine.
Abundant sediment.	Scanty deposit.
<hr/>	
Dropsy early.	Dropsy late.
No high tension.	Signs of high tension.
No visual disorders or chronic uræmia.	Visual disorders and chronic uræmia.
Cyanosis.	No cyanosis.
Nocturnal micturition not common.	Nocturnal urination the rule.

CLINICAL NOTES.

1. Dyspnoea on exertion is one of the earliest symptoms.
2. The urine usually decreases when œdema of the feet and legs appears.
3. Acute exacerbations due to excesses, indigestion, sudden exposure to cold, occur. The urine then is highly albuminous, with blood and blood casts.
4. Intense dropsy and almost complete anuria is not necessarily fatal in this disease.
5. Temporary improvement often occurs, but relapses are common.

6. Complication of chronic nephritis is possible if the disease last long enough. Granular casts then appear and remain. Patient may then die in a few days from uræmia.

Prognosis.—That of the primary disease. Essentially incurable, and depends on the degree of compensation for the mitral defect by hypertrophy of right ventricle. When fatty degeneration or dilatation takes place, death within

a few months. Effective compensation may relieve patient for several years.

Tendency to acute intercurrent nephritic attacks is an unfavorable sign.

Dangers.—Exhaustion from dropsy; pulmonary apoplexy; heart failure.

Treatment.—*General.*—Avoidance of what, to patient in question, is an excess, and particularly *sudden* exposure to cold; have warm clothing, and rooms comfortably heated.

Medical Treatment.—Relieve dropsy with digitalis, caffeine, and strophanthus;* then give phosphate of strychnine or nux vomica and phosphoric acid for a long period of time. Caffeine in four- to eight-grain doses during the day, and paraldehyde, in capsules, in two or three doses of ten or fifteen drops each, at night, for relief of dropsy, dyspnoea, etc.

Diuretin in fifteen-grain doses four times daily, increased to seventy-five or even one hundred and twenty grains daily, for the dropsy. Occasionally causes gastric symptoms. Should act in a few days, if at all. Essence of pepsin prevents gastric irritation by this drug. Convallaria and phosphorus for rapid heart action. Alcoholic stimulants and cardiac ones together when there is dilatation of the right side of the heart or fatty degeneration. Adonidin, digitalin and digitoxin are powerful cardiac remedies, especially digitoxin in doses of from $\frac{1}{250}$ to $\frac{1}{125}$ of a grain.

THERAPEUTIC NOTES.

1. Van Allen finds elixir of coca a great help to the action of digitalis and other diuretics in cardiac dropsies.

2. Physicians who believe in appreciable doses adopt the routine of giving, first, cardiac stimulants (digitalis, convallaria, strophanthus, caffeine, nitroglycerin), until relief

* These are said to work better together than separately.

is obtained, when a systematic course of heart-tonics (nux vomica, strychnine, phosphoric acid, phosphate of strychnine) is given.

3. Strychnine in the large doses now fashionable ($\frac{1}{30}$ to $\frac{1}{25}$ grain) may produce headache, in which case McNutt advises nux vomica and phosphoric acid instead.

4. Instead of digitalis, the active principles digitalin and digitoxin are sometimes used. The latter is given in minute doses, $\frac{1}{250}$ to $\frac{1}{125}$ of a grain.

5. Instead of adonis the principle adonidin in one-eighth grain doses is sometimes used.

6. The benzoate of sodium and caffeine in two- to four-grain doses, six to eight times daily, is recommended by Pavinsky in chronic renal hyperæmia and passive congestion of the liver.

The writer has lately seen a number of cases in which cardiac, hepatic, and renal symptoms existed at the same time. The utmost difficulty has been experienced in managing these cases, the necessity for attention to every one of the organs being seemingly equal.

CLINICAL CASE.

In one case of this disease, which the writer saw, with rapid, violent heart-action, cardiac remedies alone failed to relieve either in small or large doses. Hyperæmia of the liver followed, with bile in the urine. One-tenth grain doses of the mild chloride of mercury hourly for ten hours, followed by a dose of Rubinat water for one day, no medication the next day, with repetition of the mercury on the third day, and on the fourth day a prescription of digitalis, cactus, and caffeine combined, brought the heart down to 84 and relieved the violent action.

CHAPTER XII.

ACUTE NEPHRITIS.

Synonymes.—Acute Bright's disease, acute catarrhal nephritis, acute desquamative nephritis, acute parenchymatous nephritis, acute diffuse nephritis, acute croupous nephritis, glomerular nephritis, glomerulo-capsular nephritis.

Definition.—The term acute is generally applied to an inflammation of the kidneys lasting less than six months. If the disease lasts longer, it is chronic. *Acute diffuse nephritis* is the term used when the inflammation involves more or less confluent localizations in the kidneys, separated from one another by intervals of healthy tissue. *Catarrhal* or *desquamative* nephritis when the tubules are plugged with epithelia, escaping from the apices on pressure. *Glomerular* nephritis when the glomeruli project as pale-gray points. *Croupous* nephritis when there is coagulable exudation in the interstitial tissue. *Bacterial* nephritis when there is plugging of the tubular canals with accumulation of bacteria. *Glomerulo-capsular* nephritis when Bowman's capsule is thickened and the lining epithelium swollen and desquamated.

Etiology.—Acute nephritis is of (a) infectious, (b) septic, (c) toxic origin, sometimes (d) due to pregnancy, and sometimes (e) follows exposure to cold or is due to unknown causes.

I. *Infectious Origin.*—Secondary to all the acute infectious diseases, principally *scarlet fever*; also, to diphtheria, infectious sore throat, cholera, typhoid, small-pox, erysipelas, cerebro-spinal meningitis, typhus, pernicious malaria, dysentery, epidemic influenza, and even whooping-cough,

mumps, measles, and chicken-pox; to chronic infectious diseases, as tuberculosis, malaria, syphilis.

Due to passage of soluble specific virus through the kidneys, *i. e.*, products eliminated by pathogenic microbes.

The nephritis of acute articular rheumatism and pneumonia is classified under this heading.

II. *Septic Origin*.—Morbid processes combined with sepsis, suppuration and inflammation; surgical affections, pyæmia, septicæmia, puerperal fever, diphtheritic and valvular endocarditis; certain skin diseases, eczema, acute pemphigus; inflammatory conditions of the lower urinary passages.

The nephritis from severe burns is classified under this heading.

III. *Toxic Origin*.—Due to poisoning by cantharides, turpentine, copaiba, cubebs, mineral acids, oxalic acid, carbolic acid, nitre, potassium chlorate, potassium chromate, potassium iodide, phosphorus, arsenic, corrosive sublimate, oil of mustard, scilla, salicylic acid and coal-tar products, boracic acid, opium, sharp condiments. External applications of carbolic acid, iodoform; frictions with tar, storax, Peru balsam, petroleum, naphthol, chrysarobin, pyrogallic acid, and various ointments for scabies and psoriasis. Pto-main poisoning, as in violent gastritis and intestinal catarrh, is also classified under this heading.

IV. *Other Conditions*.—Acute nephritis is also known to follow sudden chilling, as when a person breaks through ice; exposure to cold and wet, as in battling with snow or wading; and it also occurs in the course of pregnancy.

Morbid Anatomy.—Varies greatly with severity and duration of the disease, and localization of changes. Several fundamental types and varieties of kidneys exist, besides combinations.

In severe cases we may find the following, macroscopically:

Kidneys.—Increased in size and weight.

Capsule.—Easily separated.

Substance.—Flaccid or brittle.

Surface.—Injected, dotted with punctate hæmorrhages.

Cut Surface.—Shows cortex increased in volume, mottled from an increased opacity or a yellow color of the convoluted tubules, and in hæmorrhagic cases speckled with blood.

Glomeruli.—Injected. Project as translucent, pale-gray points. (Glomerular nephritis.)

Blood-vessels.—Injected.

Pyramids.—Reddish, streaked with opaque-gray lines due either (*a*) to plugging of canals with epithelia (desquamative nephritis), or to (*b*) presence of accumulation of bacteria (bacterial nephritis).

Microscopically we may find the following :

Tubules.—Dilated, from swollen granular, possibly fatty or necrotic epithelia; contain desquamated and disintegrated epithelia, red and white corpuscles, hyaline, granular and epithelial casts, with, perhaps, blood casts.

Glomeruli.—Enlarged, nuclei increased.

Capillary Loops.—Plugged with bacteria or hyaline clumps (glomerular nephritis).

Bowman's Capsule.—Thickened, lining epithelia swollen and desquamated (glomerulo-capsular nephritis).

Summary.—In post-scarlatinal cases we may find changes in the capsule investing the Malpighian corpuscles (Bowman's capsule), *i.e.*, anatomical changes in and about the glomerulus. In the second to sixth week, thickening of Bowman's capsule. As early as the first week, masses of corpuscles within and just without Bowman's capsule, rupture of tuft-vessels, hence blood in Bowman's capsule; the epithelia of this capsule and of the tubules swollen (cloudy swelling).

Clinical Features.—The features are usually dropsy, with albuminous and bloody urine. Dropsy may be absent and different combinations of symptoms occur, as follows :

Post-Scarlatinal Nephritis.—(Fourteenth to twenty-second day.) Increased temperature, headache, drowsiness, stupor, myalgia, especially in the back, œdema of face and extremities, anasarca, dropsy, and great dyspnœa; in severe cases, rapid diminution in volume of urine, suppression, coma, and convulsions. Milder cases begin with œdema, dropsy; nausea and slight pain in the back; dimness of vision, waxy pallor, anæmia, vomiting, severe dropsy, drowsiness



FIG. 14.—Acute Diffuse Nephritis. Case of Scarlatina. *a*, swollen endothelium of the glomerulus; *b*, proliferation of lining cells of glomerulus; *c*, compressed vascular tuft; *d*, swollen stroma infiltrated with cells; *e*, dilated convoluted tubules; *g*, swollen epithelium peeling off; *h*, hyaline cast.—(From DELAFIELD and PRUDDEN.)

and stupor follow. Albuminous urine, etc. (See THE URINE.)

Nephritis from exposure to cold or unknown cause: chills, fever, pain in back and in bladder, difficult and frequent micturition, diminished volume of urine, dropsy; in severe cases these initial symptoms are followed by cerebral symptoms, coma or convulsions in from twenty-four to thirty-six hours, albuminous urine, etc.

Nephritis in the course of acute febrile disorders: headache, dimness of vision, drowsiness; stupor, delirium, coma, convulsions if severe, albuminous urine, etc.

Nephritis *in the course* of acute infectious disorders may show itself by œdema, diminished urine, gastric symptoms, headache, dimness of vision, drowsiness, stupor, delirium, coma, or convulsions with the albuminous urine, etc.

Nephritis from poisoning will be noticeable for gastric symptoms, albuminous urine, etc., etc.

CLINICAL NOTES.

1. In some cases the entire clinical picture is that of acute meningitis: fever, prostration, restlessness, sleeplessness, delirium, headache, stupor, typhoid state, with little or no dropsy; absence of albumin, casts, and blood from the urine, but presence of pus.

2. In children: fever, gastro-intestinal symptoms, drowsiness, mild convulsive seizures or simply anæmia may be the only symptoms of an acute nephritis.

3. There may be no symptoms to attract attention except abdominal pain, speedily followed by coma.

4. The dropsy may follow the acute initial symptoms in a day or two and rapidly increase, or may gradually appear during convalescence from the acute infectious disease. Puffiness of the eyelids is usually first noticed, followed by involvement of lower extremities and genitals.

5. The dropsy is most common in (*a*) post-scarlatinal cases, (*b*) those due to malaria, (*c*) pregnancy, and (*d*) exposure to cold and unknown causes, (glomerulo-nephritis); in many infectious cases dropsy is absent (parenchymatous nephritis).

The Urine.—*Micturition.*—Frequent.

Quantity of Urine.—Decreased. In severe cases may be only six or eight fluidounces per twenty-four hours, or suppressed entirely. Frequently less than a pint.

Color.—High-colored, opaque, dirty-red (smoky) from blood.

Reaction.—Acid.

Specific Gravity.—Usually 1020 to 1035.

Urea.—Grains per ounce: increased; grains total: decreased.

Chlorides.—Diminished.

Uric Acid.—Increased, relatively.

Albumin.—Abundant: Fifth mark on Esbach tube, or even much more possible. May be small or even absent at first; may disappear temporarily; may persist after other symptoms disappear.

Sediment.—Abundant: casts abundant; hyaline, epithelial, blood plenty; granular casts present; a few fatty. Blood corpuscles and shadows, pus corpuscles, renal epithelium, uric acid, urates.

CLINICAL NOTES.

1. Glomerulo-nephritis is recognized by the dropsy, large percentage of albumin, and chiefly hyaline character of the casts.

2. Parenchymatous nephritis by the absence of a considerable degree of dropsy.

3. Hæmorrhagic nephritis by the blood and blood-casts in the urine.

4. Cartarrhal or desquamative nephritis by the abundance of renal epithelia and pus corpuscles.

5. Septic and pyæmic nephritis by the bacterial casts and typhoid symptoms.

6. Some cases are, according to Porter, degenerative rather than inflammatory. These cases are marked by absence of blood and of blood-casts.

Prognosis.—Two cases out of three recover.

Favorable Signs.—Urine less dark and less scanty before end of first week, and at end of two weeks quantity of urine not much below normal, and at end of four weeks

but little albumin. A trace of albumin may be present for months and finally disappear.

Unfavorable Signs.—Severe symptoms early in the case: suppression of urine or scanty, bloody urine early. If granular and fatty casts are numerous at end of sixth to eighth week, chronic nephritis is likely to ensue. Numerous pus corpuscles in the sediment are thought a bad sign.

In scarlatinal cases it is noticed that recovery sometimes takes place even when uræmia, anuria, and pulmonary œdema occur; on the other hand, death may unexpectedly occur in spite of apparently unimportant symptoms. On the other hand, Porter holds that the degenerative cases (marked by absence of blood and of blood-casts) are hopeless.

Duration.—Under favorable circumstances recovery takes place in about four weeks; complete recovery is possible even after a year. As a rule, if the disease lasts six months it is to be regarded as chronic.

The Dangers in acute nephritis are (*a*) extension of dropsy to chest with pulmonary œdema, (*b*) anuria and uræmia, (*c*) cardiac failure, (*d*) chronic nephritis with retinitis, (*e*) extensive inflammation of external organs. Removal to a hot climate during or just after convalescence will sometimes prove to be beneficial.

The Important Complications of acute nephritis are pericarditis, retinitis, and serous inflammations, especially peritonitis.

Dietetics.—If urine nearly or wholly suppressed, arrow-root gruel only, no milk. If urine more abundant, milk in small quantity mixed with arrow-root gruel, rice in thin broth, plain rice pudding. In severe cases no meat or fish for two weeks; when severe symptoms subside, exclusive milk diet; mix milk with Vichy water. Sweet potatoes allowable when patient begins to take solid food. Grapes, oranges, and strawberries allowable during convalescence.

During convalescence a farinaceous diet and removal to a hot climate are useful.

Treatment.—Preventive.—In scarlet-fever cases milk-diet throughout the fever, rest and avoidance of the slightest chill will sometimes prevent the onset of nephritis.

General.—Rest, warmth, milk diet; five or six quarts of hot water daily, if stomach tolerates it. Woollens for underwear, night-dresses, etc. Entire skin washed in tepid water, one member at a time, with thorough rubbing, every day. Avoidance of the slightest chill. For severe back-ache, cups (dry) over the kidneys in infectious cases, cups (wet) in cases following exposure or irritant poisoning. Counter-irritation over kidneys.

Medical Treatment.—The remedies now classical in the treatment of this disease are :

Aconite, belladonna, cantharides, terebinthina, apis, digitalis, mercurius cor., ferrum.

Remedies which have been recommended from time to time for various uses are :

Copaiva, oil of sandalwood, pichi, equisetum, ammonium benzoate, aurum muriaticum, jaborandi, sambucus, veratrum album, veratrum viride, glonoin, cactus, strophanthus, apocynum cannabinum, elaterium, magnesium sulphate, arsenite of copper, tartar emetic, bryonia, scilla, rhus toxicodendron, potassium citrate, potassium bitartrate.

Treatment of Early Stages.—Give *aconite*, first decimal dilution, twenty drops in four ounces of water, teaspoonful every one to three hours in early stages, either when there is bounding pulse and hot skin, or tense small pulse and cool surface, with irritable stomach and anxiety.

Give *belladonna*, 1x dilution, in the beginning, when there is fever, headache, vomiting, and scanty, bloody urine.

Give drop doses of tincture of *cantharides* three times daily, increased if necessary to six or eight times daily, after the beginning, when fever has subsided or been

quelled by belladonna, and when the urine is highly albuminous, scanty, bloody, and there are the bladder symptoms of this remedy, tenesmus, etc.

Give *turpentine* in the lower decimals for several days after blood appears, especially if fever, dyspnœa, headache, and other cerebral symptoms are increasing rapidly in severity.

For Later Stages of the Disease.—Arsenic, mercurius cor. and ferrum are the remedies, though mercurius is sometimes serviceable in the early stages of idiopathic cases.

Give arsenic in drop doses of Fowler's solution four to eight times in twenty-four hours in highly anæmic and refractory cases, when patient is feeble, waxy, breathless, distressed, restless, anxious, and has weak, irritable heart.

Give mercurius cor., 3x trit. in *distilled* water, in long-lasting cases, when no dropsy but anæmia, short breath, much albumin in urine, frequent micturition, especially when there is diarrhœa with tenesmus, etc.

Give ferrum in form of Boudreaux's syrup (or pills) of the protochloride of iron, thirty drops four times daily, increased to one or two teaspoonfuls for cases where long-continued anæmia and prostration are the features, and especially when ferrum phos. has not relieved the case. The iodide of iron is sometimes exceedingly useful in acute nephritis.

The Special Uses of the other remedies are as follows :

To Promote Perspiration.—Pilocarpine 2x in two- to five-grain doses every two hours; sambucus tincture ten to fifteen drops every hour, or, better, hot infusion of the flowers; jaborandi 1x dilution, teaspoonful in half-glass of water, of which mixture teaspoonful every fifteen minutes until profuse perspiration occurs; vapor bath and pilocarpine.

For Uræmic Symptoms.—The above, and also arsenite

of copper 2x or 3x, especially when there are convulsions, three grains every half an hour to two hours (Goodno).

For High Arterial Tension, Small Tense Pulse.—In strong patients, veratrum viride 1x; in weaker, chloride of gold and sodium 2x, one grain every hour; glonoin 2x dilution, five to ten drops every two hours.

As Diuretics.—One drachm of cream of tartar in a pint of lemonade; half an ounce to an ounce daily of potassium citrate.

For Dropsy.—Apocynum, elaterium, and Epsom salt. For long-lasting dropsy resisting other agents, diuretin (not in early stages); dose, eight to twenty-five grains a day for children 2 to 5 years old; twenty-five to forty-five grains a day for children 6 to 10 years old; sixty to seventy-five grains a day for adults: in warm water, with sugar.

For Œdema of the Lungs.—Give tartar emetic and arsenicum.

For Serous Inflammations.—Bryonia, cantharides, scillitin, mercurius cor., senega.

For Weak Heart and Soft Irregular Intermittent Pulse.—Digitalis, strophanthus, cactus or adonis (not when pulse is small and hard).

For Severe Pain in the Back.—Pichi, cantharis, and cupping. In “idiopathic” cases after exposure to cold, etc., rhus tox., ten drops of the tincture in four ounces of water, teaspoonful every hour (especially when the hyperæmia subsides and there is not only backache but soreness); oil of sandalwood for backache and highly albuminous urine; pichi when blood is abundant, with numerous epithelial, waxy, and granular casts.

For Mitral Insufficiency with Insufficient Compensation.—Digitalis, followed by diuretin for the ascites and anasarca. Diuretin should be given six days before its use is abandoned.

For Acute Dilatation of the Heart, shown by irregular,

halting action, frequent, thready, fluttering pulse, cold extremities and frequent respirations, pulmonary œdema impending: digitalis tincture four or five minims every three or four hours for a day or two, ceasing for a day or two, and beginning again; or digitalin $\frac{1}{120}$ th of a grain instead; or strophanthus two to five minims of the tincture; caffeine one or two grains, with one or two grains of sodium benzoate; strychnine $\frac{1}{100}$ th grain, or even more, subcutaneously.

For Signs of Collapse, as alarmingly irregular, rapid breathing and cool extremities, tincture of strophanthus as above.

For Diaphoresis, especially in children. Spread the bed with several layers of woollen blankets. While the child is being stripped, wring out a cotton sheet which has been immersed in a bucket of *boiling* water. Spread the sheet quickly on the open blankets and wrap up the child in it, leaving only head exposed. Bring over the blankets and tuck in all around as snugly as possible. Place a cloth wet in *cold* water on the child's head, and leave there. The pack should last from fifteen to twenty minutes to an hour; if the child goes to sleep, leave undisturbed until it awakes. When taken out, give a cool sponging. (Tooker.)

CLINICAL NOTES.

1 Searle, of Brooklyn, thinks mercurius cor. the main remedy for acute nephritis, alternating it with aconite or ferrum phos. and giving warm baths (98° to 100°), prolonged half an hour to an hour.

2. Woodward, of Chicago, often uses merc. cor. in the earliest stages, and ferrum, apis, terebinth, digitalis and nitric acid later.

3. Jousset, of Paris, relies on belladonna, cantharis, apium virus, Koch's lymph (in the more chronic cases), and sometimes iodide of sodium.

4. Hale, of Chicago, in addition to the usual remedies, suggests *oil of sandalwood* and *pichi*.

5. Goodno, of Philadelphia, uses, among other remedies, *aconite* 1x and *cantharides* tincture, and thinks highly of the *arsenite of copper*, 2x or 3x, for uræmia. (Hughes uses the acetate of copper and diaphoresis.)

6. Hughes, of London, uses *cyanide of mercury* in post-diphtheritic nephritis; Blackley, in this disease, advises *arsenicum* and *phosphorus*.

7. Millard (late of New York) used *cantharides* in alternation with the *mercurials* in acute nephritis. He thought *digitalis* one of the most valuable diuretics in acute nephritis.

8. Purdy, of Chicago, advises fluid extract of *convallaria* in three- to ten-drop doses, together with *digitalis*, when symptoms of cardiac hypertrophy are marked.

9. Tooker, of Chicago, praises *diuretin* for removing long-lasting dropsy.

10. T. F. Allen, of New York, finds the *iodide of iron* wonderfully curative in acute nephritis.

11. European observers have of late praised *lactate of strontium*, in doses of fifteen grains six times daily, as a diuretic. It was formerly held that this drug caused albumin to decrease without diuresis. The writer uses the Paraf-Javal solution in smaller doses, at first beginning with five drops four times daily.

12. The writer finds *protochloride of iron* especially efficient in lingering anæmic cases with dropsy and debility, provided there are no contra-indications by way of high tension, coated tongue, constipation, etc.

Inunctions of Pilocarpine.—In acute nephritis following scarlatina, Julia advises rubbing every morning, after dry cupping the dorso-lumbar region, with an ointment composed of three ounces of vaseline and one and a half grains of pilocarpine, afterward covering the region with a rather thick layer of cotton.

THERAPEUTIC SUMMARY.

The balance of testimony is in favor of aconite, belladonna, and especially cantharides, in the early stages, with digitalis where cardiac symptoms are prominent, copper or pilocarpine for uræmia, and ferrum, arsenicum, and the mercurials later. The value of the mercurials alone, in the earlier stages, is disputed, though locality and kind of disorder may be responsible for the variance.

CHAPTER XIII.

CHRONIC NEPHRITIS. CLASSIFICATION. CHRONIC DIFFUSE
NEPHRITIS.

For clinical and didactic purposes we classify chronic nephritis as follows :

I. Chronic diffuse nephritis. Two forms: large white kidney and smooth atrophied kidney.

II. Chronic fibrous (interstitial) nephritis terminating in cirrhosis.

III. Lardaceous or amyloid degeneration or infiltration.

CHRONIC DIFFUSE NEPHRITIS.

Synonymes.—Bright's disease, second stage; chronic croupous nephritis; chronic tubular nephritis; large white kidney; fatty kidney; chronic parenchymatous nephritis.

Note.—This is the disease discovered by Doctor Bright; hence sometimes called "the Bright's disease of Bright."

Etiology.—Occurs more often in men than in women; especially common in those from 30 to 50 years of age.

1. The result of acute nephritis, especially (*a*) post-scarlatinal, (*b*) idiopathic, and (*c*) that of pregnancy.

2. Occurring in the course of chronic anæmia; especially in that due to phthisis, cancer, gastric ulcer, and in pernicious anæmia.

3. Associated with amyloid degeneration of various organs, and perhaps due to the causes of amyloid disease. (See AMYLOID DISEASE.)

4. Arises obscurely and insidiously from unknown causes. Authentic causes are wanting in the greatest number of cases.

5. Malaria, syphilis, exposure to cold and wet, and *alcoholism* are important causes.

6. Due to diseases of the lower urinary tract, especially calculous disorders, purulent cystitis, stricture of the urethra, and prostatitis. It may accompany malignant neoplasms, and the latter escape recognition in consequence.

Morbid Anatomy.—This depends on the duration of the disease and other circumstances. We distinguish two principal varieties of kidneys: (a) *the large white kidney*, and (b) *the small (atrophied) white kidney*; also (c) *amyloid degeneration combined with chronic diffuse nephritis*, giving a still greater pallor to the kidneys, is well known. It is difficult, however, to make during life a precise diagnosis of the anatomical lesion.

Large White Kidney.—Macroscopically we find the following:

Kidneys.—Increased in size and density. Capsule: adherent in spots.

Renal Surface.—Quite smooth, pale, gray, mottled with white or yellow specks seen through transparent film.

Stellulae Verheyenii.—Often conspicuous.

Cortex.—Enlarged.

Cut Surface.—Mottled; due to swelling, opacity, and *fatty degeneration* of epithelium of the convoluted tubules.

Malpighian Corpuscles.—Indistinct.

Punctate hemorrhages appear both on the renal surface and on the section of the kidneys.

Microscopically we find the following changes (not uniformly distributed, but occurring in more or less circumscribed spots):

Glomeruli.—May show changes similar to acute nephritis.

Tubules.—Dilated; contain leucocytes, hyaline and fatty casts.

Epithelia of Tubules.—Fatty, desquamated, disintegrated.

Interstitial Tissue.—Irregularly infiltrated with leucocytes.

NOTE.—When anæmia is a conspicuous symptom, fatty stages predominate over interstitial.

Small White Kidney.—This represents the atrophic stage of the large white kidney, and is due to shrinkage of fibrous tissue and absorption or excretion of the fat.

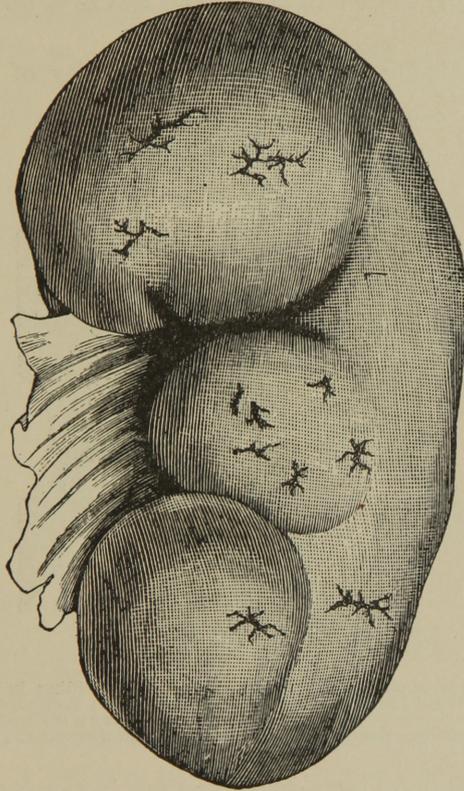


FIG. 15 (a).—Large white kidney showing commencing regression.—(From RALFE.)

Macroscopically we find the following :

Kidneys.—Nearly normal in size, density increased.

Renal Surface.—Smooth or rough, of reddish-gray color, spotted with white or yellow.

Cortex.—Diminished in volume.

NOTE.—It is possible to find extensive atrophy of a limited portion of the organs with compensatory hypertrophy of the remaining parts. The degree of atrophy and contraction cannot always be discovered with the naked eye. Atrophy of the parenchyma may take place with hyperplasia of the connective tissue, giving rise to a *large atrophied kidney*.

Microscopically we find closer proximity of sound and

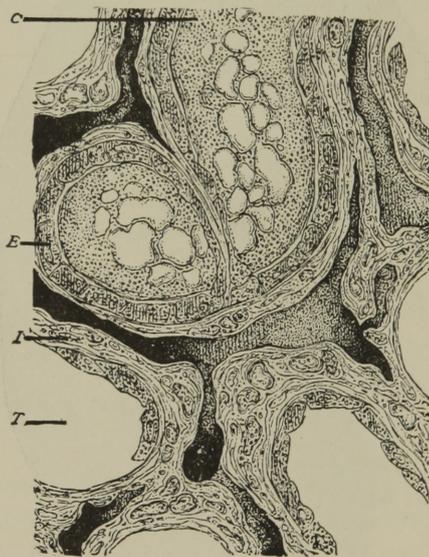


FIG. 15 (b).—Hypertrophy of Kidney.—*C*, granular cast, holding in its centre waxy lumps; *E*, endothelial lining of the tubule around the cast; *T*, empty tubule; *I*, interstitial connective tissue, with injected blood-vessels, holding a moderate number of inflammatory corpuscles. Magnified 600 diameters.—(From HEITZMANN.)

atrophied Malpighian corpuscles than in the large kidney, together with irregular patches of fibrous tissue in which the tubules have disappeared altogether.

NOTE.—There are many transitional and mixed forms and varieties of the fundamental types, especially as regards swelling of the cortex, fat, and hæmorrhagic spots, so that post-mortem examinations frequently cause disappointment in cases where the symptoms during life have been classical.

Clinical Features.—Dropsy, anæmia, debility and digestive disturbances (without obvious cause), together with albuminous urine containing abundant sediment, are the features.

Dropsy.—First puffiness of the eyelids in the morning, swelling of ankles and feet toward night; later progressive, obstinate and general throughout the whole subcutaneous tissue; eventually extreme, and ultimately involving serous cavities, lungs, and brain.

Anæmia.—Face pale, puffy; mucous surfaces pale; extremities and body dough-like.

Debility.—Progressive. Patient feeble, helpless, finally bed-ridden.

Emaciation.—Also progressive, but masked by dropsy.

Digestive Disturbances.—In the beginning loss of appetite and morning nausea; later vomiting before breakfast, diarrhœa. Diarrhœa is, however, not so prominent as in amyloid kidney.

Miscellaneous.—Headache and wakefulness; vaso-motor affections resulting in hyperæsthesia and paræsthesia (“dead finger,” itching, burning, etc.), may be the earliest symptoms of the disease.

Atrophic Stage—Clinical Features.

Heart.—Left ventricle somewhat hypertrophied, and, if disease lasts long, dilated.

Aortic second sound accentuated. Pulse tension increased. Dyspnœa frequent, may be asthmatic in character, due partly to uræmia, partly to pulmonary œdema, or hydrothorax. Uræmic symptoms more severe than in stage before atrophy; dysentery, delirium, coma, convulsions, paralysis, retinitis not so common as in the interstitial form.

After atrophy sets in we find the quantity of urine more abundant, specific gravity lowered, urea deficient, albumin still abundant but not in such enormous quantity as before, casts not so numerous, fatty casts less frequent and waxy casts present.

The following analysis shows the characters in the atrophic stage:

Volume of urine per 24 hours, 2350 c.c. 77 fl. oz.

Day urine, 1150 c.c.

Night urine, 1200 c.c.

Specific gravity, 1010.

Urea per liter, 7.5 gm. ($3\frac{1}{2}$ grains per fl. oz.)

Urea total, 18 gm. (280 grains.)

Phos. acid per liter, 0.65 gm. (0.3 grain per fl. oz.)

Phos. acid total, 152 gm. (24 grains.)

Albumin, 5th mark on Esbach tube.

Casts, plenty; hyaline, waxy, granular, and a few fatty.

Sediment: besides casts, pus corpuscles and epithelia from kidneys and bladder.

The Urine.—*Before atrophy* sets in we find the following:

Quantity.—About half normal, or less than two pints, with marked fluctuations. Night urine, on average, equals, or more often exceeds, day.

Specific Gravity.—Usually below 1020.

Appearance.—Opaque, hazy, dirty.

Color.—Runs from pale to dark-red, according to quantity of urine.

Reaction.—Acid.

Albumin.—Abundant. Seldom less than 3 to 5 in Esbach tube, and often enormous, one to three per cent. by weight, 50 per cent. bulk, or practically filling the whole tube when coagulated. Percentage increases with the specific gravity.

Urea.—Diminished, usually both relatively and absolutely. Seldom normal or above normal per 24 hours, except when dropsy subsides.

Chlorides.—Diminished.

Phosphates.—Usually diminished in ratio to the urea.

Sediment.—*Milky*, abundant; remarkable for variety and number of constituents; all sorts of casts, various in length

and breadth; broad hyaline, dark granular and fatty the characteristic casts. Granular masses numerous; numerous pus corpuscles, disorganized renal epithelia, fat drops, fat crystals, small shreds of connective tissue. Few blood-corpuscles except during acute recurrences.

Differential Diagnosis.—Chronic diffuse nephritis must be differentiated from amyloid degeneration, and the acute exacerbations from acute nephritis. Moreover, the atrophied white kidney must be differentiated from the granular atrophied or contracted kidney:

THE URINE IN

<i>Chronic Diffuse Nephritis.</i>	<i>Amyloid Degeneration.</i>
Urine yellow, hazy.	Urine paler, clearer.
Urinary sediment large.	Urinary sediment small.
Casts and cellular elements numerous; granular and fatty casts as well as waxy.	Casts few; cellular elements not abundant; few large hyaline or waxy casts.
Albumin large.	Albumin large.

THE SYMPTOMS OF

<i>Chronic Diffuse Nephritis.</i>	<i>Amyloid Degeneration.</i>
No history of chronic suppurations.	History of chronic suppurations.
Anæmia.	Sallow bronzed skin; cachexia.
Diarrhœa not prominent.	Diarrhœa prominent.
Liver and spleen not always enlarged.	Liver and spleen usually enlarged.
<i>Acute Nephritis.</i>	<i>Acute Exacerbations of Chronic Nephritis.</i>
No history of dyspepsia, anæmia and œdema before the attack.	Dyspepsia, anæmia and œdema precede the immediate attack.
Dropsy follows the initial symptoms after a day or two.	Dropsy rapidly increases during exacerbation.
Fatty casts not numerous.	Fatty casts numerous or casts contain fat droplets.
24 hours urine much decreased or suppressed.	24 hours urine not so much decreased; anuria generally absent.
<i>Atrophic Stage of Chronic Diffuse Nephritis.</i>	<i>Granular Contracted Kidney.</i>
Sediment fairly abundant; casts found in more or less variety.	Sediment small; casts none or few hyaline.
Percentage of albumin high; 5th mark on Esbach or more.	Albumin small, traces or absent.

Prognosis.—Recovery is possible when the disease is limited to a portion of the kidney, and this explains the unexpected recoveries which every physician sees. Prognosis depends on whether sufficient unaffected kidney remains to keep up the necessary elimination of urine and urea. Long continued obstinate dropsy with scanty urine are unfavorable signs. Sudden increase in œdema or onset of severe uræmia unfavorable. Milder forms (parenchymatous degeneration) may terminate favorably for the time, but develop into severe nephritis subsequently.

Incomplete recovery may take place, *i.e.*, a long pause, with almost entire disappearance of albumin and dropsy. Large quantities of albumin, prolonged decrease in the twenty-four hours' quantity of urine, and increase in the pus corpuscles of the sediment are said to be unfavorable signs, but remissions may take place even under such circumstances. Most writers hold that casts however numerous do not have much influence on the prognosis, yet the author has seldom observed recovery in cases where the long, dark, granular casts are numerous. While complete cures are exceptional, even the most serious cases can sometimes be cured, especially if of malarial or syphilitic origin.

In a large number of cases observed by the writer during seven years, 42 per cent. were dead at the end of that time.

McNutt says as many as 50 per cent. of the cases recover.

If the disease lasts beyond a year, the prognosis becomes, according to Purdy, increasingly gloomy.

Dangers —Emaciation and exhaustion from dropsy and hydræmic conditions of the blood. Œdema of the lungs or larynx. Intercurrent acute inflammations of the lungs or serous cavities, as pleurisy, pericarditis, pneumonia or erysipelas. In atrophied kidney, collapse of the heart, secondary inflammations, general œdema, and finally uræmia, are the principal causes of death.

MISCELLANEOUS CLINICAL NOTES ON CHRONIC DIFFUSE
NEPHRITIS.

1. Charles Heitzmann held that if crystals are found in the urine of chronic diffuse nephritis only one kidney is affected.

2. When the pathological process is limited to one kidney, hypertrophy of the rest of the kidney or of the heart may take place sufficient to compensate, and recovery occur.

3. Cases due to malaria, syphilis, or surgical processes may be treated successfully.

4. The kidneys in this lesion eliminate drugs insufficiently, especially iodide of potassium, quinine, salicylic acid; the formation of hippuric acid from benzoic is said also to be retarded.

5. Whether the odors of asparagus, turpentine, etc., are absent from the urine in this lesion is disputed.

6. Uræmic symptoms in this disease are more commonly those of chronic rather than of acute uræmia, namely: stupor, expression of suffering, headache, cutaneous pruritus, frequent vomiting before or after meals, or when fasting, serious dyspepsia, diarrhœa, and especially asthmatic troubles.

7. Convulsions have been known to follow disappearance of dropsy after hot baths.

8. Dropsy sometimes persists even when violent diarrhœa is present.

9. Habitual abortion (premature loosening of placenta, formation of white nodules) has been observed.

10. An acute hæmorrhagic nephritis may appear during the course of a chronic nephritis, which has not before been apparent in its symptoms.

11. Diseases of the liver and spleen may occur, such as hepatitis, nutmeg liver, lipomatosis hepatis, acute and chronic tumors of the spleen.

12. Striking remissions and intermissions are frequently seen, with disappearance for a time of albumin, casts, and dropsy, and increase of strength.

13. Cases which begin acutely last about three months; those which begin gradually, much longer—a year or more.

14. In rare cases there is no œdema, but periodic renal hæmorrhages of a few days' duration, every week or month, for several years; in the intervals the urine is that of contracted kidney, and there are but few general symptoms.

15. Abortive kinds may exist without symptoms other than granular casts and renal epithelia in the urine; or there may be the usual dropsy, anæmia, chronic dyspepsia, etc. The patients are usually alcoholics, and the disorders may remain stationary or even be partially cured (slight nephritis with circumscribed lesions).

16. A large amount of liquid ingested may not greatly increase the quantity of urine.

17. In extreme cases, when the urine is less than ten fluidounces for twenty-four hours, an enormous quantity of albumin (nearly 5 per cent. by weight) and high specific gravity—1045 to 1050—have been noted.

18. The writer has frequently found the total urea for twenty-four hours but little decreased. Before death, however, in the same cases, a marked decrease took place.

19. The ear is frequently affected in this disorder—otitis interna, pains and noises without evident cause, sudden deafness from labyrinthine affection, remarkable changes in the hearing, etc., are noticed.

20. In rare cases the symptoms are those of cholera nostra, or genuine dysentery, masking other symptoms, save dropsy and albuminuria.

21. As to inflammations of serous membranes, pleurisy is most common, peritonitis next, and pericarditis third.

22. According to Southey, out of 106 cases with dropsy only 38 had uræmia, or 35 per cent. Fürbringer's experience is that only 17 per cent. had uræmia.

23. In large white kidney the urine is hazy when voided; in the secondary atropic stage it is pale and clearer.

24. The disease frequently spares weak patients but carries off vigorous ones.

25. Fürbringer mentions the case of a patient who had remained weeks in uræmic coma, and from whom over fifty quarts of fluid had been drawn by puncture, who nevertheless recovered sufficiently to go about the hospital gardens, the kidneys having gone on to the stage of contraction.

26. Violent hæmorrhages should not be held to indicate an acute rather than a chronic lesion.

27. In some cases dropsy co-exists with an abundant flow of urine.

28. McNutt holds that half the cases recover. In my own observations, covering a period of seven years, out of 127 cases 53 are dead, a mortality of only 41 per cent. thus far. (See Mitchell's new "Manual of Urinary Analysis," page 312.)

Differential diagnosis between the stage preceding atrophy and that of atrophy :

<i>Preceding Atrophy.</i>	<i>Atrophy.</i>
Urine per twenty-four hours averages below normal; color reddish.	Urine not decreased; color light.
Albumin abundant to enormous.	Albumin abundant.
Sediment: Abundant, milky, numerous casts, fatty casts a feature.	Not so abundant; fatty casts less frequent; waxy present.
Uræmia not common.	Dyspnœa and uræmia more common.

29. There are undoubtedly some cases in which the lesion is of a degenerative rather than inflammatory type, especially in cases of toxic origin. Porter distinguishes the degenerative from the truly inflammatory by the absence of blood and blood-casts from the former class of cases. In acute cases of a degenerative character the prognosis is always grave, and in the chronic cases, while an apparent recovery may take place, a fatal termination will finally result. E. M. Bruce, of Chicago, emphasizes these claims of Porter.

CHAPTER XIV.

TREATMENT OF CHRONIC DIFFUSE NEPHRITIS.

General Treatment.—Greatest care in avoiding chilling of the surface. Removal from proximity to large bodies of cold water like the Northern oceans, seas, and lakes. Continuous residence in warm, equable climate. When change of climate not possible, heavy woollen underclothing to be worn day and night. Habitual free ingestion of liquids to promote perspiration.

During the winter patients should be kept in a warm, well-ventilated room, and in recumbent position as much as possible.

Women must stay in bed, or at least in a recumbent position, during the menstrual period.

All over-exertion to be avoided. This is a relative term: comparatively slight exertion may be over-exertion to some patients. Sexual intercourse, use of alcoholic drinks, tobacco, etc., are in the same category.

Bathing.—From ten minutes to half an hour every one to three days in water, temperature of which is gradually raised to 105° F. Rubbing and wrapping in blankets afterwards, but excessive sweating to be avoided.

Robust patients may take vapor baths preferably, with stay, when possible, in apartments where bath is given, until next day; such baths to be taken daily, or once in three or four days, according to strength. If uræmia threatens, twice daily.

Diet in the Less Severe Cases.—The patient may take the following:

1. What he does take frequently, but little at a time.
Soups: Vegetable, sago or vermicelli.

2. Oysters (raw only) and fresh fish, which should not be fried.

3. Meats: Tender beefsteak and mutton chops once a day, but not in very severe chronic cases. The fat portions of steaks and chops to be preferred. White meat of poultry.

4. Vegetables: Green vegetables, except beans and peas; vegetable salads.

5. Farinaceous food: In general, properly-cooked farinaceous foods are allowed. Well-risen bread, well-cooked rice, tapioca, arrowroot, etc.; bread and milk.

6. Desserts: Rice pudding, milk pudding, tapioca pudding. Fruits: Those which are laxative and those not too acid, as ripe peaches, pears, grapes.

In some cases where the symptoms are not urgent, fruit, as, for example, an orange first at breakfast, followed by oatmeal and cream, are advisable. At the noon meal, tender steak, or chops; at night, skim milk and "zwieback."

7. Drinks: *Distilled water*, flavored with lemon juice; such mineral waters as are almost free from solids.

Articles to be Avoided.—The patient should avoid the following:

1. Overloading the stomach; all animal soups.
2. Cooked oysters and fried fish.
3. Meats: all smoked and seasoned meats; ham, tongue, corned beef, sausages, pork; all hashes and stews; turkey, lamb, gravies, eggs.
4. Vegetables: beans and peas.
5. Farinaceous food: heavy, soggy bread; batter-cakes.
6. Dessert: pies, cake, ice-cream.
7. Beer, ale, porter, coffee, ice-water. Hard waters not to be taken, if purer waters can be obtained; the solvent power of hard water is not as great as that of soft.

In general it may be stated that starchy, saccharine and oleaginous articles of food are to be preferred to nitrogenous

ones, and if the patient can do without meat it is advisable for him to drop it, or, if he craves it greatly, to eat fat meat only.

It must be admitted that there are some patients who do not do well on any one-sided diet, but for whom ordinary mixed diet is the best thing. Schreiber actually recommends that patients under ordinary mixed diet eat in addition eggs, either raw or boiled, and meat. Some physicians report success from the use of raw eggs and milk.

Diet in Severe Cases.—Nitrogenous food reduced to minimum, and in many cases a diet consisting solely of two to four quarts of skim-milk per twenty-four hours, taken at short intervals during the day. McBride's milk diet is as follows:

The patient is to take three or four times daily, and at regularly observed intervals, from two to six ounces of skimmed milk.

This must be taken slowly, and in small quantities, so that the saliva may be well mixed with it. The reaction of the milk to test-paper must be neutral or alkaline.

The first week is the most difficult to get over, unless the patient has a strong will.

During the second week two ordinary quarts may be consumed during the day. The milk must be drunk four times daily—at 8 A. M., at noon, at 4 and 8 P. M. The hours may be changed, but regular intervals must be maintained.

If the patient comply with these directions he will complain neither of hunger or thirst, although the first doses appear so very small.

The daily quantity may be increased to eighty or more ounces.

If, after having attained this quantity or more, the patient gets worse, diminish the amount to the quantity used the first week, and increase more slowly.

Constipation at the beginning is a good sign. This may be remedied by warm-water injections, or by the use of castor oil, rhubarb, addition of sugar of milk to the milk, or by taking some bicarbonate of soda at bed-time. If the constipation be obstinate a little coffee may be added to the morning dose of milk, or, towards 4 p. m., stewed prunes or a roasted apple.

If, on the other hand, diarrhœa results, and rumbling of the bowels is frequent, the milk is too rich or is being taken in too large doses.

Feverishness is no contra-indication to its use. If the patient be thirsty, he may drink Clysmic, Bethesda, Poland or Vichy water. If he have a strong desire for solid food at the end of the second or third week he may have a little stale white bread or toasted bread with salt in the morning, and again at 4 p. m. Once a day he may have some soup made of milk and oatmeal.

After continuing this treatment for five or six weeks it may be modified by allowing the milk only thrice daily, and once a day steak or a chop. Raw meat digests most easily and should be used in preference to the cooked, when possible.

It may be necessary to add a little salt to the milk in some cases, and in others to have the milk drunk when very hot. If the patient become flatulent, buttermilk is often beneficial in small quantities.

Notes on Milk Diet.—1. Exclusive milk diet must be abandoned when it causes too great polyuria, when symptoms of anæmia and exhaustion are noticed, and when the albumin is but small in amount. In such cases allow vegetables and farinaceous foods, as oatmeal, cracked wheat, granula, wheatena, and, if the patient still loses strength, a small amount of broiled or roasted meat once daily at early dinner.

2. Milk which has been violently shaken is said to be better tolerated than that which has not.

3. When the stomach is very irritable an ounce of *iced* milk may be given every half hour.

4. When milk is not tolerated, peptonizing it sometimes results in toleration.

5. In some cases malted milk is better borne than milk alone.

6. Kumyss, matzoon, or buttermilk may be substituted partly or wholly for the sweet milk, if the latter is not well taken.

7. The writer seldom finds patients who are unable to take milk when it is mixed with imported Vichy water, beginning with one-third milk to two-thirds Vichy, and progressing to two-thirds milk and one-third Vichy.

8. In one desperate case (a boy of 8) which the author saw, the milk was made palatable by flavoring with vanilla extract and adding sugar. The patient took this with eagerness, though refusing other kinds of milk mixtures, and finally recovered.

9. When the patient is out of danger, arrowroot and rice, together with cereal foods, fat bacon, zwieback, butter, mutton-broth, chicken-broth, clam-broth, and oyster-broth may be allowed.

10. In some cases clam-broth alone has been taken as a diet to the exclusion of milk, when the latter was not tolerated or failed to nourish.

Climatology.—In America portions of California, New Mexico, Texas, and Mexico; California between St. Bernardino and Los Angeles at points where temperature is most even. In the West Indies, the Barbadoes. In Europe, Pau, Cannes, Rome, Naples, Malta, Malaga. In Africa, Algeria and upper Egypt; the dry plateau north of Cape Town.

During the winter in America patients go to Eureka Springs, in Arkansas, to Tallahassee, Aiken, Thomasville, and San Antonio.

Patients from the Mississippi Valley sometimes find the south shore resorts of the Atlantic coasts suitable during the heat of the summer, as Newport, Block Island, and Nantucket.

The writer, however, greatly prefers southern California (continuous residence) for the severe cases. Several of his patients are not only improving there, but able to work at their business or profession, though totally incapacitated at home in the Mississippi Valley. Patients who come home, under the impression that they have recovered, have found it necessary to return, and the severe symptoms subside again in the more equable climate.

Every specialist knows the tendency of exacerbations to set in, coincident with the violent changes of the weather near the Lakes and north Atlantic.

Doctor Waddell speaks highly of Avalon on Catalina Island, off the California coast, as a resort for those with chronic nephritis, especially in summer, the peculiar situation of the town being well adapted for such patients. On the mainland the district including Claremont is suitable.

Mineral Waters.—Those containing sulphate of calcium to be avoided. Use the purer waters, as Poland, Chippewa, or Mus-ki-kee-wa-bo on the one hand, or the mildly alkaline bicarbonate waters of Waukesha, certain of the Eastman springs, etc. The writer knows from experience the diuretic value of Waukesha water, having tested it in a case where the patient collected and measured the 24 hours' urine for 196 consecutive days. On hydrant water this patient voided less urine than water taken; at Waukesha more urine than water taken, the quantity increasing from 25 or 30 ounces per 24 hours to 100 ounces in a short time.

In cases associated with excessive deposits of uric acid the various lithia waters may be taken, as Buffalo, Londonderry, etc.

On the Pacific coast McNutt recommends the Napa Soda, Coronado, and Bartlett waters.

In Colorado the waters of Pueblo have attracted some attention for their efficacy in chronic nephritis.

In Arkansas, the Arkansas lithia, and potash-sulphur.

To attempt to enumerate all the different waters used would take up a volume in itself.

For mixing with milk the writer prefers the Célestins (Vichy) water, especially in the case of "high livers" and gouty patients.

CHAPTER XV.

CHRONIC DIFFUSE NEPHRITIS: GENERAL MEDICAL TREATMENT.

THE standard remedies are cantharis, merc. cor., apis, arsenicum, and ferrum. Lactate of strontium should not be forgotten. "Give cantharis in drop doses of a good tincture three times daily, gradually increasing to ten times a day, if necessary, when the urine is scanty, highly albuminous, micturition frequent and perhaps painful, stomach irritable, and dropsy general.

"Give merc. cor. (one or two drops of the 3x dil. every three hours) after the dropsy subsides, when the patient is still anæmic, urine highly albuminous and still rather scanty, stomach and bladder irritable; especially valuable in syphilitic cases."

Give ferrum in form of Boudreaux's syrup or pills of the protochloride of iron for cases where protracted anæmia and debility are the features without excessive dropsy, but not when there is high tension or digestive disturbances. Ethereal tincture of the chloride of iron, dose five to ten drops, three to six times daily, or Basham's mixture (acetate of ammonium and iron) may be used in teaspoonful doses or more. The writer has found that, when the above preparations are not well borne, Hensel's iron does admirably well. Peptonates and vegetable irons are also now much in vogue.

"Give arsenicum (drop doses of Fowler's solution three times daily, gradually increased, if necessary, to five drops) in cases due to malaria; when there is tendency to hydrothorax or the usual symptoms calling for this drug, as weakness, restlessness, anguish, thirst for small quantities, dark, cloudy urine, nausea, anasarca, headache.

“ Give apis (apium virus, 3x trit.) when œdema of the lids and scanty or suppressed urine are prominent in acute intercurrent attacks; or when much albumin persists with but few casts after other symptoms are cured.”

Give lactate of strontium when the above drugs fail, especially if merc. cor. fails to reduce the albumin after subsidence of dropsy under cantharis. In connection with a diet of milk mixed with Célestins Vichy, this drug sometimes acts well, and is worth trying. Use the Paraf-Javal solution, beginning with small doses, five drops four times daily, and increasing rapidly, if tolerated by the stomach.

THERAPEUTIC NOTES.

1. Aconite and mercurius may be required in acute intercurrent attacks.

2. Nux vomica and nitric acid are of service when gastric symptoms are conspicuous.

3. Phosphoric acid (2x dil.) should be given when there is excessive loss of flesh and mental and physical debility.

4. Chlorate of potassium is suggested by Goodno in rapidly progressing cases where anæmia, breathlessness, palpitation, scanty urine and marked albuminuria are features.

5. Hughes thinks turpentine the leading remedy in cases where an acute intercurrent attack follows exposure to cold; and Carter advises it, in doses not greater than five minims of the oil, in cases where albumin and blood keep recurring as soon as patient gets up and moves about.

6. Apocynum, aurum, digitalis, jaborandi, and glonoin are of the utmost value in certain special cases described further on.

7. Helonias, hellebore, antimony, belladonna, cuprum, potassium iodide, scilla and stramonium may occasionally be needed; so also erigeron, millefolium, coccus cacti and pichi.

8. Not infrequently thorough washing out of the kidneys accomplished by ingestions of large quantities of water does great good. In one or two cases, which the author has seen, ten to twenty glasses daily of the still Londonderry lithia water produced decided amelioration, albumin, casts and crystals diminishing in marked degree, and not increasing again after the quantity was lessened. Geneva water has also done the same thing in other cases.

9. Searle, of Brooklyn, advises Carlsbad sprudel in cases where uric acid crystals are numerous. The liver disorder must be corrected before the usual remedies, as merc. cor., can be effective in their action on the kidneys.

10. In a case complicated by pregnancy and miscarriage the same writer gave bromide of arsenic 3x from April to Dec., until casts disappeared and volume of urine became normal, a trace of albumin only remaining.

11. Hengstebeck advocates the following treatment of renal dropsy: apisin 5x, one dose every hour, or acetic acid 5x. The latter he thinks unjustly neglected, and that it stands midway between arsenicum and apis. If there be increased thirst and gastric symptoms think of arsenicum album 5x, phosphorus 5x, calcarea arsen. 4x, the ferrocitrate of quinine 3x; when there is considerable anæmia blatta orientalis 2x, coccus cacti 2x. Hot baths, wet packs and regulation of the bowels with podophyllin, leptandrin, sulphur and nux are also to be used.

12. The late Dr. H. B. Millard was a believer in the following treatment: The patients are placed upon full doses of the iodide of potassium, and in addition take Fowler's solution in large doses, with corrosive sublimate; or, in other cases, the protiodide and biniodide of mercury. He regarded mercurial preparations as absolutely indispensable, and used with great success ergotinine, caffeine, strophanthus, sparteine, arsenic and the various preparations of iron. He also believed nitroglycerin and strontium to

be of similar value. If uric acid existed in excess he neutralized it by means of Vichy, Vals or similar waters, and also employed piperazin-water with phenocol.

He sent his patients to Evian, Vichy, or Royat, and if the hepatic functions were greatly deranged, to Carlsbad, Marienbad or Vichy.

13. Reni-puncture is advocated by Reginald Harrison when the kidneys are in a state of tension. He advises operation in two groups of cases: first, when death is imminent from lesion, grave from the onset, with more or less suppression of urine; and, second, in those cases where the direction is not toward recovery, albumin does not decrease, casts persist, and the urine is below normal in quantity. Saundby thinks reni-puncture suited only to cases of localized albuminuric kidney, often unilateral at first, and frequently the result of latent ascending ureteral changes.

14. To prevent uræmic convulsions Searle gives one-half pint of lemon juice each twenty-four hours, in divided doses mixed with water.

CHAPTER XVI.

SPECIAL TREATMENT OF THE TROUBLESOME FEATURES OF
CHRONIC DIFFUSE NEPHRITIS.

Special Medical Treatment.—Cases of moderate severity, if taken in time, will sometimes yield under treatment already described, and either a relative cure take place, or occasionally an absolute recovery. Obstinate cases resisting general treatment develop special features, which imperatively demand special therapeutic measures, though the relief obtained be but temporary. Even in these severer cases recovery sometimes takes place when least expected.

Troublesome Features.—The special features likely to cause trouble are, in usual order of frequency, the following:

1. Dropsy.
2. Dyspnœa.
3. Circulatory and cardiac troubles.
4. Gastro-intestinal disorders.
5. Uræmia (convulsions).
6. Renal hæmaturia.
7. Persistent albuminuria.

Treatment of Dropsy.—The methods by which dangerous dropsy may be reduced are the following, in order of efficacy:

1. By sweating and purging (diaphoresis and catharsis).
2. By stimulating the kidneys (diuresis).
3. By increasing the activity of the circulation.

Diaphoresis.—Hot baths, vapor or dry, alcohol sweats, jaborandi.

Sweating may be brought about by the warm bath, as already described, by the vapor bath, hot-air bath, or alcohol sweat.

Alcohol sweats are given by saturating flannels with 50 per cent. alcohol, wrapping them round a jug of hot water, and also round hot bricks. The water-jug is placed under the patient's flexed limbs, and the bricks at his side, not near enough to burn. All, including the patient, are wrapped in flannels.

Vapor baths or hot-air baths are not always well borne by feeble or elderly patients. Warm baths, as already described, are safer.

The drugs which promote sweating are jaborandi (1x dil.) or pilocarpine (2x trit.) in 2- to 5-grain doses every 2 hours. In robust patients the vapor bath, followed by use of pilocarpine, is most efficacious.

Purging may be accomplished by giving tablespoonful doses of a saturated solution of Epsom salt every 3 or 4 hours, or by giving two tablespoonfuls of the salt itself, dissolved in half a glass of water, at 7. A.M. and 4 P.M., for 5 or 6 days, if necessary, or by giving a tablespoonful of Rochelle salt mornings before breakfast in cases more amenable to treatment.

Obstinately constipated cases may require $\frac{1}{10}$ grain of elaterium at night, or $\frac{1}{20}$ grain to $\frac{1}{8}$ grain every four hours till free watery stools are produced. Moreover, this drug is in some cases less weakening than massive doses of salts.

REDUCTION OF DROPSY BY STIMULATION OF THE KIDNEYS.

Apocynum, diuretin, potassium bitartrate, mercurius dulcis, apis, sambucus, kava-kava, juniper.

The most efficient and reliable diuretic is apocynum, in doses of 10 or 15 drops of a watery infusion of the green root every two hours, or of a tincture or a good fluid ex-

tract, 3 to 10 drops, four times daily. It is less irritating when given in chloroform water. Potassium bitartrate in doses of from 30 to 60 grains, or even more, 3 times daily, in a pint of lemonade; mercurius dulcis in $\frac{1}{10}$ -grain doses every hour for a day, followed the next morning by a dose of Rubinat water, acts practically as a renal stimulant; or in more urgent cases 1 to 2 grains of the crude drug every 2 or 3 hours till copious, thin, bilious stools are produced; diuretin (salicylate of sodium and theobromine) in 15-grain doses, four times daily (increased to 20 if the stomach tolerates it) until urine is increased in quantity or for six days (dose may be increased to 120 grains a day when elixir of pepsin is used). Supplement its action with digitalis and strychnine.

Apis, collinsonia, sambucus, kava-kava and juniper are also of use as diuretics, and should not be forgotten when other means fail. Instead of the bitartrate of potassium that of lithium now finds considerable favor in cases where uric acid is supposed to play a part in aggravating the disease.

CLINICAL NOTES ON DROPSY.

1. In one case which the author saw the dropsy was reduced by a mixture containing one fluidounce of the fresh alcoholic tincture of apocynum, two fluidounces of the fluid extract of stigmata maidis (corn-silk) and three fluidounces of the detannated syrup of wild cherry; dose, usually one teaspoonful every three to six hours; in this case (adult, male), every two hours.

2. Epsom salt in doses of two tablespoonfuls at 7 A.M. and 4 P.M., given in half a glass of water for five or six days, proved efficacious in the case of a robust adult which the writer saw with Dr. White.

3. When the dropsy is from heart-failure, purging is dangerous, and is known to precipitate convulsions or coma.

4. In the writer's experience, dropsy that refuses to yield

to any but heroic measures will usually either return after removal, or the patient will succumb in other ways; but exceptions occur, hence the utility of the measures.

5. In one case, regarding which the author was consulted, dropsy disappeared under use of apis and sambucus.

6. In the treatment prescribed by Dr. T. E. Roberts several years ago, forty drops of paraldehyde at night every hour for three hours, followed next day by citrate of caffeine, one grain every four hours, relieved dyspnœa, increased urine, and reduced dropsy. Patient alive and in good condition at date (1897).

7. Digitalis is said to work better in some cases when combined with adonis vernalis; when digitalis is not well-borne, adonis and convallaria may be given. The dose of digitalis in infusion is forty to sixty minims every six hours; of the tincture, one to four minims every six hours; of adonis, ten drops of the fluid extract every four hours; of convallaria, fifteen minims of the tincture.

8. Scoparius tincture in fifteen-drop doses, diluted with water, is given every three hours in the chronic cases, but is not deemed suitable for the acute attacks. Infusion of scoparius: dose, one to two fluidounces four times daily.

9. Dr. R. H. Fitz, of Boston, says that in desperate cases, after failure of other remedies, a pill of calomel, squill, and digitalis, one grain each, is sometimes effective.

10. Pilocarpine has a diuretic effect in some cases in doses of $\frac{1}{20}$ of a grain every two hours. Follow with digitalis, if necessary.

11. Owing to the irritant character of apocynum, the writer prefers to give it in smaller doses every two hours rather than in large doses four times daily.

CASES FROM PRACTICE.

1. In one case, male, 45, Bœricke & Tafel's tincture of apocynum, one fluidrachm in half a glass of water, tea-

spoonful every two hours, reduced the dropsy, and the patient had such a remission of symptoms as to be able to enjoy life like well persons for a period of some months.

2. In another case given up by attending physicians the fluid extract (Parke & Davis) of apocynum, in ten-drop doses, reduced the dropsy, and the patient is alive to-day, after several years.

3. In the case of an elderly man, dropsical, and with both albumin, casts and a trace of sugar in his urine, the following treatment, continued two months, reduced the dropsy, caused albumin to disappear, and relieved subjective symptoms: diuretin and Epsom salt irritated the stomach and weakened the patient, who was then put on elaterium, apocynum, and strychnine. Infusion of apocynum was at first used, but as it seemed to irritate the bladder, recourse was had to the tincture. The dosage was as follows: elaterium one-tenth grain in tablets, two in the early morning; apocynum tincture, at first seven drops, three times daily; later reduced to three drops, three times daily; strychnine $\frac{1}{100}$ th grain night and morning.

The elaterium brought about eight to fifteen free movements of the bowels daily, to the relief of the patient, the dropsy, which was causing great pain in the limbs, subsiding gradually, until in two months it was practically gone. Of late the patient has had arsen. iod. 3x and kali. mur. A trace of sugar still remains in the urine, which is normal in quantity and specific gravity and free from all but a trace of albumin.

4. Digitalis combined with cactus and caffeine relieved violent heart action and reduced dropsy in the case of a middle-aged woman which the author saw. The prescription made by the attending physician was tincture of digitalis, one and one-half fluidrachms, cactus tincture, one and one-half fluidounces, citrate of caffeine, thirty grains, in water to make four ounces; teaspoonful every four hours.

This case, however, was a cardiac one with hepatic complications later, and cannot be held to prove the value of these drugs in nephritis.

5. Several years ago Dr. Thomas E. Roberts relieved dropsy and dyspnœa by giving forty drops of paraldehyde, hourly in the evening for three hours, followed next day by citrate of caffeine, one grain every four hours. Patient alive and in good condition to-day (1897).

6. Dr. Vaughn has given me particulars of a supposed hopeless case (male) in which subsidence of dropsy and recovery took place in a few weeks under the following treatment: antiphlogistine was applied to the region of the kidneys, fresh every twenty-four hours; protonuclein in doses of one tablet every two hours was employed. Arsenicum 3x and baptisia were also given alternately.

REDUCTION OF DROPSY BY USE OF HEART-TONICS OR STIMULANTS.

Secondary heart failure may prevent efficient diuresis, so that cardiac tonics or stimulants may be needed: Sparteine, corn-silk, caffeine, adonis, strophanthus, strychnine.

Give sparteine in one-grain doses of the first decimal trituration every three hours, or five grains of the second decimal every two hours; or fluid extract of corn-silk ten to twenty drops every two hours; or citrate of caffeine in four- to eight-grain doses every four hours (alone or combined with paraldehyde at night); or ten-drop doses of adonis vernalis four times daily; or strophanthus in doses of two to five minims of the tincture. Strychnine, night and morning, $\frac{1}{100}$ th of a grain in addition to catharsis and diuresis.

TREATMENT OF DROPSY BY PUNCTURE.

If the dropsy resists all treatment, after delaying as long as possible puncture the legs above the ankles or make several moon-shaped incisions just below the internal

malleolus. The incisions may, however, never heal, and, as in the case of bursting, the dripping prove a serious burden to the already weakened patient.

ŒDEMA OF THE GLOTTIS AND LUNGS.

Apium virus or pilocarpine, the latter in doses of one-thirtieth to one-twentieth of a grain every two hours.

THE TREATMENT OF DYSPNŒA.

The chief remedies are as follows:

Quebracho, glonoin, the nitrites, caffeine and paraldehyde, apocynum and oxygen, strychnine. When the heart is weak, give ten-drop doses of the tincture of quebracho every half an hour, or strychnine in doses of $\frac{1}{100}$ th of a grain four times daily. In desperate cases hypodermics of strychnine. When the dyspnœa is due to vaso-motor causes (high tension), give aurum (chloride of gold and soda) in doses of ten drops of the second decimal dilution, gradually increased to twenty, glonoin, or the nitrites.

Glonoin is given in one two-hundredth of a grain at first, increased, if well borne, to one twenty-fifth, or even one-quarter grain, three times daily. The nitrites (sodium or potassium) in doses of from one to five grains of the first decimal. Potassium-cobaltic nitrite, dose one-eighth to one-half grain. Caffeine and paraldehyde as already described.

Apocynum infusion in one dose of two teaspoonfuls in gelatine capsules, followed by a cup of hot milk and inhalation of oxygen.

CLINICAL NOTES ON DYSPNŒA.

1. Apocynum and oxygen relieved in two hours a serious attack of dyspnœa in a case which the author saw. Ozonic ether has been used successfully, it is claimed, in some cases.

2. Jaborandi sometimes relieves dyspnœa by promoting elimination.

3. Thirty-drop doses of a 3 per cent. solution of ethyl nitrite is advised by Leech.

4. Cardiac asthma may be relieved, according to Babcock, by hypodermic injections of one-sixth to one-eighth of a grain of morphine combined with one-twentieth of a grain of atropine.

5. Instead of quebracho, aspidospermine in doses of one-tenth grain every half-hour may be used.

6. In a case in which great dyspnoea and dropsy were the features, with hypertrophied and dilated heart, emphysema, hypostatic congestion of the lungs, and slight hydrothorax, paraldehyde in doses of forty drops every hour at night for three hours, followed by citrate of caffeine in one-grain doses the next day every four hours, relieved dyspnoea, allowed sleep, and diminished œdema. The dose of the paraldehyde was varied from thirty to fifty drops. The best way to give it is to mix the dose with equal parts of alcohol and to add one ounce of water. (Thomas E. Roberts.)

TREATMENT OF VARIOUS CARDIAC AND CIRCULATORY TROUBLES.

We find in chronic diffuse nephritis high arterial tension, with headache, due rather to toxæmia than to arterio-sclerosis. If this is of vaso-motor origin give glonoin, the nitrites, or the chloride of gold and sodium, in doses as above for a week or two; then suspend action for a day or two to see if the good effect persists. (Hale.) If due to hepatic causes, give euonymin or mercurius dulcis. The writer has noticed that in some cases jaundice and enlargement of the liver do not appear until late in the case, so that if glonoin or the nitrites fail to relieve, euonymin or mercurius dulcis must be used promptly.

Give mercurius dulcis in one- to ten-grain doses of the first decimal trituration every two hours, or in urgent cases

2 or 3 doses of five grains of the crude drug; euonymin in doses of from $\frac{1}{100}$ to $\frac{1}{10}$ grain, four times daily, together with morning and evening use of Carlsbad sprudel salt or phosphate of soda.

Some cases not affected by above treatment yield to *veratrum viride* in ten-drop doses of the second decimal dilution, increased in a few days to the same dose of the first decimal, every two or three hours, until pulse is large and soft.

Dilatation of the Heart. — Symptoms are galloping rhythm, shortness of breath; scanty, highly albuminous urine and localized dropsy; *digitalis* in 5 to 10 drops of the tincture once in six hours; *convallaria* in like dose; *cactus* in like dose, or as high as twenty to thirty drops plus $\frac{1}{100}$ grain strychnine. (Hale.)

TREATMENT OF GASTRO-INTESTINAL DISORDERS.

In some cases persistent nausea or violent vomiting is a feature. Clam broth should be tried; ice, Vichy and milk, or iced milk, pilocarpine first decimal dilution, and apomorphine fourth decimal trituration, when there is deadly sickness and fear of death. A favorite prescription with the writer is fluid extract of ergot four drops, chloroform five drops, in one teaspoonful of water, used successfully by Dr. L. G. Bedell in one case which the author saw with her.

Bismuth, creosote and arsenite of copper are sometimes sufficient to relieve the distress. *Nux vomica*, nitric acid, *ipeacac* and *pulsatilla* are also to be thought of.

Severe diarrhœa may be moderated by arsenicum, arsenite of copper, *veratrum album* or *croton tiglium* in the third decimals. It should not be checked too quickly.

TREATMENT OF URÆMIA.

Scanty, high-colored urine with granular casts and albumin: one fluidrachm of *jaborandi*, first decimal dilution

in half a glass of water, teaspoonful every fifteen minutes until perspiration is marked, then every hour for forty-eight hours. Follow with tincture of digitalis, fifteen minims in half a glass of water, teaspoonful every hour, until heart's action is improved. If albumin remain abundant and urine still not abundant, give lactate of strontium in five- to ten-grain doses four times daily. In the writer's experience, jaborandi, given as above, followed by digitalis, is not dangerous even in chronic nephritis. In severe cases, when patient is unconscious or in convulsions, a hypodermic of $\frac{1}{12}$ grain pilocarpine, followed in three hours by another, and in twenty-four hours enough to make one-third of a grain, has proved efficient. When the patient is conscious and has perspired freely, the pilocarpine may be given in tablets, making in all $\frac{1}{12}$ of a grain a day for a few days afterwards, until danger is past. But the writer prefers always to supplement the treatment with digitalis.

In chronic poisoning of long standing, milk diet, laxatives and the hot-air bath is about all that the patient can stand when his kidneys have become incapable of performing their functions.

In the last stages of uræmia and eclampsia Dumarest advises intra-muscular injections of saline solutions.

In a case (elderly male) where the symptoms were uræmic (dizziness and great prostration) the writer prescribed lactate of strontium in ten-grain doses and farinaceous diet; Célestins Vichy and milk; albumin, which for several weeks had been 11 to 16 per cent. bulk (ferrocyanic, centrifuge), was reduced to 4 per cent. in a week, with great improvement in general condition. Patient is at present writing, a year later, in quite as good health as usual before the attack.

TREATMENT OF EXCESSIVE RENAL HÆMORRHAGES.

In the writer's experience (confirmed by Dr. McMichael, of New York) in many cases tincture of thlaspi bursa pas-

toris in thirty-drop doses, four times daily or oftener, will stop excessive flow of renal blood when other agents fail. Its use may need to be kept up for several weeks. Other remedies are turpentine, erigeron, millefolium, coccus cacti, and pichi, to say nothing of the crude astringents trillium, geranium (fifteen to thirty drops), hamamelis (thirty to ninety drops), gallic acid (two to ten grains), and ergot (three grains of the extract).

TREATMENT OF PERSISTENT ALBUMINURIA.

Mercurius cor., third decimal; strontium lactate, five to fifteen grains; gallic acid (two to ten grains); Hensel's tonic. Cases occur in which no drugs appear to be of value.

CHAPTER XVII.

THERAPEUTIC SUMMARY: CHRONIC DIFFUSE NEPHRITIS.

THE treatment of the various features in alphabetical order may be summarized as follows:

Albuminuria (persistent).—Mercurius cor., strontium lactate, cantharis, potassium chlorate, chloride of gold and sodium, turpentine, euonymin, helonias, protochloride of iron, oil of sandalwood, copaiva, tannate of sodium.

Anæmia (persistent).—Iron: peptonates, protochloride, Hensel's ethereal tincture, Basham's mixture, ferrum phos., waters containing iron and arsenic.

Bronchitis.—Merc. cor., arsenicum, kali bichrom. (third decimals).

Cardiac and Circulatory Symptoms.—See dyspnœa, dropsy, headache, asthma, high tension, dilatation.

Cardiac Asthma.—Stimulants, morphine plus atropine.

Coma.—Jaborandi, pilocarpine.

Convulsions.—Arsenite of copper, jaborandi, pilocarpine

Constipation.—Magnesium sulphate, elaterin or elaterium.

Difficulty of Breathing.—See dyspnœa.

Dilatation of Heart.—Digitalis, convallaria, cactus, and strychnine.

Diarrhœa.—Arsenicum, arsenite of copper, veratrum album, croton tiglium.

Dyspepsia.—Nux vomica, nitric acid, pulsatilla, Carlsbad sprudel, euonymin, diastase.

Dyspnœa.—Quebracho, aspidospermine, glonoin, nitrites, caffeine and paraldehyde, apocynum and oxygen, strychnine, chloride of gold and sodium; purgation; cratægus.

Dropsy.—Sweating and purging, jaborandi, Epsom salt, elaterin; apocynum, potassium bitartrate, lithium bitartrate, diuretin, digitalis, strychnine, mercurius dulcis, apis, collinsonia, sambucus, kava-kava, juniper; sparteine, corn-silk, adonis vernalis, strophanthus, caffeine and paraldehyde.

Erysipelas.—To prevent, after incisions, wrap incised member in hot moist flannels changed every two or three hours, sponging with warm water, and cleanse flannels before re-applying. Drainage tubes.

Gangrene.—Pack in fullers' earth to overcome odor. Rapidly fatal.

Hæmaturia.—Thlaspi, ergot, gallic acid, trillium, turpentine, geranium, hamamelis, millefolium, erigeron, coccus cacti, pichi.

Headache.—Glonoin, the nitrites; local application of cloth saturated with equal parts chloroform, tincture aconite, chloral and powdered camphor (one ounce each); jaborandi; alternate applications hot and cold water. Eliminative treatment, euonymin, mercurius dulcis. Caffeine.

High Tension (cardiac hypertrophy).—Glonoin, nitrites, chloride of gold and sodium (euonymin, mercurius dulcis, pilocarpine, veratrum viride).

Hydropericardium.—Arsenicum. Eliminative measures, stimulants.

Hydrothorax.—Arsenicum. Eliminative treatment. Aspiration.

Jaundice.—Euonymin, mercurius dulcis, chelidonium, iridin, podophyllum, phosphate of sodium, inspissated bile, pancrobilin.

Nausea.—Clam broth, ice, iced milk, Vichy and milk, jaborandi, apomorphine (4x), ergot and chloroform water; bismuth, creosote, arsenite of copper, nux vomica, nitric acid, pulsatilla, ipecac.

Palpitation.—Glonoin.

Pericarditis.—Arsenicum. Poultices or hot fomentations.

Peritoneal Effusions.—Tapping.

Pleuritis.—Arsenicum. Poultices or hot fomentations (no tapping).
Eliminative measures.

Pneumonia.—Digitalis, ergot, iodine, phosphorus, chelidonium; dry cups to chest and loins; warm poultices to loins.

Edema.—Of glottis: apis, pilocarpine; of lungs (rapid, shallow breathing, dyspnoea, cyanosis), no pilocarpine: digitalis and ergot, dry cups to chest, ammonia. Eliminative measures.

Piles.—Collinsonia (five drops tincture).

Varicosis.—Collinsonia.

Vomiting.—See nausea.

CHAPTER XVIII.

CHRONIC FIBROUS (INTERSTITIAL) NEPHRITIS.

Synonymes.—Chronic fibrous nephritis; contracted kidney; granular kidney; granular atrophy of the kidneys; chronic catarrhal nephritis; granular degeneration of the kidneys; gouty kidney; red atrophy of the kidneys; intertubular nephritis; third stage of Bright's disease.

Definition.—A form of nephritis in which the elements of the kidney are contracted, often to such an extent as to be visible post-mortem to the naked eye, of slow insidious development, sometimes interrupted by violent recurrent attacks.

Etiology.—It is probable that contracted kidney is the final result of a certain number of different processes. Those over 40 years of age are most liable to it, though cases have been known in children. It results from long-continued irritation of the kidneys, due to various causes, as syphilis, malaria, gout, malassimilation of food from irregular habits or worry, alcoholism, poisoning by lead and other substances; prolonged obstruction to outflow of urine from any cause, as stricture, chronic pyelitis especially calculous, cysts in the kidneys.

It is frequently associated with general arterio-sclerosis.

It is probable that hereditary influence has something to do with its development, as in some families it is as rife as tuberculosis in others.

Some writers insist that it is three or four times more frequent in men than in women; others that no special preference for sex has been clearly demonstrated.

Morbid Anatomy.—*Kidney.*—Diminished in size; weight decreased, even as low as an ounce; density increased, surrounded by fat. Hard, resembling hard leather.

Capsule.—Thickened, strongly adherent; on removal carries small portions of renal surface with it.

Renal Surface.—Smooth, granular; granules red or reddish-gray, according to quantity of blood present; minute cysts; white or yellow specks (lime salts, urates).

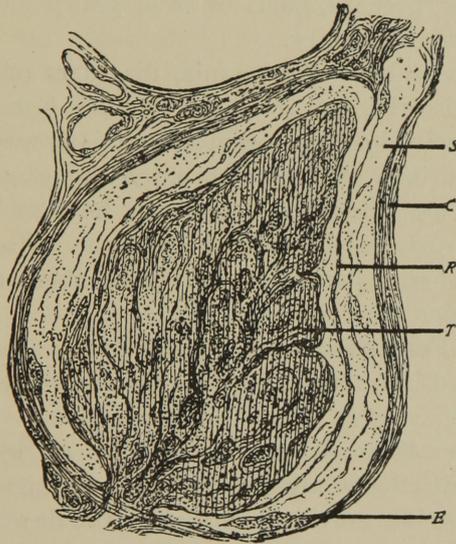


FIG. 16.—Cirrhosis of the Kidney. Atrophied Tuft. *T*, tuft, transformed into fibrous connective tissue; *R*, remnants of epithelia of the tuft; *S*, structureless, newly formed basis-substance; *E*, remnants of epithelia of the capsule; *C*, considerably thickened capsule. Magnified 500 diameters.—(From HEITZMANN.)

Cut Surface.—White or yellow streaks (lime salts or urates).

Cortex.—Thin.

Pyramids.—Short.

Glomeruli.—Indistinct.

Tubules.—Indistinct.

Blood-vessels.—Larger ones usually conspicuous.

Microscopically we find more or less extensive, dissemi-

nated patches of fibrous and granulation tissue with obliteration of some tubules, dilatation and varicose condition of others; obliterated arteries, or walls of both tubes and arteries thickened; glomeruli sclerosed, perhaps infiltrated with lime salts.

The patient is usually a man over 40 years of age, belonging to the well-to-do classes, with previous condition of robust health and addiction to nitrogenous diet and good living. Has, perhaps, gout, or is of gouty ancestry, with apoplectic family history.

He first complains of insomnia, disorders of vision and digestive disturbances, or of ear troubles, loss of strength interfering with business occupations; is drowsy, and may have peculiarities of temperature. Although naturally of an amiable and sanguine disposition, he may become depressed, peevish, suspicious, and impatient. No albumin as yet may be found in the urine. Later there are clinical features which are more marked.

Clinical Features.—The clinical features are conveniently divided into those of the earlier and those of the later stages.

1. *Earlier Stages.*—No symptoms at all save urinary ones; patient rises at night to urinate, and then voids urine of lower specific gravity than that of the day urine. The 24 hours' urine is deficient in phosphoric acid, shows a trace of albumin, and a few hyaline casts and oxalate crystals. Albumin may be absent from the night urine, and sometimes from the day. This condition may persist for years without more serious symptoms. Occasionally retinitis may be discovered in the earliest stage of the disorder, claimed by some to be present in certain cases before albumin is found in the urine.

2. *Mild Uræmic Disorders.*—Headache, dyspepsia, visual troubles, with rather pale urine, containing a little albumin and a few casts as before, with less urea than normal, and deficiency of phosphoric acid.

The uræmic symptoms may be more severe in certain cases, and include the following:

Neuralgia: Mild post-cervical, facial; sciatica; unilateral headache. Mental symptoms: Great irritability, distaste for life.

3. *Symptoms of High Arterial Tension.*—Slow, hard, cord-like radial pulse (62 per cent. of the cases). Throbbing temporals, headache, hæmorrhages (nasal, cerebral, cutaneous, into retina). Retinal changes are said to be found in 25 per cent. of the cases, but in the author's experience they are found late in the course of the disease.

4. *Symptoms of Hypertrophy of the Left Ventricle.*—Palpitation, displacement of apex beat downward and outward, increased area of cardiac dullness, especially to the left, accentuation of the second sound in the second right costo-sternal interspace (80 per cent. of the cases).

Headache, giddiness, tinnitus aurium, general congestion, oppression, dyspnœa without lung trouble apparent, asthmatic attacks, angina, shortness of breath on exertion, consciousness of violent beating of the heart.

NOTE.—In this stage exposure or excess may bring on hæmorrhages, acute uræmia, or inflammation of internal organs, as follows: lobular pneumonia in 13 per cent. of the cases; pleurisy; pericarditis; bronchitis common, and persistent winter cough; peritonitis rarely.

The Urine in the Stage of Hypertrophy.—The features are polyuria, night urine equal to or more usually exceeding day, deficiency of urea, marked deficiency of phosphoric acid; albumin small, sometimes traces only, or absent; casts few, hyaline or absent.

Polyuria is not invariably present. On some days the urine may be sub-normal in quantity, but the general tendency is to void more urine than normal.

Quantity in 24 Hours.—Usually, in earlier stages, two or three times the amount normal for the patient, from 2500

to 3000 c.c., 80 to 100 ounces at most. Occasionally 4000 or 5000 c.c. are passed, especially if patient drinks freely. In one of the writer's cases the patient voided 5330 c.c. of a specific gravity of 1001.

After cardiac dilatation, oliguria, unaffected by diuretics.

Urea.—Deficient, both relatively and absolutely.

Phosphoric Acid.—Greatly decreased, relatively and absolutely. Characteristic.

Chlorides and Sulphates.—Decreased. Chlorides less than other constituents.

Color.—Pale, transparent when fresh; hazy at end of 24 hours.

Specific Gravity.—Varies from 1005 to 1010, and seldom goes above 1012 until stage of heart failure, when it may rise to 1018 or 1020. The specific gravity of the day urine is higher than that of the night.

Albumin.—As a rule, small in quantity (less than one on Esbach tube, less than ten per cent. bulk by the ferrocyanic method in centrifugal machine, five minutes at 1000 revolutions per minute). In acute intercurrent attacks, uræmic attacks, or febrile attacks, increases.

May be absent from night urine and present only in traces in day when heart not dilated. May perhaps be absent altogether at times, especially when not in last stage, and when the disease is of vascular origin, or when cardiac symptoms (not dilatation) predominate over renal ones.

ANALYSIS OF THE URINE IN A TYPICAL CASE DURING STAGE OF CARDIAC HYPERTROPHY.

Patient male, age 57, not drinking much water.

Volume of urine 24 hours, 34 fluidounces.

Day urine, 11 fluidounces.

Night urine, 23 fluidounces.

Specific gravity, 1015.

Reaction, acid.

Urea per 24 hours, 170 grains.

Phosphoric acid, 20 grains.

Uric acid, 3 grains.

Total solids, 560 grains.

Albumin, very plain trace.

Sediment, several hyaline and granular casts, one with fat granules, a few oxalate crystals.

Later Stage.—1. Symptoms of cardiac dilatation in addition to hypertrophy: Extension of cardiac dulness to the right, possibly systolic souffle at apex, pulse weaker, more frequent, irregular; dyspnœa prevalent; dropsy sets in, beginning at the feet, extending upward, and perhaps involving abdominal cavity; cirrhosis of the liver, sub-jaundiced hue of skin, hæmorrhoids, obstinate diarrhœa, watery stools at night.

2. *Nutrition affected* and patient loses flesh, has dry, withered skin, hard, rigid hair, drawn features, sunken face, subnormal temperature, loss of sexual desire and power. (In earliest stages sexual irritation and increased desire.) Anxiety and wakefulness are frequent.

3. *Chronic Uræmic Symptoms* now pronounced: Dyspnœa, often asthmatic; gastro-intestinal symptoms; nausea, vomiting, diarrhœal attacks; cutaneous symptoms, intolerable itching and burning of the skin, persistent eczema; general muscular weakness.

4. *Acute Uræmic Attacks.*—Giddiness, drowsiness, coma, muscular twitchings, periodical convulsions; sticky, urinous perspiration; strong odor of urine in breath and body.

The Urine in the Last Stage.—Quantity may be, and usually is, less than normal; albumin may increase in quantity (to second mark on Esbach tube, 20 to 30 per cent. bulk ferrocyanic); casts more easily found, including a few granular.

Differential Diagnosis.—In the *earliest* stages (before hypertrophy): Chronic interstitial nephritis must be differentiated from various nervous diseases, among which are neurasthenia and chronic myelitis, since the condition of the urine of those diseases sometimes resembles that of

chronic interstitial nephritis, a fact which seems to have been overlooked by our authors. The differential diagnosis from mild cases of neurasthenia is difficult, but age of the patient and previous history of nervous prostrations may distinguish. Chronic myelitis may be distinguished by the symptoms, paraplegia, anæsthesia, hyperæsthesia, and the like. Chronic interstitial nephritis must be distinguished from certain cases of myocarditis, the urine, pulse and symptoms being alike when the patient with myocarditis is an alcoholic or suffers from hunger. A dilated and hypertrophied heart is, moreover, essentially in a condition of chronic myocarditis. History of high tension with loud second sound and symptoms of chronic uræmia serve to distinguish the two diseases, since weakness of the heart and feeble sounds are characteristic of myocarditis.

NOTE.—In the stage of cardiac dilatation uræmic symptoms and the urine serve to distinguish chronic interstitial nephritis.

THE URINE OF

<i>Chronic Renal Hyperæmia.</i>	<i>Chronic Interstitial Nephritis.</i>
Oliguria.	Polyuria.
Percentage of solids (grains per ounce) increased.	Percentage of solids decreased.
Color increased.	Color decreased.
Albumin small.	Albumin small.
Casts few, hyaline.	Casts few, hyaline.
Urates and uric acid in sediment.	No crystalline sediment.
Blood corpuscles in sediment.	No blood corpuscles, unless cystic disease.

Chronic interstitial nephritis must be distinguished from chronic hyperæmia of the kidneys.

SYMPTOMS OF

<i>Chronic Renal Hyperæmia.</i>	<i>Chronic Interstitial Nephritis.</i>
Valvular diseases without hypertrophy.	Hypertrophy without valvular diseases.
Weak, thready pulse.	Full, hard pulse.
Dropsy, chiefly of lower extremities.	No dropsy, till late.
No uræmia.	Chronic uræmia.
No rising at night to urinate.	Rising at night.
No visual disorders.	Visual disorders.

NOTE.—In the stage of cardiac dilatation the light color of the urine and deficiency of solids with increase in albumin serve to distinguish from renal hyperæmia, in which oliguria is accompanied by a darker-colored urine, higher percentage of solids, but with a small quantity of albumin.

Chronic interstitial nephritis must be differentiated from hysterical polyuria: The urine in the former disease keeps its low specific gravity in spite of decrease of daily quantity below the average normal.

Chronic interstitial nephritis is distinguished from chronic diffuse nephritis by the absence of general dropsy till late, the small quantity of albumin, and the few casts. In the later stages of chronic diffuse nephritis polyuria is accompanied by a yet considerable amount of albumin and numerous casts, while in chronic interstitial nephritis polyuria is associated with but little albumin and few casts.

The large amount of albumin and rareness of uræmia serve to distinguish lardaceous (amyloid) disease from chronic interstitial nephritis.

In senile atrophy of the kidney and atrophy due to chronic endaortitis we find urine similar to that of chronic interstitial nephritis. The diagnosis rests upon the progressive development found in chronic interstitial disease, and the probability that in the other cases albumin and casts have been found for many years in individuals seemingly in good health.

Dangers.—During cardiac hypertrophy: hæmorrhages into retina, brain, or internal organs.

Over-exertion or exposure may lead to pneumonia, dysentery, acute anæmia, carditis, pleurisy, œdema of the lungs, less commonly peritonitis.

After cardiac dilatation: uræmia, exhaustion from dyspnoea or obstinate diarrhœa, or secondary inflammation in the chest proving rapidly fatal.

Prognosis.—The disease is incurable, but subject to long periods of remission. If symptoms are of chronic uræmia (headache, dyspepsia, visual disturbances), without cardiac hypertrophy, disease may be checked for years by diet and medication—in extreme cases twenty years. Suitable climate may help. After cardiac hypertrophy is established, life is usually prolonged not more than a few years at most, though exceptions occur. After cardiac dilatation takes place it is a question, as a rule, of months, or even weeks.

Death sometimes occurs unexpectedly in earlier stages when the patient is apparently enjoying a remission, from sudden cerebral hæmorrhage or acute uræmia, or more gradually from acute inflammation of serous membranes, lungs, or intestines.

CLINICAL NOTES.

1. The writer has seldom seen a case of chronic interstitial nephritis in which albumin could not be found after exercise.

2. The author has seen cases in which no albumin at all could be found in the urine voided on rising in the morning.

3. The more severe uræmic disturbances may last but a short time or may recur with intervals between of comparative health.

4. The visual disturbances range from enfeeblement of the eyesight to total blindness; the latter may be transitory (uræmic) or due to retinitis.

5. In late stages the dyspnœa is probably cardiac rather than solely uræmic.

6. Atheromatous degeneration of the aorta and sclerosis of the smaller arteries in various organs may be associated with the disease, as also pulmonary emphysema, cerebral hæmorrhage or softening, and fibrinous inflammation of the serous membranes of the body.

7. If the digestive power of the stomach is unaffected, the general nutrition of the patient may be excellent.

8. Fatal uræmia may take place when the urine is free from albumin and of normal specific gravity.

9. Cardiac hypertrophy without valvular disease is of the greatest importance in directing the attention to the kidneys.

10. Failure of cardiac compensation is often indicated by a diminution in the quantity of urine before œdema of the lungs or of the larynx or severe uræmic symptoms (as Cheyne-Stokes breathing, convulsions, sleeplessness, sopor or coma) become manifest.

11. Senile contracted kidney is not accompanied by polyuria, but by oliguria, owing to feeble tension and absence of cardiac hypertrophy. Albuminuria is not common and uræmia absent.

12. There are probably a number of intermediate forms between contracted kidney and senile kidney.

13. It is doubtful whether endocarditis is a consequence of contracted kidney.

14. Cerebral hæmorrhage accompanies the cardiac hypertrophy in 16 per cent. of the cases. In 358 cases of contracted kidney Southey observed it 79 times, or 45 per cent.

15. An albuminuria coinciding with headache, dyspepsia and a tense pulse is always suspicious.

16. Whether or not albuminuria exist, insomnia, disorders of vision and digestive disturbances should direct attention to the kidneys.

17. In certain cases peculiar temperature variations, with weakness, pallor, loss of weight, and night-sweats, may suggest tuberculosis or malarial fever.

18. Disturbances of the nervous system are very marked and appear early. Amiable and sanguine dispositions may change to morbidly depressed, peevish, suspicious, and impatient.

19. Hyperexcitation of the nervous system and suicidal tendencies may develop.

20. A great variety of clinical histories exist. It is impossible to describe all the ways in which the disease may begin and run its course. Not less than ten distinct ways are known.

21. In 60 cases treated by Dieulafoy albuminuria was absent in one-fourth.

22. Uræmia and hæmorrhages are more common in this form of nephritis than in any other.

23. Uræmic attacks may come on when the patient is passing 30 to 40 ounces of urine of specific gravity 1020.

24. The most important symptom is constant weakness. The writer finds this often the only symptom complained of. Next in order is headache, then digestive disturbances, and intractable rheumatic pains and persistent neuralgia.

25. Minor symptoms are auditory troubles, vertigo, itching of the skin, muscular twitchings, cramps in the calves, especially at night, and sensitiveness to cold, especially of lower limbs.

26. In 111 cases of death from apoplexy in St. George's Hospital interstitial nephritis existed in 55.

27. In advanced cases apathy and semi-torpidity of physical and mental powers occur. Coma is more likely than convulsions.

28. Patients often appear to get well after acute intercurrent attacks, but all the symptoms may return, weakness increase, and death take place from exhaustion.

29. The limit of duration of the disease lies probably somewhere between ten and twenty years.

30. The disease is perhaps more common in children than supposed. Guthrie reports seven cases, Goodno two. Acute infectious diseases or lithiasis may develop it in children. Great pigmentation of the skin is often strikingly apparent.

31. Heitzmann insisted that there was an acute interstitial nephritis.

CHAPTER XIX.

THE TREATMENT OF CHRONIC FIBROUS (INTERSTITIAL)
NEPHRITIS.

MODERN writers are agreed that the disorder is essentially incurable, hence the necessity of prophylaxis.

Prophylaxis.—Avoidance of meat and highly-seasoned foods and rich gravies, regular ingestion of fluids, avoidance of alcoholic beverages, malarial localities, and irregular modes of life.

Overworked men and indolent, luxurious women should form the Turkish-bath habit in early middle life, especially if of gouty ancestry, but chilling after the bath is said to be a frequent cause of this disease.

Climatology as in chronic diffuse nephritis. Avalon on Catalina Island is good when nervous symptoms are prominent, with insomnia.

Regimen.—Woollens next to the skin at all seasons of the year, and special care to avoid exposure and over-exertion or excess. Systematic out-door exercise graduated to the strength and habits of the patient, hence out-door life in a mild, equable climate, like Southern California, of the utmost benefit. Skin and bowels to be attended to. Warm clothing and frequent warm baths, with care to avoid subsequent chilling. During stage of cardiac hypertrophy patient must be particularly cautious about running or over-exertion.

Diet.—Owing to the long continuance of the disorder milk diet is not possible, nor is it useful except perhaps during acute intercurrent attacks, when Vichy and milk are useful. Alcoholic drinks are forbidden, especially beer and cham-

pagne. The diet should be farinaceous as far as possible, with sufficient fish, chicken, and occasional meat to keep up the strength. The patient should drink sufficiently of liquids to keep the urine a little above three pints daily; but when there is already polyuria, it is doubtful whether copious ingestion of mineral waters is of value.

During stage of heart failure diet should be more liberal and a little meat allowed daily.

Medicinal Treatment.—In the early stages, when debility, dyspepsia, digestive and nervous symptoms are the features, coupled with rising at night to urinate, give *chloride of gold and sodium*, 2x dilution, 10 drops four times daily, increasing gradually to 20 drops, and continuing treatment for months. (Hale.)

For the headache and other symptoms of high tension give *glonoin* in drop-doses of the one per cent. solution every one to three hours till relief is obtained.

To prevent enlargement of the heart when pulse shows signs of tension, regulate action of bowels systematically.

If urine falls below normal *before* the stage of cardiac enlargement, give lithium benzoate in 2- to 5-grain doses and tincture of digitalis in 5-drop doses until diuresis is established. (Digitalis in such dose not to be given, however, when the heart is enlarged.) If these drugs irritate the stomach, try citrate of potassium in 10- to 20-grain doses instead of the lithium benzoate. Mercurius dulcis 3x and cantharides in alternation are serviceable for this purpose.

In syphilitic cases give iodide of potassium and bichloride of mercury from the beginning, the iodide in doses of from 5 to 10 grains, well diluted, after meals, three times daily, the mercury in doses of $\frac{1}{100}$ to $\frac{1}{32}$ of a grain. The protiodide of mercury in the lower potencies or $\frac{1}{4}$ -grain doses of the crude sometimes works better than the above.

During the stage of cardiac hypertrophy the coats of the

smaller arteries are weak and liable to rupture, so that there is danger from hæmorrhages; hence keep patient as quiet as possible, restrict diet, and caution about running for trains, etc. Bowels to be carefully attended to in this stage; a hard, full pulse, fulness in the head and vertigo call for free, watery stools. Give glonoin in dose as above, or the nitrites of sodium or potassium in 3- to 5-grain doses every four or five hours, or potassio-cobaltic nitrite in 4- to 7-grain doses. The nitrites are less likely to cause headache than the glonoin. If acute uræmia is impending, do not give glonoin or nitrites.

For acute intercurrent attacks at this time (shown by diminution in quantity of urine, increase in albumin and casts) do not give digitalis in large doses nor use hot-air bath, as they increase tension, but keep patient quiet, on low diet, and promote free action of the bowels, using citrate of potassium as a diuretic. If necessary, give elaterium for the bowels.

In the early stages of the disease Donner gives ferrum phos. and belladonna in alternation for their anti-irritative and anti-inflammatory action. The following remedies are also indicated in the first stages:

Scilla Maritima.—Frequent and severe tenesmus vesicæ, with profuse evacuation of watery urine.

Nitric Acid.—Frequent and profuse urination, immoderate quantities passed.

Iodium and Kali Hydriodicum.—Frequent desire to pass urine, with discharge profuse; emaciation, dry skin, hypertrophy of the heart.

Ammonium Benzoicum, apocynum androsæmifolium and erigeron canadense are also recommended. The choice of the remedy will be made from pronounced secondary symptoms. Other remedies which correspond to contracted kidney are:

Apocynum Cannabinum.—At first very profuse passage of

urine, of a pale color, consisting of several quarts daily without sediment; then, as secondary symptoms, the urine is very much diminished, with dyspnœa and a torpid condition of the kidneys. One may begin with medium potencies, and gradually go down to the tincture.

Asclepias Syriaca.—Great increase in the quantity of urine; pale urine, of low specific gravity, alternating much with little urine and headache, vertigo, and dyspnœa. It is best used in the tincture. *Asclepias tuberosa* is an analogue.

Helonias Dioica has cured several cases of reported interstitial nephritis, yet it would seem to be indicated in the parenchymatous variety, for it has, amongst other symptoms, "much albumin."

Coccus Cacti.—More indicated in the stage of decreased urine; dark urine; scanty, with a pronounced sediment; it increases, as a diuretic, the amount of urine, and removes dropsical accumulations, if they are not too far advanced. The second or first potencies. Similarly acting remedies are: *Apocynum cannabinum*, *asclepias syriaca*, *chimaphila umbellata*, *helleborus*, *prunus spinosa*, *scilla*, and *terebinthina*. This latter remedy is more especially indicated when there is a gouty kidney in question. It must be administered with care, in low preparations. In gouty kidney, together with *terebinthina*, there are, as analogues, *urtica urens*, *plumbum oxalatum*, *natrum phosphoricum* and *natrum sulphuricum*. The best simile of interstitial nephritis is presented by *plumbum*, for contracted kidney is most frequently observed in lead-workers; but though Donner has sometimes obtained decided improvement with it, he has never succeeded in bringing about a recovery (with from the 10x–30x). The iodide of lead, as recommended by Puhlmann, has yielded him no results.

Phosphorus, though more properly of value in the parenchymatous form, is also of service here and, above all, in the terminal stage, where it will prolong life and control the pulmonary complications.

In the Stage of Cardiac Dilatation, digitalis, strychnine, and iron are the remedies for prolonging life. Give 5-drop doses of tincture of digitalis, $\frac{1}{50}$ -grain doses of strychnine sulphate or phosphate, and Boudreaux's syrup or pills of the protochloride of iron, according to the indications. Allow meat once a day.

If the urine decreases in quantity, give apocynum. Hot-air baths may be tried when the patient is not too weak.

If dropsy increases, give digitalis tincture in larger doses, say 10 or 15 drops, with 5 or 10 drops of the fluid extract of adonis, and that of convallaria in 10- or 15-drop doses of the tincture, discontinuing for a few days if pulse becomes slow to a marked degree.

Inhalations of amyl nitrite are serviceable for the overaction of digitalis and similar drugs. Salines may also be necessary, even when diarrhœa is present, in order to reduce the dropsy.

For inflammations of the lungs digitalis and 20- to 30-minim doses of fluid extract of ergot.

Degenerative retinal lesions demand iron and strychnine; hemorrhagic ones leeching of the temples and 3 to 10 grains solution of ammonium chloride in aqueous solution.

For the acute uræmia of this stage (coma) give jaborandi and digitalis as before.

Obstinate diarrhœa may be modified by veratrum, arsenite of copper, or gallic acid.

The heroic treatment as described above will sometimes prolong life, but the outcome is always the same.

Treatment of Nose-Bleed.—Hydrastis internally in 10-drop doses of the tincture every two or three hours, and a spray of a 5 per cent. solution of the fluid extract in water. External compression upon the bleeding nostril, either by the fingers, iced cloths, ice-bags, or ice; the hot nasal douche, water having a temperature of 90° F., injected until it emerges from the non-bleeding nostril unmixed

with blood; ice in the mouth; cold cloths, ice or cold metals applied to the spine; immersing the scrotum in iced water; Chapman's bags, containing water at a temperature of 105° F. to the spine.

Internal compression: by means of absorbent cotton pledgets which may be saturated with astringents in solutions; by means of long, narrow strips of iodoform gauze, gently introduced until the nostril is entirely occluded; by means of small rubber bags, on the principle of Barnes' dilators. Finally, plugging the posterior nares with Bellocq's canula, which should be the *dernier ressort*, as it is not devoid of danger.

A twenty per cent. solution of antipyrine, applied on cotton pledgets, which are allowed to remain *in situ*, has been recommended as a reliable remedy.

THERAPEUTIC NOTES.

1. Digitalis and iron in large doses should not be given during the stage of cardiac hypertrophy prior to dilatation, especially when there is high arterial tension.

2. Nitroglycerin and the nitrites in large doses are dangerous when acute uræmia is impending.

3. Mercury in large doses should not be given in rheumatic cases or those due to lead poisoning. Mercurius vivus 3x is recommended in cases of lead poisoning.

4. Aconite and mercurius cor. 3x for the acute intercurrent attacks.

5. Phosphoric acid 2x for frequent urination, loss of flesh, mental and physical exhaustion.

6. Opium and morphine should only be given when needed in single (not repeated) doses, as cumulative action may result in fatal narcosis.

7. Nitric acid and nux vomica in potency should be tried for the gastro-intestinal symptoms; for the uræmic vomiting, creosote, carbolic acid, cocaine (seldom curative, general

eliminative measures being necessary). If the vomiting is not uræmic, ice, occasional doses of opium, and diet. There is no specific for the vomiting of this malady.

8. In the summer, a sojourn in the pine forests, where the altitude is not high; and sea-bathing in the *Southern* waters may be recommended.

9. Headache is often obstinate, and may become a serious feature, lasting for years. For the acute, blinding cephalalgia glonoin is sometimes efficacious, but has failed even in enormous doses. For the chronic headache, caffeine in one case gave most relief, but was not curative. Caffeine in the form of the uncombined chemically pure alkaloid is now used in doses of 5 to 10 grains, maximum dose 10 grains at one time, 30 grains in a day. Caffeine combined with small doses of strychnine is sometimes more efficacious than caffeine alone. Searle mentions a case which baptisia tincture relieved most.

10. Dyspepsia is often ameliorated by warm baths. Cold baths should not be used, as they increase blood-pressure.

11. For the dysentery, rectal injections of solutions of boracic acid.

12. Those patients who cannot take iron in the usual forms may try ferrum phos. 3x, chalybeate waters, or peptonates of iron.

13. Patients may follow their usual occupations, avoiding physical and mental over-exertion.

14. Merc. cor. 3x is the favorite prescription for albumin uric retinitis. Dr. Speirs Alexander records a well-marked case in which defective vision improved, power of accommodation returned, and retinal degeneration cleared up under use of this remedy.

15. In the writer's experience, 10-drop doses of the second decimal dilution of aconite have been effective in controlling the feeling of "rush of blood to the head" which patients sometimes complain of in this disorder. If obsti-

nate, a mild aperient water like Célestins Vichy may be given at the same time. Aconite 3x is also quoted as of benefit in renal hæmaturia.

16. In the uræmic attacks, Donner employs belladonna; but more frequently, cannabis indica in low potencies, and glonoin.

As to hydropathic measures, washing with lukewarm water, warm baths, hot-air baths, steam baths in beds, are sometimes applicable, though in many cases kidney-patients do not tolerate these water measures. In no disease can such mischief be done as with these very means; uræmic attacks, and a sudden death may be brought about thereby.

The diet should be easily digestible and nutritious, with especial regard for individual conditions and the capriciousness of these subjects, for they will often do well without the use of milk. This latter is frequently badly borne, and is best dispensed with. Coffee, tea, and alcoholic beverages are not to be forbidden entirely; only excess injures. A good glass of wine will help these patients, who are often greatly reduced. The patient should not be told too often of the fatal termination of his disease, for depressing emotions have an unfavorable influence. (Donner.)

CHAPTER XX.

LARDACEOUS (AMYLOID) DEGENERATION OR INFILTRATION.

Synonymes.—Hyaline, waxy, or albuminoid degeneration or infiltration.

Definition.—All affections of the kidneys are included under this head, in which *the walls of the blood-vessels*, especially those of the Malpighian tufts, are the seat of a degeneration with exudation which gives a chemical reaction resembling that of starch with certain reagents, as solution of iodo-potassium iodide plus dilute sulphuric acid; the dirty violet coloration given by starch with these reagents being noticed. It is called waxy, for the reason that the cut surface has this appearance. Lardaceous or amyloid degeneration may occur as a complication of either chronic diffuse nephritis or chronic interstitial nephritis, producing noteworthy modifications of these diseases. It may also occur in an otherwise normal kidney, in which case it is of no importance, except as a possible cause of chronic nephritis.

Morbid Anatomy.—Macroscopically we find :

Kidneys.—Enlarged, in later stages much enlarged.

Capsule.—Easily removed.

Surface.—Smooth, pale-yellow, anæmic.

Cut Surface.—Waxy appearance, rather dry, but little blood.

Cortex.—Thickened, half the thickness of medulla, instead of the normal one-third or one-fourth.

Malpighian Bodies.—Quite dark and prominent; size of millet seeds, dull, semi-translucent.

Medulla.—Rays distinct, pyramids distinct and abnormally pale.

NOTE.—If an aqueous solution of iodine (iodine in iodide of potassium) be added to the cut surface, the parts of the latter instantly turn a dark mahogany color; iodine and sulphuric acid, a violet appearance; methyl-violet a red, while normal tissues are stained pale blue.

The macroscopic features are pallor of the kidney and translucency of the glomeruli.

The vessels of the liver, spleen, and intestines will often show similar degenerative changes.

Microscopically we find:

Malpighian Bodies.—Rather enlarged; glassy in part only at first, later wholly.

Bowman's Capsule.—Lining at first unaffected; later, degenerated.

Glomerular Capillaries.—Walls affected by homogeneous translucent thickening.

Afferent Arteries.—Walls affected by homogeneous translucent thickening.

Interlobular Arteries.—Walls affected by homogeneous translucent thickening.

Basement Membrane of Convoluted Tubes.—Affected later.

Epithelium.—Later becomes fatty, rarely amyloid.

The features are first a homogeneous translucent thickening of the walls of the glomerular capillaries and afferent arteries occurring irregularly in patches, some of which are limited; later involving the whole tuft of vessels in some places, the lining of Bowman's capsule, and even the basement membrane of the convoluted tubes with fatty degeneration of their epithelium.

NOTE.—The methyl-green stain for sections is applied as follows: Soak the specimen for several hours in a two per cent. aqueous solution of methyl-green, wash in water until the deep green begins to turn decided rose, mount in equal parts glycerin and water. Microscopically examined, the rose-color, indicative of the seat of amyloid change, is found

to be confined to the walls of the smaller vessels and those of the Malpighian coil, the intervacular portion or parenchyma remaining green and free from any waxy transformation.

Etiology.—Most common in persons 20 to 50 years of age. The cause is *chronic suppuration*, most commonly that of pulmonary and intestinal tuberculosis associated with

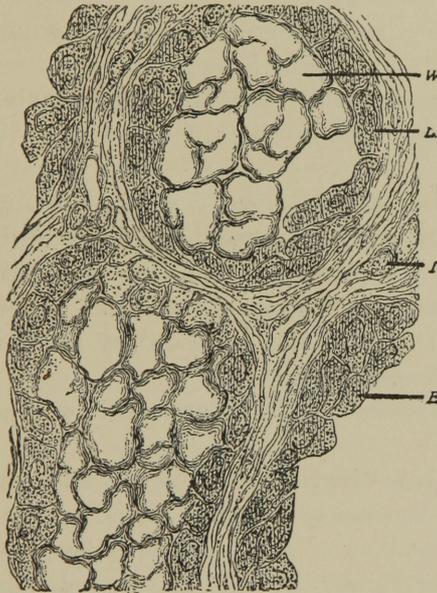


FIG. 17.—Waxy Degeneration of the Kidney in Chronic Croupous Nephritis; Formation of a Waxy Cast. *W*, shining waxy lumps in the calibre of the tubule; *L*, epithelia and endothelia of the tubule, partly in waxy change; *E*, unchanged tubular epithelia; *I*, interstitial connective tissue. Magnified 600 diameters.—(From HEITZMANN.)

ulceration and cavity formation; necrosis of bone, old sinuses, long-discharging empyemas, chronic ulcerations of the skin or bowels, fistulas, psoas and lumbar abscesses, ulcerating cancer, especially uterine, pyo-nephrosis and any obscure cachexia.

It may result from pulmonary tuberculosis not accompanied by suppurating cavities.

Syphilis, even before ulcerative or suppurative changes, is said to be a cause of it. It occurs sometimes late in the course of syphilis. Lead and mercury poisoning, gout, and malaria, are given as causes.

Suppurative nephritis in one kidney is often seen in cases where both kidneys were involved in chronic diffuse nephritis with amyloid degeneration.

It is held by some writers that a syphilitic taint in connection with a suppurative process is absolutely essential for the production of the lesion.

The disease is usually associated with amyloid disease of the spleen, liver, and intestine, but it may be limited to the kidneys.

Clinical Features.—History of chronic suppuration or syphilis. The patient is anæmic, and in addition to pallor has a muddy complexion, with brown rings about the eyes. Gastro-intestinal symptoms are common, especially vomiting and diarrhœa, together with dropsy and enlargement of the liver and spleen.

Uræmia, dyspnœa, retinitis, and cardiac hypertrophy are rare.

The *urine* is not increased in quantity and may be slightly diminished, constantly contains much albumin, is clear, acid, of pale-yellow color, and of specific gravity 1010 to 1015. The sediment is scanty and contains but few casts, which are mostly large, hyaline and waxy, though granular and fatty occur. Pus- and blood-corpuscles are not abundant.

Differential Diagnosis.—Amyloid disease must be distinguished from chronic diffuse nephritis. (See CHRONIC DIFFUSE NEPHRITIS, Differential Diagnosis.)

Amyloid disease associated with chronic diffuse nephritis shows itself in diminished urine, with abundant sediment of casts and pus-corpuscles.

Amyloid disease following on chronic interstitial nephri-

tis and cardiac hypertrophy is associated with polyuria and a high percentage of albumin.

Atrophied kidney (without hypertrophy of the heart), together with amyloid degeneration, is evidenced by diminished urine and scanty sediment with considerable albumin, or sometimes in no diminution of urine, with but little albumin and a single slender hyaline cast.

Prognosis.—The majority of the cases terminate fatally. It is said that some recover completely, but these are probably isolated cases. Fürbringer has never seen one recover.

In children where the disease is dependent on surgical affections the prognosis is more favorable; also in syphilis.

General Treatment.—Purdy insists on a liberal and sustaining diet, the most nutritious compatible with the digestion, together with as much fresh air or moderate exercise as possible. Milk diet is not allowed, owing to the weakened condition of the patient. A good wine, as Burgundy, is highly beneficial at meals.

Medical Treatment.—Removal by surgical operation of the exciting cause, when due to suppuration. Treatment of syphilis, if the cause, with potassium iodide.

In cases not due to syphilis, or to special known cause, the iodides of iron and arsenic are the remedies. Calcareo carb. and phos. in tuberculous cases. Calcium chloride in 5-grain doses in milk largely diluted when there is enlargement of the lymphatic glands. For the extreme weakness give phosphoric acid 2x dil. In tuberculous cases, cod-liver oil, the hypophosphites, etc.

For the dyspepsia give nux vomica, bismuth, wine of pepsin, diastase, and Burgundy wine at meals.

For excessive albuminuria gallic acid in 2-grain doses or upwards.

For the obstinate diarrhœa try acetate of lead 1x, or small doses of the crude drug if nephritis be absent (shown by scantiness of sediment, few casts); rectal administration

of deodorized tincture of opium is sometimes successful. When intestinal ulceration exists the diarrhœa is best controlled by copper sulphate 1x and belladonna tincture, with rectal administration of opium. When dropsy and scanty urine are a feature, hot air-baths and diuretics will be needed.

THERAPEUTIC AND CLINICAL NOTES.

1. Do not use cathartics in lardaceous cases.
2. Iron should not be given in tuberculous cases.
3. Nephritic complications should be treated as already described in the chapters on Nephritis.
4. In hospitals where the antiseptic system is used the disease is said to be less frequent than formerly.
5. In the writer's practice the disease is a rare one.

CHAPTER XXI.

A GENERAL SUMMARY OF DISEASES OF THE KIDNEYS.

THE following summary readily enables the student and practitioner to get at the essential features of the ætiology, pathology, diagnosis, prognosis, and treatment of renal diseases most commonly met in general practice.

ÆTIOLOGY.

Acute Hyperæmia.—Exposure to cold, *surgical operations*, irritant or toxic influences.

Chronic Hyperæmia.—Obstruction to the circulation of the blood, as in valvular disease, tumors, pregnancy; most commonly *mitral diseases*.

Acute Nephritis.—From infection of septic or toxic origin, or due to exposure to cold or pregnancy. Most commonly a *sequela of scarlet fever*.

Chronic Nephritis.—The result of acute nephritis, exposure to cold and wet, diseases of the lower urinary tract; may arise insidiously without known cause. Commonly due to *alcoholism*.

Chronic Interstitial Nephritis.—Long-continued irritation of the kidneys from various causes, as gout, malaria, syphilis, plumbism, prolonged obstruction to outflow of urine; commonly from *long-continued malassimilation of food*.

Amyloid Degeneration.—Chronic suppuration, tuberculosis, syphilis; most commonly *pulmonary and intestinal tuberculosis*.

PATHOLOGY.

Acute Hyperæmia.—Renal surface dark red, renal substance soft. Malpighian tufts congested, renal arteries and those of Malpighian tufts engorged with blood.

Chronic Hyperæmia.—Enlarged, hard, congested, purple kidneys; marked congestion in the medulla and bases of pyramids. In older cases kidneys not enlarged; there may be even slight degree of granular atrophy; if due to thrombosis, kidneys greatly enlarged, engorged, and showing epithelial necrosis.

Acute Nephritis.—Varies greatly. In post-scarlatinal cases anatomical changes in and about the *glomeruli*, especially in Bowman's capsule, are common.

Chronic Diffuse Nephritis.—(Large white kidney.) Kidneys increased in

size, capsule adherent in spots, surface quite smooth, pale-gray, mottled with white or yellow specks; tubules dilated, full of casts and fatty, desquamated, or disintegrated epithelium.

Chronic Diffuse Nephritis.—(Small white kidney.) Kidneys nearly normal in size but density increased, surface reddish-gray, spotted; cortex diminished in volume; closer proximity of sound glomeruli to atrophied ones, irregular patches of fibrous tissue.

Chronic Interstitial Nephritis.—Kidneys diminished in size and weight; density increased; hard; capsule strongly adherent; patches of fibrous and granulating tissue; thickening of walls of tubules and arteries, and obliteration of arteries; glomeruli sclerosed or infiltrated with salts.

Amyloid Degeneration.—Enlarged pale kidneys, translucent glomeruli; homogeneous, translucent thickening of the walls of glomerular capillaries and afferent arteries, irregularly in patches.

CLINICAL FEATURES.

Acute Hyperæmia.—Aching in loins, tenderness in renal regions, disorders of micturition; scanty, bloody urine with but little albumin, few casts (mostly hyaline), sediment of urates.

Chronic Hyperæmia.—Valvular murmurs; weak, thready pulse; dropsy of lower extremities; dyspnoea, hacking cough, general cyanosis. Scanty, red, cloudy urine, of increased specific gravity, small amount of albumin, few (hyaline) casts, and sediment of urates.

Acute Nephritis.—Patient usually young, with history of eruptive disease or exposure to cold; dropsy, pallor, uræmic symptoms; diminished urine, hazy and dirty red from blood, highly albuminous, and containing numerous casts.

Chronic Diffuse Nephritis.—Long-lasting dropsy, anæmia, debility, digestive disturbances, urine pale, cloudy, abundantly albuminous, containing much sediment with granular, fatty, or waxy casts. After atrophy sets in, polyuria.

Chronic Interstitial Nephritis.—Rising at night to urinate, in patients over forty of previously robust health; high tension pulse, cardiac hypertrophy without valvular disease; chronic uræmia; finally cardiac dilatation. Polyuria, urine of poor quality, slightly albuminous; few casts. After dilatation of heart—urine below normal in quantity, and albumin more abundant.

Amyloid Degeneration.—History of chronic suppurations; anæmia, sallowness, gastro-intestinal symptoms, obstinate diarrhœa, enlargement of liver and spleen; clear, pale-yellow urine abundantly albuminous, with but little sediment (few large hyaline or waxy casts). Urine may contain 30 or 40 per cent. bulk of albumin with but half a dozen casts in the sediment of half a fluidounce of the urine.

PROGNOSIS.

Acute Hyperæmia.—Usually favorable; unfavorable in previously nephritic cases and after surgical operations; or if long-continued suppression.

Chronic Hyperæmia.—Essentially incurable. Length of life depends on

degree of compensatory cardiac hypertrophy. Acute intercurrent nephritic attacks are an unfavorable sign.

Acute Nephritis.—Two cases out of three recover. Extension of dropsy to chest, anuria, cardiac failure, inflammations of internal organs and chronic nephritis with retinitis are the dangers.

Chronic Diffuse Nephritis.—Unexpected recoveries occur; lengthy remissions may take place. If disease lasts over a year, prognosis usually bad.

Chronic Interstitial Nephritis.—Incurable, but disease may last many years. After cardiac hypertrophy, patient may live but few years; after dilatation, but few months.

Amyloid Degeneration.—Majority of cases terminate fatally. Prognosis more favorable in children, in syphilitics, and in cases due to surgical affections.

ESSENTIALS OF TREATMENT.

Acute Hyperæmia.—Rest. Copious ingestion of fluids; dry cups and warm poultices to back. Vigorous measures if there is suppression; cupping, active sweating, purging, saline diuretics, rectal injection of one quart of salt solution. Aconite, cantharis, digitalis, jaborandi, mercurius dulcis.

Chronic Hyperæmia.—Digitalis, caffeine, strophanthus, strychnine, phosphorus, phosphoric acid, diuretin, convallaria, adonis.

Acute Nephritis.—Arrowroot gruel, if suppression; otherwise milk diet; milk and Vichy, copious fluids, careful bathing. Aconite, cantharis, belladonna, turpentine; later arsenicum, mercurius, ferrum; jaborandi, arsenite of copper, cream of tartar, apocynum, elaterium, digitalis, strophanthus, Epsom salts, diuretin in special emergencies.

Chronic Diffuse Nephritis.—Milk diet, hot baths, change of climate, pure water. Cantharis, mercurius-corrosivus, apis, arsenicum, ferrum, strontium lactate, apocynum, aurum, digitalis, jaborandi, and glonoin. Cardiac stimulants for special cases.

Chronic Interstitial Nephritis.—Avoidance of all over-exertion. Diet farinaceous as far as possible; careful bathing; chloride of gold, plumbum acetikum, glonoin, nitrites, lithium benzoate; cardiac stimulants after dilatation. Mercurius corrosivus and iodides in syphilitic cases.

Amyloid Degeneration.—Diet liberal, not confined to milk. Iodides, especially of iron and arsenic, phosphoric acid, cod liver oil, hypophosphites; surgical operations for removal of suppurating causes.

CHAPTER XXII.

THE PATIENT IN RENAL LESIONS.

THE following is a short sketch of the patient from a strictly clinical standpoint:

Chronic Renal Hyperæmia.—The patient is at first in good general condition, digestion and assimilation being unimpaired, but has difficulty of breathing, especially on exertion, and is dropsical about the feet, while valvular disease or fatty degeneration and dilatation of the heart are apparent, with weak thready pulse and hacking cough. He passes urine decreased in quantity with increased color and specific gravity, containing a little albumin and a few hyaline casts. Finally he becomes dropsical to an extreme, and cyanotic.

Acute Nephritis.—The patient is most likely a child or young person with history of recent acute infectious disease or exposure to cold and wet, with swollen face, general dropsy, pallor, drowsiness, and gastric symptoms, passing but little urine, which is abundantly albuminous, contains blood and numerous casts, chiefly hyaline, epithelial and blood. If the urine remains scanty long, or is suppressed, patient has coma or convulsions.

Chronic Diffuse Nephritis.—The patient is from 30 to 50 years of age, pale, puffy under the eyes, with doughy face, without appetite, vomits before breakfast, dropsical, finally to an extreme degree, feeble, finally bed-ridden. Passes at first too little urine, which is rather dark; later too much pale urine, abundantly albuminous, with abundant milky sediment containing all sorts of casts.

Chronic Interstitial Nephritis.—The patient is usually a man over 40, of previously robust health and hearty ap-

petite, of gouty or apoplectic family history, who rises at night to urinate, has a tense pulse, headache and dyspepsia, displacement of the cardiac apex-beat downward and outward, and accentuation of the second sound in the second right costo-sternal interspace. He passes a great deal of pale urine of low specific gravity, especially at night, containing little or no albumin and few or no casts. Later he becomes more or less dropsical, the heart is weak, the urine decreases, and he dies of uræmia.

Lardaceous Disease.—The patient is a child, or more commonly between 20 and 50 years of age, pale or sallow and cachectic, of muddy complexion, with brown rings round the eyelids, weak, has history of chronic suppurative or syphilitic process or is of tuberculous family history, has gastro-intestinal symptoms, including obstinate diarrhœa, enlarged liver and spleen, and passes considerable pale urine of low specific gravity, abundantly albuminous, and exhibiting but little sediment.

CHAPTER XXIII.

THE TOXÆMIA OF PREGNANCY.

ALTHOUGH this subject properly belongs to the domain of obstetrics, it will not be amiss to give it brief consideration here.

Etiology and Pathology.—Profound blood-changes. Increase of extractive matters with the general increase of heart-pressure. Presence of toxins in the blood, liver, and muscles, associated with renal insufficiency or inefficiency.

Clinical Features.—The chief signs are salivation, digestive disorders, including excessive nausea, peculiar taste, and constipation, general malaise, anæmia, headache, irritability of temper, visual and auditory symptoms, œdema, drowsiness, dyspnœa, involuntary twitchings, general prostration, and the changes in the urine.

Malaise and slight headache, without albuminuria, may be the earliest symptoms.

Predisposition.—In the author's experience, women with history of convulsions during previous confinements, and those of neurotic family history, are particularly liable to danger.

The Urine.—The writer finds two conditions most common, as follows:

I. Urine resembling that of chronic diffuse nephritis.

II. Renal insufficiency, with slight albuminuria at first, subject in the later months to sudden exacerbation, with scanty urine and high degree of albuminuria, but seldom much cylindruria.

In the first class of cases the diagnosis is easily made, as shown by the following typical analysis of urine:

ANALYSIS OF URINE OF PATIENT DURING CONVULSIONS FOLLOWING PREMATURE DELIVERY.

Volume of urine per 24 hours, 1075 c.c. (36 fluidounces). Day twice the night.

Specific gravity, 1012.

Urea, 10 grammes per liter ($4\frac{3}{4}$ grains per fluidounce).

Urea, 11 grammes total (170 grains).

Phosphoric acid, 0.90 gramme per liter (0.4 grain per fluidounce).

Phosphoric acid, 0.97 gramme total (15 grains).

Albumin, fourth mark on Esbach tube.

Sediment, numerous medium and large granular casts, a few hyaline and a few waxy. Blood-corpuscles, pus-corpuscles, renal epithelia.

Patient took apocynum and Boudreaux's protochloride of iron, and in one month was up and about. She became over-confident, took cold at menstrual period, and died from convulsions a month later.

The Urine in the Second Class of Cases.—In the earlier months we have light-colored urine of poor quality, deficient in urea, with a little albumin and one or two hyaline casts.

In the later months scanty, high-colored urine with increase in urea in grains per ounce; abundant albuminuria but not a great quantity of casts.

Lusk's Classification.—Lusk classifies the cases as follows:

1. *Transitory.*—Occurs in the later months; eclampsia apt to occur; hyaline casts and sometimes granular casts; disappears after labor. This form does not generally occur in subsequent labors.

2. *The Nephritis, so-called, of Pregnancy.*—Begins early in pregnancy; few casts; small percentage of albumin; heart distressed, being too forcible; altered placenta; some œdema; death of fœtus; recurs in subsequent pregnancies; resembles, in early stages, an acute lesion, later a chronic. It is often, in all probability, a parenchymatous change, and blood, as a rule, is absent from the urine.

3. *An Aggravation of a Pre-existing Nephritis.*—The woman has a chronic interstitial or parenchymatous ne-

phritis before her pregnancy, which is aggravated into an acute form by reason of a reflex contraction of the arterioles of the kidneys, producing anæmia of the unaffected portion. The venous congestion is due to cardiac insufficiency. Casts and albumin are present in abundance. There are œdema and albuminuric retinitis, and there may be nasal and brain hæmorrhages.

Early Recognition.—I would suggest that, in the case of every primipara and every woman with neurotic family history or that of convulsions at previous confinements, the nurse be instructed at the beginning of the seventh month to collect and measure the urine several times weekly, to test for albumin, and to determine the urea, the latter a very simple matter since the invention of the clamp for the Bartley tube, as described in my new book on URINARY ANALYSIS, page 60. The nurse should further be instructed that whenever daily inspection of the urine shows it to be darker in color than usual, the determinations of albumin and urea should be made thrice daily—morning, noon, and night. As I showed in my Minneapolis paper, increase in the percentage of albumin and a significant increase in the percentage of urea have been observed by me in fatal cases. If, for example, the nurse finds that the percentage of albumin is doubled over that of the previous day, and the urea, instead of 6 to 8 grains per ounce, runs 12 to 16 per ounce in the twenty-four hours' urine, the patient should at once be put to bed, on a milk diet, and given whatever remedies may appear necessary.

Prodromal Symptoms.—There are three prodromal symptoms which, one or the other, or all together, are characteristic of this disease. They are headache, epigastric distress, and disturbances of vision. The headache may be very severe and is often extremely so, but frequently it amounts to only a feeling of fullness and a moderate pain either frontal or temporal. The epigastric symp-

tom may amount to almost a crisis, so that it sometimes seems as if the stomach were eliminating the poison. Thus, one of Seabury Jones's patients who had convulsions after her second confinement suffered only from the former symptom in her first, but to such a degree that for several days no food at all could be administered. The sensation is at times one of most intense burning. The eye symptoms may amount only to a dimness or haziness of vision, or to complete loss of sight, or only to flashes of light.

Diet.—When there is reason to fear the presence of toxæmia it is customary to put the patient on a milk diet. Wright, however, holds that the best diet is the following: Milk, buttermilk, koumiss, as much as the patients care to drink, no more; plain water in abundance; tea once a day, if desired; cocoa, lemonade, mineral waters, etc.; stale bread and butter; dry or cold toast and butter; rice, tapioca, arrowroot; fish without rich gravy; limited amount of white meat and raw oysters; limited amount of salt; vegetables of all sorts, restricting the supply of potatoes, and encouraging the use of greens, such as lettuce, spinach, water-cress, etc.; ripe fruits, such as oranges, bananas and grapes; other fruits cooked, such as apples, pears and peaches; mineral waters, especially Hunyadi Janos, or a mixture of Friedrichshall and Carlsbad; milk diluted with such waters as so-called soda-water or Apollinaris or Sprudel or Vichy. Patients are not allowed to take both milk and fish or meat at the same meal. In a limited number of cases eggs, beef, mutton, and bacon are allowed; but where the poison appears to injure the kidneys, especially with profuse albuminuria, prohibit meats of all sorts, eggs and oysters, and put the patient on a diet largely composed of diluted milk and vegetables.

In the writer's experience, which has been almost altogether with very serious cases, anything but milk or milk and Vichy has hardly been possible. In the earlier stages,

however, before the sudden increase in the albuminuria, Wright's diet, based on the theory that the liver and intestines are at fault, is worthy of consideration.

Medicinal Treatment.—The principal remedies are mercurius cor., helonias, apis, arsenicum, glonoin, apocynum cannabinum, lachesis, jaborandi, and uranium nitrate.

Mercurius cor. and *helonias* are used in diametrically opposite conditions; the former when the urine is scanty, the latter when clear, light-colored, and profuse. *Apis* has scanty urine like mercurius, but œdema of the face and extremities is marked. *Arsenicum* when numbness, prostration, anæmia, and dropsy are features.

Glonoin is suited to congestive headaches, pulsations, quick throbbing, frequent desire at night to urinate, and rush of blood to the head. The writer, however, finds that *aconite* is more reliable for precisely these symptoms than glonoin. *Apocynum* is indicated in dropsical conditions, slowly-acting kidneys, with weakness, depression, drowsiness and labored action of the heart. If too large doses irritate the stomach, administer liquid pepsin after it, as in case of diuretin. *Lachesis* is indicated in dropsical conditions associated with albuminuria, where œdematous tissues are dark; when the urine is dark and albuminous and the symptoms are worse after sleeping.

Jaborandi, or its alkaloid, pilocarpine, is given as a routine measure in doses of $\frac{1}{8}$ to $\frac{1}{3}$ of a grain, hypodermically, once weekly after albumin appears until no longer necessary. It should not be given unless respiration and heart are normal. *Uranium nitrate* is said to be valuable the more closely the symptoms resemble diabetes mellitus.

Wright's Treatment.—Wright believes in a thorough course of free purgation, as follows:

As soon as symptoms of toxæmia arise, the patient is required to take one-half to one ounce of Epsom salts at once, and thereafter two to four drams every hour for two

or three doses; an enema is also administered immediately after the first dose of salts is taken, in urgent cases especially, where there is a large amount of albumin in the urine and a small quantity of urea excreted. In less urgent cases a few small doses of calomel, one-quarter grain every half-hour. After six doses are administered, to be followed by the salts. After the bowels are freely opened, smaller doses of salts are given, sufficient to produce not less than four watery evacuations in each and every twenty-four hours. For the first few days he does not object to twelve motions in the twenty-four hours. When the bad symptoms become less severe, he stops the administration of the salts for a time, but he interferes to prevent anything approaching constipation, and desires not less than two evacuations of the bowels every day until after labor. The following prescription is given for a thorough course of free purgation:

R. Magnesii sulphatis,	. . . . .	ʒij.
Acidi tartarici,	. . . . .	ʒiij.
Tincturæ cardamomi compositæ,	. . . . .	ʒij.
Aquæ ad,	. . . . .	ʒiv.
Sig.—A dessertspoonful in hot water t. i. d.		

The magnesium sulphate removes a large quantity of serum from the blood, and with it a certain proportion of the circulating toxines, without extracting the blood-corpuscles. It aids the liver and kidneys, which otherwise soon become seriously diseased from the effects of the poisoning and overwork.

He leaves the kidneys severely alone, excepting so far as the water has a diuretic effect. He desires to have a large amount of water taken into the system. He finds very little benefit from profuse perspiration, but recommends the daily warm bath and woollen fabric next to the skin. He is opposed to the induction of abortion, and, to a less extent, to inducing premature labor.

Urethan in large doses, amounting to 300 or 400 grains daily, has been used by Dr. Kinnicutt in the treatment of convulsions.

Poitou-du-Plessy believes that chloroform, judiciously and methodically administered, exercises no noxious influence on the kidneys, and that no fear should be entertained in regard to its employment in uræmic convulsions where we wish to combat the medullary excitability. Bromide of ethyl he likewise believes exercises a more pronounced action on the medulla, and acts even more rapidly than chloroform; therefore he considers advantageous the administration of a mixture of the two agents for anæsthetic purposes.

Babacci and Bebi, from experiments on animals, claim that ether is safer than chloroform, since the albuminuria caused by it is transitory.

For uræmic convulsions the following is suggested:

1. Removal of ten or fifteen ounces of blood, to be repeated if necessary.
2. Inhalations of chloroform until the convulsions are controlled.
3. Administration by enema of a mixture of

R. Musk,	. . . . .	gr. viiss.
Chloral hydrate,	. . . . .	gr. xliv.
Yolk of egg,	. . . . .	No. 1.
Distilled water,	. . . . .	fl. ℥v.

4. Administration hourly of a tablespoonful of a mixture of

R. Strontium bromide,	. . . . .	℥j.
Syrup of orange-flower,	. . . . .	fl. ℥iiss.
Distilled water,	. . . . .	fl. ℥iij.

5. Restraint of thighs, and legs wrapped in cotton. Absolute milk diet.

INDICATIONS FOR INDUCTION OF LABOR.

The usual indications are the following :

1. Decrease in the 24 hours' urine.
2. Increase in albumin.
3. Increase in percentage of urea (grains per ounce).
4. Heart growing weaker.
5. Strength rapidly failing.
6. Dropsy increasing greatly.
7. Premonitory symptoms of convulsions.

CHAPTER XXIV.

CYSTS OF THE KIDNEYS.

WE have to distinguish between simple cysts and cystic degeneration. In the writer's opinion this distinction is not usually made sufficiently clear in the books. Cysts may be found in kidneys otherwise healthy, in which case there may be only one cyst or several, and the usual size is not larger than an apricot, though cases occur in which they are of size sufficient to make an abdominal tumor. Cysts are found in diseased kidneys, in which case they are multiple and sometimes innumerable, and in greater or less numbers are a constant accompaniment of chronic interstitial nephritis.

When now the cysts occur in diseased kidneys in such numbers and of such size as to exceed all other changes in the kidney, and to produce extreme enlargement of the organ, forming an abdominal tumor, the term *multilocular cystic kidney* is used.

MULTILOCLULAR CYSTIC KIDNEY.

Definition.—Enlargement of the kidney due to formation of innumerable cysts in one or usually both kidneys, producing symptoms resembling those of renal atrophy.

Etiology.—All cysts probably arise from dilatation of the tubules or of Bowman's capsule, caused by obstruction to escape of urine. Congenitally, absence of ureter or other malformation interfering with escape of urine may cause the disease, and in adult life chronic interstitial nephritis by distal constriction of uriniferous tubes may cause proximate dilatation of them by the urine.

In addition, however, there is usually symmetrical enlargement of both kidneys in cases occurring in adult life.

Morbid Anatomy.—The shape of the kidney is in the main retained, the size enlarged from that of a fist in con-

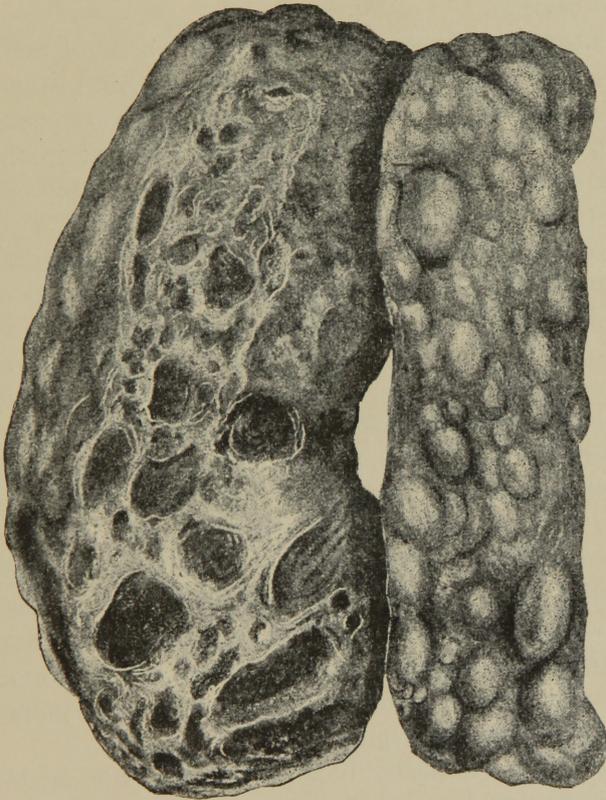


FIG. 18.—Cystic degeneration of the Kidney.—(MORRIS.)

genital cases to that of an infant's head in adult cases, and the weight increased, reaching from 2 to 16 pounds. Both kidneys, as a rule, are uniformly enlarged and lobulated from presence of innumerable cysts of all sizes, the larger

ones the size of plums and usually in the centre of the organ, separated from one another by an intervening fibrous structure. The cysts occupy both medulla and cortex. Renal tubules and glomeruli are here and there recognizable in the fibrous structures. The cysts are essentially closed cavities.

Contents of Cysts.—The cysts contain fluid varying in consistence and in color. A thin, watery fluid is common, but viscid, syrupy, caseous or almost solid contents may be found. Urinary salts and albumin are found in the thin liquid as well as blood pigment. The more solid contents consist of fat-granules, epithelium, cholesterin, uric acid and triple phosphate.

Symptoms.—In the fœtus the abdomen may be so distended as to interfere with childbirth or prevent the descent of the diaphragm, causing death from asphyxia. The longer the person lives the larger the diseased kidney, the number of cysts increasing with the growth of the person. In adults the symptoms are those of chronic interstitial nephritis (enlargement of left ventricle, increased tension, pallor, cachexia) plus hæmaturia, obstinate in character, and usually a bilateral, soft, non-fluctuant renal tumor. In later stages nausea, vomiting, headache, and suppression of urine are observed. The patient dies of coma, or more frequently of convulsions; less frequently of exhaustion following renal hæmorrhage, bronchitis, pneumonia, or pulmonary œdema with severe dyspnœa.

The Urine.—Quantity increased, color pale or bloody, specific gravity low (1015 to 1005), urea deficient, phosphoric acid not always decreased, albumin at first small, increasing in quantity with age of patient, abundant when blood is present in the urine. The sediment contains large granular casts, pus, blood, and in late stages triple phosphate crystals, due to accompanying cystitis.

Differential Diagnosis.—

CHRONIC INTERSTITIAL NEPHRITIS.	CANCER.	CYSTIC DISEASE.
No tumor.	Tumor.	Tumor.
Hæmaturia, not common or obstinate.	Hæmaturia.	Hæmaturia, obstinate.
No pain.	Pain.	No pain.
No cachexia.	Cachexia.	Cachexia.
Patient over 40.	Patient under 5 or over 60.	Patient 40 to 55.

The tumor in cancer is rapid in growth, nodular, and of unequal resistance; in cystic disease bilateral, of slow growth, non-fluctuant and soft, preserving the shape of the kidney, while the aspirating needle withdraws fluid.

Prognosis.—In the new-born child, if appreciable enlargement is found, early death may be predicted.

In the adult prognosis is unfavorable, but patient may live for years after discovery of tumor.

Dangers.—Suppression of urine, coma, and especially convulsions; exhaustion from obstinate hæmaturia; pulmonary lesions.

Treatment.—The medical and hygienic treatment is that of chronic interstitial nephritis. Absolute rest and administration of styptics when hæmaturia. The latter may resist all treatment. *Thlaspi* must not be forgotten when hæmaturia is severe; dose, 30 drops of the tincture. *Millefolium*, *trillium*, *geranium*, *hamamelis*, gallic acid, and ergot may be given empirically to control the bleeding.

HYDATID CYSTS.

Formation.—Due to encapsulation and proliferation of the parasite *tænia echinococcus*.

Diagnosis.—The cysts are usually unilateral, and likely to be very large, filling the whole side of the abdomen. They may show by quick, short, bimanual percussion-strokes a peculiar whiz known as hydatid vibration. Passage of the daughter-cyst through the ureter may occasion

renal colic. If the cyst ruptures into the kidney, hooklets may be found in the urine. Aspiration should reveal the same (Fig. 19 (b)).

Prognosis.—Uncertain, usually unfavorable.

Treatment.—Surgical. Occasional cures are claimed.

When the cyst has ruptured, and the vesicles are being

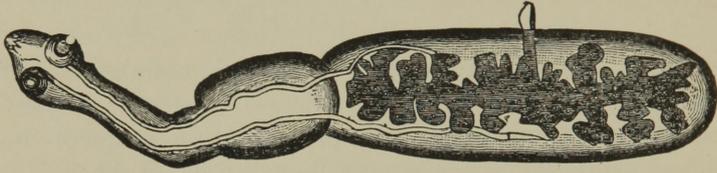


FIG. 19 (a).—*Tænia Echinococcus* complete. \times about 16.—(PORTER.)

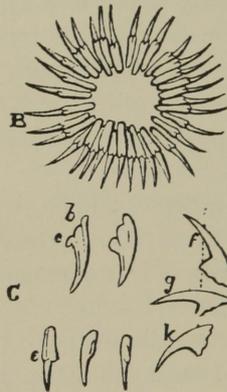


FIG. 19 (b).—(B.) The circle of hooklets seen upon its under surface; thirty-four in number, seventeen long and seventeen short. (C.) *b, c*, Lateral views of the separate hooklets—*b*, the base; *c*, the central extremity or bifid process of the base; *e*, hooklets viewed upon the concave or inferior border; *f, g, k*, a diagram illustrating the movements and position of the hooklets.—(RALFE.)

freely discharged from the bladder, there remains little for us to do but to watch the progress of the case. The abdomen should be firmly bandaged, and gentle friction employed over the tumor to aid their escape. The patient should be warned against undue exertion, or engaging himself in any occupation, likely to cause strain during their

discharge, in case suppurative action be excited, or even rupture of the discharging cyst caused. As diuretics have been found to assist the discharge of the vesicles, these remedies may be administered, and if there is much pain from colic during their passage sedatives should be combined with them.

CHAPTER XXV.

SUPPURATIVE RENAL LESIONS.

WE distinguish abscess of the kidney, and paranephric or perinephric abscess. Tuberculosis of the kidney will be considered in another chapter.

ABSCESS OF THE KIDNEY.

Synonymes.—Suppurative nephritis. Surgical kidney. Pyelo-nephritis.

Classes.—1. Metastatic abscess due to entrance into the kidneys of pyogenic bacteria through the circulation.

2. *Surgical kidney*, or suppurative nephritis, due to extension of an inflammation upward from a lower point in the urinary tract.

Etiology.—Trauma and embolism are the common causes of metastatic abscesses. Infectious or septic emboli containing bacteria, as from infectious endocarditis, infectious thrombus of the lungs, or some vein, being transferred to the kidneys, cause abscess there. Hence malignant endocarditis, resulting from a number of diseases, may be the cause of metastatic abscesses. Diseases of the lower urinary tract, or surgical operations on the same, may be the cause of the surgical kidney.

Morbid Anatomy.—*The kidney* may show either one abscess or a great number; in the latter case they may be either discrete or confluent. The size varies from that of a pin-head to one large enough to fill the whole space between renal capsule and renal pelvis.

When the abscess results from extension of the inflammation from below (pyelo-nephritis) we find opaque, gray-

ish, bead-like streaks along the pyramids from apices to renal cortex, having an injected border, and tending, as they enlarge, to become confluent, soft in the centre, and to form an abscess.

The tubules may contain in earlier stages colonies of bacteria, often of the bacillus coli; the epithelium is necrotic; the adjacent interstitial tissue infiltrated with leucocytes.



FIG. 20.—Suppurative Nephritis. *T*, remnants of uriniferous tubules, whose epithelia are coalesced into multinuclear masses; their boundary line in part destroyed by the inflammatory infiltration; *I*, interstitial tissue, almost completely converted into inflammatory corpuscles; all blood-vessels destroyed. The breaking-up into single pus-corpuscles not yet accomplished. Magnified 500 diameters.—(From HEITZMANN.)

The epithelium of the convoluted tubules undergoes granular degeneration.

Results of the Abscess.—Previous presence of renal abscess is shown by a scar, which is depressed, or by a calcified nodule. If the suppuration extend to the paranephric fat tissue, we have paranephric abscess. This, or the renal abscess, may communicate with the pelvis of the kidney, or with the gastro-intestinal tract.

Clinical Features.—1. Irregular chills, with corresponding elevations of temperature.

2. Continued intervening fever, with not so high temperatures as during the chills.

3. Various nervous, digestive, circulatory, and respiratory symptoms, as in fevers.

4. Pain is slight, except when there is injury to kidney or involvement of peritoneum.

5. The patient has generally an anxious expression; face at first flushed, later sallow or jaundiced. Mouth dry; tongue coated (often brown), fissured, crusted. Pulse rapid, feeble; there may be thirst, loss of appetite, headache, vomiting, hiccough, diarrhoea, profuse sweats, drowsiness, sopor, and low delirium.

The Urine.—1. Reaction likely to be alkaline, especially in ascending cases.

2. Albumin usually small in amount, corresponding to elevation of temperature.

3. Albumin *sometimes* abundant, especially in ascending cases.

4. Casts mostly hyaline and epithelial. Not always present.

5. Renal epithelia and pus-corpuses in the sediment.

6. Usual absence of blood-corpuses.

7. Pus in abundance in the urine, when the abscess breaks into the renal pelvis.

8. In cases of pyelo-nephritis we find renal and pelvic epithelia together.

9. Micturition may be frequent, but the quantity is often small, 500 c.c. or less.

10. In primary cases the reaction of the urine is acid.

11. In chronic cases involving but one kidney there is polyuria, 2500 to 3000 c.c. in 24 hours, with acid urine, pus, and a few casts; urinary solids are low.

12. In ascending cases there is alkaline, offensive urine,

with more albumin than the pulse accounts for, and swarms of micro-organisms.

Differential Diagnosis.—Injury, or signs of a malignant endocarditis, together with the clinical features and urine as above, distinguish the abscess sometimes called metastatic. History of disease of the lower urinary tract or surgical operation on the same the surgical kidney.

Suppurative nephritis is distinguished from pyelitis by the graver constitutional symptoms, viz.: chills, fever, sweat, and sometimes pains in the renal region, together with the various disturbances due to fever.

Complications.—Pulmonary œdema, erysipelas, dropsy, perinephric abscess.

Prognosis.—Depends on whether the pus is absorbed or discharged into the urinary or gastro-intestinal tract; in the latter case, prognosis serious. When one kidney only is involved, patient may live some little time. When both kidneys are affected, prognosis is serious. Prognosis is also usually serious in patients who have had prolonged obstruction to escape of urine from a stricture or enlarged prostate. Recovery is, however, possible in these cases, but permanent renal atrophy results. In pregnancy the prognosis is favorable, the case being a removable pressure.

Immediate Cause of Death.—Death is usually preceded by profound coma. Convulsions are rare.

Prophylaxis.—If the patient has a chronic disease of the lower urinary tract, all instruments used must be thoroughly sterilized. Enforced retention not allowed; patient to be supplied with rubber urinals. Avoidance of cold and damp to be enjoined, sitting on cold or wet objects to be prohibited.

Keep the urine from decomposing by administration of one tablet of betanaphthol 1x, as suggested by Dr. E. M. Bruce, of Chicago, or by use of various antiseptics mentioned under TREATMENT.

Diet in Renal Abscess.—The patient being put to bed the following diet is advised: Soups, milk, yolks of eggs, free from white and beaten up with brandy, arrowroot flavored with Madeira, broth from veal stock thickened with cream and arrowroot, boiled sago or tapioca with a little milk. Stimulants to be given freely, if there is much asthenia. If urine scanty, give large quantities of diluents, barley water, linseed tea, warm water, but no saline diuretics.

Treatment.—Apply antiphlogistine to the region of the kidneys, and give one tablet of protonuclein every two or three hours. Dry cupping may be tried for relief of congestion and to favor diuresis. Dampen the bottom of an ordinary tumbler, drop in a piece of loose dry cotton, moisten the skin with warm water, light the cotton, invert the glass instantly, and, if the cotton sticks to the bottom of it, apply to the region of the kidneys.

If a cupping-glass with rubber bulb be at hand, the above process may be dispensed with.

Open the bowels once daily with warm enemata or mild purgatives.

Remedies.—Those commonly used are chiefly antiseptics, as eucalyptol, salol, creosote, boracic acid, terebinth, chininum arsenicum, betanaphthol 1x, urotropin.

Enterol is a new antiseptic possessing particular advantages in the treatment of septic conditions of the urinary tract. It is a combination of various cresols, and passes along the urinary tract in the form of ethereal sulphates. The dose is one fluidrachm of a 1 in 500 solution. The urine exhibits a gray-green color, and does not undergo the usual ammoniacal fermentation.

THERAPEUTIC NOTES ON SUPPURATIVE NEPHRITIS.

1. Enterol is not to be given in acute nephritis, renal congestion, or when the heart is feeble or the stomach

ulcerated. It should be greatly diluted in cases of inflamed stomach.

2. Elaterium may be needed if there is obstinate constipation with scanty urine, or ergot if with polyuria.

3. If foul urine accumulates in the bladder there is probably less risk in drawing it off than in letting it stay; after catheterization an antiseptic solution may be introduced.

4. The writer has had considerable experience with the solution of boracic acid suggested by Ralfe, namely, *pure* boracic acid, 120 grains; glycerin, one fluidounce; hot water, eight fluidounces. A few teaspoonfuls daily will usually suffice to keep the urine acid and prevent decomposition. In some cases, however, even this agent fails.

CLINICAL CASES.

A typical ascending case which the writer saw was a man 69 years of age, with history of long-standing urinary disease. This patient was weak, confined to his bed, sensitive over region of the right kidney, had chills and elevation of temperature, and suffered from frequent and painful urination. The twenty-four hours' urine was not obtained, but the sample of morning urine was only 1010 in specific gravity, of strongly alkaline reaction and ammoniacal odor, containing stringy pus impossible to measure, and 12 per cent. bulk of albumin. Urea was only 6 grammes per liter (3 grains per fluidounce), and phosphoric acid 0.7 gramme per liter (less than one-third normal). The features were the strongly ammoniacal character, absence of crystals, excess of albumin over what the pus would account for, and extremely low percentage of urea and phosphoric acid. The patient was given various remedies without avail, and died of uræmia in two weeks. Just before death it was said "an eruption came out, first over one eye, then became general over the face." (Erysipelas?)

Of three other cases, in two of which phosphoric acid

was marked in its deficiency, death took place from uræmia in a few weeks. In the third case, in which the quantity of urine was 2000 c.c. and urea 24 gm., phosphoric acid 2 grammes, life has been prolonged several years, probably owing to the fact that only one kidney is involved.

CHAPTER XXVI.

PARANEPHRIC ABSCESS.

Synonymes.—Suppurative paranephritis, perinephric abscess.

Definition.—Purulent inflammation of the *fat* capsule of the kidney. The terms perinephric abscess and paranephritis are used synonymously with paranephritis, but should be confined, strictly speaking, to inflammation of the *fibrous* capsule.

Morbid Anatomy.—Formation of pus in the fat-capsule, and of a trabeculated cavity between it and the peritonæum having ragged walls and communicating sinuses containing blood, pus, and sloughs.

Etiology.—Due to extension of inflammatory process from elsewhere, or from a wound, surgical operation, or various suppurative lesions. Occurs in the sequence of infectious diseases, especially typhus, typhoid, and small-pox.

Most commonly found in suppurative nephritis, and chronic renal tuberculosis.

Occurrence.—Twice as often in men as in women. More frequent in adults than in young people.

Results.—May extend both upward and downward and perforate the loin, perinæum, or groin, the urinary tract, intestinal tract, or the peritonæum or pleura.

Clinical Features.—1. Obscure onset; complicates many other diseases.

2. Fever a common feature; often intermittent, associated with chills and thirst. Temperature persistently elevated.

3. Disturbances of digestion, together with debility and emaciation. Constipation.

4. Respiration may be quickened.
5. Finally patient is in typhoid condition.

Localized Symptoms.—1. Swelling occupying lumbar region; space between lower ribs and crest of ilium sometimes bulges. If not, the swelling may be perceived by bimanual examination with patient in dorsal position.

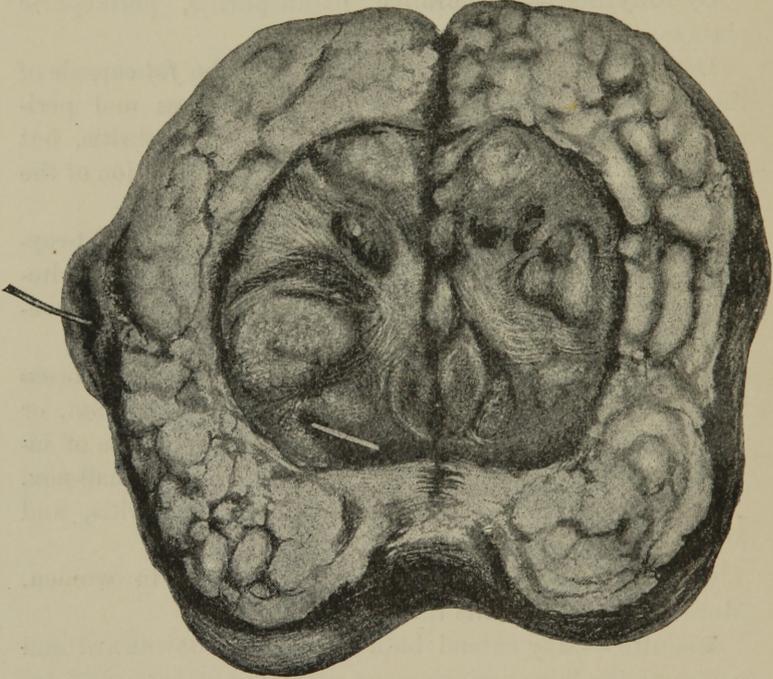


FIG 21.—Perinephritis.—(MORRIS.)

2. Pain in region of the kidneys, worse on pressure; sometimes extends into the legs, worse on movement.
3. Skin in region of the kidneys congested and œdematous.

The Urine.—1. Features of renal congestion; trace of albumin; a few blood-corpuseles.

2. If pus is present with pelvic epithelia, pyelitis co-exists.

3. Sudden large quantity of pus shows rupture of abscess into the urinary tract.

4. Unless the abscess results from trauma or pre-existing urinary disease, urine may be normal, except when abscess is so large as to cause renal congestion.

Differential Diagnosis.—It is to be distinguished chiefly from suppurative nephritis. In paranephric abscess we find a large tumor, so that the space between the lower ribs and crest of the ilium sometimes bulges. In suppurative nephritis there may be merely a well-defined lumbar swelling extending downward. The urine in cases not due to trauma or previous urinary disease is normal, that of suppurative nephritis never normal. For other features in the differential diagnosis see table of diagnosis of tumors.

Prognosis.—Depends on that of the cause.

Favorable if cause can be remedied, when disorder primary and recent, provided early surgical treatment is resorted to, with drainage.

Unfavorable if pus is allowed to burrow, since abscess may rupture into peritonæum, pleura, or intestines.

Unfavorable when secondary to grave renal lesions, or those of neighboring organs.

Unfavorable when secondary to spinal disease.

Most unfavorable when the disease follows the puerperal state in septic conditions.

Recovery possible in cases where patient has strong constitution, even after bursting into bowels.

CLINICAL NOTES.

1. Paranephric abscess may result from purulent absorption in cases of inflammation of the connective tissue about the uterus, vagina, or rectum after childbirth, and is not an uncommon complication of pelvic cellulitis.

2. It may follow surgical operations on the testicle or spermatic cord after inflammation of connective tissue about

the bladder; or operations on the rectum, perinæum, or uterus.

3. Suppurations in the gall-bladder, liver, and spleen may be followed by it.

4. A painful tumor in the region of the kidneys, together with fever, points to paranephric abscess.

5. Aspiration may reveal presence of pus, when urinary examination is negative.

6. If appendicitis is the cause, the onset is sudden and progress rapid.

7. Recovery follows both absorption of pus and spontaneous evacuation, when cause of disease is remediable.

8. Recovery from spontaneous evacuation presupposes free drainage and freedom from sepsis.

9. Death may take place from septicæmia, embolic abscesses, progressive emaciation, debility, or lardaceous degeneration of the kidneys.

10. Abscess in connection with spinal caries may suggest paranephric abscess, and may even open into the pelvis of the kidney. Molecular fragments of carious bone may be found in the pus and assist the diagnosis.

11. Subphrenic abscess or appendicular abscess may in some cases become perirenal by extension.

Treatment.—Absolute rest, milk diet, free movements of the bowels, cold applications when as yet no redness or fluctuation. Cupping and application of leeches may relieve the pain and congestion. Inunctions of belladonna or application of a liniment of chloral and camphor, equal parts, for the pain; morphine by mouth or rectum may be necessary.

As soon as pyrexia and rigors suggest suppuration, aspirate and apply large poultices.

If fluctuation can be made out, and there is increase in the symptoms, an incision is advised, with drainage.

Remedies.—The principal remedies to be given internally are aconite, arnica, belladonna in the beginning, followed by hepatic sulphur, mercurius, silicea when pus is evidently present.

CHAPTER XXVII.

TUBERCULOSIS OF THE KIDNEY.

WE shall first consider the classification and pathology of the different varieties, then the diagnostic and therapeutic features.

Classification and Pathology.—Senn's classification is as follows:

1. Miliary tuberculosis.
2. Caseous nephritis.
3. Tubercular pyelo-nephritis.

Miliary tuberculosis is usually the result of general tuberculosis, and commonly affects both organs at once. It may be associated with a like affection of the bladder, prostate or testicles without symptoms which are especially renal.

It is manifested by the presence of few or many minute, gray, more or less opaque tubercles surrounded by an injected border, more abundant in the cortex, and readily observed on removal of the capsule. On section, linear clusters of tubercles are often to be seen continued towards the pyramids.

Caseous nephritis, known also as scrofulous kidney, renal phthisis, renal tuberculosis, and nephro-phthisis, is located in the substance of the kidney. It may be unilateral, or both kidneys may be affected. When unilateral, the right kidney is usually the one involved. The disorder is sometimes primary.

The disease manifests itself by the extension of cheesy masses from the apices of the Malpighian pyramids upward into the cortex. At the periphery of these cheesy portions miliary and agglomerated gray and cheesy tubercles are to

be seen. Microscopically we find the tubules filled with necrotic epithelium and large numbers of the tubercle bacilli. The interstitial tissue is likewise infiltrated with cells, and is necrotic. Unaffected portions of the kidney become invaded by the bacilli, either along the tubules or by entrance of the bacilli into the lymphatics or blood-vessels. The apices of the pyramids become softened as



FIG. 22.—Renal tuberculosis.—(From ROBERTS.)

the disease progresses, and a series of cavities are formed, continuous with the renal pelvis.

Eventually the intervening septa of normal tissue become more and more narrow, and finally the kidney may become merely a fibrous bag, filled with liquid and curds, or both walls may become infiltrated with lime salts to such a degree that a calcareous shell is formed, inclosing a mortar-

like material. More commonly the kidney becomes enlarged, forming usually a symmetrical tumor.

Together with the advancement of the process in the kidney the mucous membrane of the renal pelvis, ureter, and bladder is affected, and both pelvis and ureter frequently undergo extreme dilatation. Perinephric abscess may also result from extension. Amyloid degeneration is not unfrequently associated.

Tubercular pyelo-nephritis is due (*a*), in rare cases, to escape of the contents of a primary tubercular focus in the kidney into the pelvis; more commonly (*b*) to rupture of a tubercular abscess from adjacent organs, or (*c*) to ascending tubercular infection from below. Perinephric abscess is a frequent complication.

Etiology.—The essentials are as follows :

1. Susceptibility of the kidney to tubercular infection.
2. Presence in the organ of tubercular bacilli sufficient in number and virulence to produce their specific pathological effect.

Clinically we find the following causes most common :

1. Antecedent inflammatory conditions, especially in the pelvis of the kidney.
2. Trauma.

By preference the disease attacks males from twenty to forty years of age, but children are not exempt. Puny adults are liable to it.

According to some authorities the disease is, on the whole, a rare one.

Diagnosis and Clinical Features.—There are no pathognomonic symptoms. The essentials for diagnosis are the presence of a palpable swelling, and the presence in the urine of tubercular products.

1. The first symptom is sometimes *hæmaturia*, which may be profuse, but, as a rule, hæmorrhage is less frequent in the tuberculous than in the calculous disease.

2. *Pain* radiating from the flank into the bladder, sometimes simulating an attack of renal colic. *Tenderness* in case the kidney is palpable.

3. Associated with the pain is *dysuria*, tenesmus, and constant desire to urinate.

4. Eventually a *resistant swelling*, apparently a symmetrical enlargement in the region of one or both kidneys.

5. The general symptoms of chronic tuberculosis, namely, irregular fever, night-sweats, progressive emaciation and debility, are present.

6. The presence of tubercular products in the urine.

CLINICAL NOTES.

1. In miliary tuberculosis the symptoms may be slight or absent.

2. When renal or vesical symptoms appear in a patient with pulmonary or genital tuberculosis, suspect urinary tuberculosis.

3. When persistent cystitis exists without discoverable cause, suspect urinary tuberculosis.

4. Renal symptoms rarely appear before signs of trouble in bladder or prostate.

5. In supposed primary renal tuberculosis extension to the ureter, bladder, and lower urinary tract is strong, if not positive proof of the tubercular character of the disease, rather than presence of calculous disease, for example.

6. Renal colic occurs in some cases, due to ureteric disturbances, and enlargement of the kidney from retention of urine may take place.

7. Ascending tuberculosis may be preceded by symptoms of chronic inflammation of the lower urinary tract.

8. *Pain* may be absent or slight in acute miliary tuberculosis and in chronic tubercular nephritis. Distressing when tubercular foci rupture into the pelvis, and when there is pyelo-nephritis caused by ascending tubercular nephritis.

Due to obstruction to the free flow of urine and to presence of tubercular products. Is severe, paroxysmal, and follows ureter down to the lower urinary tract, even to the meatus and testicle, which may retract. May suggest presence of stone in the bladder. In some cases the pain may be slight and dull in the lumbar region. Sometimes it is felt in the inner side of the thigh.

9. If the kidney is palpable, *tenderness* is always present, and the pain due to pressure often extends to bladder and urethra.

10. *Strangury* may be present, even when vesical tuberculosis is absent. It may suggest presence of stone in the bladder, hence occasion frequent sounding for stone, which in this case is dangerous on account of likelihood of causing mixed infection.

11. More or less elevation of temperature is usually present.

12. The prostate is often affected before the kidneys, and as a rule the testicle or epididymis first of all.

13. Cases, however, have been known in which pale urine, containing albumin and casts, preceded signs of trouble in testicle or prostate.

The Urine.—1. Acid urine containing at first blood, then pus and albumin. Pus increases as disease progresses.

2. The sediment contains pus and cheesy masses insoluble in acids and by heat. Tubercle bacilli are found in some cases, especially when the ureters are catheterized.

3. To find tubercle bacilli repeated examinations of the urine may be necessary, with use of centrifuge, especially if sediment is scanty. A large amount of urine should be examined.

4. To distinguish the tubercle bacillus from the smegma bacillus use alcohol, which immediately decolorizes the stained smegma bacillus, while the bacillus of tubercle retains its stain when exposed for several minutes.

Staining of the Bacilli.—Smear the sediment in a thin layer on the cover-glass, dry, float film downward in anilin magenta or gentian violet, rinse with a 25 per cent. solution of nitric acid, wash off in distilled water, float slide film-downward in methyl-blue. The bacilli appear red in a blue field.

Differential Diagnosis.—In renal tuberculosis pyuria is constant when the ureter is not obstructed, and intermittent in partial obstruction, while hæmaturia is seldom profuse. In calculous pyelitis hæmaturia is profuse and pyuria intermittent.

The diagnosis of renal tuberculosis is generally unsatisfactory, unless there is a palpable swelling and the products of tuberculosis are found in the urine. *Catheterization of the ureters* may aid in the discovery of the bacilli.

In the absence of palpable swelling and tubercular products in the urine the following table should be considered :

Differential Diagnosis in Renal Tuberculosis, Calculous Pyelitis and Renal Cancer.

RENAL TUBERCULOSIS.	CALCULOUS PYELITIS.	RENAL CANCER.
Pus in the urine abundant, early and continuous. Great quantities of vibri-ones and micrococci. Pyuria intermittent only in obstruction.	Pus in the urine in small quantities at first, slowly increasing. Preceded by mucus. Pyuria intermittent.	Little or no pus or debris.
Hæmaturia not frequent, slight, and in night urine as well as day. Frequently absent for long intervals.	Occasional attacks of slight, sometimes severe, hæmaturia after exercise, none at night, or after repose.	Hæmaturia usually light at first, but later profuse. Spontaneous, continuous, aggravated at intervals; and both after repose and exercise.
Pain.—Greatest in bladder, relieved when bladder is empty.	Pain.—Paroxysmal and radiating. Worse on motion.	Pain not affected by movements.
Pyrexia more or less marked.	Pyrexia not marked.	Pyrexia not marked.
Emaciation, loss of appetite, etc.	General nutrition good.	Loss of flesh, anæmia, cachexia.

Dr. Charles Adams, of Chicago, says: "The presence of tubercle bacilli in the urine is not always positive evidence of the existence of tuberculosis of the urinary organs, as they are often passed from other diseased organs out of the circulation by the kidneys. In the face of clinical evidence of infection of the urinary organs, failure of the bacteriological test is not to be taken as conclusive; in such case urine-inoculation upon animals should be tried. Clinical evidence and bacteriological or inoculation tests having shown the existence of a tubercular lesion of the urinary tract, the all-important question then arises of location of the lesion. Modern diagnostic methods have facilitated wonderfully the examination of the urinary organs. With the electro-cystoscope the interior of the bladder can be inspected, the stream of urine seen as it issues from the ureteral openings in the bladder, and the ureters themselves catheterized. In the female the ureters may be catheterized by the methods of Simon, Pawlik, or Kelly. In either male or female, the urine may be collected from the ureters separately by the method lately introduced by Harris, which accomplishes practically what is done by catheterization of the ureters with a simple apparatus such as can be used by any one possessed of any surgical dexterity."

Course.—The course is sometimes erratic. Exacerbations may occur, with moderate pain and hæmaturia, then all symptoms disappear until the next attack.

In many cases the order of symptoms is as follows: Backache, hæmaturia, and albuminuria without casts; then putrid, alkaline urine; later, swelling, pyuria, suppression of urine, and death.

The disease may remain stationary for several years.

Prognosis.—Always grave. If bilateral, death usually in a short time—one to three years after recognition. In primary cases life is seldom prolonged beyond two or three

years, and in secondary cases death takes place much sooner. In unilateral cases the prognosis is unfavorable if the disease extends to the ureter, bladder, or urethra. In rare cases recovery takes place in unilateral cases when lower urinary tract escapes, or when the disease is encapsulated and the cheesy matter becomes inspissated or calcareous. Complication with paranephric abscess usually hastens death.

Complications.—Hydronephrosis and pyonephrosis.

Treatment.—If disease is unilateral and of small area, lumbar incision may give great relief. Of late years extirpation of the affected kidney in unilateral disease has been followed repeatedly by recovery, nephrectomy being performed when the disease covers a large area.

If the bladder is extensively affected, cystotomy may in some cases prolong life.

In older cases, and in bilateral ones, or with invasion of ureters and bladder, medical treatment alone must be relied on. The diet is to be nutritious and digestible, but milk is the feature.

Catheterization, sounding, and washing out the bladder are contra-indicated.

The drugs to be used are as follows: A good egg emulsion of cod-liver oil, and, if the stomach tolerates it, the guaiacol carbonate, as in pulmonary tuberculosis.

For vesical distress, ammonium or lithium benzoate and salol.

When urine is alkaline and pyuria marked, and both appetite and digestion are poor, nux vomica, nitric acid, nitro-muriatic acid in potencies.

For strangury, sitz-baths and rectal suppositories of opium, hyoscyamus, lupulin, or belladonna. Try, also, juniperus Virginiana 1x dil., terebinth 2x dil., lilium tigrinum 3x dil., conium tincture in drop doses. If there is reason to think that lithuria co-exists, thlaspi bursa pastoris in 10- to 30-drop doses of the tincture should be tried.

For the chills and fever, aconite, baptisia, china, and quinine. Iced champagne for the nausea and vomiting of threatening uræmia. When uræmia threatens, give jaborandi, 1x dil., as previously described, or use warm baths or packs, and open the bowels.

As constitutional remedies the iodides, calcarea carb. and phos., kali, mercurius, and sulphur may be needed.

Cold sponging for the pyrexia. Diarrhœa, unless patient is uræmic, should be checked.

CLINICAL CASE.

In the case of a woman which the author saw there was palpable swelling (tumor in the right side, lying just above a line drawn through the umbilicus), great sensitiveness on pressure, frequency of urination (but no strangury), fever, night-sweats, and weakness. Vaginal examination revealed slight sensitiveness of the bladder to pressure. Examination of the urine revealed presence of tubercular bacilli.

The whole 24 hours' urine was obtained, and the results were as follows :

Quantity of urine, 750 c.c. (25 fluidounces); specific gravity, 1021. Reaction, acid. Total urea, 306 grains (20 grammes); total phos. acid, 16 grains (1 gramme); albumin, 15 per cent. bulk; pus, 6 per cent. bulk.

Sediment.—Great abundance of pus and some blood-corpuscles (blood-shadows, mostly); no casts; numerous microorganisms. Tubercular bacilli.

The features in this examination were the high ratio of urea to phosphoric acid, the large amount of albumin compared with the pus, the absence of casts, and the presence of tubercular bacilli. Cheesy masses, insoluble in acetic acid, were not found.

This case terminated fatally (without medical or surgical treatment, so far as I know) in about two months from the time that the diagnosis was made.

CHAPTER XXVIII.

TUMORS OF THE KIDNEY.

WE distinguish two varieties, benignant and malignant.

Benignant tumors are fibroma, lipoma, myoma and adenoma. Some writers mention myxoma, angioma, lymphoma, osteoma, cavernous tumors and gummata.

Malignant tumors are sarcoma and carcinoma.

BENIGN TUMORS.

Lipoma.—These are among the rarest of tumors. They are sharply circumscribed, somewhat wedge-shaped neoformations, situated, for the most part, in the cortex. They do not grow much above the size of a hazel-nut. (D. J. Hamilton.)

Fibroma.—According to Hamilton, this is a round growth about the size of a mustard-seed or larger, gray in color, and much resembling a tubercle. It will often be found lying in the medulla. It is usually a single tumor, and is composed of fibrous tissue arranged more or less concentrically.

Myoma.—The kidney is comparatively often, according to Hamilton, the seat of a tumor usually described as striated myoma. It is always congenital, and although small at the time of birth, gains bulk rapidly, so that at death it may distend the abdomen and weigh several pounds. It is located at first around the kidney, and subsequently envelops and destroys it. Some cavities filled with thick, brown-colored liquid may alone indicate the former locality of the organ. It is firm in consistence at parts, soft at others, and sometimes throughout its substance little barley-

seed-like masses of hyaline cartilage may be detected. The whole aspect of the tumor is that of a sarcoma, but there are microscopical differences, some of the cells showing a distinct cross-striation.

Rhabdomyoma usually grows in connection with the kidney, sometimes with the testis, and is always congenital.

Adenoma.—Adenoma is sometimes a multiple growth; the tumors reach the size of a pea or hazel-nut, or even larger. They project from the surface and are mostly sub-capsular. If large, they push the kidney aside and are sharply demarcated from it. Sutton holds that the only tumor of the kidney to which the term renal adenoma is applicable is what is known as congenital cystic kidney.

Shattock maintains that remnants from the meso-nephros (Wolffian body) and the meta-nephros (true kidney) often serve as matrices.

Lymphadenomata have often been found growing in the kidney.

MALIGNANT TUMORS.

These are sarcoma and carcinoma. They occur both as primary and secondary tumors, and are distinguishable from each other only by microscopical examination.

Sarcoma.—This is the most common malignant renal tumor of childhood. Primary ones are occasionally seen in the adult kidneys. They are usually of the round-cell type, and may grow to a great size. Sutton distinguishes three species, as follows:

1. Spindle-celled sarcoma and its variety, myosarcoma.
2. Round-celled sarcoma.
3. Tumors composed of adenoid tissue.

In a very large proportion of cases they are congenital or are noticed within a few months of birth.

The growth of sarcoma is rapid, and the tumor usually reaches an enormous size before it destroys life. The mass is smooth, and pseudo-fluctuation is usually present. The

tumor is composed usually of round cells. The malignancy of sarcoma of the kidney is very great, and recurrence after extirpation of the kidney is the rule. (Senn.)

A peculiar and anomalous tumor is met with in rare cases lying in or around the kidney-substance, to which it is difficult to assign a name. It grows to the bulk of a walnut or orange, is rounded, sharply cut off from the kid-

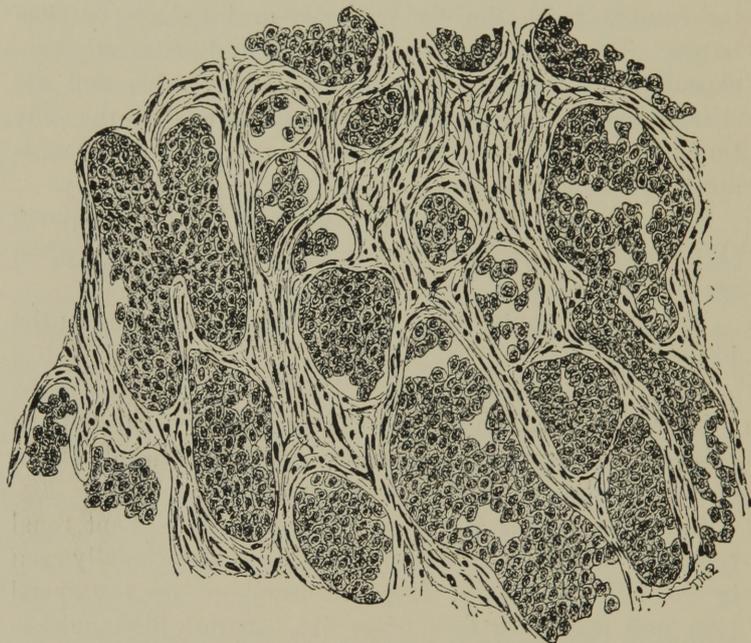


FIG. 23.—Medullary Carcinoma.—(DELAFIELD and PRUDDEN.)

ney-tissue, and provided with a capsule. A striking feature on section is the diversity of color of the exposed surface, suggesting a sarcoma in some parts, but in others there are cyst-like cavities filled with deep-brown-colored thick fluid, evidently the remains of an old hæmorrhage. (Hamilton.)

Carcinoma—There is undoubtedly a primary cancer of the kidney which springs from the epithelium. The tumor may grow to such an extent as to occupy the whole of one

side of the abdomen. It is extremely hard and tough, and nothing may remain of the affected kidney but a number of cysts filled with a thick brownish-red fluid. Most cases described as carcinoma are really sarcoma.

Carcinoma of the kidney is of the tubular variety, and the columnar epithelia are arranged in the form of tubules in a delicate, very vascular stroma.

According to the degree of development of the stroma the tumor is either hard or soft, of slow or of rapid growth. In exceptional cases the tumor, instead of springing from a matrix of embryonic cells representing kidney-tissue, originates from a displaced matrix of epithelia derived from the supra-renal capsule.

Etiology.—Primary malignant disease is more common in males than in females, and in early or late adult life. Occasionally it is found at birth.

Secondary malignant disease takes its origin from malignant disease in the vicinity, and especially from primary malignant disease of the testicles.

Morbid Anatomy.—The disease may affect one or both kidneys. In secondary malignant disease the right kidney is more often affected. The disease occurs as diffuse infiltration or as nodules, the latter being more frequent in secondary cancer.

Character of the Tumor.—The affected kidney is, as a rule, increased in size, but its shape is usually maintained. The surface of the tumor is usually lobulated. The mass varies in consistency, throughout or in different portions, from scirrhous to soft medullary or encephaloid. The color varies according to conditions present, as fatty degeneration, necrosis, hæmorrhage or pigment formation, hence may be gray, whitish-yellow, red, or black.

The tumor may in some cases be enormous in size, as large as a man's head, producing appreciable distention of the abdomen and displacement of the abdominal viscera, and may weigh as much as twenty pounds.

Location.—The fibrous capsule of the kidney may overlie the tumor or may have been perforated by it, or the capsule may separate the tumor from the kidney.

The neoplasm may grow into the renal vein, and from there into the inferior vena cava. It frequently projects into the renal pelvis, dilating and completely filling it.

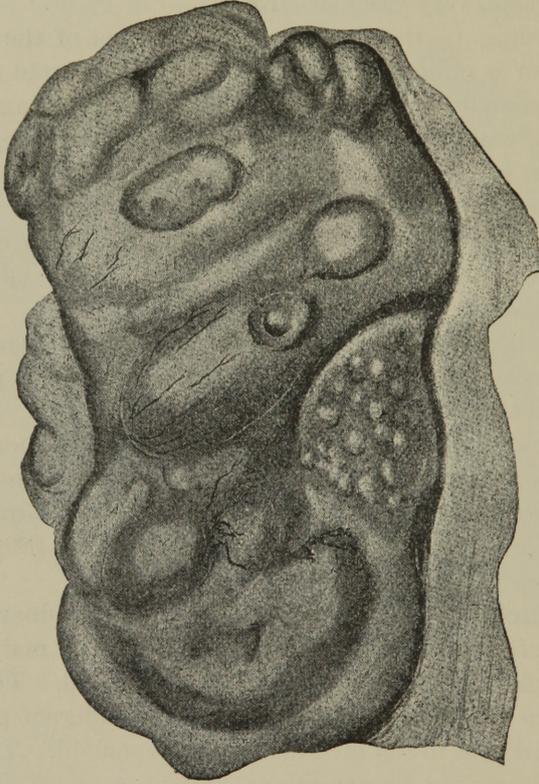


FIG. 24.—Cancer of the kidney.—(RAYER.)

Clinical Features.—These are the following :

1. Pain and pressure.
2. Progressive emaciation and cachexia.
3. Hæmaturia.
4. Swelling.

The pains are either fixed or else shoot outward and downward from extension of the growth to the lower dorsal and lumbar nerves; usually a dull ache, or paroxysmal pain, and not affected by movement. When there is pressure on lumbar nerves, there may be extreme pain in the chest, lumbar region, back, hip, testicles, thigh, and leg.

The pressure, if on abdominal veins, may cause œdema of lower extremities or ascites. If on abdominal viscera, then vomiting, constipation, anorexia, and icterus.

Cachexia is especially significant, when the patient has not lost much blood and still has fairly good appetite. Cachexia is sometimes but little noticeable in sarcoma.

Hæmaturia may be an early symptom. It may be constant or intermittent, slight, or sufficiently severe to prove rapidly fatal. Renal colic may be noticed from passage of clots of blood (worm-like) which may be found in the urine. In elderly persons hæmaturia often precedes recognition of tumor.

The Urine in Cancer.—In addition to the blood, epithelia and fragments of the tumor may be found. Connective tissue in large amounts may be a feature. (See writer's new URINARY ANALYSIS, Chapter XLIX.)

Glycogenic generation in the epithelia is of diagnostic importance, according to Quincke.

The urine in sarcoma has been described in the writer's new book on URINARY ANALYSIS, page 322. Heitzmann demonstrated to the author the sarcoma corpuscles, midway in size between the blood-corpuscle and pus-corpuscle. (See also page 322 in new URINARY ANALYSIS, by the writer.)

Differential Diagnosis.—Bimanual palpations may show the following in cases of cancer of the kidney:

1. Tumor in the lumbar region of the shape of the kidney.
2. Location behind the colon (determined by inflating the latter).

3. Tumor not movable.

4. Tumor separated by the intestine from liver and spleen (shown by resonance on percussion unless intestine is pushed aside).

5. If the tumor is soft and lobulated, aspiration may remove a liquid containing urea and cancer fragments.

The tumor must be differentiated from enlarged spleen, tumors of the liver, distended gall-bladder, and pelvic tumors.

Enlarged spleen may be felt as a moving body with characteristic edge.

Tumors of the liver and a distended gall-bladder are easily movable, and are not overlaid by the distended colon.

Pelvic tumors proceed from below and are not covered by the intestine.

Prognosis.—In unilateral sarcomatous disease extirpation of the affected kidney has relieved symptoms and prolonged life. When both kidneys are affected, death is usual in a year or two after recognition.

In children the disease is fatal in from ten weeks to a year. In adults from five months to seven years; on an average, in two and a half years.

Causes of Death.—These are as follows :

1. Prolonged cachexia.
2. Gangrene in the tumor, resulting from fistulæ between growth and intestine or surface of body.
3. Hæmorrhage from rupture of vessels near the surface of the tumor, either into the urinary tract or peritoneal cavity.

CLINICAL NOTES ON RENAL TUMORS.

1. Benign tumors are, as a rule, rarely of practical importance, owing to insufficient size and number.

2. In some cases, the kidney being absorbed from disease, its place is taken by true adipose tissue. In a case operated on by Dr. Charles Adams, complete replacement

Differential Diagnosis in Renal Tumors.

HYDRONEPHROSIS.	CANCER.	CYSTIC DISEASE.	PYONEPHROSIS.	PERINEPHRITIC ABSCESS.
Tumor, unilateral or bilateral.	Unilateral.	Unilateral or bilateral.	Unilateral or bilateral.	Unilateral, rarely bilateral.
Fluctuant, as a rule, sometimes hard.	Non-fluctuant.	Non-fluctuant.	Fluctuant.	Fluctuant in time.
Irregular form.	Irregular form.	Shape of kidney.	Irregular form.	Irregular form.
Varies in size from time to time.	No variation in size.	No variation; <i>hydatid cysts</i> ; diminution in size of tumor after renal colic.	Varies in size.	No variation in size.
Painless or feeling of weight and dragging.	Severe and almost constant pain.	Usually painless until suppuration.	Considerable pain in lumbar region, worse on pressure in front, relieved by pressure behind.	Severe, lancinating, and increasing pain.
Hæmaturia rare.	Frequently-recurring hæmaturia.	Hæmaturia moderate.	If due to renal calculus, hæmaturia after exercise.	When very large, blood and blood casts in urine.
Fluid pushes forward. Aspirated fluid, neutral or feebly acid, never alkaline.	Fluid accumulations push forward.	Fluids push forward. In hydatid cysts, aspirated fluid never acid, sometimes neutral, usually alkaline.	Fluids push forward. Aspirated fluid contains pus.	Fluid accumulation pushes backward.
Intermittent discharge of pale, watery urine.	Urine not intermittent.	Urine not intermittent.	Intermittent discharge of muco-purulent urine.	Urine not intermittent.
But little constitutional disturbance. No dropsy, no cachexia.	Eventually well-marked cachexia. Loss of flesh. Anæmia. Ascites and œdema lower extremities when pressure on abdominal veins.	Sallow complexion, hypertrophy of heart, arterial tension as in interstitial nephritis. Sometimes dropsy.	May be signs of uræmic poisoning, but usually absence of marked fever.	Great constitutional disturbances; continuous elevation of temperature. Marked rigors and sweat.

by fat took place in connection with a large retroperitoneal tumor (lipo-myo-fibroma).

3. Villous papillomata grow occasionally in the kidneys.

4. In at least ten cases it has been noticed that in tumors of the adrenal there is an absence of hæmaturia..

5. Adenoma may proceed from displaced portions of the suprarenal capsule.

6. Persistent violent pain in the region of the kidney, which cannot otherwise be accounted for, with progressive cachexia, warrants the gravest suspicion of malignant disease, even though other features are absent.

7. Persistent hæmaturia (whose renal origin may be suspected by the dark-color, absence of clots, etc.), with cachexia, suggests renal cancer, even if pain is absent, and no enlargement can be detected.

8. Guillet declares that an important symptom of malignant disease is the presence of a suddenly-occurring and rapidly-growing varicocele.

9. Considerable difficulty and pain on micturition are noted in early stages of malignant disease, even when the bladder is not affected.

Operative Treatment.—In carcinoma excision is justifiable only in very rare cases, where the diagnosis is made unusually early.

Even in sarcomatous cases duration of life beyond three years is unusual.

Primary nephrectomy is indicated in cases of malignant growth. The mortality in eight years has been extraordinarily diminished, as a rule—from 61.22 to 24.40 per cent. Those who remain free from recurrence for two years may be regarded as cured, though recurrence has been known after three years.

General Treatment.—Arsenicum is to be given internally in the lower decimals, as suggested by Dr. J. S. Mitchell.

The tumor may be prevented from dragging by use of a flannel roller.

Constipation is to be overcome by appropriate means.

Clots and coagula are to be removed by gently washing out the bladder.

The pain is to be quieted by application of liniments containing aconite or belladonna, or by a mixture of chloral hydrate and camphor.

As a rule, morphine must be administered when pain is severe.

Hæmaturia, if profuse, requires complete rest, cold applications to the abdomen, administration of hamamelis, ergot, ipecac, millefolium, thlaspi in 30-drop doses of the tincture, or gallic acid in 2- to 10-grain doses.

CHAPTER XXIX.

DISEASES OF THE RENAL PELVIS.

WE shall consider the following :

1. Pyelo-nephritis.
2. Pyelitis.
3. Hydronephrosis.
4. Pyonephrosis.
5. Nephrolithiasis (Renal calculus).

PYELO-NEPHRITIS.

This disorder has already been discussed under the heading of abscesses.

Tubercular pyelo-nephritis has already been considered under TUBERCULOSIS.

PYELITIS.

Definition.—Inflammation of the mucous membrane of the pelvis of the kidney. May occur without pyelonephritis, or the latter may result from it.

Etiology.—Due to the presence of an irritant, bacterial or toxic. The causes are usually as follows :

1. Due to bacterial irritant of infectious diseases, or scarlet fever, typhoid, diphtheria, small-pox, measles, cholera, acute nephritis; accompanies pyæmia, scurvy, enteric fever. Occurs during pregnancy.

2. Due to elimination of poisons, as copaiba, turpentine, cantharides, cubebs. Diabetic pyelitis from irritation due to glucose also occurs.

3. Due to rupture of neighboring abscess into the pelvis.

4. Due to, or aggravated by, presence of foreign body (calculus, parasite, blood-clot, tumor, etc.).

5. Exposure to cold is the only cause we can assign for the idiopathic or spontaneous pyelitis.

6. Due *commonly* to inflammations of the lower urinary tract (unclean instruments, failure to avoid sepsis after operations, etc.).

7. Due occasionally to childbirth, for same reason as in 6.

Clinically we find the most common causes are calculus, gonorrhœa, tuberculosis, and infection from use of unclean instruments, etc.

Occurrence.—More frequent in men and in adult life.

Morbid Anatomy.—The disease may affect one or both kidneys.

There are several pathological classes of pyelitis, as follows:

1. *Catarrhal.*—Swelling and injection of the mucous membrane with sometimes punctate hæmorrhages and turbid residual urine in the pelvis.

2. *Suppurative.*—Thickened mucous membrane with less conspicuously injected blood-vessels, but pus is present in the urine in the pelvis, and the mucous membrane may be ulcerated.

3. *Diphtheritic.*—Superficial necrosis with deposit of salts; apices of pyramids necrotic or destroyed.

4. *Hæmorrhagic.*—Cases in which hæmorrhages into the inflamed membranes occur.

NOTE.—The pathological condition in the ureter and bladder usually corresponds to that of the pelvis, but the ureters may evince evidence of only catarrhal inflammation when both bladder and renal pelvis are affected by the other lesions.

Clinical Features.—Symptoms may be masked by those of the disease of which it is a complication, or may be altogether insignificant. The most common features are as follows:

1. Dull pain in the region of one or both kidneys.
2. Sensitiveness on pressure.
3. Possibly moderately severe pain following course of one or both ureters.
4. Usually little or no constitutional disturbance. There may be nocturnal transitory fever, especially during attacks of pain.

The Urine.—In simple pyelitis we find the following :

1. Color, reaction, and specific gravity, normal. Turbidity due to pus.
2. Albumin small, usually less than ten per cent. bulk, due to pus, and varying with amount of pus.
3. Sediment varies in bulk according to the amount of pus present; the latter more abundant in chronic than in acute cases.
4. Sediment contains numerous pus-corpuscles, few or many blood-corpuscles, and numerous epithelia.
5. The quantity of urine is lessened in acute cases, but greatly increased in chronic, with diminution of solids.
6. While the freshly-voided urine is acid, it soon, on standing, becomes alkaline, and triple phosphate is deposited.
7. When there is retention of urine, the latter may, when voided, be alkaline from decomposition.
8. Small gelatinous masses composed of rod-shaped bacilli and a little calcium oxalate are found in cases due to septic inflammation of the lower urinary tract.
9. Heitzmann claimed to distinguish epithelia from pelvis of the kidney. (See writer's new manual of URINARY ANALYSIS, p. 300, for figure.) Other writers assert that the epithelia cannot be distinguished from those of the bladder.
10. If pyelitis is confined to one kidney, the flow of purulent urine may be followed by that of a normal urine, due to temporary obstruction of the ureter continuous with

that of the diseased pelvis. Catheterization of the ureter (by the method of Kelly or of Harris, of Chicago,) demonstrates the existence of such a condition.

11. Some writers describe the urine of chronic pyelitis as having a greenish tint, an odor slightly of rotten eggs, and, if the urine is acid, a sediment containing pus-corpuses with tooth-like projections; triple phosphate crystals in *acid* urine are said to be a feature.

12. In chronic pyelitis we sometimes find frequent but painless micturition.

Differential Diagnosis.—Pyelitis is to be differentiated from pyelo-nephritis and from cystitis as follows:

PYELO-NEPHRITIS.	PYELITIS.	CYSTITIS.
Alkaline urine.	Acid.	Acid or alkaline.
Absence of tenesmus vesicæ.	Absence of tenesmus.	Vesical tenesmus.
Albumin sometimes abundant.	Albumin seldom abundant.	Albumin seldom abundant.
Constitutional symptoms marked.	Constitutional symptoms not marked.	Constitutional symptoms not marked.
Pain over the renal region.	Pain over the renal region.	No pain over renal region.

In chronic pyelitis there is sometimes polyuria, suggesting chronic fibrous (interstitial) nephritis, but pain over the region of one or the other kidney and absence of the cardio-vascular symptoms serve to differentiate.

Prognosis.—1. *Favorable*, when due to bacterial poison of infectious diseases or to toxic irritants; except when due to acute nephritis, cholera, or diphtheria, where prognosis is grave.

2. *Serious*, if a surgical operation to remove cause is necessary.

3. *Serious*, when pyelo-nephritis results, though even then recovery is possible.

4. *Serious*, when bilateral.

5. *Serious*, when associated with grave vesical disorders, owing to danger of pyelo-nephritis.

6. *Serious*, when after chronic pyelitis of long duration, amyloid disease or chronic interstitial nephritis results.

Treatment.—Essentials of general treatment are as follows :

1. Confinement to bed in acute cases, whether following the infectious diseases due to toxic irritants or idiopathic.

2. Great care to be taken to avoid chilling of surface of body.

3. Avoidance of sexual intercourse.

4. Non-nitrogenous or largely farinaceous diet. In severe cases absolute milk diet, as long as fever lasts. Milk diet is also best for the chronic suppurative or tuberculous forms.

5. Long-continued lukewarm baths during exacerbations.

6. Unless the polyuria is excessive, patient should drink very freely of water.

Medical Treatment.—The principal remedies in pyelitis are as follows :

Cantharis, *uva ursi*, *hepar sulphur*, *mercurius*.

In addition to the above the following are recommended :

Belladonna, *copaiba*, *terebinthina*, *arsenicum*, *nux vomica*, *phosphorus*, *petroleum*, *china*, *silica*, *chimaphila*, *sulphate of quinine*, *sepia*, *pulsatilla*, *sulphur*.

Cantharis, not lower than the third, is the remedy, when micturition is painful and the urine contains pus and blood. Useful in either acute or chronic pyelitis.

Uva ursi is best adapted to acute pyelitis, and is best given, according to Hughes, in form of a trituration of the leaves.

Hepar sulphur is suited to the chronic cases, especially when from any cause there is pain like renal colic. Use 6x dilution. The patient is very sensitive, suffers pain both during and after micturition, and the urine escapes slowly or with difficulty, the last drops being tinged with blood.

Belladonna in form of tincture is serviceable for the time being, when pain is severe.

Mercurius is said to be indicated especially, when the amount of pus in the urine is very large.

Copaiba is indicated by pain in the renal region, tenesmus, and hæmaturia with albuminuria.

Terebinthina for violent burning, tearing pain in the renal region, pronounced strangury, scanty, bloody urine, frequent micturition at night.

Arsenicum in the 3x trituration for the cachexia caused by long-lasting suppuration. Hæmaturia with burning pain, albuminuria with weakness, emaciation and œdema, colliquative diarrhœa and hectic fever are arsenicum symptoms.

China is recommended by Hughes in chronic suppurative pyelitis.

Silica is recommended by Jousset in high dilutions as of value in suppuration.

Chimaphila (in ten-drop doses of a good fluid extract) diminished the pus sediment in one of the writer's cases of simple pyelitis of not long standing.

Sulphate of quinine is recommended (in doses of from 15 to 22 grains) for the pernicious attacks during the acute period of pyelitis. It should be administered during the decline of the attack.

Chronic Pyelitis.—The remedies are as follows (in addition to those already mentioned):

Barosma.—Recommended by Dr. E. M. Hale in chronic pyelitis.

Benzoic Acid.—After the pain and fever of the acute stage have subsided, but urine is still cloudy, scanty, of dark-brown color, and strong urinous (*not ammoniacal*) odor.

Berberis.—Useful in the pains of chronic pyelitis. Suppuration on the left side, very severe pain from left kidney down ureter to hip. *Berberis vulgaris*, first decimal dilution. Berberis is a remedy which is especially suited to disorders of the lumbar region.

Borax.—In doses of 5 to 20 grains for hyperacidity of the urine.

Boracic Acid.—In doses of 2 to 5 grains for excessively ammoniacal urine, so as to prevent decomposition.

Creosote.—In doses of 1 to 2 minims when generally indicated, and also when urine is foul.

Eucalyptol.—In doses of 2 to 5 minims in an emulsion, to prevent decomposition of the urine.

Ferrum.—Give ferrum phos. 3x when there is great weakness and emaciation, with other indications for iron.

Terebinth.—In dose same as eucalyptol when the urine is hyper-acid.

Surgical Treatment.—Since pyelitis is sometimes due to obstinate urethral stricture, the latter must be relieved, so that the urine may flow freely.

THERAPEUTIC NOTES.

1. In this disease, as in all others where pus formation occurs, administer protonuclein, one tablet every two hours, to repair the waste.

2. Applications of antiphlogistine to the renal region should not be forgotten.

3. In recent cases of moderate intensity buchu, arbutin and gallic acid will sometimes reduce the amount of pus.

4. In older cases, where there is much pus, boracic acid in 2- to 10-grain doses, largely diluted with water, often acts efficiently.

5. Oil of sandalwood, oil of eucalyptus and various similar substances are recommended in pyelitis.

6. In cases of simple pyelitis copious draughts of distilled or spring water will often prove to be of great benefit for washing out the pus.

7. Urotropin is recommended by Leopold Caspar in cases of chronic suppurative inflammation of the bladder and renal pelvis in elderly people. The symptoms are weak-

ness, loss of appetite, pale color, dry, crusted tongue, thirst and slight rise of temperature. They are cases of chronic urinary fever due to absorption of micro-organic toxins or of urinary poisons. Dose, from 3 to $7\frac{1}{2}$ grains, taken first twice, later three times, daily in a glass of water.

8. Satterthwaite suggests that the patient sit over a steaming decoction made by putting a bunch of wormwood in a chamber or other receptacle in a closed water-closet-chair, and then pouring on it boiling-hot water.

9. In cases which have been aggravated by sexual excesses damiana is said to be useful.

10. Wet cups followed by warm poultices and leeching are advised by some writers.

11. Porter believes in giving inspissated bile in pyelitis.

12. When the urine is strongly acid, alkaline demulcent drinks and terebinthina internally are administered.

13. In chronic cases change of air, especially from the interior to the sea, is recommended.

14. For the gouty patient the imported Vichy water and the various alkalies are useful; for the oxaluric patient Contrexéville water, and either oxalic acid in potency, nitro-muriatic acid or lysidine. (See OXALURIA.)

CHAPTER XXX.

HYDRONEPHROSIS.

Definition.—Dilatation of the pelvis of the kidney with urine alone.

Etiology.—Prolonged obstruction to the outflow of urine due to the following causes:

1. Contraction of one or both ureters, unless resulting from inflammation, ending possibly in obliteration of the canal.
2. Compression of the urinary tract below the pelvis, as by tumors.
3. Obstruction from (*a*) congenital causes, as atresia, congenital folds or twists, or oblique insertion of the ureters, or more commonly from (*b*) acquired causes, as inflammatory processes around the ureter, displacement of the uterus, ovarian or rectal tumors which compress or constrict the ureters, or from (*c*) result of causes within the urinary tract, as inflammation, stricture, enlarged prostate, calculi, tumors.

4. Obstruction due to unrecognizable causes.

Clinically we find urethral stricture, enlarged prostate, renal calculi and displacements of the kidney among the commonest causes. Landau holds that spasmodic contraction of the ureter is a noteworthy cause.

Morbid Anatomy.—1. We find a cystic tumor, the shape of the kidney and in its site, composed chiefly of the dilated renal pelvis and calices, the kidney more or less atrophied, appearing as an appendage to the pelvis.

2. The interior of the sac is composed of communicating smaller sacs (dilated calices), at the bottom of which are seen the flattened pyramids.

3. The sac contents are a liquid of low specific gravity resembling the urine of chronic interstitial nephritis. In cases of long duration neither urea nor uric acid may be

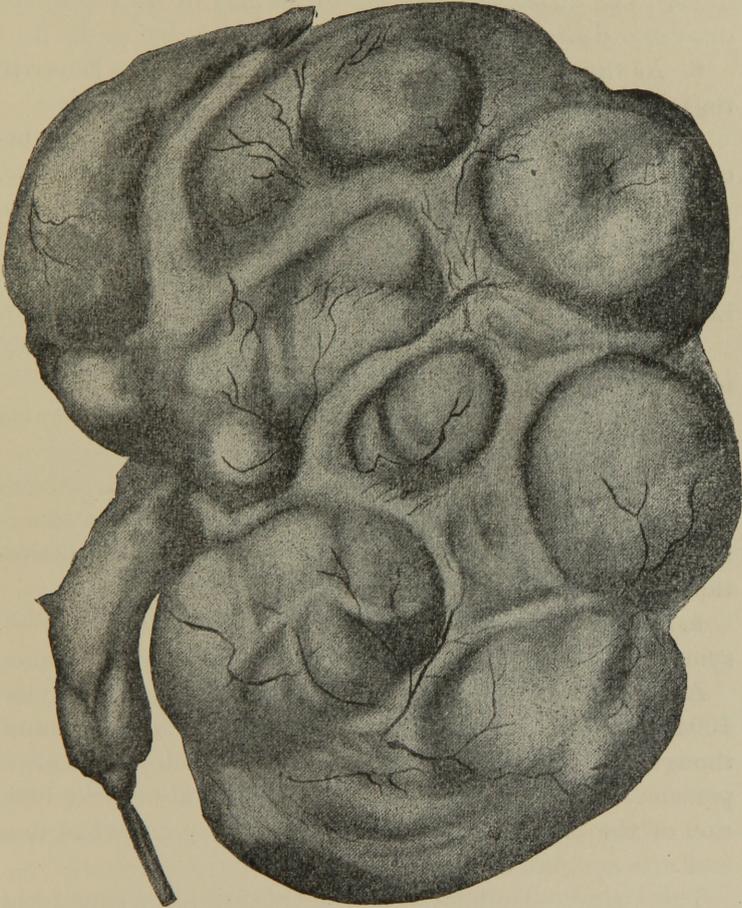


FIG. 25.—Hydronephrosis; second stage; the kidney substance completely atrophied.—
(LE DENTU.)

found in it. If there is complicating hæmorrhage or inflammation, blood, pus, cholesterin, fat, or chalky substances may be present, otherwise no sediment.

4. In some cases the cyst appears as large as an abdominal tumor, containing several gallons.

5. If the tumor is very large the abdominal organs are likely to be displaced, and the colon may lie on the tumor or at one side of it.

6. As the dilatation progresses, chronic fibrous (interstitial) nephritis arises in the kidney.

7. If the obstruction is in the ureter, the latter may become so dilated as to suggest that it is the small intestine.

Clinical Features.—1. Gradually forming tumor; no symptoms, and no lesion recognized except post-mortem.

2. Constant dull pain in the loin over affected kidney, lasting a long time, and development of fullness or tumor.

3. Intermittent hydronephrosis; temporary diminution in quantity of urine per twenty-four hours, possibly vomiting and fever for a few days, followed by polyuria, possibly hæmaturia and relief.

4. Large tumor, unilateral or bilateral, filling greater part of abdomen; smooth, resistant; transmits sense of fluctuation; pain extending to thigh; persistent constipation and dyspnœa may accompany it.

5. Double hydronephrosis with progressive enlargement; symptoms of chronic fibrous nephritis, as chronic uræmia.

Aspirated Fluid.—The liquid is of low specific gravity, 1004, and never alkaline when fresh. Urea may be found, though not always. An abundance of sodium chloride is present. Pus is often present. The neutral or acid reaction of the aspirated fluid is an important point when urea and uric acid are absent.

The Urine.—Unilateral hydronephrosis; the sound kidney excretes normal urine.

Bilateral.—Normal urine until close of life, then that of chronic fibrous nephritis.

Differential Diagnosis.—The renal nature of tumor may be suspected from the seat, especially when the colon lies

in front of it. The colon in such a case, when empty, may be felt as a movable cord, and can be distended by inflating the intestine. The larger the tumor, the more likely the colon to be displaced laterally. Aspiration withdraws a fluid containing urea and uric acid, except in unilateral cases of long standing.

Prognosis.—*Unilateral*: Produces merely mechanical discomfort. Intermittent: not essentially serious. Bilateral: if progressive, prognosis unfavorable, like chronic fibrous nephritis.

Rupture of Sac.—In any variety prognosis grave. Rapidly fatal termination usual.

In congenital cases death takes place at birth, or in a few months or years.

When due to renal calculus or uterine displacement, prognosis depends on the cause.

Usual Causes of Death.—Suppression of urine, rupture of the sac into the abdomen, or interference with the functions of other organs. Suppurative pyelo-nephritis and death may follow operations on the lower urinary tract when hydronephrosis is present.

Treatment.—If due to lesions, such as displacements, renal calculi, etc., careful manual pressure, emptying the sac, friction over tract of ureter or on the sac, hot baths, etc. If due to pelvic tumors, lower bowel to be emptied daily; support of tumor as in prolapsed uterus by pessaries. If tumor rapidly increases and cannot be emptied by ordinary pressure, surgical means necessary, as tapping, nephrotomy, or nephrectomy. Landau thinks nephrectomy contra-indicated. Recently another mode of operating has been tried, viz., stitching the sac to the skin. J. K. Thornton holds that if the fluid re-accumulates after several tapplings, nephrectomy is preferable to nephrotomy and drainage.

Aspiration affords temporary relief, and by repetition

sometimes cures. The needle is to be inserted, if on the right side, two and a half inches behind a line perpendicular to the anterior superior spine of the ilium, and midway between the crest of the ilium and last rib. On the left side, an inch higher up.

Medical treatment of this disorder is practically unavailing.

THERAPEUTIC NOTES.

1. Congenital bilateral hydronephrosis cannot be relieved by treatment. Unilateral cases are sometimes tapped, but there is serious risk of rupturing the sac or producing peritonitis. In rare cases the fluid can be forced out by manipulations.

2. Acquired hydronephrosis has been relieved by massage; some danger attends this measure, as too much force may rupture the sac.

3. Intermittent hydronephrosis due to movable kidney and kinking of ureter may be relieved by nephrorraphy.

4. Nephrotomy is rarely fatal, but in more than half the cases produces permanent fistula.

5. Nephrectomy has had a mortality of forty-one and three-tenths per cent.

CHAPTER XXXI.

PYONEPHROSIS.

Definition.—Dilatation of the pelvis of the kidney with urine mixed with pus.

Etiology.—That of hydronephrosis, the renal pelvis becoming in addition to dilatation the seat of suppurative inflammation. Septic inflammation, pyelitis, renal tuberculosis, and malignant disease of neighboring organs are among the causes. It is said to occur, like pyelitis, in the course of acute nephritis, diphtheria, and other infectious diseases.

Clinically we find impaction of stone in the pelvis a common cause.

Morbid Anatomy.—That of hydronephrosis, except that the sac contains pus in addition to urine, and instead of a smooth, shining, grayish-white wall, there is a rough, opaque-yellow, perhaps granular or ulcerated wall.

Clinical Features.—Those of hydronephrosis, except that the tumor rarely attains so large a size. Persistent pyonephrosis has the symptoms of suppurative pyelitis. Evacuation of the tumor, like that of hydronephrosis, may take place into the intestine, pleura, or lungs.

Aspiration will show presence of pus.

Previous to the progressive development of the tumor there are noticed symptoms of pyelitis, but pus disappears from the urine when the tumor is perceived.

The Urine.—In intermittent pyonephrosis the diminution in size of tumor is associated with presence of pus, blood and albumin in the urine. The presence of large amounts of fat in the urine has been noticed in this disorder, as well as in paranephritis.

Differential Diagnosis.—Pyonephrosis is differentiated from hydronephrosis by smaller size and presence of pus; from circumscribed peritonitis by presence of pus in the urine: from solid abdominal tumors by aspiration.

Prognosis.—*Unfavorable*, if primary disease is tuberculosis of renal pelvis or bladder, or malignant disease of uterus or rectum.

Unfavorable, if distention of the renal pelvis is rapid and due to sudden impediment in escape of pus; the danger to life is in such cases great, unless surgical interference is possible (nephrotomy or nephrectomy).

Unfavorable, if urine is alkaline and there is vesical irritation.

Not immediately unfavorable, if urine acid, pus in small bulk in the renal pelvis, obstruction and suppuration unilateral in otherwise healthy patient.

Pyonephrosis is essentially a chronic disorder, and the pyuria and hæmaturia may continue over a long period of time.

Favorable, if tumor ruptures into some part of conducting portion of the urinary tract, and at the same time no grave structural change has taken place in the affected kidney.

Amelioration, if rupture takes place into alimentary canal, though constant danger of acute peritonitis.

Death soon follows rupture into retroperitoneal tissue, peritoneal cavity, or thorax. Death may follow inflammation induced in renal substance or neighboring parts. The patient may succumb to slow, gradual exhaustion and anæmia with low fever, symptoms of amyloid degeneration of various organs, pyæmia and septicæmia.

Recovery has been known to take place when formation of pus ceases, and the sac contracts on a cheesy mass.

Treatment.—Attend to cause of obstruction; displacements of pelvic organs, tumors, renal calculus, urethral stricture, enlarged prostate, etc., must be looked for and, if

possible, remedied. If the purulent discharge from the kidney is found intermittently in the urine, and there are signs of calculous obstruction, keep patient at rest on a sofa or specially constructed couch and administer diluents, as distilled water, freely. If the urine is over-acid, give alkaline waters and *terebinthina*. If alkaline, render acid with boracic acid unless the irritation is primarily due to uric acid as shown by history, in which case alkalies may prove more serviceable. If swelling increases in bulk and there is more pain, and pus is not freely found in the urine: if fever, gastric symptoms, rigors, sweat, and emaciation are noticed, together with evidence of extension of the inflammation, then surgical interference is immediately required. First, *nephrotomy* with free antiseptic drainage at point of election *behind*. If the purulent discharge from the sinus is continuous and undiminishing, nephrectomy is to be performed when the patient has recovered from the pyæmic condition. Mortality is lower when there is no calculous obstruction.

CHAPTER XXXII.

RENAL CALCULUS.

Synonymes.—Nephrolithiasis. Stone in the kidney.

Definition.—The conditions associated with the formation of precipitates from the urine in the kidney or renal pelvis.

Occurrence.—In men rather than women; most frequently in children and elderly people.

Etiology.—The causes are as follows :

1. Heredity.
2. Locality.
3. Sedentary and luxurious habits.
4. Gout.

Cause of Formation.—Clots, shreds of tissue, and ova of parasites may serve as nuclei, but immediate cause of formation is not always understood.

Varieties.—The most common are :

1. Uric acid and urates.
2. Calcium oxalate.
3. Phosphates.

Rarer are calcium carbonate, cystin, xanthin, and indigo.

Size, Number, and Form.—Calculi occur in one or both kidneys, are single or many, and vary in size from that of a grape-stone to that of a goose-egg. They may be round or smooth, granulated or spinous, or irregularly branching, with protuberant knobs projecting into dilated calices.

Properties of the Calculi.—Calculi are found in acid urine, except phosphatic stones, which occur in alkaline. Uric acid are yellow, red or brown, lamellated when broken.

Calcium oxalate (oxalate of lime) are dark-brown and dense.

Phosphatic calculi are gray, somewhat porous, and easily broken.

Cystin calculus is of a waxy character.

Xanthin forms a hard brown stone.

Indigo a dense blue mass.

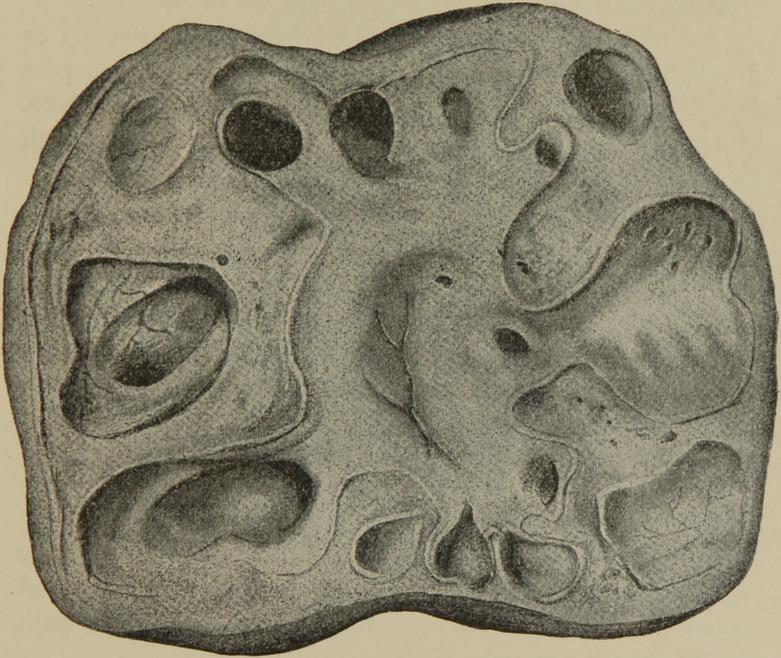


FIG. 26.—Calculous pyelitis.—(RAYER.)

Clinical Features.—If the stone is smooth and embedded in the renal parenchyma, no symptoms or inconvenience. Usually, however, the symptoms are as follows:

1. *Lumbar Pain.*—A dull ache, either fixed or radiating toward the genitals or upper portion of the thigh of affected side. The pain may be referred to the sound kidney.
2. Irritability of the bladder.

3. Chills and fever in case pyelitis is caused.

4. *Renal Colic*.—Due to passage of the stone through or into the ureter, with symptoms as follows: pain beginning instantaneously, even when the patient is asleep; more commonly after exertion. The pain is cutting, stabbing, sharply defined along the course of the ureter, either toward the genitals or into the thigh.

It may be most severe in the back or radiate upwards into the epigastrium. The pain may cease as suddenly as it came, if the stone slip back into the renal pelvis or pass into the bladder. Recurrence of paroxysm may take place, if stone again endeavors to pass from pelvis into or through the ureter.

Conditions Associated with Renal Colic.—Chilliness, chills, faintness, nausea, vomiting; increased frequency of micturition, and hæmaturia. The latter may be present several days after passage of the stone. The quantity of urine is generally less than normal, but, after the attack, polyuria is common. In rare cases there may be total suppression of urine, even though the stone is impacted in but one ureter.

Impaction of the stone may lead to ulceration, perforation, abscess and peritonitis.

Position of the Patient During the Attack.—Usually on the affected side, with up-drawn knees. Testicle of affected side is frequently retracted, or even swollen, if pain extends to the scrotum.

Length of Time of Attack.—The spasm may last for an hour or more, or recurrent paroxysms may continue for many hours, with sudden relief, if stone enters the bladder.

Situation of the Calculus.—If the calculus be in the *substance of the kidney*, and there is no pyelitis, pain slight, or severe for a time and then disappearing for years. Sometimes constant dull pain in the loin. No general disturbance.

If the calculus be free and moving in some large cavity of the kidney or in renal pelvis, the pain is felt not only in the loin, but along the course of the ureter, and even as far as to testicle, inner aspect of thigh, or lower part leg, even in the heel. Pain much worse on motion.

If the calculus be dislodged from the infundibula or from



FIG. 27.—Radiograph of oxalate stone in substance of the kidney.—(From FENWICK.)

fixed position in renal pelvis, pain, then severe and paroxysmal, nausea, faintness, vomiting.

If the calculus be in the ureter, then renal colic, agonizing pain, nausea, faintness, writhings and contortions, even convulsions. After some hours, pain subsides suddenly. There may be sudden suppression of urine on one side; urine reduced suddenly to half the normal quantity.

If the calculus be impacted in the ureter, pain sets in suddenly and is only gradually relieved; does not cease sud-

denly, but there are paroxysms of pain, until finally the ureter becomes habituated to the presence of the stone.

If the calculus be impacted in the ureter close to vesical exit, site of pain after having for some time shifted in a direction generally downward, suddenly becomes *fixed*; there is evidence of suppression of urine on one side.

If the calculus has become merely displaced from renal orifice of ureter, but is not yet in bladder, another paroxysm of pain may take place at any time.

If calculus has passed into bladder, patient may possibly be aware of it. The renal colic ceases and after a time signs of the presence of the stone show themselves as follows: hæmaturia after strong bodily exertion, disappearing after a long rest. Day urine contains more blood than night. The urine begins to show the features of cystitis. (See CYSTITIS.) Sounding for stone will sometimes reveal its presence.

Both kidneys affected or one only? If the stone is primarily phosphatic the disorder is limited to one kidney.

If the stone is uric acid or oxalate, both kidneys may be affected.

If during renal colic, while one ureter is blocked, the urine voided be perfectly normal, then the one kidney is healthy.

In doubtful cases try compression of ureters or catheterization.

It must be remembered that absence of the symptoms mentioned above does not necessarily signify absence of calculus. In some cases the diagnosis cannot be made with certainty. The urine is often normal in all respects and gives no sign of the presence or character of the calculus. Renal colic may be the first marked symptom. Moreover, the symptoms of calculus, viz., lumbar pain, extending at times to the groin and testicle, paroxysmal, aggravated by movements, accompanied or followed by hæmaturia, pyuria,

and frequent micturition, may all be present, and yet there be neither stone in the kidney nor disease of the bladder. (See TUBERCULOSIS OF KIDNEY.)

The Urine.—1. Persistent presence of blood-corpuscles in the sediment is a feature. At times, especially after exertion, blood visible to the naked eye.

2. Features of pyelitis; pus in small quantity in acid urine.

3. Passage of gravel.

4. The writer with the aid of the centrifuge nearly always finds casts, hyaline or finely granular or yellow granular. They are probably dependent on the hyperæmia incited within the pelvis of the kidney.

5. It is said that in some cases of unilateral renal calculus the urine is normal, and that in other cases evidences of renal disease, not calculous, appear.

ANALYSES OF THE URINE IN RENAL CALCULUS.

In the case of a man from whose kidney Dr. Charles Adams removed a large stone, the following analyses of the urine were made by the writer prior to the operation :

	First Analysis.	Second Analysis.
Volume per 24 hours,	725 c.c. (24 fl. oz.)	1400 c.c. (47 fl. oz.)
Ratio of day urine to night,	0.7 to 1.	0.4 to 1.
Urea total,	18.5 gms. (285 grs.)	18 gms. (280 grs.)
Phosphoric acid,	1.3 gms. (20 grs.)	1.47 gms. (22 grs.)
Uric acid,		0.7 gms. (11 grs.)
Urea to phos. acid,	13 to 1.	14 to 1.
Urea to uric acid,		26 to 1.
Specific gravity,	1019.	1012.
Total solids,	30 gms.	34 gms.
Albumin,	(Esbach) 0.05 per cent.	0.0016 per cent.
Pus sediment,	Abundant.	Abundant.
Crystals,	None.	None.
Casts,	A few granular.	None.
Epithelia,	Renal.	Renal and bladder.

These analyses show the following :

1. Stone in the kidney is not necessarily accompanied by excess of solids in the urine.

2. Total urea and total phosphoric acid may be deficient in the urine of a patient having stone in the kidney.
3. With deficiency as above of urea and phosphoric acid, uric acid may, however, be in considerable *relative* excess.
4. Crystals may be at times entirely absent from the urine.
5. Casts may be found at times.

In several other cases confirmed by operation the writer has found casts in greater abundance than the use of the centrifuge alone would account for.

Differential Diagnosis.—The conditions which may be confounded with renal colic are as follows:

1. Intestinal or gastric colic.
2. Hepatic colic.
3. Pain from perforating appendicitis.
4. Movable kidney with nephralgia.
5. Tabes dorsalis.
6. Nephritis.
7. Hernia.
8. Dysmenorrhœa.
9. Lead-poisoning.

Intestinal colic is not so sharply defined as renal, and improves rapidly, as does gastric.

Appendicitis is on the right side, and lacks the limitation of pain to the course of the ureter and also hæmaturia, while localized extreme tenderness is present.

Lead-poisoning may be suspected if there is a blue line around the gums, paralysis of the extensor muscles of the forearm, constipation, etc.

Dysmenorrhœa may be inferred by the regular periodicity and connection of the pain with the menstrual flow.

Hepatic colic is on the right side, shows jaundice and dilatation of the gall-bladder. In tabes the pains, if associated with Argyll-Robertson pupil, loss of knee-jerk, or disturbances of co-ordination, can be easily differentiated from renal colic.

Nephralgia from movable kidney lacks the hæmaturia of calculus. In nephritis the character of the urine and the

symptoms already described in former chapters will serve to distinguish when renal colic is absent. Calculous pyelitis may be inferred from persistent presence of blood-corpuscles in the urine and persistent pain limited to region of the kidneys. Worse on motion, and often associated with hæmaturia.

According to Fenwick, renal calculus may be simulated by the following :

1. Primary tuberculosis, the most common cause of error.
2. Movable kidney, with kinkage of ureter.
3. Interstitial inflammation, with density of structure, causing adhesions to surrounding parts and retractions under the ribs, evoking fixed renal pain, and generally, during the attack, frequency and difficulty of micturition. (Section of the capsule relieves these cases.)
4. An inflamed, dilated pelvis.
5. Propinquity of the gall-bladder, appendix and colon, with their tendency to provoke reflex sympathetic spasm of the right ureter.

Use of the Roentgen Rays.—The Roentgen rays are able, when a 12- to 16-inch spark is used, to give a fair representation, in the case of thin people and children, of the kidney, and in some cases unimpeachable evidence if renal calculus has been discovered; but with stout, heavily-built adults, failure most commonly results.

Oxalate-of-lime calculi are most easily detected. Fenwick exposes the kidney by operation, bringing it out on the loin, and throws Roentgen rays from a 10-inch coil on it, using a fluoroscope screen for examining. The object of this procedure is to detect a small, prickly calculus imbedded in the end of a lengthy calyx of an undilated pelvis, as well as to render an incision on any located stone more precise, especially in cases in which the kidney has been negatively explored before, and with a view to obviating opening the kidney at all when no stone is present.

Uric-acid calculi are not revealed by the X-ray method, though this is disputed by Laurie and Leon, who claim to show them.

Associated Conditions.—Commonly, dilatation of renal pelvis, which is often extreme, and pyelitis; abscess of the kidney or paranephritis may result from the pyelitis, the latter shown by increase in size of renal tumor and persistent elevation of temperature. Chronic nephritis may also result, with mild uræmic or amyloid disease, with prolonged cachexia.

CLINICAL NOTES.

1. Great difficulty sometimes occurs in distinguishing certain cases of spinal caries from renal calculus. Frequent examinations of the urine will serve to distinguish.

2. Direct palpation of the kidney is of but little value in detecting presence of calculi.

3. In the writer's experience, lifting of a heavy object by persons not used to such work frequently precipitates an attack of renal colic.

4. Cases may begin in childhood, last fifteen years or more, and recover under proper treatment.

5. When the ureters are catheterized, an excess of crystals found in the urine of one side over that found on the other is sometimes a true guide.

Prognosis.—Immediate, generally favorable. Successive attacks not necessarily fatal.

Continuous presence of stone in the pelvis is a menace to health, on account of possibility of production of serious renal inflammations and degenerations.

Anuria is a serious complication; not always fatal, even if it continue twenty days.

Treatment.—Preventive. If calculus is suspected, great care must be taken to avoid violent, and particularly sudden, exertions, jolts, falls, or the lifting of heavy objects.

In case of uric-acid calculus non-nitrogenous food, with avoidance of sweets, is essential.

Alkaline mineral waters are useful: Londonderry, Buffalo, Geneva, Waukesha, imported Vichy, and Saratoga. It is possible that artificial waters act even better, as, for example, those made by adding lithium carbonate to charged water, or sodium or potassium bicarbonate.

R. H. Fitz recommends a benzoated water, as follows:

Fifteen grains each of lithium benzoate and bicarbonate (?), together with twenty grains of potassium bicarbonate, are dissolved in a pint of carbonic-acid water. Dose, two pints daily.

Piperazin in doses of five grains, twice or thrice daily, in large quantities of water, is of value in dissolving uric-acid calculi. The dimethyl-tartrate (lycetol) is perhaps better than the pure piperazin. Large doses of piperazin sometimes occasion alarming symptoms, even of insanity.

Lysidine is used as a uric solvent in doses of 10 minims of the 50 per cent. solution, largely diluted with water, three times daily.

In cases of oxalic-acid stone, patient should avoid sweets and starchy food, charged waters, and such articles as tomatoes, apples, rhubarb and bananas.

Distilled water is the best beverage, several pints a day of which should be taken between meals. (See OXALURIA.)

In cases of phosphatic stone, patient is to avoid residence in limestone districts (which may also be said, in general, in regard to other kinds of calculus), and to use distilled water or pure spring water as a beverage.

Renal Colic.—*Glycerin* in doses of from 1½ to 5 ounces shortens the attacks, lessens or stops the dull lumbar pains frequently remaining after the attack, and postpones the return of the attacks.

Argentum nitric., according to Dr. C. Preston, is preferable to every other remedy when the passage of sand or sediment in general through the urethra produces active symptoms: is superior to *lycopod.* and *nux vomica* in renal

catarrh and attacks of nephritic colic. Little or no pain during urination is an indication for the remedy, although it also relieves when the symptoms seem to call for *canthar*. The pains may be very severe, almost driving one crazy, and extend from the kidneys along the ureters to the bladder; at other times they are burning in character, and are accompanied by the voiding of red sand or uric-acid sediment. Its main indication is catarrh of the kidneys.

Berberis is useful in renal colic from uric-acid gravel or calculus. Cutting pains go from kidneys and radiate to the loins, hips and back; the urine has a gray, meal-like sediment.

Calcarea carbonica is said to be useful when berberis, lycopodium, and other remedies fail in renal colic, or when there are general indications for its use.

Cantharis.—Cutting and contracting pains from the ureters to the penis, with relief from pressure on the glans penis. Urine turbid, scanty, cloudy when passed during the night, with white sediment. Hæmaturia (not profuse) from renal colic; constant, inefficient desire to pass water.

Cannabis Sativa.—When, in consequence of passage of sand or gravel, there is much soreness along entire urethra.

Kava-Kava, in 10-drop doses of the fluid extract, is said to relieve the pain of uric-acid calculus. It is certainly useful as a diuretic.

Lycopodium.—Dull pains in the kidney, relieved by voiding urine. Urine highly-colored, scanty, red sandy sediment of uric acid and urates. *Solids normal in character and quantity, but water deficient*. If much irritation from crystalline urates in children, urine may contain mucus and pus, causing whitish sediment, or even blood from laceration of mucous lining of the bladder.

Nux Vomica.—Pain running from right kidney, extending to genitals and right leg; painful and ineffectual desire to urinate; urine comes in drops, with burning and tearing pain at neck of bladder and in urethra.

Ocimum.—Nausea excited by pains: urine scanty, contains uric acid in sediment; pains go tearing down *right* ureter only.

Papaine.—Recommended as worthy of trial as a preventive of renal calculi; in one-grain doses, to be taken with meals.

Pareira Brava.—Stone in the bladder or trying to pass from the kidney; constant urging to urinate; violent pains in the glans penis; straining; pain causes screaming; patient goes down on all fours to urinate; urine contains much viscid, thick, white mucus, or deposits red sand and has strong ammoniacal odor; the pains go down the thighs during efforts to urinate.

Pichi is said to be of undoubted value in lithiasis and renal stone, controlling hæmaturia and pain, especially in wineglassful doses of the fresh infusion. (Dose of the fluid extract, 10 to 30 minims or upwards.) Useful to allay irritation after passage of uric-acid calculus. The writer prefers to give 10-drop doses of the first decimal solution, frequently repeated.

Stigmata Mæidis (Corn-silk).—Not easy to procure at all seasons of the year. In chronic pyelitis and renal colic this drug, in wineglassful doses of the fresh infusion, is said to be of great value.

Thlaspi Bursa Pastoris.—It has been claimed that this remedy is exceedingly useful in causing expulsion of "red sand." (Tincture, 30-drop doses.)

Uva Ursi.—Calculus passing from kidney. Renal hæmorrhage and pyelitis. Constant urging to urinate; straining, with passage of blood and muco-pus, or straining without any discharge or few drops at most, after which cutting and burning in the urethra, with discharge of blood. Stools hard.

For *calculous pyelitis* try especially corn-silk, copaiba, pichi.

The general treatment of the conditions antecedent to calculus will be discussed in the next chapter, under Lithuria, Oxaluria, and Phosphaturia.

CHAPTER XXXIII.

LITHURIA, OXALURIA, PHOSPHATURIA.

Lithuria : Synonymes.—Uraturia, uricaciduria.

The terms lithæmia and uric acid diathesis are also used more or less synonymously with the above.

Definition.—The voiding of urine containing a brick-dust sediment composed chiefly of urates of sodium, potassium, etc., and of uric acid. In a large majority of these cases an actual relative excess of uric acid in solution is to be found in the urine, thus differing from phosphaturia, in which the writer usually finds actual diminution of phosphoric acid, and from oxaluria.

According to Sir Henry Thompson, if, without any errors of diet, a patient under 40 habitually passes urine which soon deposits a pinkish sediment, or which, though clear when voided, soon becomes thick and opaque, or covered with a delicate film or pellicle exhibiting faintly a play of prismatic colors—or if in a few hours there is seen in the sediment a deposit of free uric acid—“red-pepper crystals”—there is undoubtedly an undue tendency, either inherited or acquired, to produce uric acid.

Etiology.—The sediment occurs under various physiological conditions—as, for example, in winter, when the urine for any reason is concentrated or highly acid. It is found in a large number of diseases (see new URINARY ANALYSIS, page 259), of which acute inflammatory diseases, as rheumatic fever, the crisis in continued fevers, renal congestions, and various hepatic disorders are most prominent.

Clinical Features.—These are essentially as follows:

1. Mental irritability or depression, and easily induced exhaustion.
2. Headaches, insomnia, or restless sleep.

TREATMENT OF LITHURIA.

Diet and Hygiene.—The patient is to avoid sweets and excess of nitrogenous foods, to drink freely of soft water, and to get as much fresh air and moderate exercise as possible. Bicycle riding, not carried to excess, is certainly good.

Hygiene and Climatology.—The lithæmic patient needs air. Open windows at night, fresh air in the daytime, bicycle-riding, and mountain-climbing are of the utmost value. The amount of exercise is to be regulated by the pulse. Those with a slow pulse can endure with impunity exercise which would be violent and dangerous for others.

Change of climate is beneficial. In the writer's experience, dry, mountainous regions are preferable to the seashore. The author's favorite prescription for lithæmics is two weeks at Saratoga, with drinking of Congress or Hathorn water, followed by three weeks in the *mountainous* portion of the Adirondacks, at either Lake Placid, Adirondack Lodge, or St. Hubert's Inn, according to the tastes of the individual. A week at each one of the above-named places is advisable for those unfamiliar with the Adirondacks, so that in subsequent visits the one best-liked may be selected from experience. Lake Placid is enjoyed by those who like a beautiful mountain lake with extensive views; Adirondack Lodge by those who prefer to be in the heart of a primeval forest in the foot-hills of the highest mountains, and St. Hubert's by those who like the diversity of valley, mountains, lakes, and forests. While the Adirondacks are well-known to those who live in the East, the benefits of their climate are comparatively unknown to Western people. Not of little importance is the purity of the spring water in the mountain regions named above. An additional advantage is the proximity of chains of lakes where those fond of boating and fishing can find all they desire.

Mineral Waters.—For the lithæmic, waters containing *sulphate of soda* are by far the best; alkaline waters, like Vals, Vichy, etc., may cause the urinary sediment to disappear temporarily, but their curative range is limited. The best known sodium sulphate waters are Pullna, Hunyadi Janos, Friedrichshall, Marienbad, Carlsbad, Rubinat, and Kronenquelle.

The full dose of Hunyadi Janos is from five to seven ounces taken an hour before a light breakfast, during which a cup or two of some hot liquid is to be taken.

Marienbad water is far more agreeable than Hunyadi Janos, since it contains no sulphate of magnesia. Dose, half a pint or more. Carlsbad contains no magnesia. It is best suited to robust patients.

Sir Henry Thompson recommends Carlsbad water to which a little Hunyadi Janos is added. From four to seven ounces of Carlsbad at a dose, heated, to which as much Hunyadi Janos is added as is demanded by the bowels of the patient.

In America the best saline waters are probably the Congress and the Hathorn, although others are now being found in Arkansas which may prove valuable.

Searle thinks highly of an effervescing draught composed of dilute lemon-juice and bicarbonate of soda. A solution of Carlsbad salt and lithium benzoate has been recommended, and theoretically should be useful in several ways.

Remedies.—Those usually recommended are acidum nitromuriaticum, bryonia, calcarea phos., argentum nitricum, cimicifuga, chelidonium, coccus cacti, colchicum, kali bichromicum, china and china sulph., lithium, ledum, lycopodium, natrum mur., nux, natrum sulph., ocimum, phosphorus, pulsatilla, ptelea, plumbum, sepia, spigelia, sulphur.

Of these the writer has used most lithium benzoate, acidum nitromuriaticum, calcarea phos., cimicifuga, and nux. Lithium benzoate (2 to 10 grains) is satisfactory in dissolv-

ing the sediment of urates and increasing the urea-uric acid ratio. Dilute nitromuriatic acid (5 to 7 drops) in cases where hepatic symptoms are prominent; cimicifuga in drop doses of the tincture for the lumbago of lithæmics; calcarea and nux 3x for lithæmic children.

CLINICAL NOTES.

1. Haig's view is that the normal ratio of urea to uric acid is 33 to 1. When this ratio is diminished, owing to excess of uric acid in the circulation, there is increased vascular tension, causing a characteristic headache. When the ratio is increased, uric acid is stored up in the body, chiefly in the liver, spleen, and joints.

2. According to Haig the acids, mercury, lead, iron, lithia, antipyrin, opium, and various other drugs cause uric acid to be withheld from the urine, while the salicylates increase the quantity. His treatment consists of non-nitrogenous diet and administration of salicylate of sodium.

Instead of the salicylate the writer has used oil of gaultheria, as suggested by Dr. Axtell. Cones of lactose are saturated with it and given, five at a dose.

3. The writer finds imported Vichy water (Célestins) well-suited to those with uric acid sediments and renal irritation from them. Given as a beverage, in conjunction with lithium benzoate for curative effect.

4. The writer insists upon plenty of sleep for lithæmics, and in well-ventilated rooms.

5. The following receipt for lithæmia is guaranteed by the writer to be almost infallible: Given a person with a tendency to brick-dust sediments: take him (after a hard day's work) in the evening to the smallest, stuffiest, and most-crowded theatre in town. After the performance invite him to a restaurant, feed him on lobster and ice-cream, give him plenty of beer or champagne to drink, and keep him up until after midnight. Take him home in the worst-

ventilated and most-crowded conveyance you can find, and have him sleep (if he can) in a small, steam-heated room, with windows and doors closed. Make him rise at six the next morning, take a cold plunge-bath, and give him sour fruit for his first course at breakfast. Coop him up for the day in a small, steam-heated office, with plenty of people to bother him, and you will have him as a patient for not less than three weeks afterwards.

OXALURIA.

Definition.—The voiding of urine containing crystals of calcium oxalate, while at the same time the patient complains of certain nervous or digestive troubles, or both. The deposit is not necessarily associated with increase in the total quantity of calcium oxalate in the urine.

Associated Disorders.—Jaundice, spermatorrhœa, disturbances of digestion, and neurasthenia.

Etiology and Pathology.—The origin of oxalic acid in the body is obscure, and the quantity of it in the urine is not indicated by the number of crystals in the sediment. The acid sodium phosphate of the urine holds the substance in solution, and the crystals form during progressive decomposition of the phosphate. Certain articles of diet, as apples, tomatoes, bananas and rhubarb favor their formation, and, in the spring of the year, when rhubarb is eaten, the writer finds always an increase of the oxalate crystals in samples of urine examined.

Clinical Features.—These are usually the following:

1. Digestive disturbances, particularly flatulence.
2. Inability to retain the urine, when desire for micturition comes.
3. Mental and physical fatigue from slight exertion; listlessness.
4. Nervous symptoms: headache, wakefulness, mental depression, hypochondria.

5. Backache or lumbar pain, generally on one side, and sometimes severe; perhaps due to mechanical irritation of ureter by the crystals.

6. Acute intercurrent attacks of prostatic urethritis, perhaps due to irritation from the crystals.

The Urine.—According to Heitzmann the typical condition of the urine is as follows:

1. Quantity per 25 hours: decreased.
2. *Color.*—Increased.
3. *Reaction.*—Acid.
4. *Specific Gravity.*—High, 1025 or upwards.
5. *Sediment.*—Crystals of the oxalate occurring as octahedra, disks, spheres, or dumb-bells.

Some authors hold that the crystals are found mainly in alkaline urine, but the writer has shown by a large number of cases that this is not true.

Clinical Notes.—1. The writer finds a sediment of calcium oxalate very common in diabetes mellitus, and it is said that oxaluria may be followed by glycosuria.

2. Patients who have sediments of urates or uric acid in their urine frequently show oxalate either accompanying the former or alternating with them.

3. The chief danger in these cases is the possible formation of calculus. In the writer's experience, confirmatory of Dr. Beale's statement, the dumb-bell crystals are to be regarded as minute calculi. For example, in January, 1898, a patient complaining of lumbar pain brought urine for examination; dumb-bell crystals, octahedra, and concretions were found in the freshly-voided urine. Diagnosis of oxalate calculus was made, and in March the patient voided a small rough stone of that variety.

TREATMENT OF OXALURIA.

Climate and Hygiene.—The oxaluric patient does better in dry climates. He should avoid damp or clayey soil

and sleep as high from the ground as possible. Camping out in the mountains of the West has repeatedly been of benefit to my oxaluric patients. The sea-shore is not so well suited to them.

A cold compress over the abdomen at night, as recommended by Ralfe, has relieved some of the writer's cases in which flatulence was complained of.

Diet.—Patient should avoid articles of diet rich in oxalic acid, as apples, bananas, rhubarb, tomatoes, etc.; all sweets and sweet or carbonated drinks, such as are usually sold at soda-fountains, and indigestible materials generally. Hard water is to be avoided. Distilled water is probably the best drink. Diet composed chiefly of meat is thought to be best.

Medical Treatment.—Give five to seven drops three times daily of *dilute nitrohydrochloric acid*, freshly prepared, in cases of young men with sediment of oxalate crystals in the urine and complaining of malaise, great repugnance to mental and physical exercise, and depression of spirits.

In each case make up a fresh preparation of dilute acidum nitromuriaticum as follows: mix nitric acid, four parts by weight, with hydrochloric acid, fifteen parts by weight, in a large glass beaker. When effervescence has ceased, add seventy-six parts by weight of distilled water and mix well. Give five to seven drops of this freshly-prepared acid three times daily, *after* meals. It is held by some authorities that after mixing the strong acids the mixture should stand four weeks, until it turns brown, before dilution and administration.

In the cases not relieved by diet, abundant ingestion of distilled water, and dilute nitrohydrochloric acid, try *lysidine* in ten-drop doses three times daily. In one case of long-standing two doses of lysidine given by the writer appeared to relieve the lumbar pain, which had persisted for a number of days. (Lysidine, ethylene-ethenyl-diamine, may be

had in form of 50 per cent. solution, the dose of which is usually ten drops three times daily. The indications for lysidine are said to be irritability of the bladder, irregular heart action, and nervous symptoms. Its action is usually speedy, which is fortunate, owing to the cost of the substance. The dose should be well diluted with water.)

Basham's tincture in doses of from two to four teaspoonfuls, and tincture of hydrangea in ten-drop doses have been recommended.

From a strictly homœopathic standpoint oxalic acid in potency is said to be curative and adapted to those cases in which there is burning during micturition, and backache.

Kali sulphuricum is used by Hæрман, of Paris, and T. F. Allen, for oxaluria.

PHOSPHATURIA.

Definition.—Clinically, by phosphaturia we mean the voiding of urine containing a phosphatic sediment. The term "excess of phosphates" is used synonymously, but if this means excess of the total $P_2 O_5$ in the urine it is incorrect, for only in rare cases do we find this excess, and to such cases the term phosphatic diabetes has been given, when the quantity is far above three grammes per twenty-four hours.

Etiology.—The cause of the sediment is deficiency of acidity on part of the urine, with sometimes a relative excess of earthy phosphates, as compared with alkaline ones.

The causes of persistently alkaline urine are as follows:

1. Food or drink abounding in alkaline salts, as alkaline mineral waters.
2. Indigestion due to hypochlorhydric.
3. Ammoniacal fermentation of the urine in the renal pelvis or bladder.

Clinical Features.—These are usually the following:

1. Mental and physical weakness.
2. Backache and sexual weakness.
3. Neurasthenic or hypochondriacal symptoms.

The chief danger in these cases is the formation of calculus.

The Urine.—The essential features of the urine are as follows:

1. Color not increased, usually diminished to lighter than normal.

2. Urine turbid when forcibly voided.

3. Reaction less acid than normal; may be neutral or alkaline.

4. The urine, when heated, becomes cloudy, but the cloudiness disappears in great part when five or ten drops of 20 per cent. acetic acid are added, care being taken to shake the tube after such addition. At the same time effervescence may be noticeable.

5. The urine on standing deposits an abundant whitish flocculent sediment. Removed with a pipette, this sediment is more or less soluble in 20 per cent. acetic acid.

6. In some cases the sediment is so abundant as to pass out at the end of urination as a white or creamy mass, alarming the patient, who mistakes it for semen.

TREATMENT OF PHOSPHATURIA.

Diet and Hygiene.—The patient should avoid hard water and in general adopt a nutritious diet; he should have as much sleep and exercise in the open air as possible. Change of climate often helps. Sexual intercourse is undoubtedly bad for those affected with phosphaturia and should be restricted to a minimum, or altogether forbidden.

Medical Treatment.—*Urotropin* is recommended by Leopold Casper as a remedy for phosphaturia, in doses of from fifteen to thirty grains a day. (*Urotropin*, $C_6H_{12}N_4$, is hexamethylentetramin, formed by the action of ammonia on formaldehyde. It appears in the urine as early as fifteen minutes after administration. It is readily soluble in water, and its influence upon the urine extends over a considerable period of time. It is a urinary antiseptic.)

The usual dose is a five-grain capsule four times daily, followed by a full glass of water; the range of dose is from three to seven and one-half grains, taken first twice and later three times daily, in half a pint of water.

The ordinary "acid phosphates" sold at the soda-fountains will sometimes make the urine sufficiently acid to dissolve the phosphatic sediment. *Acidum phosphoricum* 2x dil. will do the same.

When, however, the case is a bad one, the writer prescribes Ralfe's formula, as follows: boracic acid one hundred and twenty grains, glycerine one fluidounce, warm water eight fluidounces. This, in teaspoonful doses, usually suffices to clear the urine. It should be made up fresh from time to time. The sediment may, however, return after its use is discontinued, unless in the meantime the patient's general health improves.

For the phosphaturia which sometimes persists after cystitis, injections of citric acid, five to ten grains in a pint of warm water, are recommended.

Following the paper of Robin in 1894 the writer called attention to the theoretical value of the glycerophosphates in phosphaturia. The wine of *phosphoglycerate of lime*, containing ten grains per fluidounce, is prescribed in doses of a tablespoonful or two, two or three times daily, at meals. Where alcohol is contra-indicated the syrup may be given in the same dose, or the capsules (four grains) in doses of one capsule three times daily. The dose of the above for children is one-half.

Phospho-albumen, so-called, may also be prescribed for these cases, and the various preparations of phosphorus or the hypophosphites.

For cases where there is marked deficiency of phosphoric acid with or without phosphatic sediment, as in neurasthenia, Addison's disease, etc., the writer gives the phosphoglycerate of lime, or a calisaya and phosphorus mixture, preceded if necessary by mild purgation.

CHAPTER XXXIV.

URETERITIS.

Definition.—Inflammation of the ureters.

Etiology.—Usually a secondary disorder, following pyelitis or disease of the lower urinary tract.

Clinical Features.—In *acute ureteritis* the features are (1) severe abdominal pain, chiefly on one side, beginning in the renal region and gradually extending to the bladder; and (2) tenderness and swelling of the vesical end of the ureter, which in women can be felt by the finger per vaginam.

In *chronic* cases we find the following:

1. Increased frequency of urination, greater when standing, not absent when lying down.
2. Bearing-down pain, also increased by standing.
3. Tenderness felt, and desire to urinate excited when pressure is made over the curve of the ureter.

Diagnosis.—The diagnosis must be made chiefly by exclusion. If there are no evidences of trouble elsewhere, and yet the urine contains pus and epithelial *débris*, especially in women, *after a cleansing injection*, it may be reasoned that the ureter is the seat, at least partially, of the inflammation. Often, however, there occurs what is known as *renal tenesmus*, violent and painful contractions of one or the other ureter and corresponding pelvis of the kidney, with marked tenderness or soreness under pressure of the latter organ, proceeding from morbid irritability of both structures.

The pains occur in paroxysms, which vary in frequency, duration, and severity in different cases, according to the

stage of the preceding ureteritis and the extension of the lesion to one or both sides. As a rule, it is confined at first to the groin on one side of the body, and afterward to the corresponding lumbar region. In the more severe attacks, the pain, besides being violent in these situations, radiates to the hip, the outer and inner sides of the thigh, the knee, leg, and even to the toes. Cramps of the muscles of the lower extremity on the affected side also occur in these severe paroxysms. In the well-marked cases, attacks of this sort come on daily, or even several times a day. They are most frequent and severe during the menstrual periods. The patients describe them as occurring most often during the night. They awake with a pressing desire to urinate; the emptying of the bladder is accompanied by more or less pain and spasm, and its evacuation is followed by a cramp-like pain, ascending along the course of the ureter to the kidney, and radiating to the lower extremity. The patient sleeps, as a rule, on the affected side, with the face turned toward the pillow, and it is the habit of many to draw the opposite thigh up over its fellow against the abdomen. The pain is excited in the early stages by the marital relation, which in nearly all cases becomes intolerable in the advanced stages of the disease.

Differential Diagnosis.—To distinguish renal tenesmus from renal colic, make pressure over the ureter where it lies in the vesico-vaginal septum, or inject the bladder with warm water.

The pressure of the water, when sometimes only a few ounces are used, causes an irresistible desire to urinate, which, if not promptly relieved, is followed by the pain along the ureter and in the kidney, even in the corresponding hip and lower extremities, down to the ends of the toes. The patients recognize the pain produced in this way as the symptoms which have been their chief source of suffering. The attacks of renal tenesmus brought on by either

of these procedures may last for several hours or days, and are frequently accompanied by great mental excitement and hysterical manifestations. Hence the necessity of caution in adapting these means to the peculiarities of the case.

Prognosis.—Ureteritis without renal tenesmus has the same prognosis as pyelitis. With renal tenesmus prognosis is less favorable.

Treatment.—Give large quantities of water, and bland, nutritious, chiefly albuminous diet. Use gentle massage and advise light exercise.

The chief remedies are *aconite* in acute cases, *arnica* when the result of trauma, *mercurius* when much pus is present in the urine; also the remedies mentioned under nephrolithiasis when this is a cause. Alkaline diuretics are sometimes useful. The treatment for renal tenesmus is surgical, and is called kolpo-uretero-cystotomy. An opening through the vesico-vaginal septum not smaller than a silver half-dollar is made, having specific and close relation to the outlet of the affected ureter and kidney.

CHAPTER XXXV.

CYSTITIS.

Synonymes.—Inflammation of the bladder.

Definition.—Inflammation of the mucous membrane of the bladder.

NOTE.—In order to understand much that follows, reference should be made from time to time to Figures 28, 29, 32, 33, 34, 36 and 37, in which the anatomy of the parts is brought out.

Etiology.—Due (*a*) to general causes or (*b*) local ones. Not always possible to make this absolute distinction.

I. *Due to General Causes.*—Slight degrees of cystitis are found in infectious diseases, especially typhoid fever, influenza, mumps, scarlet fever, and others in which a slight degree of acute nephritis exists. Probably due to local action of bacteria or toxins concerned in the origin or progress of the primary disorder. Cystitis is frequently associated with gout, and is explained as a result of a direct irritation of the mucous membrane by the concentrated urine.

II. *Due to Local Causes.*—Injuries from instruments, injections, pressure of fæces or of pessaries, or the foetal head; from foreign bodies, as calculi and bacteria, especially the gonococcus; irritating substances taken internally may produce cystitis, as cantharides, copaiba, cubeb, or even mustard; retention of urine from whatever causes; extension of inflammation from neighboring parts, especially when an unclean catheter is used.

Clinically we find cystitis most common following gonorrhœa in young men, the result of stone or enlarged pros-

tate and retention of urine in old men, and in women as a result of childbirth or extension of inflammation from the vagina or rectum. In diseases of the spinal cord cystitis from retention is common.

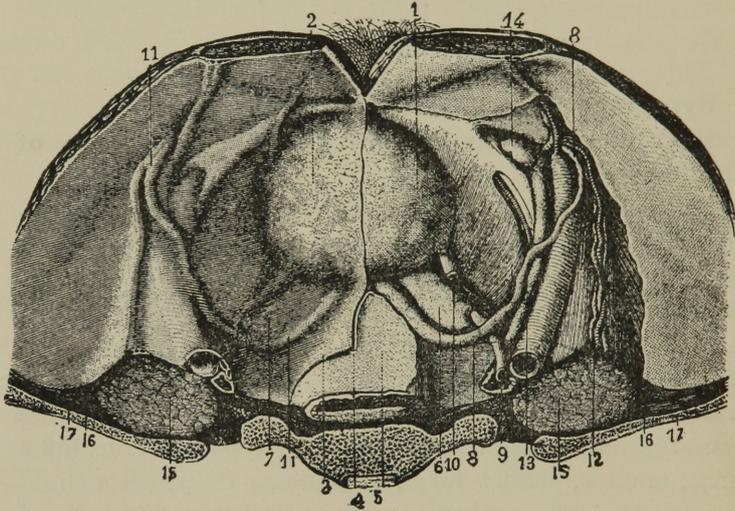


FIG. 28.—Relations of the posterior and inferior regions of the bladder in man. 1, right half of posterior surface of bladder; 2, left half covered with peritoneum; 3, semicircular fold which this membrane forms when empty; 4, median section of this fold; 6, right seminal vesicle; 8, seminal duct; 9, ureter; 11, 11, left ureter, covered by peritoneum; 12, spermatic vein and artery; 13, external iliac artery and vein.—(SAPPEY.)

Morbid Anatomy.—The disease assumes the following forms.

1. Catarrhal.
2. Pseudo-membranous.
3. Phlegmonous.

Catarrhal cystitis may be either acute or chronic. Acute catarrhal cystitis is marked by red, swollen mucous membrane, and slimy bladder contents; purulent contents mark a suppurative condition.

Chronic catarrhal cystitis is marked by blue slate-colored spots in the mucous membrane, and slimy rather than purulent contents.

Pseudo-membranous cystitis is marked by the presence either of fibrinous clots, or more frequently by ecchymoses, ulcerations and superficial necrosis, the latter appearing as opaque-gray or yellow patches, sometimes containing urinary salts, which are especially prominent at the neck and on projecting folds of the mucous membrane.

Phlegmonous cystitis is characterized by destruction of

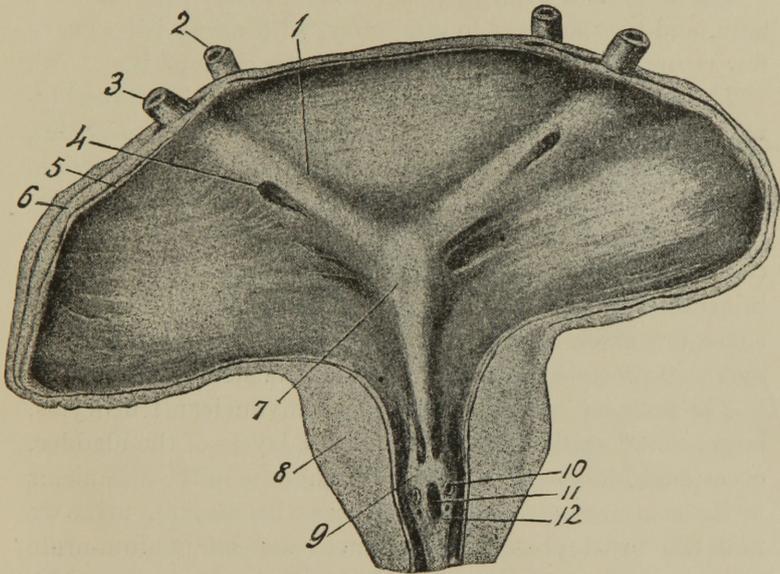


FIG. 29.—Lower part of the male bladder, with the beginning of the urethra. Exposed by incising the anterior wall and laying it open. 3, ureter; 4, opening of the ureter; 2, vas deferens; 9, colliculus seminalis; 7, Bell's muscle; 8, section of prostate; 10, orifice of the common ejaculatory duct; 11, opening of utricle; 12, mouths of prostatic gland-ducts; 1, Mercier's band.—(HENLE.)

the submucous layer and detachment in shreds or flakes of the mucous membrane, or exfoliation of the same as a cast.

Clinical Features.—The essential features are the following:

1. Pain in the bladder.
2. Tenesmus.
3. The condition of the urine.

The pain is usually referred to the region of the symphysis pubis, but may extend to the perinæum and rectum; is early, distressing, and persistent. May be preceded by a chill and fever, the latter lasting for some little time. There may be a sense of weight and an aching feeling in the perinæum, which is increased by accumulation of fæces in the rectum. The pain is somewhat relieved by micturition.

The tenesmus is even more severe and distressing than the pain, and may amount to strangury, with micturition every few minutes and passage of blood at the close of it.

The Urine.—The feature is the *cloudiness* of the freshly-voided urine, due to particles of slime, leucocytes, epithelia, numerous micro-organisms and some few blood-corpuscles. The *color* in acute cases is darker than normal, the quantity not being increased, but rather diminished. In chronic cases the color is often lighter than normal. The *reaction* in acute cases is acid, in chronic cases usually alkaline. In some few cases of long-standing cystitis in old men with enlarged prostate the urine remains persistently acid.

The sediment contains numerous polynuclear leucocytes, large, round epithelia from the middle layers of the bladder, occasional blood-corpuscles, and numerous micro-organisms in the acute cases. In chronic cases with alkaline urine we find the usual phosphatic sediment and ammonium-urate crystals. (See writer's new URINARY ANALYSIS, pp. 262, 274, 278.) The micro-organisms in chronic cystitis are usually pathogenic bacteria. (URINARY ANALYSIS, p. 323.)

The pus in chronic cases is sticky, in acute cases flocculent. The pus-corpuscles in chronic cases are partially destroyed by the alkaline urine, so that much granular *débris* is found, and those corpuscles which remain may be ill-defined and indistinctly seen.

Heitzmann located the seat of the inflammation by observation of the size of the epithelia from the middle layers, the large ones coming from the region of the neck.

The urinary solids are usually somewhat diminished in total amount.

Albumin is present in considerable amounts in acute post-gonorrhœal cystitis involving only the vesical neck—sometimes enough to settle to mark 1 on the Esbach tube. Such quantity of albumin makes showing enough, when the urine is boiled, to alarm both physician and patient. In other cases but a trace of albumin is found, especially in chronic cystitis. Nucleo-albumin (mucin) reaction is prominent in these cases.

The odor is strongly pungent in the acute cases, but not ammoniacal when freshly voided. On standing, however, the ammonia odor is soon perceived.

In chronic cases a pungent odor is also common, but in the more severe cases the ammoniacal odor is noticed. In the ulcerative cases a particularly foul odor is present.

Clinical Features of Chronic Cystitis.—Pain and tenesmus are not so noticeable, but the obstruction to the flow of urine and consequent fermentation of urine result in frequent and difficult urinations, extending over a period of weeks or months, with backache, headache, leg-ache, and a whole line of symptoms more or less distressing, including constipation, alternating with diarrhœa.

The urine becomes more and more cloudy, although perhaps lighter colored; the pus increases, and also the albumin. The pus becomes sticky, owing to the alkalinity of the urine.

Differential Diagnosis.—Cystitis may be differentiated from pyelitis by the vesical pain, tenesmus, and the character of the urine. Presence of casts, together with a larger amount of albumin than pus or a small quantity of blood will account for, suggests renal complication. The writer finds that a sediment of pus-corpuseles which measures $1\frac{1}{2}$ per cent., when sedimented for five minutes at a speed of 1000 revolutions, may be found in urine which yields no

measurable quantity of albumin with the ferrocyanic test-liquid.

According to Salkowski and Leube, 2 per cent. of pus in urine (weight?) corresponds to $\frac{1}{10}$ per cent. of albumin. If, on boiling the urine, a moderate precipitate of albumin, one-twentieth to one-twenty-fifth of the volume of the urine, is formed, its exclusive origin from pus is to be inferred, if several pus-corpuses are found by the microscope in each drop of the shaken urine.

When there is $\frac{1}{10}$ per cent. of albumin (first mark on Esbach tube), it is said that there should be found 10 or 15 pus-corpuses in every field, if the albumin is due to the pus. If fewer than these are found, suspect renal complication.

The writer, however, finds that the number of pus-corpuses seen depends on the microscopic field—a half-inch objective, for instance, increasing the number very materially over the one-fifth inch.

In case of doubt, try Thompson's method, as follows:

Take a clean, soft rubber catheter, a piece of three-sixteenths-inch rubber tubing, a two and one-half inch glass funnel and a two-inch piece of glass tubing. Into one end of the rubber tubing insert the stem of the funnel, and in the other end the glass tubing. The glass tubing must be drawn down small enough to insert in the distal end of the catheter. Now pass the catheter into the bladder (noting the point at which the passing is painful), and draw off the urine. Insert the glass tubing into the end of the catheter. Raise the funnel to sufficient height so that there is force enough for liquid to run freely into the bladder. Pour in very carefully a warm solution of boracic acid, then lower the funnel, and let it act as a siphon to draw the solution out again. Repeat this until the washings are clean. If more than two ounces can be borne without much distress, there is no objection to using three or four ounces at

a washing. Now let the apparatus remain *in situ* for ten or fifteen minutes (raising the funnel), then draw off the urine which has descended from the kidneys, and set it aside for examination. Now repeat the process of washing. If the first washing is fairly clean, it is reasonable to say that the pus comes from the kidneys or ureters. If, however, a single washing does not cleanse the bladder, it is reasonable to say that the pus is from the bladder.

Ureteral catheterization (method of Kelly or of Harris) will, of course, determine whether the pus is from the kidneys or not.

Course.—In *acute cystitis*, if a mild form is present, the fever subsides in a few days, the pain and tenesmus gradually disappear, and the urine becomes normal.

Severe forms of acute cystitis show greater febrile disturbance, more irregular course, and frequent wide daily variations between the extremes. The severity of the symptoms may be due to complicating pyelonephritis. Cerebral symptoms (delirium, somnolence, stupor) may appear.

Abscesses may form, symptoms of which are localized induration, pain, and tenderness shown by rectal examination. If the severe symptoms continue, the patient may collapse, temperature become sub-normal and pulse imperceptible.

In *chronic cystitis* pain and tenesmus may be comparatively slight, but the urine grows more and more cloudy, the sediment contains more pus, while albumin increases. The pus becomes sticky from the action of the alkaline urine, and forms a gelatinous mass, which can be removed from the vessel only with difficulty. The digestion becomes more or less impaired, and there is slight loss of flesh and strength.

CLINICAL NOTES.

1. Prevesical inflammation in the space defined by Retzius may be in part a result of cystitis, and is shown by a

sharply defined, usually symmetrical tumor above the symphysis, terminating in suppuration, though sometimes undergoing resolution.

2. The severer forms of acute cystitis or acute exacerbations of chronic cystitis represent usually (*a*) diphtheritic or gangrenous inflammation of the mucous membrane, or (*b*) extension of the inflammation to the subperitoneal and paracystic fibrous tissue.

3. In abscess formation sloughs of mucous membrane may plug the urethra.

Prognosis.—Depends on the length of continuance of the disorder. In long-continued chronic cystitis the prognosis is undoubtedly unfavorable from danger of extension to the kidney or to the neighboring fibrous tissue. When abscesses form there is danger of peritonitis from extension toward the peritonæum. If the abscess evacuates into the bladder there is relief to the pain and discomfort.

Diet.—In *acute cystitis* the patient is to avoid salty and spiced foods, pork, lobster, cheese, beans, fried foods, pastry; also beers, champagne, coffee, all acid drinks, and saline mineral waters. May drink lithia waters freely during the day; but in small quantities at a time. A small cup of hot milk at bedtime is useful.

If the symptoms are severe, absolute milk diet should be insisted on.

In chronic cystitis the diet should be nutritious and readily digestible, owing to the tendency to gastric derangement. In acute exacerbations the diet should be as in acute cystitis.

One of the writer's patients with chronic cystitis in locomotor-ataxia seemed greatly helped by buttermilk.

Hygiene and Various Palliative Measures.—In *acute cystitis* rest in bed, with elevation of the pelvis, is helpful. Administration of teas made of hops or linseed is advised.

Hot applications (as an ear of corn which has been

boiled) to the perinæum, warm sitz-baths, fomentations of hot water, and hot water enemata sometimes do good.

Warmth of clothing and of climate are essential, the latter especially in chronic cystitis.

Constipation should be overcome by massage of the colon, oatmeal at breakfast, hot water enemata, or Rubinat water.

In very severe asthenic cases leeching the perinæum will relieve the pain there.

Medical Treatment.—As is usually the case in a disorder in which it is frequently impossible to remove the cause, and in one which is liable to acute exacerbations, we find a great variety of drugs used and palliative measures employed.

Acute Cystitis.—Dr. P. Jousset, of Paris, recommends the following remedies in the treatment of acute cystitis: cantharis and its analogues, apium virus, capsicum, terebinthina, copaiba, tarantula, conium, pulsatilla, aloes and eupatorium purpureum. All these remedies present certain common characteristics; tenesmus of the bladder, dysuria or retention of the urine, which is sanguinolent or purulent. Colchicum, nux vomica, petroleum and rhus tox. may also be remembered.

Cantharis.—Very painful tenesmus, veritable strangury, with very frequent emission of small quantities of urine which burns on being passed. It often contains albumin and blood in very considerable quantities. At other times it may contain considerable pus. In some cases the pains radiate into the kidneys, and are associated with suppression of the urine. These symptoms point to subacute cystitis, even with extension to the kidneys, and present a picture of gonorrhœic cystitis. It is also of service in the very painful period of tuberculous cystitis, with hæmaturia. In chronic cystitis, when the quantity of pus is considerable, it is also indicated. He has cured a patient who was re-

duced to the last degree of emaciation by the profuse sup-
puration of long duration.

As it easily aggravates, it is advisable to begin with the
sixth or even the twelfth dilution, three to four times a day.
If necessary, one may increase the dose even to two or three
drops of the mother-tincture.

Apis Mellifica.—The symptoms produced by this drug are
far less pronounced than those of cantharis; frequent uri-
nation, scanty urine, tenesmus, burning pains, with occa-
sional involuntary micturition, constitute the principal
symptoms. It, as well as tarantula, may be prescribed in
cases where cantharis is not well tolerated. The third tri-
turation may be administered every two or four hours.

Tarantula.—An analogue of cantharis, this drug is fre-
quently prescribed, with success, in acute cystitis. Same
method of administration as the preceding.

Terebinthina.—This drug and its analogues, so frequently
employed in the old school, resemble cantharis in many of
their symptoms. A considerable hæmaturia during acute
cystitis is an indication of terebinthina.

Eupatorium Purpureum.—Scantiness and even suppression
of urine, with extremely painful tenesmus, agitation, grow-
ing, dull and deep pain in the bladder and kidneys. The
presence of gravel in the urine is also an indication. From
the first to the sixth decimal dilution.

Chronic Cystitis.—Cantharis is also here the principal
remedy where there are pain and tenesmus, with purulent
deposit in the urine.

Dulcamara.—The chief remedy when the deposit in the
urine is principally mucus. The urine is viscid, turbid,
whitish, with a white and viscous deposit of a bad odor.
The third dilution is usually prescribed, though in case of
resistance one may employ the mother-tincture, in ten-
to twenty-drop doses, daily.

Calcarea Carbonica.—Indicated in a similar condition,

with very fetid urine and difficult and incomplete urination. From the sixth to the twelfth decimal, two or three doses per diem.

Uva Ursi.—A traditional remedy in urinary affections. It modifies very well catarrh of the bladder. The infusion is generally used. Jousset prescribes the mother-tincture, ten to twenty drops at a dose.

Surgical Treatment.—This consists of washing out the bladder or permanent opening of that viscus through the perinæum.

For the treatment of acute cystitis following gonorrhœa, E. M. Bruce advises the following:

Give gelsemium, 1x, on account of the history, to be followed by, or in alternation with, such remedies as belladonna, cantharis, cannabis sat., vesicaria, ferrum phos. If there are good indications for any special remedy, give it.

Usually agonizing urination is the thing most complained of, and chimaphila, stigmata maïdis, and uva ursi have been the most satisfactory remedies. If blood is present, terebinth. or helonias.

After the acute stage has passed and the patient has but moderate pain on urinating, but complains of the imperative nature of the desire, petroselinum is certainly of service in a great many cases. With this line of treatment nearly all of these cases get well.

If the pain becomes too great to be borne, a few doses of salol, or the injection into the bladder of a small quantity of a two per cent. solution of cocaine in a warm saturated solution of boric acid, rather than any form of opium, is suggested.

The writer has used the following remedies: For agonizing tenesmus in gonorrhœal cystitis, pichi 1x dil. in 5- to 10-drop doses; for frequent and painful micturition in women, terebinth. 3x and liliun tigrinum 2x, as suggested by Dr. Hemsteger; hyöscyamus tincture in drop doses, increased to 5 or 10, if necessary, for frightful tenesmus.

Chronic Cystitis.—E. M. Bruce, of Chicago, recommends the following: *Chimaphila*, *uva ursi*, *stigmata maidis*, saw palmetto, sandalwood, *triticum*, *pulsatilla*, *berberis vulgaris* and benzoic acid therapeutically, and boracic acid, salol, and beta-naphthol chemically. Saw palmetto and *pulsatilla* when the prostate is enlarged and tender; *triticum* and *lycopus* when the flow of urine is started after considerable delay and effort; *berberis* when the urine is loaded with uric acid and the pain extends from the bladder to the kidney; benzoic acid when there is inability to hold the urine, especially at night when in bed. Boracic acid, salol, and beta-naphthol to relieve pain and sterilize the urine.

Washing Out the Bladder.—Modern methods eschew the use of the catheter. A well-known instrument is that of Valentine, in which hydrostatic pressure suffices for the process, no catheter at all being used.

E. M. Bruce has devised an apparatus by which the liquid, by care and gentle pressure, may be forced up even past strictures into the bladder. It consists of a heavy eight-ounce, salt-mouthed bottle, fitted with a double perforated cork. Through one opening is passed a right-angled glass tube (A), which must fit tight and extend only a little way below the inferior surface of the cork. To the distal end of it attach a double rubber pressure-bulb, with, say, some three feet of three-sixteenths-inch rubber tubing. Through the other perforation pass a similar tube (B), but it must extend to within one-quarter inch of the bottom of the bottle and be provided above the cork with a valve. To B attach a piece of rubber tubing (same size as to A), and some three feet over this tubing draw a four-inch glass funnel, with the bell opening toward the distal end. This is to catch the splash. Into the end of the tubing insert a piece of glass tubing about three-eighths-inch in diameter, drawn down so as to fit the meatus of the penis, and of sufficient

length to extend two inches beyond the rim of the funnel. Fill the bottle with the solution to be used. Open the valve in the tube (B) and gently press the bulb on the other tube; as soon as the tube (B) is filled with liquid, close the valve.

The apparatus is now ready for use. Have the patient hold the glass tubing tightly in the meatus of the penis, open the valve and make a gentle pressure on the bulb. Wash the urethra out well before forcing any liquid up into the bladder. Even if there are strictures, with care and gentle pressure the liquid may be forced up into the bladder. Do not attempt to force in over an ounce or two at first; allow the patient to pass this out, and then repeat. Exercise the greatest care and judgment in increasing the amount of liquid injected for each washing.

Solutions for Vesical Irrigation.—For irrigation a 1 : 100 boracic acid or a 1 : 1000 or 1 : 2000 solution of carbolic acid is employed by Jousset. In very sensitive cases Bruce prefers to anything else the following :

R. Fl. Ext. hydrastis (non-alcoholic), . . . . .	. . . . .	ʒiv.	
Boracic acid, . . . . .	. . . . .	grs. xxx.	
Water, . . . . .	. . . . .	Oj.	M.

SIG.—Use at temperature 100°–105° F.

After there is less sensitiveness, one gets the best results from potassium permanganate 1 : 8000, and gradually increasing to 1 : 4000.

The bladder is likely to be very intolerant of liquids of a very low specific gravity as compared with urine, so that it is often desirable to add some sodic chloride or boracic acid to increase the specific gravity. Distilled water is almost always painful.

Occasionally there is a case which seems to stand still, and some more active agent even than permanganate is necessary. Creoline has done good service a few times.

Use it in from 2 to 5 drops to the pint. It is severe treatment, but occasionally brings good results.

Solutions Used in Washing Out the Bladder.—Three per cent. solution of boracic acid is a favorite; $\frac{1}{4}$ per cent. cocaine, $\frac{1}{2}$ per cent. resorcin, $\frac{1}{6}$ per cent. carbolic acid, 5 per cent. sulphate of soda are used; also, 10 drops tincture of opium in 100 c.c. of water. Astringent injections are $\frac{1}{2}$ per cent. alum, $\frac{1}{4}$ per cent. zinc sulphate or carbolate, $\frac{1}{15}$ per cent. potassium permanganate, 2 per cent. tannin, $\frac{1}{10}$ per cent. silver nitrate. When the urine is very offensive and strongly alkaline, any of the following may be used: $\frac{1}{10}$ per cent. potassium permanganate, lukewarm water with a few drops of amyl nitrite, half a liter (one pint) of water containing 3 to 5 drops of amyl nitrite, $\frac{1}{10}$ to $\frac{3}{10}$ per cent. solution of salicylic acid, $\frac{1}{2}$ per cent. creolin solution, 25 per cent. solution of peroxide of hydrogen. When there is a heavy sediment of phosphates, $\frac{1}{10}$ per cent. solution of equal parts hydrochloric acid and carbolic acid, or $\frac{2}{10}$ per cent. solution of salicylic acid, or 2 per cent. salicylate of soda.

In bacteriuria, 1 in 10,000 of corrosive sublimate.

Supersaturated solution of boracic acid may be made as follows: Add to 100 parts of boiling water 15 parts of boracic acid and 1 part of calcined magnesia; let cool. Lavaux has used this solution successfully in chronic cystitis when the ordinary 4 per cent. solution failed to relieve. Poisoning from the use of boracic-acid injections is occasionally reported.

In severe forms of chronic catarrh of the bladder it may be necessary to use drainage, the patient lying in bed and the urine flowing off continually through a catheter introduced and tied to the penis.

Washing Out the Bladder with Catheter.—In the treatment of chronic cystitis Ultzmann believes in efficient washing out of the bladder, with the after-employment of

antiseptic or astringent solutions. In washing out the bladder a soft catheter is to be used. In most cases a simple India-rubber tube is sufficient, one end of which is slipped over the end of any ordinary syringe. By nipping the tube the liquid can be retained or the syringe refilled without trouble. After micturition the soft catheter or tube is passed, and any urine left behind drawn off. Several ounces of lukewarm water are now injected, and the catheter is withdrawn a little so that the end is brought to the neck of the bladder. On now opening it, the organ is completely emptied. The injections should be continued until the returning liquid is quite clear. The patient should stand during the process, for in this way the sediment is most readily evacuated. After the bladder is washed out, antiseptic solutions may be introduced.

Use of the Catheter.—Whenever the bladder becomes sufficiently distended to produce pain and the ordinary remedies fail to give relief, recourse is to be had to the catheter. Before employing a soft catheter, it must be soaked for ten minutes in hot soap-water and flushed out with it; then it is disinfected with a strong germicide lotion, preferably corrosive sublimate, from which it must be freed again by another flushing with *salt water* before it is anointed with iodoformized vaseline for introduction.

(The salt water should be tepid, and, in strength, a teaspoonful of salt to a quart of water. The iodoformized vaseline should be 1 : 50 in strength.)

A simple India-rubber tube is preferable for use in cases in which it can be passed.

After use, the catheter should be again flushed out thoroughly with carbolic or mercurial lotion, dried, and put away in a tight box or wide-mouthed bottle. If needed frequently, the catheter should be kept immersed in a 5 per cent. carbolic lotion. Before using, however, the adherent carbolic lotion must be always removed by washing in salt water.

Injections may be made by use of an ordinary fountain-syringe. Whatever solution be used, the temperature of it should be 100° F. when it reaches the bladder, say 105° to 110° in the syringe.

In giving injections an ounce or two only of fluid at a time should be used first, and pain should not be inflicted. The water, after remaining in the bladder for a few moments, should be allowed to run out. It will bring with it at first whatever substance is mixed with the urine—always mucus, sometimes pus and mucus. The injection should be repeated until the water runs away clear. After a time there will either be an improvement in the bladder itself, or it will have grown accustomed to injections, when larger quantities of water, and often of much higher temperature, may be introduced.

Catheter Fever.—In cases of chronic retention of the urine, death sometimes results from removal of too much urine.

According to Klopel, in operations for the relief and cure of chronic retention of urine, the complete evacuation of all the urine at first should not be permitted, but rather the withdrawal of a few ounces, and the immediate injection of a solution of boracic acid in volume equal to one-half of quantity of urine withdrawn, lessening at each succeeding injection the quantity of fluid thrown in and increasing the amount of urine withdrawn. Thus, by regular gradation the bladder is emptied, and the circulation, in its abnormal walls, is accommodated by degrees to the new order of things. The same may be said of the ureters and of the kidneys.

It must be carefully borne in mind that in nearly all chronic diseases of the lower urinary tract the kidneys become involved in time.

Death has been known to follow the passage of a sound in the treatment of stricture. (F. Müller.)

Washing out the bladder by use of catheter is only allowable when urine stinks with ropy muco-pus, especially when such a condition is the result of residual urine. In other cases renal abscess from ascending pyelitis is possible, especially after 50 years of age. (Fenwick.)

CHAPTER XXXVI.

CYSTITIS IN WOMEN.

FUNCTIONAL DISORDER OF BLADDER
OR URETHRA.

Urine normal or nearly so.

Micturition frequent and painful, but relieved when bladder is empty.

REAL CYSTITIS.

Urine loaded with triple phosphate and muco-pus. Alkaline in reaction.

Great and prolonged tenesmus. Pain and straining after water has all been voided.

Treatment.—If the trouble is functional, attend to causes. A displaced womb must be replaced and retained in its proper position; a diseased womb must be cured, rectal trouble relieved, a foreign body in the bladder removed, etc. Rest is an essential in the treatment.

Chronic cystitis often proves to be a very difficult disorder to treat satisfactorily.

Dr. Madden, of Dublin, treats severe cystitis in women by dilating the urethra, which permits a continuous outflow of the secretion. This treatment, together with mild washing of the bladder, usually affects a speedy cure. If not, the fundus and neck of the bladder should be wiped with a bit of cotton soaked in carbolyzed glycerin and passed through the dilated urethra. The use of cocaine will prevent the pain of the operation.

In general, before any operative interference is undertaken the urine should be normally acid; this can generally be accomplished by the free use of citric acid in the shape of lemonade or lemon juice and water; the mineral acids act more slowly, and benzoic acid is not often well borne by the stomach if administered for too long a period of

time. The use of citric acid in one day has been known to remove a thick phosphatic crust on the edges of a vesico-vaginal fistula, or on the wound through the perinæum in lateral lithotomy.

Symptoms present in a case of cystitis are often but an expression of the organ that there has occurred a lesion or a morbid process at a distance from the part seemingly affected. Anal and rectal inflammation are not uncommon causes of cystitis. Resort to dilatation of the urethra will be followed by the best results in cases where tenesmus is an important symptom, and in which the parts around have been contracted and hypertrophied. Faradism with one pole near the uterus and the other over the bladder gives speedy relief. Corrosive sublimate, 1 to 2000, will often prove of benefit when no marked organic changes have occurred, the train of symptoms due to suppuration, fermentation, and to uncleanliness generally. No general rule of application can be laid down in all cases. Some will yield readily, others will defy all recognized methods.

According to Jousset, opening the bladder through the perinæum or vagina in women is justifiable only in very rebellious and chronic cases.

In painful cystitis in women curetting by Guyon's method is often curative.

In the female, Escat advises, for obstinate cases, epicystotomy and cauterization, followed immediately by vaginal cystotomy for drainage.

In cases of hyperæmia of the bladder local applications of nitrate of silver and of glycerite of tannin and ichthyol; the fine coil of the Faradic current; absolute rest and mild diet; correction of any abnormal condition of the urine; perfect drainage and rest for the bladder by means of an artificial vesico-vaginal fistula are now advised.

FISSURE IN THE NECK OF THE BLADDER IN FEMALES.

According to Morris, fissure of the neck of the bladder is apparently much more commonly met with than fissure of the anus, but seldom recognized. The fissure can be seen by gently distending the urethra with proper specula, and throwing in light with a head mirror. It is a narrow, grayish ulcer, similar to a narrow aphthous spot in the mouth. The primary symptoms are pain on urination, lasting tenesmus after urination, and frequent urination. Secondly come catarrhal cystitis and nervous derangements. The ulcer may be caused by the compression of folds of urethral mucous membrane by a uterus out of place, from a scratch by a passing bit of gravel, or it may be simply microbic, as the aphthæ of the mouth are now known to be.

Treatment consists in dilating the urethra slowly with the finger, to accomplish the same end as when we stretch the sphincter of the anus for fissure in that locality. Immediately after urination a few drops of a 5 per cent. cocaine solution injected at the neck of the bladder will at once control the painful tenesmus. The wool tampon for the vagina will give a feeling of great comfort and lessen tendency to spasm of the bladder. Absorbent cotton should never be used for the tampon, because when it becomes stony in a few hours it irritates the bladder, just as it usually does the uterus.

The above treatment failing to cure, the bladder should be opened to give the urethra rest. This is best done by introducing a Sims uterine dilator through the urethra, pressing the bladder-wall backward, and then slipping a scalpel through the wall between the blades, entering from the vaginal surface. In one aggravated case, recently, Morris opened the bladder above the pubes and poured into it, twice daily, an ounce of a mixture of boroglyceride and glycerin. Boroglyceride and glycerin is the best thing for any sort of hypertrophic catarrh. Clots in the bladder

should be digested out with pepsin. If the bladder is acidulated with citric acid, pepsin will digest the thick tenacious muco-pus quickly, and give patients great relief. In old cases with contracted bladder, expansion daily with Davidson's syringe and warm boric acid solution will gradually enable the bladder to hold a pint or more of urine.

Pain in the *meatus urinarius* may be caused by *urethral caruncle*, by chronic congestion or suppurating cyst of the urethra, by abscess of the urethro-vaginal septum, or by a tender, congested condition of the urethral mucous-membrane. Chronic congestion of the urethra is chiefly seen in pregnant women; the urethra is swollen and tender and feels like a thick cord. Not only the act of micturition, but sexual intercourse may occasion almost unbearable suffering.

THERAPEUTIC NOTES ON CYSTITIS.

1. Dr. C. W. Rose reports the following case of cystitis cured by *chimaphila* :

The patient, a man of 45 years, tall, and weight about 170 or 180, had been in the army, and ordinarily lived a quiet life. Had suffered in younger days from severe case of gonorrhœa, developing into gleet :

"Gave twenty drops of *chimaphila* tincture three times a day, also ten drops of vesicaria that often, washing the bladder out by aid of calenduline and pix-cresol, dissolved in hot water, every night. The first week saw not much, if any, change, except less pain in the bladder; thereafter, however, I had the great pleasure of learning that urine became clearer, that less mucus was discharged. In fourteen days mucus almost gone, no more blood at all. In three weeks patient reported as much better and happy. We now discontinued the washing of the bladder. I continued internal treatment, gradually reducing dose, when now I have patient on *cantharis* 3x, evidently getting well."

2. Dr. J. H. Cook gave teaspoonful doses of the fluid ex-

tract of *corn-silk* (*stigmata maidis*) with success in an obstinate case.

Dr. R. K. Paine gives five-drop doses of the tincture for cystitis in old men with enlarged prostate and retention.

3. Dr. E. M. Hale gives the following indications for *juniperus Virginiana*: Distressing dysuria, severe burning, scalding, cutting pain in urethra when urinating, violent tenesmus vesicæ, constant urging to urinate day and night. Use the 3x dil. on discs to five-drop doses of the 1x or 2x; in dropsy and very scanty urine wineglassful-doses of an ounce of the berries in a quart of water every two hours, hot.

4. *Pyoktamin* (blue) in doses of $1\frac{1}{2}$ grains in capsules one to three times daily is given in chronic cystitis. The urine becomes blue or greenish within five hours of the initial dose and remains so for several days, after the last dose has been given. Toxic symptoms may be produced, and care must be taken to procure a pure article and to begin with small and infrequent doses. If powdered nutmeg be given at the same time, it is said that bladder irritation by it may be avoided. In spite of all objections to its use, great improvement in chronic cystitis is said to follow it.

5. *In cystitis from spinal paralysis* little can be accomplished by local treatment. Thirty-grain doses of *sodium hyposulphite* is highly recommended for hopeless cases. To make the urine acid give benzoic or boracic acid internally.

6. In acute cystitis *arbutin* in doses of from fifty to eighty grains a day and buchu in teaspoonful doses of the fluid extract every three hours are often given for the purpose of affecting the mucous membrane of the bladder. Dilute solutions of them are advised by Dr. Fitz.

7. Strümpell commends potassium chlorate, twenty grains in not less than six ounces of water, three or four times in twenty-four hours.

8. *In subacute or chronic cystitis* stimulating diuretics harm-

ful in acute cases are said to be often serviceable, as oils of cubeb, copaiba, sandalwood; also terebene, and even turpentine in ten-minim doses in capsule. A combination of the oils of eucalyptus and cubebs is sometimes employed.

9. Dr. Pennoyer, of Kenosha, has called the writer's attention to the value of *digitalin* 3x for tenesmus and frequency of urination in cases worse at night, and dependent on mental strain.

10. *Conium tincture* in two-drop doses hourly has been found efficacious by Dr. S. P. Hedges in relieving tenesmus.

11. Fluid extract of *collinsonia* is mentioned in the treatment of cystitis.

12. *For the tenesmus in women* four pledgets of cotton dipped in two teaspoonfuls of a 5 per cent. solution of cocaine hydrochlorate, and inserted one by one into the urethra, are recommended. In a case which was under the care of the late Dr. Wesley Dunn, much relief was obtained from use of these pledgets.

13. *Cantharidin* is sometimes used instead of cantharis: dissolve one milligramme of Merck's cantharidin in a little alcohol, dilute with distilled water to make 100 c.c. (about three and a half fluidounces), and give a teaspoonful three times daily when no urethritis exists.

14. *Viscid pus* is best dissolved by adding a teaspoonful of common salt to a pint of tepid water, used with the irrigator.

15. *For the frequency of urination* which may persist after acute cystitis, daily injection of six ounces of warm water containing a tablespoonful of lac bismuth is said to be efficacious.

16. *For the frequency* in gonorrhœal cystitis ten-drop doses of the oil of erigeron, taken on sugar, every three hours, are recommended.

17. *In chronic cystitis* cod-liver oil sometimes seems to be beneficial.

18. In a case of *chronic cystitis* in a middle-aged man which the writer saw, imported (Célestins) Vichy and electricity for the pain over the bladder were the agents which effected a cure. This patient was better when hunting in the West and drinking the alkaline water of that region!

19. For *post-gonorrhœal cystitis* a combination of buchu, hyoseyamus and potassium bicarbonate is used by some physicians with reported success.

20. For the *cystitis of locomotor-ataxia*, one to three quarts daily of the Stafford mineral water seemed to give relief in one case which came under the writer's observation.

21. Dana recommends *thuja occident.* in doses of five drops of the tincture every three hours.

22. For *chronic cystitis*, with frequent micturition and ammoniacal urine, Dr. L. D. Rogers, of Chicago, gives arsenicum 3x and pulsatilla 3x every four hours in alternation. In addition, he gives four times daily one tablespoonful of a 1 per cent. solution of boracic acid.

23. In *acute cystitis in women* Lutaud recommends the following:

For the insomnia, chloral given as an injection:

Chloral hydrate,	. . . . .	5j.
Yellow of one egg,		
Water or milk,	. . . . .	fʒiiss.

The hypodermic injection of morphine (the patient never being permitted to make the injection herself) is still the best means of calming the paroxysms of pain. Cataplasms, baths, and hypogastric fomentations are useful. Topical applications in the vagina assist in allaying inflammation about the neck of the bladder:

Camphorated lanolin,	. . . . .	ʒij.
Extract of belladonna,	. . . . .	ʒj.

Saturate a tampon with the above and introduce night and morning into the vagina.

When the pain is intense, apply in the same way—

Muriate of cocaine,	gr. xv.
Distilled water,	fʒvj.

Internally, for the acute form:

Oxalic acid,	gr. viij.
Distilled water,	fʒiij.
Syrup bitter orange-peel,	fʒj.

A dessertspoonful every four hours.

24. *In chronic cystitis* Lutaud says:

The mild antiseptics hold first rank, as—

Boric acid,	ʒj.
Sodium biborate,	ʒiss.
Distilled water,	Oij.

ʒj to ʒij are injected rapidly and allowed to flow away.

If the bladder is still irritable, use smaller amounts.

Injections of silver nitrate are but rarely employed; instead, iodoform is preferred, especially in cystitis of gonorrhœal origin.

In such cases an injection of the boric-acid solution above mentioned is given; then follows an injection of five ounces of tepid water, containing a coffeespoonful of the following emulsion:

Iodoform powder,	30 parts.
Glycerin,	40 parts.
Distilled water,	20 parts.
Gum tragacanth, . . . . .	.25 part.

Pyoktanin is also recommended in gonorrhœal cystitis, in the proportion of—

Pyoktanin,	gr. xv.
Boiled and distilled water,	Oij.

Inject morning and evening for from ten to fifteen days.

Constitutionally, in gonorrhœal cystitis, extract of pichi was proposed by Wyman, and is thus employed:

Extract of pichi,	10 parts.
Tr. cannabis indica,	2 parts.
Lime-water,	90 parts.

A dessertspoonful every four hours.

Or the following may be employed :

Bromide of ammonium,	10 parts.
Tr. hyoseyamus,	5 parts.
Fluid extract buchu,	10 parts.
Distilled water,	60 parts.

A coffeespoonful every four hours.

If there is pus in the urine, the following is useful :

Benzoic acid,	1 part.
Orange-flower water,	50 parts.
Boiled water,	900 parts.
Sugar,	100 parts.

Take by the glass between meals.

25. Dr. Parker says : " For cystitis in women I do not hesitate to specify Tarrant's aperient, because I know of no other as efficacious.

" Besides the injections into the bladder, I recommend the use of hot sitz-baths, once or twice a week, together with injections into the vagina of hot water with boro-glyceride, or glyco-boron, as it is commonly called.

" After the injections, I use suppositories of glyco-boron, and where the pain is sufficiently severe to warrant its use, I recommend the addition of a sufficient quantity of morphine to allay the pain.

" Where there is prolapse, or misplacement of the uterus, I use ring pessaries of tarred jute, which I find very acceptable to the patients.

" Special attention is given to diet, bread and milk, soft-boiled eggs, toast, chicken, baked potato and milk, dipped toast, hasty pudding and such articles of diet having the preference, and especially avoiding tea, coffee, spices, and anything which might increase irritation of the kidneys.

“The recumbent position, and, when in bed, I suggest the patient rest as much as possible upon the stomach.”

26. Dr. E. M. Hale cured a case of cystitis in a woman of 50, first with copaiba, second attack with chimaphila; in the last attack chimaphila failed, but the following cured in four days :

℞. Balsam copaiba,	. . . . .	℥ss.
Oil sandalwood,	. . . . .	℥ss.
Oil cinnamon,	. . . . .	℥j.
Emulsion acacia,	. . . . .	℥iiiss.
Simple elixir,	. . . . .	℥iiij.

Sig.—A dessertspoonful every four hours.

CHAPTER XXXVII.

STONE IN THE BLADDER.

Synonymes.—Vesical calculus.

Etiology.—For the formation of stone in the bladder two conditions are essential :

1. A tendency toward *deposit* of the urinary solids from solution in the urine.
2. A local disposition for the solids thus deposited to adhere.

The writer cannot adopt the phraseology of those who say that systemic tendency toward excessive *elimination* of urinary solids is essential for formation of stone, since numerous analyses in the case of phosphatic stones in particular have shown me an actual deficiency of total phosphates, and it has been shown time and again that a deposit of calcium oxalate does not necessarily mean excessive elimination of the substance. In the case of urates and uric acid stone formation is probably associated with excessive elimination. It is, however, not so much a question of excessive elimination of the solids as it is inability on part of the urine to hold these solids in solution, due to alterations in its composition, and reaction.

It is possible that the relative excess of certain solids together with relative deficiency of others is at the bottom of the tendency to deposit.

In the region about Chicago the writer finds a tendency toward deposit of various salts of calcium (lime) in the urine, but whether the total amount of calcium in the urine is increased or not is difficult to say.

The *nucleus* in most cases is an aggregation of uric acid crystals, depositing originally in the kidney and passing

into the bladder; in some ten per cent. of the cases extraneous substances, as blood-clots, altered ropy pus mixed with precipitated phosphates, or aggregations of crystals of oxalate of calcium from the kidneys.

Occurrence.—Stone in the bladder occurs from foetal life to old age.

Children are more liable to uric acid calculi, and old persons to phosphatic.

It is about thirty times as common in men as in women. Negroes are less subject to the disorder than the other races. It seems to be more common in certain localities than others. The writer's attention has been called to the comparative infrequency of calculous diseases in Savannah, Georgia, and to the frequency in the region around Chicago. Stone in the bladder is said to be infrequent in New England, but not uncommon in Ohio, Kentucky, Tennessee, North Carolina and Alabama. In Europe the same tendency to calculous disease exists in certain localities.

Morbid Anatomy.—The muscular coat of the bladder becomes gradually hypertrophied from increased use, and its interlacing fibres begin to stand out in relief. A tendency to habitual contraction is established, due to irritation and intolerance of distention. The lining membrane of the bladder loses its normal salmon-pink color and becomes deep red, granular, or even villous, with occasional ecchymosis, and sometimes patches of yellowish surface-exudation. The bladder walls are thickened materially by the exudation also taking place in the submucous web of connective tissue around the enlarged follicles.

Conditions Favoring the Formation of Stone.—Among these may be mentioned the following:

1. Diseases of the brain or spinal cord (paralysis of the bladder).
2. Free use of animal food and malt liquors coincidently with excessive fatigue and profuse sweating.

3. Presence of foreign bodies introduced into the bladder from without.

4. Retention of urine from any cause.

Clinically, whenever we find residual urine we expect sooner or later to find stone in the bladder. That stone may form rapidly, *i.e.* within a few weeks, there is good reason to believe.

Beer and the Bicycle.—The writer, being a bicyclist himself, has been able to study the habits of cyclists. So far as those in the neighborhood of Chicago are concerned, the tendency is to eat heartily of animal food and to drink freely of beer after excessive fatigue and profuse sweating. Now there is little doubt but that such circumstances favor concentration of the urine, during which crystallization of stone-forming constituents is likely. In those who have a history of previous calculus formation, and in adults generally of gouty habit, bicycle riding with hearty eating of animal food and drinking of beer should be a favorable condition for stone formation. As a matter of fact, the writer knows of one person addicted to long rides, hearty meat-eating, and free use of beer at the time, who has had repeated attacks of renal colic, though as yet has shown no signs of stone in the bladder, so far as the writer is aware.

Classification.—Calculi in the bladder may be divided into three classes, as follows :

1. Those formed from normal constituents of urine : uric acid, urates, phosphates, and mixed calculi of uric acid or urates coated with phosphates.

2. Those formed from normal constituents, but not deposited in normal urine : oxalate, and carbonates.

3. Those formed from substances entirely foreign to normal urine : indigo, xanthin, cystin.

Physical Characteristics of Calculi.—Vesical calculi are usually solitary, but cases are known to the writer in which a number have occurred with the result that the crushing operation resulted fatally in one case.

They vary in size from that of a large pea to a magnitude limited only by the capacity of the bladder. The hardest stones are likely to be solitary, namely, the uric acid and the oxalate.

As a rule they are rough from crystalline deposits, but cases occur in which they are smooth.

Clinical Features.—The classical symptoms of stone in the bladder are the following:

1. *Pain* along the urethra, at end of the penis, in the testicles or down the thighs.

2. *Sudden stoppage of the stream* (caused by the carrying of the stone by the flow of urine to the outlet of the bladder), accompanied by a twinge of sharp pain shooting along the course of the urethra, and felt most acutely at the meatus.

3. *Frequency of urination.* Both pain and frequency are worse on motion.

The Urine in Stone in the Bladder.—The urine is that of gradual inflammation of the bladder. At first, increase of mucus and epithelial *débris*, with deposit of crystals and a slight hæmaturia after rough or violent exercise or a jolting ride. Later, the urine of cystitis, with deposit of crystals and blood at the close of micturition, the hæmaturia being worse after motion.

In severe cases the urine may be very foul and tinged with blood, the pus sediment being surmounted by a layer of blood. Albumin may be abundant, and the symptoms (severe chills, fever, and prostration) suggest presence of pyelonephritis.

CLINICAL NOTES.

1. It is known that stone may be present in the bladder without giving evidence of its presence during life.

2. A small, smooth stone of uric acid may occasion but slight cystitis; large or rough stones (phosphates or oxalate) occasion considerable cystitis, with hæmorrhage.

3. Misplaced sensations are sometimes caused by the chronic cystitis of stone, the usual kind of pain being absent.

4. Children with stone habitually pull upon the prepuce, and, in general, the calculous patient habitually squeezes and rubs the under surface of the glans penis, just behind the frænum.

5. Rest upon the back, with the hips raised, relieves the pain of stone.

6. Uneasy sensations and sometimes acute pain are felt in the rectum; more or less dull pain above the pubes, radiating to the hips, sacrum, thighs, and perinæum.

7. In a few cases calculi have been known to work their way out of the bladder through ulcerations involving all its coats.

Diagnosis.—Stone being suspected from the symptoms and condition of the urine, the diagnosis is confirmed by sounding, the use of the cystoscope, or the X-ray apparatus in the case of phosphatic or oxalate stones.

Prognosis.—The prognosis in vesical calculus depends essentially upon the general condition of the patient, his ability to undergo operation, and the kind of operation which is possible or necessary.

Dangers and Complications in Cases of Stone in the Bladder.—Abscess formation in the bladder and prostate; outside of the bladder, in the neighborhood of the neck, from pericystitis, and pelvic cellulitis terminating in abscess; in children both acute and chronic peritonitis, due to operations for relief.

The usual cause of death, when the patient is not relieved by operation, is pyelonephritis.

Treatment.—*Preventive* treatment of stone has been considered under LITHURIA, PHOSPHATURIA, and OXALURIA.

Palliative treatment in cases not fit for operation consists of rest, milk diet, remedies previously considered under

CYSTITIS for relief of pain, and, in the case of uric-acid stone, alkaline waters, borocitrate of magnesia in 10-grain doses two hours after a meal; in phosphatic stone the remedies already mentioned under PHOSPHATURIA.

Surgical treatment is the essential for stone in the bladder, and the crushing operation of H. J. Bigelow, of Boston, is used in the majority of cases.

CHAPTER XXXVIII.

TUBERCULOSIS OF THE BLADDER.

Etiology.—The disease is rarely primary. If primary, the trigonal submucosa is by far most likely to suffer. The cause is generally tuberculosis of a neighboring or associated organ.

Occurrence.—It occurs usually in young patients from 15 to 25 years of age, with family history of tuberculosis or cancer, and personal history of masturbation with increasing frequency of urination.

Pathology.—The bladder may be invaded in two ways: First, and more commonly, by surface inoculation by the stream of tuberculous urine from the kidney or its pelvis; second, by continuity along the line of the ureter.

Irritating products of tubercular inflammation affect the trigonal mucous surface, causing symptoms resembling gonorrhœal cystitis. If, then, an excoriation takes place from the irritation, or a rent is made by an instrument, tubercular infection is easily accounted for.

Extension by continuity from the ureter results in swelling, congestion, excoriation, and finally ulceration.

Clinical Features.—These resemble, in secondary cases, those of vesical calculus. (See **STONE IN THE BLADDER.**)

In primary cases of invasion of the middle coat of the bladder from the blood-vascular channels the symptoms are none, or but slight. If any, they are usually as follows:

1. Slowness in starting the stream, weakness of flow, and difficulty in emptying the bladder.
2. Residual urine in more or less quantity in later stages.
3. Gnawing pain behind the pubes, when the bladder is disturbed, not quickly relieved by urination.

4. Slight hæmorrhages from over-distention.

In other words, symptoms closely resembling those of obstructive prostatic disease.

Differential Diagnosis.—Vesical tuberculosis is to be differentiated from vesical calculus as follows :

1. Absence of history of passage of renal calculus.
2. Exercise does not cause so marked an increase of vesical irritability.
3. The pain is in the middle of the penis, and does not pass forward under the glans.
4. The sudden arrest of the stream relieves the pain.
5. Nocturnal frequency rapidly increases, depending on distention reflex.
6. Evidences of a contracting bladder are present.
7. Presence of tubercular products in the urine.
8. Cystoscopic examination shows no stone.

The differential diagnosis between primary cases and obstructive prostatic disease must be made. The cystoscope shows a patchy disseminated tuberculosis under the transparent mucous lining of the bladder.

Differential diagnosis between vesical calculus and tuberculosis coming from an infected seminal vesicle is made by observation that in tuberculosis from this cause the bladder is unable to hold more than five or six ounces; the pain ceases when about half of this is voided; there is much straining at the end of urination, and extrusion of a few drops of blood; the distress subsides as the bladder is partly filled; day and night frequency is about the same; the cystoscope shows a patchy inflammation along the side of the affected vesicle only.

If the infection comes from the prostate, the symptoms are those of cystitis of the neck. Differential diagnosis is to be made as follows: Finger in the rectum detects an unusual sensitiveness in the intervesicular space, especially if the bladder is partly filled. Distention reflex is marked.

Nodules may sometimes be felt in the bladder wall. The detection of the disease in the prostate usually serves to do away with the necessity of instrumentation.

In general, use of the cystoscope for diagnostic purposes enables us to do away with that of the stone-searcher, a most dangerous instrument in tuberculous cases.

Treatment.—Climate, diet, and anti-tubercular remedies are the main reliance. Oils of sandalwood and cubebs are the chief special remedies.

CHAPTER XXXIX.

TUMORS OF THE BLADDER.

Classification.—According to F. S. Watson, a division of bladder-tumors may be made as follows:

I. *Benign.*—Papilloma, myxoma, myoma; rarer forms, angioma, cysts. Cysts are hydatid, dermoid, and serous; they are rare.

II. *Malignant.*—Sarcoma and cancer. Sarcoma shows the following varieties: Fibro-sarcoma, lympho-sarcoma, myo-sarcoma, round-cell, and spindle-cell. Cancer is either flat-cell or glandular.

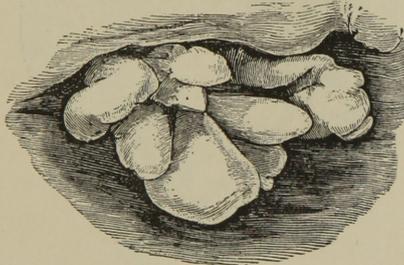


FIG. 30.—Vesical Polyp.—(From THOMPSON.)

Papilloma is the most frequent of benign growths, carcinoma of malignant. Sarcoma is, however, not so rare as formerly thought.

Etiology.—Middle life is most subject, except in the case of myxoma, which is more often found in childhood. Males are more liable than females. The lower third of the bladder is more liable to the growths than the upper two-thirds.

Pathology.—*Papilloma*, as frequently occurring, is a growth in which there is a well-defined pedicle, from the

summit of which branch out a number of papillæ-bearing heads. (Fig. 31).

The pedicle varies in length, thickness, and structure. It may be as long as an inch or more, and it varies in size from that of a knitting-needle to that of the thumb, or larger. The structure of the papillæ is as follows: Their base is made up of unstriped muscular fibre and connective tissue. From this spring the individual papillæ. Each of the latter consists of a delicate framework of connective

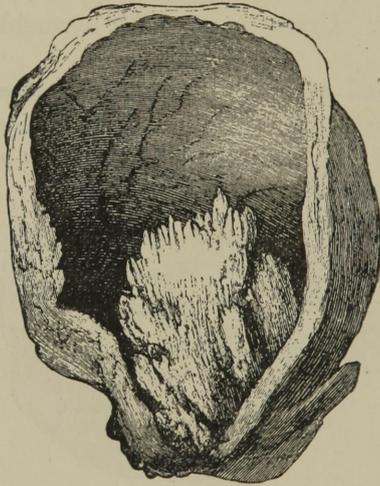


FIG. 31.—Papilloma of the Bladder.—(From THOMPSON.)

tissue, through the centre of which run loops of capillary blood-vessels with very delicate walls, lined with endothelium, bearing endothelia with large nuclei. Externally each papilla is covered with one or more layers of epithelium of columnar form with large nuclei; these are of the same type as the epithelia of the deeper layers of the normal mucous membrane of the bladder.

Myxoma, or polyp, is a single growth, pedunculated, and resembling in gross appearance nasal polypus. (Fig. 30.)

Vesical myomata are rather rare, only about sixteen cases

being known, but they have been found in both sexes and at the two extremes of age.

They are very analogous in their character and structure to uterine fibromata. They spring from the thickness of the muscular wall of the bladder, and extend either on the outside or inside of that organ, hence the division into "myomes excentriques" and "myomes cavitaires." (Albarran.) The latter are the more frequent. They may be sessile or pediculated, and their size may vary from that of a nut to that of an adult's head, and even larger. They are usually very limited, encapsulated, and easily enucleated.

In the case of a "myome excentrique," there are scarcely any vesical symptoms; the myoma only betrays its presence by the slow growth of a tumor which hinders the function of neighboring organs.

In the case of a "myome cavitaire," the ordinary symptoms of vesical neoplasms are observed: frequent hæmaturia, painful micturition, sense of weight in the perinæum or hypogastrium.

By rectal or vaginal examination, especially when combined with abdominal palpation, the presence and nature of these tumors may often be made out.

The progress of these myomata is variable; death is oftenest the result of secondary accidents of infection. (Terrier and Hartmann.)

Carcinoma.—The stroma of a carcinomatous growth, composed of the tissue of the submucous and vascular layers of the bladder, with more or less round-celled infiltration, is full of alveoli, well packed with epithelial cells, following with more or less accuracy the types of the bladder epithelium. The formation of cancer "nests" varies much in different specimens, and often in different parts of the same specimen.

Clinical Features.—These are the following:

1. Hæmaturia preceding pain in benign growth.

2. Pain or irritability of the bladder often preceding hæmaturia in malignant growths.

3. Relief of pain after an attack of bleeding.

CLINICAL NOTES.

1. Tumors of the bladder may grow about the ureteral orifice, cause hydro- and pyo-nephrosis, and death, with renal symptoms suggesting Bright's disease.

2. The hæmaturia of bladder-growths may take place even during sleep, is very abundant, and shows progressively increasing frequency and abundance as the disease progresses. It is, as a rule, intermittent.

3. Occasionally hæmaturia is continuous.

4. Instrumental manipulation within the bladder is liable to produce hæmorrhage, and one or two fatal cases from this cause are on record.

5. The pain is not, as a rule, increased by exercise.

6. In malignant growths pain is a prominent symptom sooner or later, and is frequently of a radiating character. In exceptional cases pain may be absent.

7. Frequency of micturition is not more noticeable at night.

The Urine.—The features are the following:

1. Presence of blood.

2. Presence of bits of the surface of the growth.

3. In malignant disease large numbers of epithelia of a great variety of shapes, with large nuclei. The *quantity* of these epithelia is of importance.

In order to find the bits of growth, the writer has resorted successfully, in one or two cases, to the following simple method:

The urine is diluted with water until the blood-corpuscles are in large part dissolved, after which sedimentation in the centrifuge will easily collect the particles, if present, which, if examined with the microscope, show great abund-

ance of connective-tissue shreds. (See URINARY ANALYSIS, p. 315.)

In *fibrous polypi* there is cystitis of moderate severity.

Medullary sarcoma may be characterized by urine of greenish-brown color and putrid odor. In later stages there may be a severe cystitis.

In *epithelioma* we find a moderate or sometimes severe cystitis. In the sediment there are present blood, pus, small, round or oval epithelial cells, sometimes caudate cells with two or three small projections, their nuclei large and brightly glistening, with several in the same cell. Sometimes ten or twelve cells may be found together, forming a shred.

In *villous* or *vascular* tumors the urine is normal in quantity, red-brown to brown-black in color, feebly-acid reaction, but alkaline when tumor grows rapidly; the sediment is fine, flocculent, brownish in color, with reddish or large shreds; the urine is usually normal in consistence, but at times stiffens suddenly to a jelly-like mass; after long shaking, again becomes liquid and of slightly reddish-yellow color. Sometimes there are severe symptoms on micturition.

Physical Examination.—When there is no prostatic hypertrophy, the finger in the rectum may detect an area of induration in the case of malignant growths, and a sense of increased resistance. The bladder should be nearly or quite empty.

The cystoscope is another means for detection. If for any reason it cannot be used, digital exploration of the bladder by way of the perinæum is the last measure at our command.

Differential Diagnosis.—Benign growths are to be differentiated from malignant growths as follows: If the area of induration can be felt by the finger in the rectum, if the patient be over 50 years of age, and if the cystoscope shows

a growth with an ulcerated surface having irregular, ragged, everted and œdematous edges, and if pain is a marked symptom, the chances are strongly in favor of the disease being malignant.

Course and Prognosis.—Bladder-growths progress slowly. The average duration is from three to seven years, but the patient may, in exceptional cases, die in a few months, from frequent and repeated hæmorrhages or from cystitis and nephritis superadded.

Death is the inevitable result of bladder-tumors when left to themselves.

Prognosis after Operation.—Thompson reports 41 cases. In 7 papillomatous cases there was no reappearance of symptoms in from 3 to 10 years. In 15 other cases death took place; 10 were malignant, 2 papillomatous, and the rest myomatous, with suspicious nuclei. Nineteen others lived from a year to a little less than 4 years after operation.

Watson has collected statistics of 11 others, 3 of whom died in from 6 months to 2 years, 1 showed recurrence in from 2 to 5 years, 1 showed no evidence of recurrence in 4 years, 1 none in 5, and in 1 the result was not stated.

In sarcoma the statistics of Hinterstoisser show the following: Of 21 cases, 12 died, 6 recovered, 3 were unrecorded. The longest period without recurrence which Watson has recorded is that of five years.

Treatment.—To check hæmaturia, which is sometimes exhausting and dangerous, Watson advises long-continued irrigations of the bladder through a soft rubber catheter with very hot water, 110° to 120° F. The use of strong astringents and of styptics within the bladder cannot be advised, as they are liable to produce tough coagula.

In cases where the coagula have formed, it is wiser to allay tenesmus and pain with opium than to attempt to remove the clots. The pressure caused by the filling up of

the bladder tends to check the hæmorrhage after a time, and in a few hours the clots will disintegrate and pass away. If the patient's general condition is bad, and the flow of urine and blood distend the bladder to a dangerous degree, attempt may be made to break up the clots and wash them out with large catheters or evacuators.

Surgical Treatment.—In benign growths removal should be undertaken at the earliest possible moment, unless the patient be exhausted, or renal disease or other complicating malady contra-indicate operation.

In malignant growths the decision as to operation depends upon the amount of pain or hæmorrhage present. Operation as a palliative measure may be required in cases of extreme pain or hæmorrhage.

In certain cases of cancer in which the growth is of limited extent, and situated at or near the summit of the bladder, resection is occasionally successful.

CHAPTER XL.

DISEASES OF THE PROSTATE.

AMONG the various diseases of the prostate, congestion, acute and chronic inflammatory processes and hypertrophy are the ones which demand attention in a work of this kind.

PROSTATIC CONGESTION.

This occurs normally during venereal excitement, and results, when the appetite is not gratified, in the secretion of a

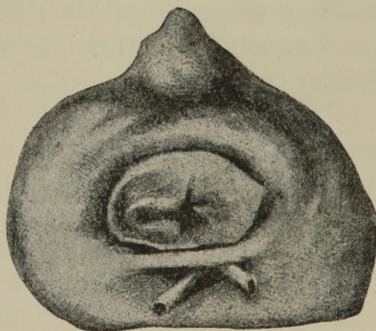


FIG. 32.—A healthy prostate from a man aged thirty-five years, with its posterior or rectal surface downward—the internal meatus being seen above, and the ejaculatory ducts in their depression below.—(THOMPSON.)

peculiar viscid mucus, which appears mixed with urethral mucus at the meatus. It is common in the case of continent men during the period before marriage, and requires no treatment save rest from sexual excitement, or a cold sitz-bath occasionally. The patient should be assured that the discharge is not seminal, which may be ascertained by microscopic examination.

In old urinary cases severe prostatic congestion some-

times takes place, resulting in complete retention of urine, and unless the latter be drawn off, severe symptoms suggesting pyelonephritis may ensue.

Treatment.—Thuja, conium, and secale are the principal remedies. In some cases, dependent on arterio-sclerosis, iodide of potash, thirty grains in four ounces of water, a teaspoonful slightly diluted twice daily.

Alcohol, spiced foods, and long sitting, as in a buggy or railway car, or on a bicycle, are to be avoided.

ACUTE PROSTATITIS.

This disorder is, as a rule, parenchymatous. Follicular prostatitis is chiefly chronic.

Definition.—Acute inflammation of the prostate.

Etiology.—Rarely a primary disorder. We find it secondary to the following conditions:

1. Gonorrhœa.
2. Stricture.
3. Sexual excess or violent exercise.
4. Irritation from various causes; acid urine of high specific gravity, use of instruments, fragments of stone, strong injections, drugs, like cantharides, internally.

Pathology and Course.—The prostate is at first congested, then inflamed, finally resolution takes place, pus exudes on the free surface or there is croupous exudation; abscess or peri-prostatic formation of pus may take place or the disease linger indefinitely as a chronic follicular inflammation.

Clinical Features.—These may be summarized as follows:

1. Rapid swelling of the prostate, which to the finger in the rectum may feel as large as a small orange.
2. Exceeding sensitiveness of the organ to the touch, which excites immediate desire to urinate.
3. Feeling on part of the patient of something protruding

into the rectum, causing in some cases ineffectual attempts at stool.

4. Heat, weight, and throbbing sensations locally.

5. Various other symptoms or sensations, as dragging, pain in back or limbs.

6. Diminution of urethral discharge to a greater or less degree for the time being.

7. Constant desire to urinate without sense of relief, and with pain as the last drops pass, when the circular fibres at the neck of the bladder squeeze the tender prostate.

8. Febrile disturbance.

9. Great mental disturbance, out of proportion to the magnitude of the disorder. Mild acute mania, even, occurs in some cases.

The remedies usually indicated are bryonia, mercurius, and pulsatilla. Bryonia and pulsatilla in drop doses of the tincture every two hours. Mercurius solubilis in the first trituration, four grains in seven ounces of water, a teaspoonful every two hours.

Prognosis.—The degree of fever is a valuable criterion on which to base an opinion. If the temperature does not rise above 101° F., and is unaccompanied by chills, sweating, and prostration, resolution without suppuration will probably occur.

Resolution, when occurring, takes place between fourth and twelfth day; recovery in from one to three weeks.

Unfavorable signs are marked chills, high fever, and considerable diminution of perineal pain and tension, indicating suppuration instead of resolution. If the abscesses are small the prognosis is still good, but where the collection of pus is very extensive the prognosis must be guarded.

CLINICAL NOTES.

1. When a patient has suffered from acute prostatitis, the possible existence of chronic follicular prostatitis must always be borne in mind.

2. Not infrequently the abscess opens in two directions, giving rise to fistulæ, which, if unrevealed, renders the life of the patient wretched beyond description.

Treatment.—The essentials are the following :

1. Absolute repose in bed with a non-nitrogenous diet.
2. Alkaline waters, as Vichy.
3. Morphine in quantity just sufficient to control severe pain and excessive action of the bladder.
4. Copious enemata of hot water for the bowels. No cathartics.
5. Suppositories, as of codeine, gently introduced, to modify the incessant desire to urinate.
6. In severe cases leeches to the perinæum, followed by hot sitz-baths and hot rectal enemata, repeated three or four times daily.

Or the measure advocated by some German surgeons of application of cold direct to the prostate by use of a rectal sound and stream of iced water.

A case is reported in which the pain and sense of weight were relieved by a galvanic current of from five to seven milliampères, the positive pole being placed in the urethra and the negative over the perinæum.

PROSTATIC AND PERI-PROSTATIC ABSCESS.

During the course of acute prostatitis pus formation is shown by the symptoms already described under PROGNOSIS. The pain is less tense and of a more lancinating character. Retention of urine may result from pressure in the already narrowed urethra.

Less marked and less intense symptoms are found in peri-prostatic cases. Œdema felt by the finger in the rectum serves to distinguish peri-prostatic abscess.

Treatment.—If the abscess bursts spontaneously, all pain and discomfort cease like magic. But, owing to the dense nature of the fibrous capsule of the prostate, they are often tardy in opening.

When fluctuation can be made out through the rectum, puncture with a trocar is to be made.

When the bulging into the urethra produces retention without yielding fluctuation, pneumatic aspiration of the abscess through the rectum is advised. Or aspiration several times daily above the pubes to draw off the urine; or careful attempts to relieve the bladder with a silver catheter.

The remedy which favors the opening of the abscess is *hepar sulphur*, which is to be given as soon as pus formation is suspected. *Silicea* should be given after the abscess has been opened or has burst, and continued until healing takes place.

CHRONIC PROSTATITIS.

Chronic prostatitis may be strictly (*a*) follicular, (*b*) follicular and parenchymatous combined, or (*c*) tubercular.

Etiology.—Chronic follicular prostatitis usually follows acute prostatitis. The disease involves the mucous surface of the sinus of the prostate and of the mucous follicles and ducts.

Clinical Features.—These are the following:

1. Slight muco-purulent oozing from the meatus, increased by costive stool.
2. In some cases painful defecation.

In the combined cases of chronic follicular and parenchymatous disease we have the following:

1. Weight and dragging-down sensation toward the perinæum, with painful feeling in the prostate.
2. Painful sensation when walking.
3. Increase of pain on crossing the legs; finally also from sitting, or in changing from sitting to standing, and *vice versa*.
4. The symptoms and urine of stone in the bladder.
5. Great mental depression.
6. Finger in the rectum finds slight enlargement and

heat of the prostate, with perhaps increased sensibility, and sounding for stone finds prostatic urethra exceedingly sensitive without presence of stone in the bladder.

Treatment.—Keyes advises repeated mild blistering of the perinæum for weeks, if necessary, by painting cantharidal collodion upon one side of the perinæum, confining the patient to bed for 48 hours, and painting the other side of the raphé as soon as the soreness of the first begins to subside. Great care is necessary to avoid the scrotum and anus in this procedure. Binding up the scrotum and covering the blistered surface is necessary.

Nutritious diet, alkaline waters, and free movements of the bowels are necessary.

Phosphoric acid, 2x dil., and phosphate of strychnine 3x, are the chief remedies internally.

TUBERCULAR PROSTATITIS.

The symptoms are of severe chronic prostatitis occurring in tubercular or debilitated subjects. Cheesy degeneration is the pathological feature. The diagnostic features are as follows:

1. The contour of the prostate felt per rectum is lumpy.
2. The course of one or both vasa deferentia can be traced as an infiltrated hard tube, joined to a distinctly enlarged, knotted, indurated seminal vesicle.
3. Steady aggravation of symptoms.
4. Slight hæmorrhages from the urethra from time to time without relief.
5. Discovery of tubercle bacilli in the urine.

The course is exceedingly slow and the prognosis bad. Occasionally cures are effected by the usual anti-tubercular measures of hygiene, diet, climate, and medication.

CANCER OF THE PROSTATE.

This is exceedingly rare. The diagnosis is based on finding free hæmorrhages from the urethra, either sponta-

neous or during urination, with relief to the symptoms and pain; the discovery of shreds of tissue of considerable size in the urine; of scirrhus cancer, the peculiar hardness of the prostate felt per rectum; if medullary, certain spots softer than others in the prostate; enlargement of the glands in the groin and pelvis. Cancerous cachexia is slow to appear. The prognosis is bad and treatment practically *nil*.

Erly H. Madison, of Oramel, N. Y., reports a case of scirrhus cancer of the prostate in a man of 67, with history of trauma.

The most prominent symptoms in this case were frequent desire to urinate, pain upon defecation, and intense pain in the region of the bladder and prostate gland, emaciation, and loss of appetite.

Post-mortem showed a scirrhous of the prostate gland about as large as a hen's egg, nodular and very hard. The peritonæum was also infiltrated with cancerous masses. There was also a small secondary cancer of the liver, some portions of which had undergone calcareous degeneration. The bladder contained about one ounce of purulent liquid, evidently partly urine, partly pus. The mucous membrane at the base of the organ, while extremely red, could hardly be said to be ulcerated. A more correct description of it would be conveyed by the term granular inflammation. The rectal wall was infiltrated by the growth and was adherent to the tumor, although rectal symptoms were surprisingly few and slight, being practically limited to pain on defecation.

The last three weeks of his illness Madison had to give him four grains of morphine, hypodermically, every four hours, and this amount did not produce complete narcosis, the effect lasting only from two to three hours. A hypodermic needle was used on this case something over one thousand times.

Such cases as this are extremely suggestive in the light

of present pathological knowledge. Here was a growth no larger than a hen's egg, which had not ulcerated, and which caused no pressure-symptom whatever excepting inability to urinate. The urine, to within a few days of death, remained entirely normal as far as chemical analysis showed. The microscope only showed a small amount of mucus from the bladder. There was never any rectal discharge, and the post-mortem showed no breaking down of the tumor. And still the growth caused death.

PROSTATIC CONCRETIONS.

These are exceedingly hard, with a polished surface. They are mainly phosphatic. If large, they may lead to prostatic obstruction and cause chronic cystitis. If they project into the urethra, a metallic instrument may be felt to grate on them. If they cause distressing symptoms, Keyes advises perineal opening and extraction.

CHAPTER XLI.

HYPERTROPHY OF THE PROSTATE.

THE etiology of enlarged prostate has not been determined. Some degree of enlargement is found in about thirty per cent. of men who have passed the fiftieth year.

Morbid Anatomy.—Prostatic hypertrophy consists in an overgrowth of all the normal elements—fibrous, muscu-

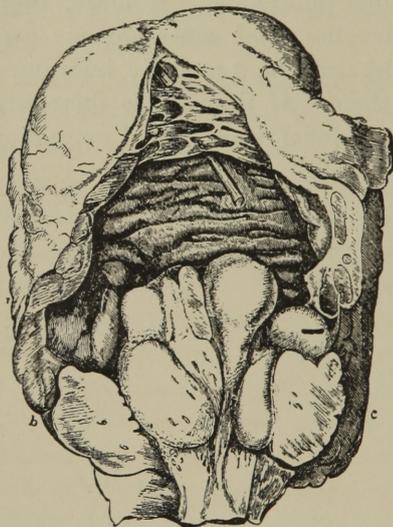


FIG. 33.—Section of bladder and prostate; the former hypertrophied, the latter forming prominent tumors within the bladder.—(From THOMPSON.)

lar, and glandular—the first two predominating. In addition to uniform enlargement there is a tendency on the part of the first two elements to arrangement into distinct nodules of spherical form.

The hypertrophied prostate presents a deformity as well

as an enlargement, due to distinct tumors projecting toward or into the bladder and urethra.

Pathology.—The morbid conditions which result are the following :

1. Distortion of the prostatic urethra.
2. Elevation of the level at the vesico-urethral orifice.
3. Obstruction to the return of blood from the bladder.

As a result of these conditions a number of others sooner or later occur: dilatation of the bladder with increase of residual urine, hypertrophy of this organ and diverticula; dilatation of the ureters and renal pelves, with stagnation of urine, congestion and catarrhal inflammation of the entire urinary tract, tendency to calculus formation, pyelonephritis, and death from uræmia.

Clinical Features.—In the earlier stages we find the following :

1. Difficulty in starting the flow of urine.
2. Feebleness of the stream.
3. Frequency of urination *at night* (due to venous congestion of the vesical neck).
4. Polyuria.

Later, when cystitis is established, we find :

1. Frequency of urination both by day and by night.
2. Absence of feeling of satisfaction after urination.
3. Dull pain along the urethra.
4. Dribbling of urine, due to increase in quantity of the residual and overtaxing of the sphincter.

The Urine.—In the earlier stages we find polyuria with urine of low specific gravity, and perhaps a trace of albumin. As much as six or eight pints may be passed in a day, and the case may be pronounced diabetes insipidus.

When vesical catarrh appears we have the urine of chronic cystitis of varying degrees of severity.

Diagnosis.—The finger in the rectum encounters a rounded, dense mass, either smooth and symmetrical or va-

riously distorted and nodulated. The normal prostate is a soft, chestnut-like body, hardly recognizable except by the skilled touch.

Differential Diagnosis.—Hypertrophy of the prostate is to be differentiated from cancer of the prostate, tubercle of the prostate, urethral stricture, vesical calculus and tuberculosis, tumor of the bladder, renal calculus and tuberculosis. The leading diagnostic features of these disorders have already been given.

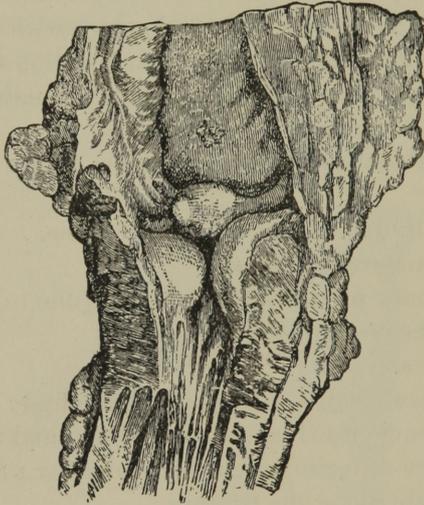


FIG. 34.—Section of bladder and prostate, showing marked but not great enlargement of lateral lobes and median portion.—(From THOMPSON.)

Course.—The disorder, as a rule, pursues a slow course, remaining, so far as the cystitis goes, mild for weeks or months, again increasing to an acuteness which confines the patient to bed. Retention of urine finally takes place in many cases, and the patient resorts to the catheter for the balance of his life.

Prognosis.—This depends on the results of catheterization.

The essentials on which to base an opinion are the following:

1. The condition of the kidneys.
2. The condition of the arteries.
3. The general nutrition of the patient: weight, flesh, vigor, condition of the skin, digestion, excretion, occupation, and habits.

In a patient otherwise in good condition the catheter may be used successfully and comfortably for ten or fifteen years or more.

Mode of Death.—In a patient with polyuria, more or less albuminuria and cylindruria, indicating a low grade ureteritis and pyelitis, uræmia is not an uncommon cause of death, supervening after taking cold, or from over-exertion or imprudence in diet.

The symptoms of uræmia in such a case are as follows:

1. Hot, dry skin.
2. Loss of appetite.
3. Sleeplessness and restlessness.
4. Dry, red, or pasty tongue and parched mouth.
5. Depression, headache, and wandering of the mind.
6. Constipation.

Polyuria, with more albumin than the pus accounts for, suggests renal disease, demands a guarded prognosis, and requires caution in treatment.

Hard and tortuous arteries with polyuria and cardiac hypertrophy are a serious coincidence, and in such cases the prognosis is bad as to time.

Treatment.—When retention of urine exists, the patient is to be shown how to use the catheter, and how to wash out his bladder. Cases are on record where men have used the catheter on themselves for twenty years or more.

When also the residuum is large (a pint or more), even though retention is not complete, it is far better to rely entirely on the use of the catheter.

Remedies.—The usual remedies for this condition are directed to the relief of the various symptoms rather than with the attempt, which is practically hopeless, of curing the disease.

Thuja in ten- to twenty-drop doses of the tincture three times daily is given for the frequency of urination and dribbling.

Sabal serrulata has a great reputation in the treatment of prostatic hypertrophy, and is given in doses of ten minims or more of the tincture.

In cases where the urine is scanty and the feet begin to swell, use triticum repens in teaspoonful doses of the tincture or of the preparation called tritica. Best given in hot water.

A mixture of the fluid extracts of chimaphila, taraxacum, and corn-silk, in the proportions by volume of 1, 2, 3, in the order named, has been brought to the writer's notice by Dr. A. B. Späch. The dose is a teaspoonful every three hours.

Triticum is sometimes substituted for chimaphila in the above formula.

See CYSTITIS for remedies of service for the various symptoms.

Suppositories for the relief of painful frequency may be mentioned as follows :

No. 1.

Iodoform, gr. xii.
 Extract of hyoseyamus, gr. viii.
 Cocoa butter, to make 8 suppositories.
 Use one every 3 or 4 hours.

No. 2.

Lupulin, ʒj.
 Mono-bromide of camphor, ʒj.
 Cocoa butter to make 12 suppositories.

No. 3.

Aristol, gr. xl.
 Alcoholic extract of belladonna, gr. ijss.
 Cocoa butter q. s. 10 suppositories.

When the pain is severe and does not yield to the above, a ten-drop laudanum suppository may be used.

Operative Treatment.—Various operations have been proposed, as McGill's suprapubic prostatectomy, perineal section, galvano-cautery, vasectomy, and castration.

The mortality after prostatectomy is still high, 18 to 20 per cent. Castration should not be performed if the patient is not very old, if he retains his sexual power, has sound kidneys, and only a moderate amount of residual urine.

According to Harrison, if the prostate has passed into a fibrotic condition, or if the obstructing third lobe represents a fibrous tumor, castration and vasectomy are unpromising.

Galvano-cautery is said to give brilliant results in the case of circumscribed growths of the prostate.

Alexander enucleates the prostate through a perineal opening, two fingers of the left hand being passed into the bladder through a suprapubic opening.

CLINICAL NOTES.

1. The chief danger in the use of the catheter lies in withdrawing the urine *for the first time*. (See CATHETER FEVER.)

2. After the first passage of the catheter the patient should remain warm and quiet preferably for an entire day.

3. The patient should take especial care to keep his feet warm and dry for the rest of his life after once using the catheter.

4. One or both testicles may swell during the use of the catheter. In most cases rest in bed on the back for a short time, use of bandage and tobacco-poultice will relieve this condition.

5. When the urine is strongly acid, citrate of potash in 20- to 30-grain doses may be needed for a time. If alka-

line and foul, the sterilizers mentioned under Cystitis may be used.

6. For frequent and painful micturition Keyes recommends liquor potassæ and extract of hyoscyamus in combination.

7. Prostatic hypertrophy is said to be ameliorated by administration of chopped prostate from steers.

8. Weltz reports a single case of senile hypertrophy of the prostate combined with complete atony of the bladder successfully treated by massage and manipulations directed toward the atony of the bladder rather than the hypertrophy of the prostate itself. He claims that massage of the prostate for this condition, by means of the finger introduced into the rectum, does not as a rule give satisfactory results, although that is the method generally taught in the Swedish school.

CHAPTER XLII.

DISEASES OF THE URETHRA.

A COMMON complication of gonorrhœa is **posterior urethritis**, occurring in from sixteen to eighty per cent. of the cases, according to different authorities.

POSTERIOR URETHRITIS.

Definition.—An inflammation of that portion of the urethral mucous membrane between the bulbo-membranous portion and the bladder.

Occurrence.—In males any time after the third week of an attack of gonorrhœa.

Clinical Features.—These are the following in the more severe cases :

1. Great frequency of urination, great urgency, and painful tenesmus.
2. Radiating pains and free hæmorrhage at the close of micturition.
3. Heightened reflex sexual irritability and abnormalities of the sexual function.

Diagnosis.—This is made by the two-glass test of the urine. The patient passes his urine into two glasses : the first portion represents the urine of the bladder plus the washings of the urethra ; the second that of the bladder only. If no disease of the bladder or kidneys is present, pus in the second glass always means posterior urethritis. The examination should be made after long retention, and also again after a short retention. After short retention, if the second glass is clear, cystitis is excluded.

Pyelitis must be excluded by absence of the features of

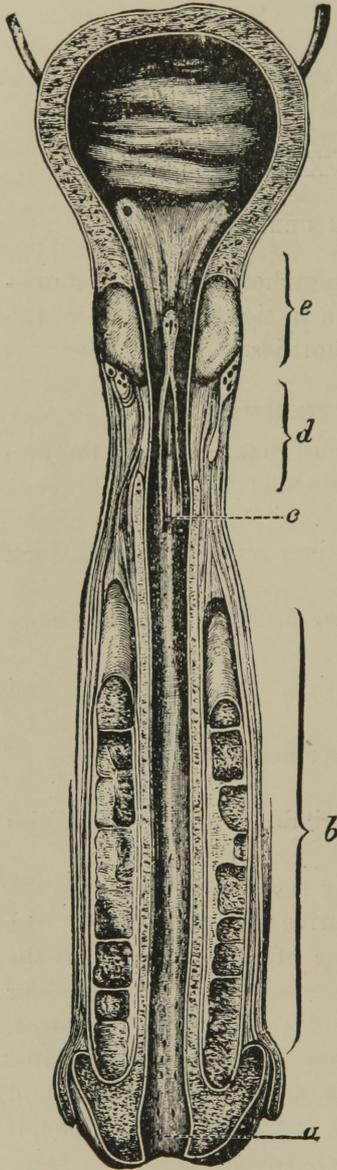


FIG. 35.—The male urethra. *a*, fossa navicularis; *b*, cavernous portion; *c*, the bulb; *d*, the membranous portion; *e*, prostatic portion.—(From FINGER.)

that disease, which have been already mentioned. The age of the patient and the history of recent gonorrhœa usually serves to distinguish the two. Considerable albumin is often found in severe cases of this disorder, which may lead the physician to suspect renal trouble which does not exist, other than what is probably a renal congestion.

Prognosis.—Complete recovery from gonorrhœa complicated by posterior urethritis is uncertain. There is possibility of extension to the bladder, seminal vesicles, and testicles.

Treatment.—In acute cases avoidance of stimulating and salty foods, alcoholic beverages, etc., as in acute cystitis. The remedies already mentioned under Cystitis are of service. Chronic cases require surgical treatment (irrigation), and often resist treatment entirely. In obstinate cases cauterization is sometimes employed.

The writer has seen cases which were aggravated by surgical treatment improve considerably when irrigations were stopped.

URETHRITIS.

If the suppuration is in the urethra anterior to the compressor urethræ, there is never tenesmus or any uncontrollable desire to urinate, but merely a severe smarting sensation as the urine passes along the urethra. In acute urethritis the mouth of the urethra is usually swollen and reddened.

Treatment.—Catarrhal urethritis is usually of but short duration, and often disappears in a few days if the causes of it, as catheterizing, masturbation, etc., are removed.

Gonorrhœal Urethritis begins about three days after exposure, and in uncomplicated cases the patient begins to improve by the twentieth day, whereas non-specific urethritis seldom lasts over twelve.

Microscopic examination for the gonococcus is necessary for differential diagnosis.

URETHRAL CALCULUS.

These occasionally occur and may reach a large size. A lump is found in the perinæum which use of the sound

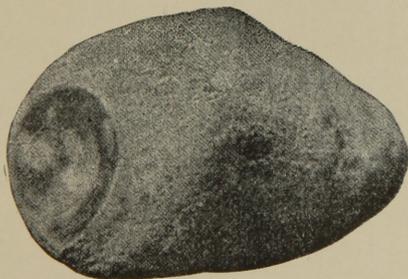


FIG. 36.

shows to be stone in the urethra. P. M. Ashburn, of Batavia, Ohio, found one of unusual size, shown in the figure.

It is $2\frac{1}{8}$ in. long and $1\frac{1}{4}$ in. in diameter. It is white on the outside, very hard, and is shaped and looks much like a

potato. It weighs dry 660 grains. At one end of it is a polished surface that corresponds with a similar surface on the smaller stone, which lay against it. This stone is of the same appearance, shaped much like a Lima bean, and weighs dry 60 grains.

CHAPTER XLIII.

GENITO-URINARY NEUROSES.

THOSE that we shall consider are the following :

1. Incontinence of urine.
2. Motor neuroses.
3. "Irritability of the bladder."
4. Spermatorrhœa.

INCONTINENCE OF URINE.

Definition.—Inability to retain the urine.

Synonymes.—Enuresis.

Etiology.—The causes are very numerous. Townsend has tabulated them as follows :

I. Reflex.

- (1.) Increased quantity of urine :
 - (a) diabetes, (b) nephritis.
- (2.) Irritant quality of urine :
 - (a) increased acidity, (b) uric acid crystals, (c) calcic oxalate crystals, (d) excess of phosphates.
- (3.) Vesical calculus.
- (4.) Hypersensitive state of external genitals from :
 - (a) stricture of urethra, (b) phimosis, (c) balanitis or vulvitis.
- (5.) Anal irritation from :
 - (a) pin-worms, (b) fissures, (c) eczema.
- (6.) Psychical.
- (7.) Increased irritability of bladder.

II. Atony of sphincter vesicæ.

- (1.) General debility.
- (2.) Spinal disease.

(3.) Acute febrile disease.

III. Malformations of bladder or urethra.

To I. 4 may be added hypersensitive conditions of the external genitals due to inflammation of the vagina, vestibule, and urethra, caused by masturbation. Small polypous excrescences about the meatus urinarius in girls.

Examination of the Patient.—1. Examine the rectum: look for pin-worms, fissure, eczema; constipation to be inquired into.

2. Examine the external genitals; look for sensitive clitoris, tight prepuce, narrow meatus.

3. Watch the child for masturbation. Look for balanitis, vulvitis, stricture of the urethra, urethritis, sensitive urethra, excrescences about the meatus urinarius in girls. Vaginal catarrh must not be forgotten. Possibility of retention in the bladder should not be overlooked.

4. In case nothing can be found by examination as above, collect the twenty-four hours' urine, examine it, and also a freshly-voided specimen; the night urine may be saved either by the devices already mentioned in case of young children, or by use of a rubber urinal in older ones.

The points to be sought for in the examination of urine are presence of cystitis, pyelitis, nephritis, or diabetes; or, if these are absent, effort should be made to ascertain whether or not there is increased acidity, whether uric acid crystals, calcic oxalate, triple phosphate, or even simple phosphates (earthy) are present.

5. If the condition of the urine shows nothing, look for malformations of the urethra and bladder, and for stone in the bladder.

6. Still further, if nothing thus far has been found as a cause, consider muscular weakness of the bladder due to general debility, anæmia; inquire for history of recent severe illness, as typhoid. Investigate the possibility of

spinal disease, and look carefully for slight palsies. Nocturnal epilepsy must not be forgotten, and mouth-breathing looked after.

7. Even if no signs of uricæmia be present in the urine, examine patient for presence of tonsillitis or pharyngeal irritation, and if found, examine urine frequently for evidences of uricæmia, especially that voided after over-fatigue at play.

8. Next inquire for psychical causes; ask the child if he dreams that he wants to urinate, or that he is urinating. Observe whether the child is intensely somnolent, unbalanced, etc., etc. Ascertain whether *periodicity* of incontinence is a marked feature; if so, the case is of nervous origin.

Treatment.—The cause must be ascertained, but in children the following is, as a rule, of help: Cool sponge-bath, with tablespoonful of sea salt added to the water, every morning. Body briskly rubbed, and especially in the region of the spine, with a moderately coarse towel. Child to be clad in woollens next to skin and to have warm shoes; it should have as much fresh air as possible in fine weather and be allowed to exercise. But very little meat should be allowed, and the quantity of drink should be restricted, in the latter part of the day especially, no fluid being given after 4 or 5 o'clock in the afternoon. The child should be taken up to urinate late at night and early in the morning, and, if necessary, once during the night, in each case being thoroughly awakened.

Remedies.—When there is irritability of the bladder, *belladonna* in 10- to 20-drop doses of the tincture, or *atropine sulphate*, one grain in an ounce of water, given in doses of one drop for each year of the child, at 4 and at 7, evenings, so as to have the pupils dilated during hours of sleep. The dose at bedtime need not be given if the child's pupils are well dilated. (Baruch.)

There are those who claim success from belladonna and the bromides in cases where belladonna alone fails.

In the case of small, feeble children, great care must be taken in giving atropine.

When the case would appear to be due to lack of tone in the sphincter due to general debility, try *rhus aromatica*, especially in nocturnal incontinence of urine in children. Dose, from 4 to 10 drops of the fluid extract four times daily, gradually increased to from 8 to 20 or 30, according to age of child. May be given in a little sweetened water. Or, children 2 to 6 years old may take 10 drops night and morning; other children, 15 drops. Its favorable effects may not persist.

Rhus tox. has long been used.

Equisetum, *eupatorium purpureum*, *pulsatilla*, and *gelsemium* are credited with cures.

Liquor ferri muriatici is recommended: 2 drops in a wine-glassful of water, tablespoonful every three hours during the day.

Ergot and electricity are used in cases of atony of the sphincter.

An admirable rule is that the bowels be thoroughly cleansed by an enema shortly before bedtime.

It is held that if the bed be tilted, so that the child lies with the heels high and the head low, improvement will follow.

White uses the following for incontinence:

R. Sodii benzoatis,	
Sodii salicylatis,	āā gr. xx.
Fld. ext. belladonnæ,	gtt. ij.
Aquæ cinnamomi,	℥ iv.
M. Sig. : A teaspoonful four or five times daily.	

Surgical treatment may be necessary to relieve tight prepuce, hooded clitoris, narrow meatus, etc.

MOTOR NEUROSES.

The motor neuroses of the urinary system are either spasmodic contractions or paralysis. *Dribbling of urine* after micturition is probably due to spasmodic contraction of the organic muscular fibres of the urethra throughout its whole length. Spasm of the external sphincter shows itself by more or less inability on part of the patient to urinate, though the impulse is frequent. The treatment is the daily passing of large metallic sounds, allowed to remain in from five to fifteen minutes.

Spasm of the detrusors (cystospasmus) is shown by a frequent, though generally painless, impulse to urinate, for the most part only by day, but also during any sleepless nights. The urine is clear, pale, of low specific gravity, neutral or faintly acid, or even alkaline, and increased in quantity. The phosphates appear on heating. If the disorder is the result of gonorrhœa, we find short, thick shreds from the prostatic urethra. The treatment is to decrease mental work, prohibit sexual excesses, advise change of air, travel, sea bathing, agreeable recreation, etc. Internally, *china*, *ferrum*, *arsenicum*, in the lower decimals. In severe tenesmus, morphine suppositories. If due to gonorrhœa, sexual excess or masturbation, then passage of sounds, use of short urethral catheter, warm rectal injections, and warm baths.

Paresis of the bladder is shown by inability to empty the bladder completely. The diagnosis is made by passing catheter immediately after patient has urinated. The amount of urine then drawn off is a measure of the insufficiency of the bladder. Moreover, patients complain that they have to wait long before urinating, pressing and straining; when the urine comes, it falls feebly down. There is no feeling of satisfaction after urinating. If the paresis pass gradually into paralysis, incontinence occurs, first at night, but later becomes constant. The diagnosis between

paresis of the sphincter and of the detrusor is made, according to Ultzmann, as follows :

PARALYSIS OF THE SPHINCTER.	PARALYSIS OF THE DETRUSOR.
Incontinence of urine, early and in the day first.	Incontinence late and in the night first.
No retention.	Retention possible.
No distention.	Bladder distended.
No dulness over symphysis.	Several finger-breadths of dulness over symphysis.
No resistance to catheter.	Powerful resistance.

The Urine.—In paresis of the bladder the urine may be normal or neutral, or feebly alkaline, with a sediment of earthy phosphates. Diabetes decipiens is sometimes an accompaniment. Gradually a purulent bladder catarrh comes about.

The *treatment* of paresis is as follows : In light cases when in strong persons slow and infrequent micturition is established, daily massage of the bladder, regular micturition at short intervals and with use of mineral waters containing salts of soda, as Carlsbad ; regular exercise with cold rubbing of entire body, cold sitz-baths, douching of the perinæum and over the bladder and lumbar region, cold showers on the back immediately after coming out of a hot bath. [Internally, Ultzmann advises quinine, ergot, strychnine. The latter hypodermically, $\frac{5}{100}$ of a gramme of strychnine nitrate in 10 c.c. of distilled water, one-half to a whole Pravaz syringeful daily, injected into the skin of the abdomen over the bladder ; to be discontinued if muscular twitching, etc., appear.]

A thoroughly carried out regular course of catheterization with vulcanized rubber catheters is advised by Ultzmann. After some weeks or months of catheterization electricity may be used, one pole as a catheter-formed electrode being passed into the bladder, and the other placed over the lumbar vertebræ, or introduced into the rectum.

Electricity should not be used too early nor at all, if there is purulent pyelitis or nephritis.

In paresis of the sphincter, or when this predominates, the electrode need be passed only into the prostatic urethra.

For dribbling of the urine faradic applications every day or every other day. Let the patient sit on a wet sponge connected with one pole of the battery and place the other over the pubes. Use a pleasant current and reverse several times during the treatment. Also apply the negative to the spine, especially the lumbar region, positive at the base of the spine. Treatments may last from fifteen to twenty minutes.

IRRITABILITY OF THE BLADDER.

Synonymes.—Neuralgia of the neck of the bladder. Frequent desire to urinate.

Definition.—Frequent desire to urinate due to more or less constant condition of irritation of the prostatic sinus in the neighborhood of the seminal ducts without inflammatory lesion.

Etiology.—The chief cause is irregular or ungratified sexual desire, especially in arthritic cases, and where the urine is acid and irritating. It may be aggravated by anything capable of inflicting a structural change in the tissues of the neck or its neighborhood (stricture, abscess, large prostate, rectal diseases, stone, worms, inflammations, etc.).

Pathology.—The prostatic sinus being congested and constantly more or less irritated from irregular or ungratified sexual desire, the congestion extends readily in both directions, involving the cut-off muscles in front and creeping backwards into the neck of the bladder through the inner orifice of the urethra. The whole urethra is sensitive and irritable, but the bladder walls themselves are insensible when touched with the point of the sound. The cut-off muscles are excessively sensitive and irritable.

Clinical Features.—These are the following:

1. Frequent desire to urinate by day and during sleepless nights, but little disturbance at night.

2. Relief after urination not perfect and desire soon returns.

3. In some cases slight burning pain on urination and in severe cases tenesmus.

4. Either slow small stream or spasmodic urination with great force from contraction of the bladder.

5. In some cases inability to urinate, or hesitation due to spasmodic contraction of the cut-off muscles.

The Urine.—May be normal, except for a deposit of amorphous phosphates, which may alternate with urates from week to week. Oxalate of lime may occur also in the sediment.

CLINICAL NOTES.

1. The patient can hold his urine better when his mind is occupied, or when under stimulation by liquor.

2. On rainy, damp, or cold days, the desire to urinate is greater, and also during worry.

3. There is depression of spirits, in some cases hypochondriasis.

4. Unpleasant sensations may be felt in the rectum or perinæum.

5. Nocturnal emissions are frequently complained of, and abnormalities of erection experienced.

6. Spasmodic urethral stricture may occur.

7. Functional disturbances of the bowels, often constipation, and feeling of lassitude may be present.

Differential Diagnosis.—Cystitis is differentiated by the presence of pus in the urine which is not found in simple irritability. The two diseases may coexist; in which case the extreme sensitiveness of the cut-off muscles will detect the cause of the cystitis, as also the history.

Dr. Peyer considers this affection a neurosis. The chief

symptom, vesical tenesmus, appears both during the day and night; there is a spasmodic state of the sphincter, with spastic enuresis and spastic ischuria, burning on urination, pains in the loins, a sense of pressure in the hypogastrium, cold feet, anæsthesia or hyperæsthesia of the genitals, inability to stand for a time, etc.

In diagnosis, examine the whole patient, his nervous system, thorax, abdomen, kidneys and pelvic organs, and then the bladder. Examine the urine for urethral threads, gonorrhœa, or long-lasting masturbation; the prepuce for phimosis, balanitis, smegma; the urethra for irritable or inflamed spots; sound the urethra; examine the post-bulbar portion by the rectum. A diagnosis must be made by exclusion. Differentially, one should exclude:

1. *Acute parenchymatous nephritis*, which is recognized by albuminuria, casts, blood- and pus-corpuscles.

2. *Contracted kidney* presents increased or decreased quantity of urine, rarely casts, albuminuria and hypertrophy of the heart.

3. *Pyelitis* has pus and blood in the urine, with pains in the regions of the kidneys.

4. *Chronic pyelitis* causes the urine to be increased nearly double in quantity, so that this sign is almost pathognomonic. The albumin is greater in quantity than the pyuria would seemingly give rise to.

5. *Diabetes mellitus* and *insipidus*, as well as *retention of urine*, offer no special difficulties.

6. A *contracted bladder* cannot be filled with over 50 to 100 gms. of urine.

7. *Stone in the bladder* has been often operated for without any stone having been found.

8. *Fissures of the neck of the bladder* are not rarely met with in men, and are sometimes due to a former gonorrhœa. There is *great* pain after urination, and in the last drops of urine are detected white bodies with red blood-corpuses. The endoscope will confirm the diagnosis.

9. *A beginning stricture or one of large calibre* may be gradually accompanied by tenesmus vesicæ and a disagreeable burning in the urethra. The sound is here the decisive measure; any one that will pass the meatus should pass through the whole canal, as the meatus is the narrowest portion. In general, where a No. 20 French bougie will not pass, one may safely say that there is a stricture.

Prognosis.—Good, if the disorder is recognized and treated carefully.

Treatment.—The essentials are the following:

1. Attention to the sexual element; purity of thought and deed, or marriage, as the case requires.
2. Avoidance of alcoholic beverages and use of tobacco.
3. Change of habits, occupation, rest from business cares.
4. In phosphatic cases the treatment of phosphaturia.

(See PHOSPHATURIA.)

5. Passage of a moderately-sized steel sound, well-warmed and oiled, and introduced with the utmost gentleness: in young men every second to fourth day; in older men, daily. Not to be used when there is prostatitis or cystitis.

SPERMATORRHEA.

This is best recognized by the finding of spermatozoa habitually in the urine, not only at night but during the day, or in advanced cases the fluids of the vesicles, prostate, and Cowper's glands.

Symptoms may be entirely absent otherwise, but in most cases they resemble those of phosphaturia or oxaluria. Drugs are of doubtful value in the treatment, which is chiefly hygienic, general, and local. Keyes advises deep urethral instillations of three or four drops of a solution of nitrate of silver never stronger than sixty grains to the ounce.

The various preparations of ergot are used, as ergotole hypodermically, for seminal emissions.

form; but it seems, according to Meisel, to be powerless against spasmodic spermatorrhœa.

SEMINAL VESICULITIS.

Dr. E. Fuller has made a study of this little-studied affection. He finds that gonorrhœa is the causative factor in the great majority of instances. Other causes are masturbation; sexual excesses; long-continued nervous strain and overwork; tuberculosis; and malignant disease. The disease is not very rare. Its symptoms are disturbances of the sexual function, most commonly a diminution or absence of sexual desire; more rarely, a great increase of desire that is not relieved by gratifying it. Erections may be extreme and painful, or entirely wanting. Ejaculation during coitus may be precipitate or tardy, and accompanied by extreme pain. The sexual act is frequently followed by discomfort in the perineal region and depression of spirits. Involuntary seminal emissions are common, even though coitus is frequently effected. The amount of seminal fluid ejected during coitus is small, and the spermatozoa are often lifeless. In gonorrhœal cases pus is present in large amount; less in non-gonorrhœal cases. Blood-corpuscles may be found, especially in the acute cases. The consistency of the seminal fluid is generally greater than normal, and sometimes appears at the meatus during straining at stool as a gluey mass. Occasionally there is a profuse urethral discharge that persists until treatment is directed to the vesicles. Sometimes there is urgent micturition; sometimes the opposite condition prevails. Pain sometimes accompanies urination, either at the head of the penis or along the urethra.

Palliative treatment consists in rest in bed, opiates, and extensive hot poultices applied to the inguinal region corresponding to the involved testicle. The testicles should be supported. Moderate diuresis and internal medication, as

in gonorrhœa, complete the treatment. In subacute and chronic cases we must endeavor to restore the muscular tone of the seminal vesicles. This is done by pressing out the contents of the sacs by means of the surgeon's forefinger in the patient's rectum, and repeating the manipulation about once a week. At the same time we should endeavor to build up the patient's nervous system. Remedies addressed to the deep urethra aid in a cure, but in most cases no sounds should be passed. Sexual intercourse should be prohibited. The prognosis is usually good.

Treatment of Priapism and Satyriasis.—Dr. P. Jousset, of Paris, thus sets forth the indications for the treatment of these affections.

The principal remedies are : cantharis, camphor, phosph., opium, bryonia, colocynthis, and tarantula.

Cantharis.—The chief remedy in priapism. In poisonings with this drug this symptom is sometimes produced with such violence that gangrene of the penis and consequent death of the sufferer follows, in twenty-four to forty-eight hours. These terrific and extreme symptoms were principally observed where the fly had been taken to revive a failing virile power. It is of especial service in the priapism of gonorrhœa.

Dose : Three drops of one of the first three dilutions, in seven ounces of water ; a teaspoonful every two hours. In gonorrhœa it not only diminishes the priapism but also ameliorates the discharge.

Phosphorus.—Priapism but less pronounced than with cantharis. It is of especial value in the erections of affections of the spinal cord and brain.

Dose : The sixth dil., four doses in twenty-four hours.

Camphor and Opium.—These two are of chief service in the priapism of cantharis poisoning : strong doses are necessary. Camphor, a drop of the tincture every two hours and camphorated oil to the hypogastrium. In very grave cases opium may be given in increasing doses until sleep follows.

Tarantula.—Of chief value in satyriasis where it is principally indicated.

Colocynthis and bryonia are indicated according to the materia medica, but he has had no personal experience with them.

Satyriasis.—Characterized by frequent erections with voluptuous sensations. Here the same drugs as with priapism are indicated, but tarantula is the chief remedy.

Dose: The twelfth dilution; lower ones will only aggravate.

Platina.—This drug has rendered him good service, but it is more indicated in disorders of imagination than by local excitement.

Dose: The thirtieth dil. twice a day.

Nux vomica.—If this drug be given to healthy persons it will produce venereal excitement, in both sexes. Trousseau points out this peculiarity in giving it as a stomach tonic.

Dose: From the sixth to the twelfth.—*L'Art Médical*, No. 3, 1894.

Treatment of Tuberculosis of the Testicles.—Dr. P. Jousset, of Paris, states the principal remedies to be *spongia*, *iodium*, *sulphur*, *conium mac.*, *agnus castus*, *clematis erecta* and *silica*. He is in the habit of alternating *spongia* and *sulphur*, the former in the third and the latter in the thirtieth trituration; one week the one and the next week the other, two doses per diem. This treatment is continued for months, and if there be no results he administers *conium mac.* In chronic suppuration he finds *silica* (thirtieth trit.) of value. Sea-baths and sea-air.

CHAPTER XLIV.

DIABETIC DETERIORATION.

It is possible that what we call diabetes mellitus is only a stage in the process of a certain type of molecular or somatic deterioration to which we may give the general name of *diabetic deterioration*.

THE THREE STAGES OF DIABETES MELLITUS.

The writer's experience agrees more or less closely with that of Heinrich Stern, of New York, who divides diabetes mellitus into three stages:

1. The prodromic or glycosuric stage.
2. The period of glycosuria or diabetes mellitus proper.
3. The post-glycosuric stage or period of ethyl-diacetic acid poisoning, recognized by diminished flow of saccharine urine, the presence of acetone in excess, of ethyl-diacetic and lævorotatory oxybutyric acids.

The Prodromic Stage of Diabetes Mellitus.—When the diabetic diathesis of a family has been proved, Stern holds that the diagnosis of the prodromic stage may be made by recognition of the following:

1. Gastro-intestinal disturbances, intolerance of carbohydrates and occasionally of hydrocarbons, hyperchlorhydria, gastrocholia, hepatico-pancreatic disturbances.
2. Sickening pain in the epigastric region, increasing after eating and upon pressure; dull pain in right hypochondriac region; sometimes a feeling of tension around the umbilicus.
3. Polysarcia, the obesity disappearing as dextrose is eliminated; no excessive appetite or thirst.

4. Diminution of sexual inclination; great nervous irritability and occasional hypochondriasis when there are concomitant genito-urinary neuroses; no emaciation if no diathesis is present in the individual other than the diabetic.

5. Disorders of the cutaneous surface; dermatalgia; diminution or suppression of perspiration and transpiration; overloading of the blood with carbon dioxide.

Stern holds that the urine of the preglycosuric stage is quite normal, barring an occasional azoturia. In this the writer's experience does not coincide with that of Dr. Stern.

I have seen several cases which later became glycosuric. In not one of these cases could the urine, when first examined, be deemed normal in all respects. Two cases were apparently those of chronic interstitial nephritis, one was lithuria, several others had deposits of uric acid or calcium oxalate, with casts and a plain trace of albumin in the urine.

The writer's method of early recognition of the diabetic diathesis is to examine the urine of every micturition of the 24 hours separately. Sugar, recognizable by Haines' test-liquid, will be found at some one hour of the day—in the writer's experience most commonly after the digestion of the noonday meal, *i.e.*, about 3 o'clock in the afternoon. The symptoms that Stern speaks of may or may not be present, and sugar may occur with but few or none of Stern's symptoms except increase in weight, due to fat, which the writer believes is often significant.

In general, then, when a person who has become fat presents himself for examination, the writer deems it wise to make separate tests of the urine of every urination of the 24 hours. Sugar will often be found in the urine voided two hours after the noonday meal. If it is not found, cause the patient to drink beer or champagne or eat

cheap candy, and test the urine the same day and the next morning. If there is a glycosuric tendency, sugar will be found in the urine of one or more urinations.

Even if no sugar be found by these methods, but the patient, having become obese, voids urine containing albumin in small quantity and perhaps casts, or sediments of uric acid and urates or oxalate of lime, the case is a suspicious one. If, in addition to this, he also has a family history of diabetes mellitus and exhibits the succession of symptoms described by Stern, the case is no doubt in the prodromic stage of diabetic degeneration.

There are some persons who void an unusual amount (above 500 grains) of urea and of uric acid (above 10 grains) before the appearance of sugar. But while this is always suspicious (since fat people do not by any means normally void solids in proportion to their weight), it is not invariable. (It is quite common, however, in cases in which sugar has disappeared from the urine, and albumin taken its place, the patient becoming nephritic; hence the physician is often puzzled to account for the condition of the urine as regards solids in what is evidently a case of chronic Bright's disease. The writer will illustrate by means of analyses of urine farther on.)

A peculiarity which the writer has noticed in two of the preglycosuric cases was that the small amount of albumin present was not reduced in the slightest degree by avoidance of meat, but remained in about the same bulk, regardless of diet.

The writer believes that a slight albuminuria and cylindruria in stout persons is frequently a forerunner of diabetes mellitus, which is, perhaps, not infrequently hastened in its development by non-nitrogenous diet, which does not at the same time exclude sweets.

Treatment of the Preglycosuric Stage.—Stern's treatment is merely to diminish the food-supply, prohibiting

only alcoholic drinks and especially malted beverages, but insisting on regularity of meals. He commends milk and American cheese, particularly the latter. The writer has found in several instances that a rigid diabetic diet for 30 days will cause disappearance of sugar, loss of flesh, and improvement in the general condition of the patient. At the end of that time the usual diet may be resumed, but the amount of food must be barely enough to satisfy the craving and sustain the strength.

Stern believes in a radical change of climate for the person in the preglycosuric stage. The changed external conditions bring about a regeneration, and if an eventual deterioration has not progressed beyond a certain point, the regained vital energy will in many instances do away with functional disturbances and ward off, or even prevent, molecular death.

Stern advises air-baths. The patient sits, undressed, in a room (which is warm enough to prevent a feeling of chilliness, but not purposely heated), or, better, performs gymnastics.

Remedies.—The writer believes uranium nitrate and aurum, together with diastatic essence of pancreas, to be the remedies in the preglycosuric stage. Stern recommends arsenic and aurum.

DIABETES MELLITUS, OR SECOND STAGE OF DIABETIC DETERIORATION.

Definition.—A chronic disease characterized by persistent presence of dextrose in the urine, and in severe cases by polyuria, polydipsia, digestive disturbances, and progressive loss of flesh and strength.

Etiology.—The causes of diabetes mellitus are said to be as follows:

1. Heredity.
2. Syphilis or syphilitic parentage.

3. Gout or gouty ancestry.
4. Nervous shocks and strains; various nerve injuries and nervous diseases.
5. Acute infectious diseases and exposure to cold.
6. Diseases of the pancreas.

Predisposition.—Adults are more subject than children, and men than women. Fat persons are more subject to it than lean, and it is a disorder of considerable frequency among Jews.

NOTES ON ETIOLOGY.

1. It is said that a family history of tuberculosis is frequently met with in diabetics. Considering, however, that family history of tuberculosis is, especially in New England and in other parts of the world, common to many who never have diabetes, the writer thinks it more likely a coincidence than an etiological factor.

2. Gastric catarrh is mentioned in connection with the etiology, but, since the connection of gastro-intestinal troubles with the first stage of diabetes has been discovered, it is possible that this disorder is an early manifestation rather than a cause.

3. According to John A. Larrabee, diabetes is connected with inherited neurotic tendencies. Epileptic, nervous, or hysterical parents are responsible, he thinks, for the diabetic diathesis in children.

4. Mild cases may become more severe under the influence of traumatism. It, therefore, becomes of interest to determine whether the advent of the second stage is hastened by trauma in a patient presumably in the first.

5. Loomis speaks of a female child twelve years of age who, after fourteen months' illness from nephritis, coming on eighteen months after scarlet fever, suddenly died of diabetic coma.

6. Diabetes mellitus in children has been known to follow typhoid fever and purpura hæmorrhagica.

7. *Transient glycosuria* in children has been noticed following a number of conditions; malaria, measles, immoderate, and also indiscriminate eating; daily exposure to wet and cold.

8. The writer thinks diabetes mellitus in children to be fairly common in the West as compared with certain other localities. Out of a total of 125 cases of diabetes which the writer has seen, 15 were children, while Prout out of 700 saw only about a dozen in children, and Schmitz (presumably a German authority) out of 2115 cases in all saw only 85 under twenty years of age, while only 10 of these were under ten years of age.

9. Cases are common in the same family. The writer knows a family which has lost three children in succession of diabetes mellitus. Isenflam reports a case in which eight children of healthy parents all died of diabetes mellitus after reaching their eighth year.

10. Stern saw one case in which the children were seemingly born with diabetes mellitus.

11. Female children are said to be more susceptible to diabetes mellitus than males.

12. Diabetes mellitus is rare in children under five years.

13. Locomotive engineers show seven times as great mortality from diabetes in America as others.

14. Diabetes is said to be common among Wall Street men.

Pathology.—An excess of sugar in the blood may result from the following causes :

1. Increased supply in the diet.

2. Failure on part of the body to decompose or store that which is introduced, due (*a*) to disturbances of the portal circulation, or (*b*) disturbances in the function of the liver. Faulty innervation may be the cause of the disturbances in the portal circulation, and the functional hepatic disturbances may bring it about that either more glucose

enters the blood without being transformed into glycogen in the liver, or an excessive transformation of glycogen in the liver takes place, setting free an excessive amount of sugar.

NOTES ON PATHOLOGY.

1. Pavy's idea of diabetes is that the whole trouble is due to imperfect de-arterialized venous blood, consequent upon vaso-motor paralysis, especially of the vessels of the chylo-poietic system.

2. Larrabee thinks there is changed polarity of the nervous system without observable lesion.

Morbid Anatomy.—The post-mortem appearances show the following:

1. In many cases no lesions at all.
2. In some cases lesions of pancreas and tissues in its vicinity.
3. Hypertrophy of the liver.
4. Enlargement of the kidneys with injection and presence of glycogen in Henle's tubes near the bases of the pyramids, with also, at times, fatty degeneration of tubular epithelium.
5. Evidences of tuberculosis of the lungs and other changes in them.

Clinical Features.—The chief symptoms are the following:

1. *Polyuria.*—There are, however, some few cases, usually mild ones, in which the quantity of urine is normal or sub-normal. Severe cases may grow milder, and the urine become normal in quantity. In severe cases several gallons may be voided during the twenty-four hours.

2. *Thirst.*—Usually in proportion to the percentage of sugar or quantity of urine. May be so severe that patient is unable to be away from the vicinity of drinking-water either by day or by night.

3. *Hunger and Emaciation.*—More marked in lean patients, and unrelieved even by large quantities of food.

4. *Sugar in the Urine.*—See remarks on the URINE.

5. *Miscellaneous Symptoms.*—The most common are loss of sexual power, constipation, pains in the muscles, debility, persistent neuralgia, depression of spirits, various skin troubles (eczema, pruritus, boils, erysipelas, carbuncles, pigmentation, gangrene). Carious teeth, fruity breath, cataract, headache and sleeplessness, localized muscular paresis, and absent patellar reflexes are often noticed. Retinitis or muscular paresis are among the ocular troubles noted. All the ocular tissues, *viz.*, the cornea, iris, crystalline lens, vitreous humor, retina, and muscles may be affected, but changes in the crystalline lens are the most common. In some cases, especially in children, cataract may develop with amazing rapidity, even in a few hours.

In young diabetics sudden blindness sometimes occurs.

Pneumaturia is occasionally met with, due probably to formation of carbon dioxide from fermentation of the sugar in the bladder.

Digestive disturbances, as nausea, vomiting, pain in the stomach and intestines, followed by great weakness, occur at times, usually, however, in the third stage, that of ethyl-diacetic acid poisoning.

The Urine.—The features are the following:

1. *Persistent presence of dextrose*; in well-marked cases the average is four per cent. The writer has seen no higher than seven and a half, but ten per cent. or more has been reported.

2. *High specific gravity* (due to sugar, and sometimes to excess of urea as well), even above 1050. Low specific gravity does not exclude the disease. The writer has seen one or two cases in which the specific gravity for a time was below 1013.

3. *Light lemon-yellow color*, when fresh.

4. *Increased frothiness.*

5. Urine drying on black shoes leaves white specks, and stiffens the linen.

6. In severe cases increase of urea and phosphoric acid; in a number of cases, however, the writer finds these substances normal or even sub-normal in amount, possibly owing to complicating chronic fibrous (interstitial) nephritis.

7. Traces of albumin. In the writer's experience several cases of diabetes have begun with a persistent albuminuria, the albumin not exceeding ten per cent. bulk and disappearing to a trace when glycosuria and polyuria appeared.

8. Peculiar fruity odor; noticed usually in later stages.

9. Occasional or periodic appearance of fat.

10. *Calcium oxalate crystals* in the sediment frequently occur.

11. *Spores of fungi* present in all cases as soon as the urine in fermenting grows more acid.

12. In later stages acetone, ethyl-diacetic acid, and β -oxybutyric acid, due to the disturbed oxidation of albuminous substances in the food and in the body.

13. In later stages, and especially before the attacks due to presence of ethyl-diacetic acid, the *acidity* of the urine increases.

ANALYSIS OF THE URINE IN DIABETES MELLITUS.

I have been sufficiently fortunate to have the twenty-four hours' urine collected several times in one case of a boy of ten. The table on page 332 is a complete report of analyses made by me.

The urine, then, fluctuated between 33 and 85 fluidounces; the specific gravity between 1028 and 1037; the sugar between one-tenth and five per cent.; the urea between 195 and 540 grains per twenty-four hours; and the phosphoric acid between 25 and 40 grains per twenty-four hours. The greatest fluctuation was in the ratio of sugar to urea, which ranged from 0.2 to 1 to as high as 12 to 1. The first analysis was made three months before the fifth.

Owing to the fluctuation in percentage of sugar shown in the second and third analyses, I suspected that the boy was not adhering to the diet. Watch was kept on him, with result that he was found secretly eating sweets.

After various vicissitudes, both as to condition and medical treatment, he died in about two years from the time the disease was first noticed.

Complications.—The most common are as follows:

1. Chronic pulmonary tuberculosis and acute pneumonia, asthma.

First Analysis.	Second.	Third.	Fourth.	Fifth.
Volume of urine in 24 hours { 58 fl. ozs. 1750 c.c....	42 fl. ozs. 1250 c.c.	70 fl. ozs. 2000 c.c.	85 fl. ozs. 2550 c.c.	33 fl. ozs. 1000 c.c.
Day urine.....	650 c.c.	1150 c.c.	1750 c.c.	.....
Night urine.....	600 c.c.	850 c.c.	860 c.c.	.....
Ratio of day to night.....	1 to 1	1 $\frac{1}{3}$ to 1	2 to 1	.....
Urea, grams per litre.....	27	11	5	29
Urea, grains per fluid ounce.....	12 $\frac{1}{2}$	5	2 $\frac{1}{2}$	13 $\frac{1}{2}$
Urea, grams per 24 hours.....	34	22	12 $\frac{3}{4}$	29
Urea, grains per 24 hours.....	540	350	195 $\frac{1}{4}$	450
Phosphoric acid, grams per litre.....	2	0.9	0.65	2.12
Phosphoric acid, grains per ounce.....	1	0.5	0.30	1
Phosphoric acid, grams per 24 hours.....	2.5	1.8	1.66	2.12
Phosphoric acid, grains per 24 hours.....	40	28	25	32
Ratio of urea to phosphoric acid.....	13 to 1	12 to 1	8 to 1	14 to 1
Sugar, grams per litre.....	40	36	58	6
Sugar, grains per ounce.....	19	17	27	3
Sugar, grams per 24 hours.....	70	72	148	6
Sugar, grains per 24 hours.....	1085	1116	2295	92
Sugar, per cent.....	4	0.1	5	1 $\frac{1}{2}$
Ratio of sugar to urea.....	.....	3 $\frac{1}{3}$ to 1	12 to 1	0.2 to 1
Specific gravity.....	1028	1036	1037	1029
Acidity.....	Normal.	Normal.	Normal.	Increased.
Sediment.....	Uric acid.	Deficient. Calcium phos. and oxalate.	.....	Urates. Uric acid.

2. In latter stages nephritis with albuminuria, cylindru-
ria, and dropsy.

3. Cystitis.

Prognosis.—In *children* the prognosis is bad. The writer, out of fifteen cases coming under his observation, does not know positively of a single recovery, though several have been lost sight of. Ten of the fifteen are known to have died in periods varying from a few months to a few years. One or two were still alive when last heard from, but in a bad condition.

Seventy-five per cent of the cases in children observed by Stern, 117 in number, died.

In *adults* the prognosis is better as to time, though the disease, when once in the second stage (polyuria, glycosuria, loss of flesh, etc.), is essentially incurable. The *milder* cases

live for years, perhaps as long as twenty years, certainly often ten years or more. The *severe* cases may not live more than a year, the usual duration being one to three years in those cases unaffected by diet or treatment.

The prognosis is rendered uncertain by the fact that mild cases may become suddenly severe, and severe cases improve up to a certain point and then linger in *statu quo* for several years. Fat diabetics usually suffer less and live longer than lean.

The writer has seen two cases in young women between twenty and twenty-five. Both died in a year or two from the time the disease was sufficiently severe to manifest the usual symptoms, although all possible care and the best medical attention were given them.

Unfavorable Signs.—Sugar is not controlled perceptibly by diet and medication; extreme weakness; lower extremities œdematous; tongue red, raw, and glazed; mouth and throat covered with aphthous patches; uncontrollable diarrhœa; acute inflammatory affection of the lungs, or, earlier in disease, chronic pneumonia. Sudden death from diabetic coma possible in such cases.

NOTES ON PROGNOSIS.

1. In children, as a rule, the smaller the child the quicker the course of the disease, though exceptions occur; for example, a child born with diabetes mellitus has been known to recover in 18 months.

2. Out of 34 cases in children, reported by Stern, one died in two days and another was alive at the end of five years; seven were cured in less than a year, one recovering in a month; six died in one month; ten lived more than a year, to die finally.

3. In 15 cases in children which the writer has collected, in addition to the 15 of his own, death took place in all, in from six days to eighteen months from the time the diag-

nosis was made, or from the time of coming under observation.

4. The writer finds in the case of adults that those who void over 60 grammes (930 grains) of urea in 24 hours seldom live more than a year or two, at most.

CLINICAL NOTES.

1. Mental excitement is known to aggravate glycosuria.
2. Death has been known to follow operation for double cataract in a diabetic child.

3. In sucking babes loss of flesh is sometimes the first noticeable symptom of diabetes.

4. Diabetes sometimes manifests itself in children by bed-wetting.

5. Drummond reports a case in a boy of seven who died of diabetic coma five months after receiving a blow on the head.

6. Diabetes mellitus may be the chief symptom of cerebral syphilis or other lesion encroaching on the medulla.

7. Diabetes mellitus may be due to gout, in which case it may yield to treatment, though likely to recur and become permanent. Some of the writer's cases having been relieved, or even apparently cured, by hot mineral water, are perhaps accounted for on this theory.

8. Not infrequently the diabetic patient becomes cunning and deceitful in regard to minor matters. As Dickinson says, the mind deteriorates morally and intellectually.

9. The writer knows of one case, that of an adult woman, who, being diabetic, died insane.

10. *The skin lesions* of diabetes are very numerous: asteatosis, anidrosis, paræsthesia xanthoma, gangrene, papular urticaria, eczema, erythema, psoriasis, acne, dermatitis, herpes zoster, mal perforant, purpura, bronzed skin, bullous and pemphigoid lesions, defluvium capillorum, paronychia, pruritus, eczema vulvæ, balanitis and balano-

posthitis; furuncles and carbuncles have been noticed by various writers. The relation between diabetes and the dermatitis herpetiformis of Dühring has been mentioned.

11. Diabetes seems actually to rejuvenate old men by counteracting the tendency to hardening of the arteries.

The Diet in Diabetes.—The writer insists that the matter of diet in diabetes mellitus is an important one. In the second stage, that of true diabetes mellitus (glycosuria with polyuria), the diet should be selected according to the length of time the patient has been ill. When the first symptoms of diabetes mellitus appear, the writer is in favor of the strictest diet; in cases which have continued in fair health for years, a moderate diet; and in mild cases, with exacerbations at times, an intermediate diet. Finally, there are cases in which no kind of diabetic diet seems to be of avail, or where diet has lost its good effect. The change for a time to ordinary mixed diet is often beneficial, but there may be need to return to even rigorous dieting at short notice.

I. *The rigid diet* in diabetes consists of meat, eggs, fish, cheese, and gelatin preparations.

The writer advises this diet to be used in the incipiency of the second stage (true diabetes mellitus) as a prognostic measure. Cases in which the sugar does not materially lessen or even disappear after ten days of this diet are usually beyond medical control, especially if, in addition, the hot mineral-water treatment fails to effect an improvement.

II. *An intermediate diet* between the rigid one and the moderate one is sometimes suited to cases which do not improve or hold their own on a moderate one, or which cannot stand the rigorous one, and is as follows:

Clam-water.

Fish, but no oysters and no shell-fish.

Meat soups, without flour or milk.

Meats.

Poultry, without dressing of bread or flour.

The following vegetables only: Lettuce, spinach, cauliflower, cabbage, olives, water-cresses, mushrooms, asparagus tops, cucumbers.

Eggs and carefully made omelet.

Cheese.

Desserts.—Blanc-mange, made of white of egg, beaten up and flavored with vanilla, sweetened with a little saccharin, gelatin jellies sweetened with a little saccharin.

Nuts.—Almonds, hazel-nuts, walnuts, cocoanuts, Brazil-nuts.

Drinks.—Waukesha, imported Vichy, and Carlsbad waters. Hot alkaline waters, or even hot Poland water, before meals and before going to bed—a glass or two, half an hour apart.

No bread of any kind allowed in this diet. A baked potato once or twice a week is preferable, if patient becomes rebellious.

III. *The moderate diet* in diabetes is adapted to cases of the second stage which are admittedly chronic, but are holding their own and enjoying a fair degree of health. It is as follows:

Shell-fish and Fish.—Oysters cooked in any way without milk or flour. Clam-water. All kinds of fish, but sauces should contain no flour. Soft-shell crabs and fish-roe for those with whom they agree; the same may be said of fish-balls (made without potatoes or flour), shrimps and craw-fish.

Soups.—Consomme (beef, veal, chicken or turtle), with asparagus points, okra, ox-tail, turtle, terrapin, oyster or clam, but all without flour or milk; mock turtle soup, mullagatawny, tomato, gumbo fillet. Beef tea.

Meats.—Beefsteak (with or without fried onions, according to digestion), broiled chicken, lamb chops, tender mutton chops, roast beef, roast mutton, game (for those with whom it agrees). Tongue, sweetbreads, lamb fries. Poultry should not contain dressing made of bread or flour; currie should not be thickened with flour. No liver allowed.

Vegetables.—Lettuce, spinach, *cauliflower*, cabbage, tomatoes, *radishes*, oyster-plant, celery, *onions*, string beans, water cresses, mushrooms, asparagus tops. (Those in italics should not be given to patients whose digestion is weak.)

Relishes.—Pickles, sardines, anchovies, olives. (Not to every patient, but according as they agree.)

Eggs.—Poached, scrambled with a little chipped beef, soft boiled; carefully made omelet or ham omelet in small quantity, eaten when warm. (In some cases omelets do not agree.)

Substitutes for Sweets.—Brandy peaches, without sugar; wine jelly, without sugar; kirsch and rum jellies, without sugar; glycerin, saccharin. If saccharin is used with tea or coffee, add it before milk. A single grain suffices for a cup of coffee. Too much saccharin should be avoided. Many do not like it, and in some it causes serious gastric troubles.

Miscellaneous.—Butter; cheese, if not too constipating; salads, except potato; lean patients, whose digestion is good, may take considerable fat. Sauces to be made without flour or sugar; if to be thickened, use gluten flour.

Desserts.—Blanc-mange, made of white of eggs, beaten up and flavored with vanilla, sweetened with a little saccharin. One apple, not sweet. A few almonds, hazel-nuts, walnuts. Cheese, cranberries, strawberries, plums, cherries, lemons; if stewed, add a little sodium bicarbonate.

Bread.—Gluten bread, sparingly used. In cases where the patient is grievously disappointed at giving up bread, allow him ordinary bread in *small quantity*, as a psychical measure. But if the loss in sugar overbalances the psychical gain, be sure to cut off the ordinary bread at once. The various gluten and diabetic flours usually contain more or less starch, and should be sparingly used, but can be allowed in greater quantity than ordinary flour. (Hoffmeister allows at first 100 grammes (2 oz. 3 dr.) of bread daily, gradually reduced to 60 grammes (2 oz.), but no bread substitutes. He recommends 100 to 150 grammes of fat and fat meats daily.) All food should be masticated thoroughly.

Drinks.—Tea, coffee without sugar but with a little cream. If thirst excessive, weak warm tea (with a slice of lemon), to be drunk little at a time. Immediately after meals, dry old claret, Burgundy, dry sherry, Bass' ale or bitter beer, Budai wine (but no soda water, ordinary beer or sweet drinks), brandy and seltzer, koumiss, cream with raw eggs, good spring water not iced. In cases of constipation, sour milk.

Tobacco.—One or two light good cigars a day for those who are unable to give up smoking.

Effect of the Diet.—If the patient's urine decreases gradually in quantity, and he loses the feeling of languor so often complained of, if his weight remains the same, and there are, in general, no distressing symptoms, the diet is doing him good.

Hygiene in Trauma.—In cases of accidents involving concussion of the brain, and followed for considerable time by notable slowness of the pulse, all mental excitement and exposure to excessive heat of the sun should be avoided for a year.

Mouth-Wash.—For the disinfection of the mouth a solution of chlorate of potassium, 1 in 19, is made, and a teaspoonful of this added to a pint of water to which a little alcoholic solution of thymol is added. The mouth is well-rinsed with this mixture several times daily.

NOTES ON DIET.

1. *Diabetic baking-powder biscuit* may be made by mixing gluten flour and diabetic flour in equal proportions with addition of an egg and not too much baking-powder. To be eaten cold.

2. Apples are not allowed.

3. *Peanut flour* for diabetics is made as follows :

The kernels, including their inner coating, which is very nutritious and not very abundant in carbohydrates, are put in a tin kettle, in which small holes have been previously made. This is kept uncovered and placed on or into a pan filled with water, and this has to be kept boiling for about half an hour, to allow partial extraction of the superfluous oil. After the kernels have been dried they are pounded into fine particles with the aid of a rolling-pin. The pounded or bruised kernels are then placed in boiling water, acidulated to some degree with tartaric acid or vinegar, preferably the latter. The boiling in the acidulated water has to be continued for some time, for different reasons. Having undergone a thorough boiling with acidulated water, the ground kernels are subjected to dry heat, to effect complete evaporation of that fluid ; but great care must be exercised that they do not become browned or roasted. An additional treatment with the rolling-pin will produce nearly as fine a flour as the common wheat flour of commerce. Dr. Stern has made use of the flour in different ways, the most simple of which is in the form of a porridge, some milk being added to it. Bread and biscuits can also be baked from it, but the nicest and most easily di-

gestible form in which to utilize it is, he thinks, the German pancake.

4. Rigid diet certainly does harm in some cases, especially in the aged, and in those who have constitutional or special symptoms.

5. *Diet for Gouty Diabetics.*—Corpulent, plethoric patients with tendency to piles and uric-acid gravel and without the usual symptoms of diabetes may not, though their urine is saccharine, be benefited by the diabetic diet. In such cases the skim-milk diet may be used, chiefly for the reason that it keeps the patient in a state of semi-starvation, the natural cure for the effects of habits of gross feeding.

Rest and Exercise.—After every meal, rest from half an hour to an hour. For exercise, light work in a garden, billiard playing, use of light dumb-bells, moderate rowing, splitting wood, moderate walking, especially up hill, and horseback-riding; in hot weather, driving. All exercise should be gentle, and, in the beginning, even *cautious*. Passive exercise may be used at first.

Carefully regulated mountain climbing even may be beneficial. (The writer took a diabetic once on a mountain-climbing expedition in the Adirondacks with the utmost benefit; but great care was taken not to allow the patient to become exhausted from hunger. It happened that on one occasion the patient gave up and declared his inability to reach the nearest hotel, but after eating a piece of cold beef-steak felt as strong as ever and continued the journey!)

The altitude should not be too high, and on that account the Adirondacks are better suited than the Western mountainous regions.

Baths.—I have found the Turkish bath useful, especially for fat diabetics. Schnée advises first a Turkish bath, followed by a short stay in a Russian vapor-bath at a temperature not above 100° F., after which the skin is cooled off

by a lukewarm shower. The patient is finally allowed to have a secondary perspiration on a couch and to rest for upwards of an hour. After twelve baths of this kind he claims that the thirst begins to cease. The patient should drink a cup of beef tea an hour before entering the bath. At home, sponge bathing daily with lukewarm water, quickly followed by rubbing.

Residence.—Sleeping-rooms should be well-aired and ventilated. Houses on high grounds to be selected. *Hot, stuffy rooms* to be avoided. Open fire-places a desideratum. Temperature of dwelling-rooms never below 60° nor above 72° F. Patient should, if possible, sleep in a room adjoining another in which the window is open, the door between being open. The air in dwelling-rooms should not be too dry in winter. Water should be evaporated in the room. In the winter, if the patient go abroad he should seek the Riviera, in the summer Carlsbad. The sea-shore is better than high altitudes. In travelling, caution should be taken about fatiguing journeys. Frequent stops should be made and rests taken.

Massage and Electricity.—Massage, not too vigorous, may be employed daily between breakfast and dinner. Schnée advises a weak solution of mercuric chloride in alcohol with a little vaseline to be used in rubbing. In some cases, muscular tone is influenced by applications of electricity.

Remedies.—There is no specific for diabetes, but remedies are useful for alleviation of the sufferings of the patient. The following are often prescribed:

Arsenicum.—In emaciated patients, with great hunger and thirst, pallor, loss of strength, tendency to gangrene, dryness of the mouth and throat, watery diarrhœa, dyspnœa on slight exertion.

Creosote.—Heaviness, drowsiness, depression of spirits, head confused and dull; very severe chronic neuralgic troubles.

Phosphoric Acid.—Of value when the case is evidently of nervous origin; when there is loss of fluids, particularly seminal; patient is indifferent to all things; long-lasting diarrhœa.

Uranium Nitrate.—Languor marked and general. Excessive thirst. In cases originating in dyspepsia or digestive derangement.

Bryonia.—Dryness of the lips and tongue, persistent marked bitter taste in the mouth, invariably aggravated shortly after eating, or even drinking. Quantity of urine not so great, but specific gravity high. Pruritus vulvæ. Sleep disturbed and unrestful. Often loss of appetite and marked debility.

Lactic Acid.—Immense quantities of urine, inordinate thirst and hunger, gastric symptoms marked (acidity, sour burning risings), marked intermittent protrusion of the eyeball, and great dilatation of the pupil.

Morning urine contains but little sugar; afternoon and evening much.

Leptandra.—A case was reported by Laning, in which five-grain doses of *Leptandra*, 3d decimal, was found useful. The symptoms were those of portal stasis.

Podophyllum.—Head dull and heavy, with occasional sharp pains; tongue dry and foul in morning, at other times quite moist; urine variable in quantity; stools light colored; limbs often swollen from venous stasis.

Aurum Muriaticum.—Exceeding depression of spirits; intestinal and vesical catarrh; urine 2 times turbid from mucus, and of ammoniacal odor. Patient craves sour things and dislikes meat. Hands and feet very cold. Palpitation of the heart common.

Mercurius Solubilis.—In early stage, when there is coldness and clamminess of the thighs (1st of skin dry), with increased urination. For the gastric symptoms and constipation; much debility.

Nitric Acid.—Patient craves fat meat. In early or prodromal stages of diabetes, when there are crops of boils, etc.

Graphites.—Itching eruption in the bends of the elbows, and in the popliteal spaces, frequent attacks of vertigo; hang nails and brittleness of the finger nails.

The Tissue Remedies.—Among these *natrum sulphuricum* finds favor in the treatment of diabetes mellitus.

Maté.—The leaf of *ilex paraguayensis* reduces the sugar like opium. It is given in form of a hot 8 per cent. infusion, two to six quarts daily.

In a general way, with view to controlling the formation of sugar, the following drugs are administered:

Uranium Nitrate.—The writer prefers to give this in the 1x dil., but large doses are now used by many, one grain or more, four times daily. It is claimed that in many cases this drug decreases the amount of sugar in the urine. West advises gradual increase of dose to 20 grains.

Jambul.—The fluid extract in doses of ten minims, in capsule, three times daily, increased to forty or fifty minims, or five-grain doses of the powdered seeds. The writer has seen very little benefit from its use, though in some cases it seems to decrease the quantity of urine.

Clemens' Solution.—This is a favorite prescription with many in not over 5-minim doses to begin with. The arsenite of bromine in $\frac{1}{16}$ of a grain, increased to $\frac{1}{8}$, may be used instead. The arsenite of iron in pill form, in doses of $\frac{1}{16}$ of a grain, is recommended in cases complicated by anæmia or malaria. The dose may be gradually increased to $\frac{1}{8}$ or $\frac{1}{6}$ grain.

Opium.—When it is a question of simply checking the progress of the disease in order that the patient may live as long as possible, recourse may be had to codeine in $\frac{1}{2}$ -grain doses, three times daily, rapidly increased until 30 or 40 grains a day are taken. When it no longer controls the progress of the disease, give extract of opium in $\frac{1}{4}$ -grain

doses, three times daily, slowly increased until 10 grains daily are taken. But in no event should narcosis be produced.

Oxygen.—Inhalations of from 3 to 5 gallons daily may be used, diluted with an equal volume of atmospheric air and inhaled slowly and deeply, half a minute or so of rest being allowed between each inhalation.

Benzosol as an intestinal antiseptic, together with carbonate of lithia and Fowler's solution, is said to help some cases of diabetes.

Special Therapeutics.—In the writer's experience drugs have but little or no curative action when the disease is once chronic in the second stage. Palliative treatment for the various symptoms which give most distress is to be pursued as follows:

For the Pains.—Those which are usually in the head, chest, back, and joints the writer finds relieved by the salts of lithium, as lithium benzoate in 2- to 10-grain doses. For lancinating pains codeine is a palliative in $\frac{1}{8}$ -grain doses.

For the Constipation.—A teaspoonful of Carlsbad Sprudel salt in a glass of hot water an hour before breakfast. In some cases the fæces may have to be removed by more vigorous measures, so dry does the mucous membrane become.

In one or two severe cases of constipation Rubinat water was found efficacious by the writer. It may be necessary at times to give mercurius dulcis 1x, followed the next morning by an aperient water.

For the Depression of Spirits.—The chief remedies are arsenic and aurum, particularly the latter, in the lower potencies.

For the Insomnia and Debility.—The writer uses phosphoglycerate of lime in doses of one capsule (4 grains) (not the wine nor the syrup) three times daily. Sometimes,

also, the hypophosphites without sugar, or a phosphorus and calisaya mixture without sugar.

For the Thirst.—Hot alkaline mineral waters, two glasses half an hour apart, before each meal and before going to bed. In gouty cases this treatment often reduces the sugar to a trace or causes it to disappear altogether.

Boils and Carbuncles.—Hepar sulphur as soon as suppuration is suspected, and silicea after the discharge of the pus. Quinine in 2- to 3-grain doses four times daily, to abort.

For Pruritus Vulvæ.—Soap and water and weak perman-ganate solution or weak cocaine solution.

In cases of *diabetic gangrene* the only substantial hope is said to be in amputation.

Glycosuria may be of *nasal origin*, and cease after establishment of nasal respiration by surgical means. *Pancreas grafting* for diabetes is now under consideration.

THE POST-GLYCOSURIC STAGE.

This is the period of ethyl-diacetic acid poisoning, and finally results in coma and death.

Early Recognition.—This is very difficult, and in some cases impossible, but it may be said in general that *any sudden improvement in objective signs not confirmed by subjective sensations on part of patient* should put the physician on his guard; reduction in the excessive appetite to below standard for healthy person; unexpected and unexplained loose movements when constipation has previously been the rule; peculiar acetone odor to breath already described; acid eructations and nausea, with or without vomiting; the patient complains of general prostration and disinclination to exertion; tendency to drowsiness during the day and great despondency; attacks of intense vertigo, frontal headache, neuralgic pains; accelerated pulse, with or without decrease in volume. After variable period of indefinite symptoms like the above, the patient will complain of a

feeling of depression, is restless at night, eats nothing, has colicky pains, vomits matters sometimes having acetone odor, has sense of constriction about thorax, causing deeper breathing than usual; mental condition varies from excitability to mild, talkative delirium, alternating with drowsy or stupid intervals.

Gastro-intestinal derangements seem to stand in causal relation, and coma may follow any unusual strain on the digestion, as also after great fatigue, as of a railroad journey.

The essential features, clinically, are *the gastric crises*, which are followed by great weakness, from which the patient may not rally.

Dr. F. Hirshfeld, of Berlin, thinks that a typical case is easily recognized. A diabetic who has been feeding quite well notices gastric symptoms; a violent headache sets in and a sensation of dyspnoea. These symptoms gradually increase in severity, the respiration becomes deeper and more rapid, the sensorium become confused, the patient slowly loses consciousness, and in two to ten days after the appearance of the first symptoms death occurs.

Abortive forms frequently are noticed, where one or more symptoms are pronounced, so that a suspicion of grave coma is aroused, but the symptoms disappear in a few days. The excretion of acetone is also increased here.

A close similarity is offered by poisoning by salicylic acid in diabetics, yet here the symptoms will only last a few hours.

Again, the attacks of heart weakness which are observed in diabetics after severe exertions may be easily confounded with diabetic coma. However, examination of the urine for acetic, diacetic, and oxybutyric acids will be a certain guide as to the condition. This diagnosis is important, as these conditions of exhaustion are more easily treated than the terminal stage of diabetic coma.

A much more difficult task is to decide whether apoplexy has complicated diabetes. For example, he has observed a diabetic where an apoplectic state with an isolated paralysis was present. The patient had previously had several apoplectic seizures, with isolated paralysis, and examination of the urine revealed neither acetone nor diacetic acid.

Sometimes the abdominal symptoms, obstinate constipation, and vomiting may be so prominently in the foreground that an obstruction of the bowels may be simulated. In all suspicious cases one should examine the urine. A sudden sinking of the blood-pressure may precede, even ten days before death.

The Urine.—The quantity may in some cases decrease and sugar diminish or be absent. The writer has, however, seen cases in which this did not happen until just before death, and in some instances has no record of its happening at all. But the Bordeaux-red color with ferric chloride is marked in all cases which the writer has seen.

According to Stern and others, the urine then contains acetone in excess, ethyl-diacetic acid, and lævorotatory oxybutyric acid.

Prognosis.—This is now unfavorable, and it is only a question of time how long the patient will live.

Treatment.—During the gastric crises milk is the only diet possible, mixed with imported Vichy water or taken in form of kumyss.

For the early stages of coma a vapor-bath given in bed, and powerful stimulants, as ether, ammonia, musk, valerian, or camphor, may ward off the attack. Sodium bicarbonate in 10-grain doses may also be given. Intravenous injections of alkaline solutions have been tried, but without success, as a rule.

CHAPTER XLV.

DIABETES INSIPIDUS.

Definition.—A disease characterized by persistent polyuria, often excessive, without presence of sugar or albumin in the urine, and usually accompanied by polydipsia.

Etiology.—The disease is thought to be a neurosis, having its origin in the dilatation of the renal arteries from paralysis or irritation of their vaso-motor nerves.

The various causes may be grouped as follows:

1. Trauma, inflammation, or irritation of the brain, cerebellum, or medulla; sunstroke, cerebral tumors and syphilis, myelitis, violent mental emotions.

2. Heredity.

3. Tubercular meningitis, epilepsy, hereditary syphilis; as sequela of acute infectious diseases, and in scurvy; in saccharine diabetes after disappearance of sugar; as a result of excessive drinking; in young children from drinking alcoholic liquors.

4. Exposure to cold and drinking cold fluids when heated; abuse of diuretics. Inveterate masturbation, incontinence of urine, and tape-worm.

5. Abdominal tumors, especially near cœliac plexus, and chronic inflammatory processes in same region.

Occurrence.—Occurs in males more often than in females; more frequent in the first half of life, and may occur even in young children. In fifty per cent. of Roberts' 70 cases the patients were under twenty, and in ten per cent. infants. Only four cases out of the seventy were over fifty years of age.

In the writer's experience the disease is a rare one, oc-

curring not half a dozen times in 4000 cases of all sorts examined.

Morbid Anatomy.—Lesions of the brain and nervous system, as in the floor of the fourth ventricle, are found in some cases, and in the vicinity of the cœliac plexus in others. The kidneys are enlarged, and in certain cases the pelves and ureters dilated and the bladder hypertrophied.

Clinical Features.—These are essentially the following :

1. Polyuria, which may be excessive, one or two gallons, even, of urine being voided in 24 hours.
2. Excessive thirst, polydipsia.

These may be the only features in the mild cases. In severer cases we find :

3. Dry, harsh, hot skin ; dry mouth and throat.
4. Headache, vertigo, mental symptoms, neuralgia.
5. Loss of strength and of flesh, weakness of the pulse.

In cases where the amount of solids voided is not in excess of normal, the patient feels poorly, is easily chilled, appetite is capricious, and there is a sinking, gnawing sensation in the pit of the stomach.

When cerebral lesions are present, disturbances of sensibility or of motion are present. Headache or convulsions may occur. Ptyalism has been noticed in several cases.

Cases are known in which excessive elimination of phosphoric acid occurs. In these cases, although sugar is absent, there is, in addition to the symptoms mentioned above, a tendency to boils, ravenous appetite, possibly cataract, as in the case of diabetes mellitus. This kind of diabetes insipidus is called phosphatic diabetes, and is associated sometimes with nervous derangements or with phthisis, sometimes with neither. Again, in some cases excessive elimination of the chlorides may be noticed (chlorine diabetes).

THE URINE IN DIABETES INSIPIDUS.

We find two forms of this disorder, namely, *hydruria* and *polyuria*. In *hydruria* the quantity of urine per twenty-

four hours is enormous, and the specific gravity below 1008. In polyuria the quantity of urine, though not enormous, is greatly increased, and the specific gravity 1010 and upwards.

The total urine per twenty-four hours is usually that of fluids ingested; but if the fluids be cut off, the urine is not diminished proportionately. The volume of urine per twenty-four hours is generally greater than that of diabetes mellitus. Very young children have been known to void as much as 30 pints in the twenty-four hours. Roberts speaks of a girl of ten who voided a little more than a third of her own weight of urine. Ten to 15 pints daily (5000 to 7500 c.c.) is not uncommon in the case of children afflicted with this disease.

The total solids are as a rule above normal per twenty-four hours, though decreased relatively (grains per ounce, grams per liter).

In some cases, without great increase in twenty-four hours' urine, the total phosphoric acid is double or treble the normal per twenty-four hours (phosphatic diabetes), and the urea-phosphoric acid ratio diminished.

Albumose, hippuric acid, and inosite may occur in the urine.

Physical Characteristics.—We find feebly acid urine which readily decomposes and then deposits a creamy-white sediment of amorphous phosphates. Color and odor deficient. Appearance clear when voided, soon becoming cloudy from presence of micro-organisms. Sediment scanty, containing nothing of significance.

Differential Diagnosis.—The conditions which are to be differentiated are as follows:

1. Hysterical polyuria.
2. Chronic fibrous (interstitial) nephritis.
3. Hydronephrosis.
4. Convalescence from acute nephritis, especially post-scarlatinal.
5. Neurasthenic polyuria.

Diabetes insipidus is distinguished from the first by its persistence; from the second by absence of cardio-vascular changes and of albuminuria and cylindruria; from the third by persistence, and absence of tumor diminishing in size, with abundant flow of urine; from the fourth by the history, absence of albuminuria and cylindruria, and presence of persistent excessive polyuria.

Neurasthenics may void considerable urine of low specific gravity, but a quantity over five pints is not usually a persistent symptom, nor is there usually the thirst found in diabetes insipidus.

Eichhorn describes cases of diabetes insipidus occurring in connection with certain specific infectious diseases, such as diphtheria, cerebro-spinal meningitis, measles, scarlet fever, etc. These must be distinguished from the cases of transient polyuria described by Spitz, which occur during convalescence after certain specific fevers, especially typhoid. In these cases the polyuria lasts from six to eight weeks, and is not accompanied by polydipsia.

Course.—Uncertain. Congenital cases may last fifty or sixty years. Recovery, when it takes place, is usually in one or two years from time of onset.

Prognosis.—Death is rare from the disease itself, which may last a lifetime. The danger is from other disorders, especially phthisis, pleuro-pneumonia, or organic disease of the brain. In syphilitic cases the prognosis depends on the curability of the syphilis.

Cases beginning suddenly may run an acute course and may die within a few months, though, doubtless, not of the disease itself, but of the lesion causing it.

The condition of the urine is to be considered; if urea and phosphoric acid are not in great excess, the patient being well cared for and without hereditary taint, it is possible that he may live as long as otherwise. If, on the other hand, there is marked increase of urea and phosphoric acid,

suspect the condition to be but a prelude to serious constitutional disturbance, and give ultimately unfavorable prognosis. In some cases nervous disorder or phthisis appears; in others, diabetes mellitus. Albuminuria is an unfavorable sign, as is also œdema of the feet. In one case which I saw, apparently congenital, at the age of sixteen I found albumin; two years later casts appeared, the patient became more or less œdematous, and died of uræmia. Children may succumb to exhaustion caused by loss of rest, tormenting thirst, and mental worry.

Treatment.—Everything which aggravates the condition must be sought for, and if possible removed; inveterate masturbation, enuresis, tape-worm, and hereditary syphilis must not be overlooked. Phimosi and rectal diseases should receive attention.

When the patient is not voiding too much urea, give food and drink liberally, seeing to it that drinks are not too cold. The various drinks may be thickened, as, for example, by the use of a handful of raw oatmeal to a quart of boiling water, with a lemon sliced into it. Warm woollens should be worn, and the patient, if possible, spend winters in a warm, dry climate. Salt-water douches are sometimes useful in promoting bodily vigor. Warm baths, followed by friction of the skin with coarse towels, are beneficial.

In cases where urea is increased relatively to the weight of the patient, nitrogenous food is to be limited. Alcoholic drinks and coffee not allowed. Vapor-baths, followed by salt-water tepid douches, are recommended and a dry, bracing climate sought. Hygienic care and regulations, as in diabetes mellitus, ordinary warm baths, followed by friction of the skin with coarse towels, are often found beneficial.

Remedies.—Those already mentioned under diabetes mellitus are frequently indicated in this disorder.

In anæmia and debility, *ferrum*, *nux vomica*, and *china*;

cod-liver oil and the *iodide of iron* will help debilitated children with diabetes insipidus. In syphilitic cases, *iodide of sodium*.

Jambul will undoubtedly in some cases decrease the quantity of urine; but its action is at best but imperfectly understood, and it is said not to be efficacious with the patient on a mixed diet.

Helonin will be indicated in some cases.

Apocynum is said to be useful for the well-known "sinking sensation" at the stomach.

Strychnia, in 1-grain doses of the third decimal trituration, possibly increased in time to the second decimal, is of use in controlling the various nervous symptoms.

Sodium bromide is believed by Purdy to have arrested two cases; he thinks that the drug should be given in doses large enough to affect locomotion, and then decreased to a point just short of affecting it. In some cases the constant galvanic current has been found beneficial. Purdy says that the best results are said to follow the application of the positive pole to the cervical region over the vertebra, and the negative pole to the lumbar region and pit of the stomach alternately.

Ergot appears to have cured some cases. The doses recommended are 60 to 120 minims of the fluid extract for an adult.

Miscellaneous.—Claims are made by the older school of cures by the following agents: *Potassium iodide* and *mercury* (dose not given) reduced the urine of a child of six from 30 pints to 4 (Demme); combined use of *antipyrin*, 0.5 gramme ($7\frac{3}{4}$ grains) three times daily, powdered *valerian root* three times daily, and galvanism to the cervical sympathetic and to the spine, cured a case in a boy of twelve years, who voided 13,700 c.c. in 24 hours, with specific gravity less than 1001 (Zeuner).

Extract of ergot (10 grains in capsule three to six times

daily), zinc valerianate (1 or 2 grains in capsule three or four times a day) are deemed effective.

It is held that the dose of these agents should be increased until some therapeutic or physiological effect is produced.

W. F. Clark claims success in diabetes insipidus from ingestion of suprarenal glands.

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