

CHAPTER XL

RENAL AND URETERAL CALCULUS

THE general description of urinary calculi, their macroscopic and microscopic characteristics, pathogenesis, etc., are discussed in Chapter XXVIII. Only a few words need be added here.

Renal calculi are usually single. Exceptionally a great number of stones are found. Thus Morris removed 200 stones from 1 case and Dessirier and Legrand¹ found 400 calculi in the left kidney and 60 in the right at the autopsy of a young soldier who during life had shown no symptoms referable to the kidneys. Renal calculi run up to about 100 grammes (3 ounces) in weight, the large stones being irregularly branched to fit into the distorted and dilated pelvis and calices (Fig. 145). In operating upon a suppurating kidney one occasionally meets with very small stones, scarcely more than phosphatic dust.

Kraft² found renal calculi 40 times in 2,953 autopsies; both kidneys were affected 15 times. Legueu and Albarran agree that in about half the cases both kidneys contain calculi, yet recent X-ray investigations go to show that in the living the proportion of bilateral cases is not very great.

Renal calculi occur more frequently in men than in women. They are oftenest encountered in middle life.

MORBID ANATOMY

The changes that a calculus may undergo, such as phosphatic incrustation, spontaneous fracture, etc., have been described (p. 434).

The changes that occur in the kidneys and ureters from the presence of calculi may be considered under three heads—viz., retention, ulceration, and inflammation.

Retention.—A calculus formed in the renal pelvis may at any moment slip down and be caught at the orifice of the ureter, or at any physiological or pathological narrowing in that duct. This usu-

¹ Méd. mod., 1901.
580

² Hospitals Tidende, 1900, No. 29.

ally occurs at or near the upper end of the ureter (Fig. 147), less frequently at the vesical orifice of the canal (Fig. 104) or at the point where it crosses the brim of the pelvis. Such an impaction may be partial or complete. It is usually partial, and as the urine dammed up behind this sudden obstacle brings pressure upon it, the stone is forcibly driven into the ureter, setting up a *renal colic*. This is relieved by the passage of the stone into the bladder, by its slipping back into the pelvis, or by the gradual accommodation of the parts to the new conditions. If the stone remains impacted it causes either partial retention resulting in *hydronephrosis*, or complete obstruction resulting in an acute congestion and subsequent atrophy of the kidney (unless the obstruction is relieved). This complete retention is evinced by *anuria*—calculous anuria

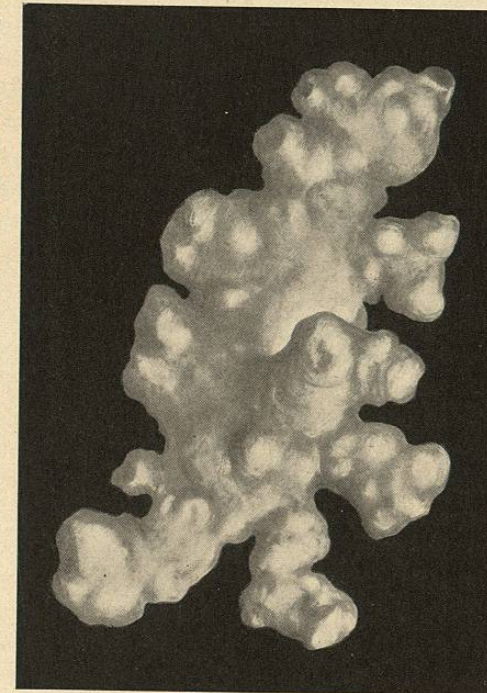


FIG. 145.—LARGE BRANCHED RENAL CALCULUS.

it is called—which is temporary if the opposite kidney is able to continue its functions, permanent and fatal if the opposite kidney stops secreting, whether on account of reflex congestion or of bilateral calculous obstruction.

Ulceration.—Ulceration occurs at whatever point in the kidney, the pelvis, or the ureter a stone may rest. If the stone is small and movable the ulceration may be insignificant. If it is large or impacted the ulceration may be so deep and extensive that actual *perforation* occurs, permitting the stone to escape from the kidney (the pelvis or the ureter) into the surrounding tissues. This complication, associated as it is with urinary extravasation, is as unusual as it is grave. *Ureteral stricture* may result from prolonged calculous impaction.

Inflammation.—A more common—in fact, *the* most common—effect of ulceration is infection. The congested ulcerated spot and

the stone itself, coated with the muco-serous exudate, form admirable breeding-places for bacteria, and if there is retention to cause a general congestion, so much the more likely is it that infection will occur. The infection is habitually descending and spontaneous. While the resulting pyelo-nephritis may assume a catarrhal form, and perhaps is usually of that nature at first, the surgeon sees it only after the suppurative stage is reached: *suppurative pyelo-nephritis* or *pyonephrosis*. It is futile to attempt the enumeration of the various lesions that may be caused by one or more stones in the various portions of the upper urinary tract. The lesions of retention, ulceration, and inflammation are combined in endless variety. There may be only localized suppuration about a small pelvic calculus, or there may be numerous calculous pockets throughout the kidney; the entire organ may be reduced to a multilocular abscess cavity filled by a great branching stone (Fig. 145). The kidney may be found atrophied, and closely contracted around a stone that had caused complete obstruction years before. Pyonephrosis results from obstruction of the ureter by stone or stricture when there is infection. Suppuration within the organ may be associated with *peri-nephritis* from extension of the inflammation or from rupture of the sac. The longer the disease continues the more extensive the destruction of renal tissue and the greater the likelihood of bilateral calculous disease.

SYMPTOMS

Any general discussion of the symptoms of renal calculus must be prefaced by the statement that the condition may exist for years without causing any symptoms whatever. The influence that this fact must have upon diagnosis and therapeutics will be considered later.

Morris mentions the notable symptoms caused by renal calculus in 103 cases of his own. These he tabulates as follows:

Pain occurred in.....	71 cases (69%).
Pyuria " ".....	50 " (48%).
Renal colic occurred in.....	44 " (43%).
Hematuria " ".....	41 " (40%).
Tumour " ".....	27 " (26%).
Troubles of micturition occurred in.....	24 " (23%).
Tenderness occurred in.....	17 " (16%).

Pain.—Of calculous diseases, Morris writes: "They are the most frequent and most painful of surgical diseases of the kidney. Probably no disease, except acute tetanus, is capable of causing worse suffering." The various pains due to renal and ureteral calculi are renal colic, pressure pains, and reflex pains.

Renal Colic.—This is the most characteristic symptom of stone in the kidney. It is due to the impaction of a stone in the ureter.¹ The pain is paroxysmal in character. It commences suddenly at any time when the patient is seemingly in the best of health, perhaps most frequently shortly after rising in the morning. It shoots down the ureter into the scrotum and to the end of the penis. The testicle of the affected side is often strongly retracted. Indeed, the entire scrotum and penis may be drawn up into a hard knot, as it were. The pain may also extend down the thigh on the affected side. There is usually an incessant desire to pass water, although there is almost absolute suppression. What little urine is voided comes away high-coloured and in small quantities at a time, often tinged with blood and mixed with epithelium from the kidney. Pain attends urination, chiefly towards its close, running down to the end of the penis. If the paroxysm is severe, faintness, nausea, and vomiting occur, the skin is covered with a cold sweat, the patient tosses restlessly about, seeking relief, but finding none. In the intervals between paroxysms there is a sense of soreness and discomfort perhaps amounting to continued pain, or the relief may be absolute. After one or more paroxysms, lasting from a few hours to many days, all pain suddenly ceases. This sudden cessation indicates that the stone has been liberated. It may have fallen back into the pelvis of the kidney, have passed down into the bladder, or have reached some dilated portion of the ureter, where it rests without interrupting the urinary outflow.

The nature of the *termination* of an attack may usually be diagnosed from the symptoms. If the calculus remains in the ureter some pain and tenderness usually persist at the point where it rests. If the impaction has occurred at the upper end of the ureter and is relieved by the stone slipping back into the pelvis, the pain during the attack is usually most intense in the loin and radiates across the back as much as down the ureter. On the other hand, if the stone travels down the ureter to the bladder, its descent is often marked by a progression of the pain from the loin to the pelvis—a progression which may be interrupted by periods of relative or absolute ease—with a corresponding increase in the vesical irritability and the pain and retraction of the testicle.

It may be here remarked that the period of calm following an attack of renal colic should be a time of utmost vigilance on the part of the surgeon (p. 592).

¹ Renal colic caused by the passage of gravel or by kinking of the ureter is discussed elsewhere (p. 631).

Pressure Pains.—When the stone is in such a position or of such a size as to fill the cavity in which it lies, it commonly causes a dull continuous ache associated with tenderness. This ache is not necessarily severe, indeed, some persons will endure it for years without attaching any great importance to it, but to the surgeon it is of the utmost importance. The history of such an ache, whether past or present, especially if associated with a point of local tenderness, may be the chief symptom determining the location of the stone.

Reflex Pains.—The two most notable renal reflex pains excited by stone are: (1) Pain following the course of the ureter into the pelvis and thence radiating to the testicle and thigh, and (2) painful and frequent urination. Both reflexes originate from distention or irritation of the pelvis or the ureter rather than from the kidney proper,¹ and may rarely occur from any irritation other than stone.

The painful and frequent urination that so often misleads the surgeon into the belief that the bladder is diseased can only be distinguished by a careful examination of the patient and the urine. This symptom occurred in 23% of Morris's cases.

It is questionable whether stone in one kidney may give pain referred only to the opposite organ. Morris, who has had more experience in this malady than any other surgeon, says: "There is not, so far as I know, any case on record in which there is completely satisfactory evidence of symptoms on one side only being caused by a stone in the kidney of the opposite side. The presence of a stone on one² side is not proof that the opposite and painful side is not also affected. That the attacks referred to one side have ceased after operating upon the opposite and painless side is not conclusive; this may be a coincidence due either to the accidental shifting of a calculus in the painful kidney or to the calculus becoming lodged in some immovable manner. There may be very advanced disease of the kidney on the painful side and a symptomless calculus in the opposite kidney." And again: "It is important to know that a stone in one kidney will sometimes excite sympathetic pain and irritation in the other; but this transferred or sympathetic pain is of an aching character, not of a spasmodic or colicky description, is only occasional, and never occurs except as an accompaniment of more severe pain on the affected side."

Hematuria.—As shown by the table, considerable hematuria is a fairly constant symptom of stone. Yet it is variable to the last

¹ I cannot accept Bryson's theory that vesical pains are always due to irritation at the lower end of the ureter.

² Painless.

degree. Some hematuria usually accompanies and follows a renal colic, and in most cases there is a fairly constant oozing of blood, showing itself only by the presence of a few red cells and a trace of albumin in the urine. Blood casts and long ureteral clots rarely occur. The bleeding is usually made worse by exercise (though the pain is not), and hence the presence of a great number of red cells in the sediment centrifuged from the urine passed after exercise is suggestive of stone. But after all, the hemorrhage caused by renal stone is an inconstant symptom.

The remaining symptoms on the list require no notice here.

COURSE OF THE DISEASE

The course of the disease is entirely irregular. The character of the symptoms bears no relation to the size or position of the stone; and the progress of the disease varies from the cases that have only a single fatal attack of calculous anuria to those that drag on for years with chronic renal suppuration, or that die of some intercurrent disease without ever having manifested any symptom referable to the calculi with which their kidneys are filled. Yet we may agree with Morris that "no disease gives rise to such a variety of morbid changes in the kidney as calculus, and none is more certainly fatal when allowed to progress without surgical interference."

Several types of the disease may be mentioned, due allowance being made for the fact that the clinical aspect of any given case is often a compound of several types. The surgeon encounters: (1) Cases without symptoms, (2) cases of renal colic, (3) cases of calculous anuria, (4) cases of renal distention, and (5) cases of renal suppuration.

Cases without Symptoms.—Morris distinguishes cases without symptoms from quiescent cases that have shown symptoms (e. g., renal colic) at some previous time. Clinically the conditions are much the same. After several years have intervened it may be impossible to obtain a convincing history of even so impressive an attack as a renal colic. Moreover, a stone may certainly remain for many years unsuspected in the kidney, and at the end of that time set up calculous anuria or perinephritic abscess (Morris), or any other form of calculous trouble. The clinical warning impressed by these cases is that after a renal colic or after any other manifestation of stone in the kidney, the subsidence of symptoms is no evidence that the stone has passed. In such a case it is the surgeon's duty to *find out* that the stone has passed. (*Cf.* Diagnosis.)

Renal Colic and Other Pains.—When the calculus does begin to give symptoms, pain of one sort or another becomes a fea-

ture of the disease. A renal colic is often the initial symptom of stone. A single colic may result in the passage of the offending stone; or the stone may remain quiescent for years thereafter, or give rise to repeated attacks of colic, or to a continuous dull pain. The attacks of colic may be singularly regular in their recurrence. I have encountered a case in which the paroxysms recurred every Sunday afternoon for several weeks; but this systematic recurrence is always suggestive of a neurosis rather than of a straightforward calculous colic (p. 631). Other cases run their course with no other notable symptom than a constant ache in the loin. There may or may not be intercurrent attacks of colic or other pains.

Other cases again give only reflex symptoms. One of my earliest professional recollections is of an old man who for years suffered only from painful and frequent urination. His bladder was washed, searched, sounded, and even cut—all to no avail. New York's best surgeons of those days could do nothing for him. Finally, his protracted agony was terminated by a fatal attack of suppression of urine, as it was called. Autopsy revealed a normal bladder and one kidney atrophied and tightly contracted about a calculus, the other somewhat dilated and with a stone plugging the ureteral orifice. Yet he had never complained of a symptom referable to either kidney.

Calculous Anuria.—Calculous anuria is a cessation of the urinary flow, caused by the plugging of one or both ureters with calculi. It is part suppression, part retention. The terminal anuria in the case mentioned above was a pure retention. One kidney had been out of commission for years; the flow of urine from the other was stopped by the obstructing stone. In other cases the blockage of one ureter throws such a burden of excretion upon the opposite kidney that it becomes acutely congested, and suppression ensues. Thus anuria may ensue (1) when both ureters are completely obstructed, or (2) when one ureter is obstructed and the opposite kidney absent, hypertrophied, or sufficiently diseased to be incapable of enduring the congestion forced upon it. The acute obstruction is clinically unilateral, but unless both kidneys are diseased anuria—prolonged anuria, at least—does not occur.

Morbid Anatomy.—The morbid anatomy of calculous anuria is striking and characteristic. The affected kidney, which may be hydronephrotic or suppurating, is intensely congested (Fig. 146). It is enlarged to twice or thrice its normal size, dark in colour, and mottled. On section its tissues are found friable and edematous. Such a large, soft, purple organ once seen is never forgotten.

The opposite kidney (Fig. 147)—if there is one—may undergo

like changes in a less degree, but the absence of congestion in it may be in striking contrast to its fellow. In all but 3 of the 58 cases collected by Morris, the opposite kidney was absent or completely disorganized.

Symptoms.—The symptoms of calculous anuria may be divided into three stages: 1. The Premonitory Stage. 2. The Tolerant Stage. 3. The Uremic Stage.

1. In the *premonitory stage* there is more or less pain, perhaps an actual colic, referred to the kidney. Happily this pain always occurs, for it is the chief sign by which the surgeon is able to decide which kidney most requires operation. It persists from a few hours to a few days.

2. The *tolerant stage* is characterized by but one symptom—viz., anuria. The patient does not pass water. This anuria is rarely absolute. A few grammes of urine tinged with blood are passed every day, or perhaps the anuria runs a remittent course. At one time or another 2 or 3 litres of urine may gush forth, a misleading promise of relief, for the flow is but temporary. This state of affairs lasts from three days to a week. *Not a*

drop of urine may be passed during several days and yet the patient may, apparently, remain in the best of health. No more striking contrast could well be imagined than that presented by calculous anuria: on the one hand, the grave renal lesion, the absolute retention, the swift fulminating character of the uremic period soon to follow; and,

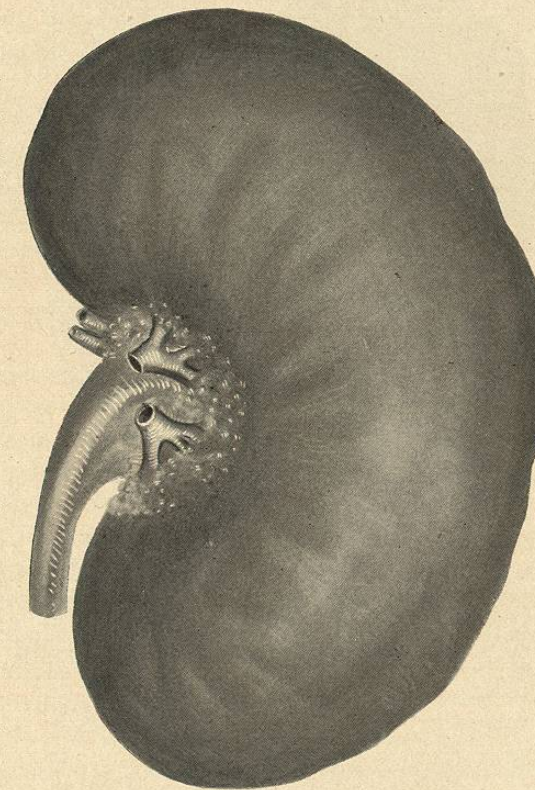


FIG. 146.—CALCULOUS ANURIA: THE CONGESTED KIDNEY.
The stone was impacted lower down the uretér.
(Compare Fig. 147.)

on the other hand, this entire absence of symptoms, local or general. The patient goes about well content. He eats, sleeps, and works pretty much as usual. Whatever pain he has had in the loin is past, and his present discomforts are insignificant. And yet all the while there is brewing within him a crisis swift and terrible.

Spontaneous recovery may occur. The obstruction is relieved; the urine gushes out, 3 or 4 litres a day, and all is well. This may occur in 20.8% (Morris) to 28.5% (Legueu) of all cases. In Legueu's¹ cases the spontaneous cure took place on the third day once, between the fifth and the tenth day twice; later still in five instances. Yet it is obvious (*Cf.* Treatment) that no time should be lost in the expectation of a spontaneous cure; for even if this occurs, unless the calculus is actually passed, the patient thereafter goes about in imminent danger of a recurrence of his attack.

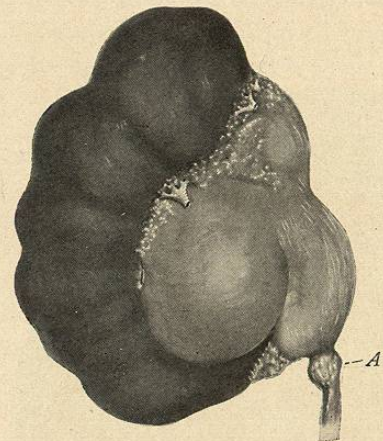


FIG. 147.—CALCULOUS HYDRONEPHROSIS.
A small stone was found lodged at A. This kidney is the fellow of the one shown in Fig. 146. They were obtained from a patient who died of calculus anuria.

When spontaneous recovery does not occur the patient passes into the third stage of the disease at the end of a week or ten days.

3. The *uremic stage* is usually ushered in by hiccough or vomiting. This is the first warning. It may continue for a day or two without additional symptoms. The pulse is tense, the temperature usually subnormal. Constipation becomes absolute and the intestines are distended with gas. The vomiting grows more severe, the intellect becomes dulled and stuporous. The patient's mind may wander a little, and he may even have maniacal attacks. There is often a restlessness of both mind and body. And thus he sinks away and dies, often within two or three days of the first hiccough or vomiting.

Such is the clinical picture of what Morris has aptly termed the gravest and most fatal of the many serious complications of urinary lithiasis. Of course there are atypical cases, the obstruction may be intermittent or partial; but such cases require no special notice.

Calculous Hydronephrosis.—Calculous hydronephrosis is due to the impaction of a stone in the ureter (Fig 147), or rarely

¹ Guyon's Annales, 1895, xiii, 865.

to a stricture secondary to a calculous ulceration. The development of the hydronephrosis is habitually marked by a series of renal colics, and hydronephrosis may be one of the features of calculous anuria. The symptoms and signs of hydronephrosis are detailed elsewhere.

Renal Suppuration.—Stone in the kidney is probably the most common cause of suppurating pyelo-nephritis. It also causes pyonephrosis (Fig. 148); while secondary phosphatic calculus or phosphatic deposit upon a pre-existing calculus results from the inflammation. Catarrhal inflammation is not encountered with calculus. The irritation caused by the stone is such that when inflammation occurs it promptly assumes a suppurative type.

The variations imprinted upon the classical picture of suppurative pyelo-nephritis by the presence of stone are few. There is the same urinary septicemia, the same absence of any great enlargement of the kidney. There may be colic, and there is usually a constant ache in the side. Hemorrhages occur from time to time.

The inflammation is rarely acute or virulent, but progresses slowly, involving the whole organ and terminating finally in pyonephrosis or perinephritic abscess.

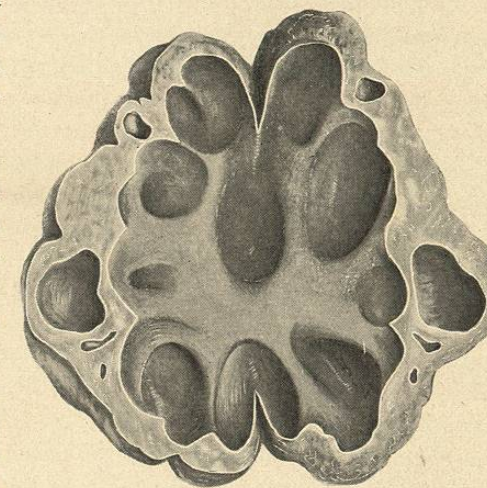


FIG. 148.—CALCULOUS PYONEPHROSIS.
This kidney contained the stone shown in Fig. 145.

DIAGNOSIS

Not one of the symptoms of renal calculus is absolutely pathognomonic. In another chapter I have collected cases illustrative of anuria, hematuria, and renal colic caused by something other than a calculus. Even the passage of a stone may be misleading. Not long ago a patient came to me with a history of having passed several calculi, and complaining of pain in her right loin. The urine showed evidence of mild suppurative pyelo-nephritis; there was local tenderness but no tumour. I performed nephrotomy, and found nothing but a dense spherical scar 2 cm. in diameter in the kidney substance and some thickening of the pelvis: no obstruction, no pouching, no stone. She was drained for several weeks, sent to a