

IV.

SUPPURATION IN THE PELVIS OF THE KIDNEY, AND IN THE KIDNEY ITSELF.—PYELITIS AND PYELO- NEPHRITIS.

PYELITIS, purulent catarrh of the pelvis of the kidney, is partly an affection of the kidney also, since the papillæ of the kidney which open into the calyces are usually involved at the same time. So it seems justifiable to substitute the term pyelo-nephritis for that of pyelitis. Some authors make the distinction between pyelitis and pyelo-nephritis, that in the latter casts should be present in the urinary sediment. Since, however, in the same case, casts may be present at one time and absent at another, and since casts appear mostly in the acute exacerbations of pyelitis, and, finally, since a so-called interstitial nephritis complicates the suppuration from the pelvis of the kidney—a form of nephritis in which we do not constantly find casts—it seems better to drop this distinction, and to consider a pyelitis as involving the kidney at the same time—in other words, as a pyelo-nephritis. The etiological factors in pyelitis may be various. We can, however, distinguish two forms. In the one case it is primary, the disease originates in the pelvis of the kidney itself; the other form is propagated from another source (by continuity), is secondary, and is the form which has arisen

from other pathological processes, in the urinary tract, or in its neighborhood. Primary pyelitis never has very frequent micturition as a consequence, and urination is very seldom painful or causes disagreeable sensations, while the pyelitis which is propagated from the bladder or prostate usually *is* accompanied by frequent micturition, since an affection of the neck of the bladder exists at the same time. Primary pyelitis comprehends those forms arising from retention of urine in the pelvis of the kidney. These are the cases arising from sharp bends or twists of the ureters such as are apt to occur in cases of movable kidney. We must also consider the cases where a fold of mucous membrane forms just where the pelvis of the kidney passes into the ureter, in the cases where the ureter is compressed, and all those factors leading to dilatation of the pelvis of the kidney, hydro- and pyo-nephrosis. Renal calculi cause a large proportion of the cases of pyelitis, likewise tuberculosis of the kidneys, and in rare cases we see as causes entozoa (echinococci) and new growths in the kidney. Pyelitis is also sometimes an accompaniment of the various acute febrile diseases (as typhoid fever), and it occasionally complicates chronic disturbances of nutrition (as diabetes mellitus). In all these primary forms frequent micturition is absent, and it only sets in when the process gradually extends to the bladder and its neck, and it vanishes at once when the process leaves the two regions last mentioned. This phenomenon is best illustrated by calculous pyelitis. Pyelitis calculosa shows no frequent micturition as long as the calculi remain quietly in the pelvis of the kidney, but as soon as these stones get into the bladder, whether with or without colicky pains, they irritate that viscus by their presence; frequent micturition sets in at once,

and lasts until the small stones have been all eliminated by the stream of urine. When this has taken place the frequent urination immediately ceases, in spite of the fact that the pyelitis may be found to exist just as much as before. This is quite as true of other forms of primary pyelitis when the inflammatory irritation is propagated from the pelvis of the kidney to the bladder.

On the other hand, we understand by secondary pyelitis either those forms which have arisen by extension from another part of the urinary canal somewhere below the pelvis, or else such forms as occur from disease about the kidney, or near the pelvis or bladder. The pyelitis arising by extension of disease from the bladder or prostate is distinguished by the complication of frequent micturition, which does not always occur in the pyelitis which comes by extension from inflammatory processes in the neighborhood. Thus we find pyelitis especially frequent after gonorrhœa and its sequelæ, stricture and prostatitis; further, in hypertrophy of the prostate and in paresis of the bladder, especially when catheterization has unpleasant consequences. Moreover, we sometimes get a pyelitis with perinephritis in pericystitis and in parametric exudations, and in all those forms of disease which in any way compress the ureters. Finally, it is a well-known fact that severe, purulent, or ichorous catarrh of the bladder, such as occurs in cases of stone, new growths, or diphtheritic processes, may extend to the pelvis of the kidney or to the kidney itself.

The pathological anatomy of pyelitis varies greatly according to its causation. We find the blood-vessels of the mucous membrane dilated in the catarrhal form. The mucous membrane has at the same time a dark-red color. In chronic cases it is grayish, pigmented, and covered with a purulent catarrhal secretion. In the

diphtheritic forms we see yellow spots of necrotic tissue on the mucous lining of the pelvis. In acute cases, the kidneys themselves look hyperæmic and slightly enlarged. On section, we frequently see a whitish striation which radiates from the cortical toward the papillary region of the kidney. In an advanced stage we find little punctiform collections of pus which run together into larger abscesses. This is the suppurative interstitial nephritis,* which is not an uncommon cause of death after operations in the bladder. In many cases of pyelitis we find the pelvis greatly dilated, and the papillary region of the kidney beginning to break down into pus. Great abscesses of the kidney form in this way, whose walls are made by the remnant of the renal parenchyma and the dilated pelvis. These changes are not uncommonly found in those cases where the pyelitis must be considered as a disease of continuity, from an obstinate suppuration in the bladder. The dilatation of the pelvis of the kidney takes place here all the quicker if it is complicated by retention of urine. In isolated cases we find the urinary tubules, especially the final, straight tubules, quite filled by bacteria and cocci. There is no doubt at all that these micro-organisms come from the bladder in most cases. At any rate, an ichorous gangrenous cystitis is usually present at the time. Klebs has named this form of nephritis—where we find cocci-emboli in the urinary tubules—pyelonephritis parasitica.

If calculi, entozoa, or new growths are combined with pyelitis, the pathological anatomy of the case will be correspondingly modified, or even essentially changed. The symptoms of pyelitis are not very characteristic, but the information derived from the microscopical and

* The so-called "surgical kidney."

chemical examination of the urine is of the highest importance, and, in most cases, is sufficient for the diagnosis. In acute cases fever is present, and frequently begin with a chill.

In the chronic forms, on the other hand, all febrile action is wanting. Pain over the region of the kidneys is only observed in acute cases, or in those chronic forms (usually unilateral) that occur with renal colic, and retention of urine or purulent secretion in the pelvis of the kidney (pyelitis with renal calculi or with movable kidney).

Chronic pyelitis, as it is usually found, is due to the extension of a process from the bladder, and but seldom shows tenderness on pressure in the region of the kidney. Pain or tenderness on pressure in the small of the back is very often mistaken for pain in the kidney. It is well known that diseases of the pelvic organs are often accompanied by pain in the region of the sacrum. Thus, in uterine disease, in rectal hæmorrhoids, and especially in diseases of the prostate and the male urethra, strongly-developed sacral pain is not at all rare. However, these pains are not situated at all where the kidney is located, but are much deeper, and extend outward from the sacrum along the iliac crest toward the right or left, or even toward both sides. The region of the kidney is at the same time quite insensitive to pressure. There are usually reflex pains which radiate from the affected pelvic viscera toward the spine.

In renal abscess, chills, continued fever, a small, quick pulse and delirium are the order of the day. These vanish at once when the pus empties itself into the urinary canal, and begin again anew when pus accumulates and can not escape. This play between exacerbation and remission may last for weeks, and result in recovery or

death. If the patient can not recover, the quantity of urine diminishes gradually to anuria. The extremities become cold, the skin livid in color, the pulse quick and thread-like. The tongue is dry, covered with brown crusts, and has a bright-red edge. A distressing hic-cough sets in, which increases gradually, and lasts until death. Somnolence or lethargy is present at the same time, and in isolated cases the patient seems to be in a profound sleep. As the secretion of urine diminishes, obstinate vomiting sets in of brownish-green hæmorrhagic masses from the stomach, sometimes frequent fluid stools are voided, and twitching of the muscles is not uncommon. Dropsy* is never present, and only in very chronic cases do we find a little œdema about the ankles which may extend as far as the knee. These are phenomena which find their explanation partly in the retention of urinary constituents in the blood, partly in the resorption of an ammoniacal urine loaded with septic substances from ulcerative processes in the bladder. In isolated cases, uræmic symptoms are the most prominent; in others, those of ammonæmia; and again, in others, symptoms of pyæmia and septicæmia predominate. Some authors call this condition urosepsis. We get our most important help in the diagnosis of pyelitis or pyelo-nephritis from the urine. While oliguria (abnormally small secretion of urine) is most apt to be present in acute pyelitis, we always get polyuria as a characteristic sign in chronic pyelitis. Polyuria, in chronic pyelitis, is explained partly by the usual presence of hypertrophy of the heart, like that found with "cirrhotic kidney," and partly because the osmotic processes, the normal relations between the blood and the water of the urine as it passes along the urinary tubules,

* Ascites.

are disturbed, the papillary and medullary regions of the kidney being especially involved.

Thus polyuria is a constant phenomenon in chronic pyelitis, and the urine secreted may amount to six litres or more in twenty-four hours. The average amount in this disease is, however, three to four litres. Acute pyelitis is usually accompanied by blood in the urine. In chronic pyelitis it is only present when stones or neoplasms are the cause. In the ordinary catarrhal form of chronic pyelitis, blood-corpuscles are never to be found in the sediment of the urine. The specific gravity of the urine is diminished according to the polyuria. In isolated cases of pyelitis the specific gravity is so low that from this alone retention of the constituents of the urine may be diagnosticated. The urine is of light-yellow color, and is rendered milky by the pus-cells suspended in the fluid. In *primary* pyelitis the reaction to litmus of the urine is generally acid, but if the pyelitis be *secondary* to, and caused by, a cystitis, then the reaction may be neutral, or even decidedly alkaline. The urine of pyelitis always contains albumen in considerable quantity, and more than the amount of pus warrants. This is conceivable if we recollect that the pyelitis represents in part a process in the kidneys also. If we may say that in cystitis pyuria is present, we are justified in saying that in pyelitis pyuria and albuminuria are present; that is, in pyelitis there is more albumen than corresponds to the amount of pus in the sediment. To determine this difference is no easy task for a beginner, though for one experienced in these matters the decision as to the value of a quantity of albumen found in the urine offers no difficulty at all. The amount of albumen in the urine of chronic pyelitis does not generally amount to one fourth of one

per cent. The sediment of the urine consists of pus in fine flakes. With the microscope we sometimes see the pus-cells aggregated to short and thick cylinders, which come from the papillary ducts of the kidney, and are of great diagnostic importance. Sometimes we find a renal epithelial scale, as it were, baked into the pus-casts; moreover, isolated epithelial cells from the urinary tubules; these come from the large main ducts. In calculous pyelitis we usually find in addition blood-corpuscles. These are in the form of little globules, such as are very characteristic of parenchymatous or very slow bleeding from the interior of the urinary tract, since their shape shows the destruction of the red

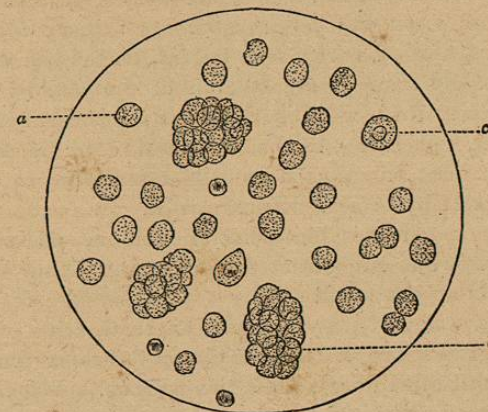


FIG. 6.—Sediment of a purulent pyelitis. *a*. Pus-corpuscles. *b*. Plugs of pus from the capillary ducts of the kidney. *c*. Renal epithelium. (Three hundred diameters.)

blood-corpuscles by the warm urine (urea). It is not very uncommon to find among the cellular elements a crystalline sediment, which may have caused the cal-

culous disease, such as uric acid, in the form of precipitated crystals; further, oxalic acid, cystin, and calcic carbonate, or crystalline phosphate.

We also find blood-corpuscles in tuberculous pyelitis, besides molecular *débris* and bacteria in abundance. Crystalline sediments are not seen here, as a rule. With the pyelitis caused by neoplasms or entozoa there is usually considerable blood, but there are no other diagnostic points to aid us, unless a piece of the neoplasm itself, or the entozoa (echinococci) come away with the urine.

When a chronic pyelitis has exacerbations with fever, we find during the first few days short and thick casts in the sediment, which are somewhat granular, and come from the large gathering urinary tubules. However, as soon as recovery begins, these casts vanish entirely. If an ichorous catarrh of the bladder exist at the same time, we sometimes see thick casts in the sediment, consisting of bacteria and cocci from the large straight tubes, such as Klebs describes as characteristic of pyelo-nephritis parasitica.

If the pyelitis is limited to one kidney, and occurs when the ureter is obstructed by plugging up, or twisting on its axis, we find during the entire time of such obstruction a perfectly clear and normal urine, which is from the sound kidney. This confirms our diagnosis of unilateral disease of the kidney. With this retention of urine, pain is felt in the region of the pelvis of the kidney, which increases with the increase of tension until it is unendurable, and is accompanied by nausea and vomiting. By palpation of this region we feel deep down, a tumor of large or small size, in which we may even detect fluctuation at times. Examination is, however, difficult, on account of the extreme tender-

ness. When the retention of urine in the dilated pelvis has continued for days, the ureter may become pervious, and, while the urine has been clear for some time, it becomes all at once very purulent, and the tension as well as the pain over the affected kidney vanishes. Such retention of urine is very apt to recur; the attacks become more frequent, the pelvis becomes more

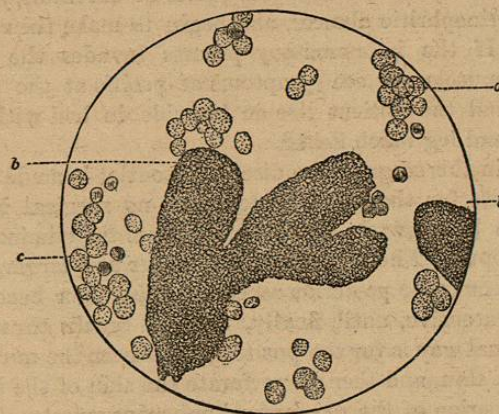


FIG. 7.—Sediment of a pyelo-nephritis parasitica. *a.* Pus-corpuscles. *b.* Casts consisting of cocci. *c.* Blood-corpuscles. (Three hundred diameters.)

and more dilated, and the ureter less and less pervious. After some time, it may be after months, during which time these phenomena have been repeated with more or less intensity, suddenly a different and very painful attack begins, which seems to last longer than the ordinary ones. The tenderness on pressure over the tumor, as well as its size, increases greatly. Finally we may discover, by pressing with the finger, a slight cedema in the skin of the back, over the situation of the quadratus

lumborum muscle on the affected side. The inflammation has extended from the diseased pelvis of the kidney, from the pyo-nephrosis to the connective tissue surrounding the kidney, and here causes a peri- or paranephritis. The perinephritis now gradually causes a purulent exudation, and a large abscess forms, which communicates with the pyo-nephrosis. In this way concretions may escape from the pelvis of the kidney into the perinephritic abscess, and begin to make their way out. If the inflammatory process invades the ileo-psoas muscle, we see symptoms of psoitis at the same time, and the patient lies on his side in bed with the thigh and leg much flexed.

If, in this stage of the disease, no outlet is made with the knife for the pus—if, moreover, no surgical interference be allowed—Nature undertakes the elimination of the pus. The abscess grows larger and larger, the œdema over the posterior aspect of the tumor becomes more extensive, until, finally, the pus breaks through. The usual way is for the pus to get between the muscles and the skin, and then to perforate the skin of the back in the region of the quadratus-lumborum muscle. This is the shortest and the best way. Sometimes renal calculi are eliminated in this manner, after which a spontaneous cure may ensue. However, the abscess may sink down toward the abdominal cavity, or appear in the neighborhood of Poupart's ligament, or even through the inguinal canal. Another way for the pus of perinephritic abscesses, to escape, is through the lungs. It is relatively an unusual way, and on account of the constant danger of suffocation a more dangerous one. I have, however, observed two cases, both of which finally recovered after a tedious illness, and an escape of pus through the lungs, lasting several weeks. In one case,

especially, pus was thrown off through the lungs at the very beginning, in such quantities that it seemed as if the patient must suffocate with each expectoration. Finally, the pus may make its way into the intestinal tract and may be carried off by this outlet with the fæces. In addition, pus may empty itself into the peritoneal cavity; but this is, fortunately for the patient, a rare occurrence. The adhesive inflammation about the abscess provides a more favorable way for the elimination of the pus. Para- or peri-nephritis is sometimes also primary, and then usually follows an injury, but it is much more often secondary, and due to an inflammatory process propagated from the kidney or its pelvis, as has been above described.

The acute exanthemata and typhoid fever are occasionally though rarely the cause of paranephritis.

The urine in cases of paranephritis varies greatly according as the process is primary or secondary to a disease of the renal pelvis. In primary paranephritis the urine exhibits merely the characters of "febrile urine." It is high-colored, though perfectly clear and transparent. There are no cellular elements in the sediment. Sometimes we may in such cases detect a small amount of albumen. But in a paranephritis which arises from a pyelitis or pyo-nephrosis, the urine shows all the characters of pyelitis or pyelo-nephritis above given, unless the ureter is absolutely impermeable. When the pus from the abscess escapes partially with the urine, we occasionally find those dark, granular, nucleated cells in the urinary sediment which are pathognomonic of abscess-pus.