

No. 223. M. L., school boy, fourteen and a half years of age. Father died with meningitis and several members of the family have died of pulmonary tuberculosis. Patient always strong and healthy. In August, 1903, while stooping down to examine a leak in a hose pipe, he remained stooping for some time, until discovered by his brother, when he seemed dazed, and at first did not answer when spoken to. He remained in this condition for four hours, when he recovered consciousness, spoke and recognized his friends, but complained of steady severe headache on the right side of his head, and vomited. During the night he slept well, but awoke with headache, from which he recovered almost completely. Twelve days later he was sent to a store on an errand, and as he did not return his mother went in search of him, and found him in another store in a dazed condition similar to that in his preceding attack. Two days afterwards the left side of his face began to twitch, he frothed at the mouth, bit his tongue and became unconscious. Chloroform was given to relieve the attack. He entered the hospital Sept. 1st, still suffering from similar attacks, except that the left arm was involved in addition. He had two attacks on the cars going to the hospital.

Physical examination. Negative. Patient complains of headache.

Sept. 2d. Four spasms to-day. Conscious but unable to speak. Knows when the attack is coming on and gets into bed. Has severe headaches afterwards. Is promptly relieved by chloroform.

Sept. 3d. No frothing at the mouth in the attacks to-day. Left arm and leg involved.

From Sept. 4th to the 8th he had two or three convulsions a day and at times seemed very stupid. No Babinski; knee jerks normal; eyes normal.

Sept. 10th. Delirious at times and stupid between the attacks of delirium. Is apparently worse.

Sept. 11th. Operation by Dr. J. T. Bottomley at Carney Hospital. Ether. Trephine opening over the face center of the right side. On opening the dura the brain protruded, but nothing particularly abnormal was found, except that possibly the brain appeared somewhat softer than usual. Several attempts to tap the ventricle brought no fluid. The opening was enlarged backwards and upwards and a small portion of the brain tissue approximately over the face center excised. Dura sutured and skin closed. He recovered well from ether and complained only of slight headache. No paralysis nor convulsions followed the operation, and twelve days later, when he was discharged, he had had no return of his symptoms, the pulsation over the wound being normal.

When heard from Nov. 1st there had been no return of his trouble.

F. L. K. No. 352. Carriage painter, referred to the writer by Dr. Hamblen of Bedford and Dr. W. N. Bullard. Thirty-nine years old, without history of insanity, alcohol or tuberculosis in his family.

Struck the right fronto-parietal region of his head, three to four years ago, against a protruding knob in the limb of a tree. The blow was not a severe one, but was followed by a lump which persisted for several months. From the time of the accident he has had more or less pain at the seat of injury and immediately preceding his epileptic seizures the pain is increased.

The first epileptic attack came in June, 1903, and headaches which he had been complaining of before that time became severe, at times "almost driving him crazy." These headaches lasted from a few minutes to twelve hours. His first attack came while

he was working in a garden on a hot day. He was unconscious for one and one-half hours.

A week later he had a second attack, falling off of a couch. Under bromides he went without an attack for five weeks, when, after overeating some bananas, the fits returned, coming at first every week and lately every day or two.

He is said to have had pulmonary tuberculosis some years ago, with subsequent healing of the cavities. He also had excision of the left elbow for tuberculosis, at the Waltham Hospital, six years ago, with excellent result. Otherwise he is a healthy, strong man.

His attacks begin with choking or gurgling, clinching of both hands, spasms of legs, relaxation and cyanosis. In some attacks he has bitten his tongue badly.

In right frontal bone, just over coronal suture and two inches from median line, is a slight depression of skull which is always and distinctly tender to pressure.

Operation by writer, Oct. 31st, 1903, at Carney Hospital. Ether. U-flap within the hair line. Trephine opening a little posterior and to outside the depression, which lay in the coronal suture. No depression of inner table. Normal tension and pulsation of dura. Opening enlarged forwards to include sensitive area. On turning back the dura the pia-arachnoid in this region appeared markedly opaque, edematous and at least $\frac{1}{16}$ -inch thick. In the meshes were numerous grayish, opaque miliary nodules, tubercular in appearance. The largest of these were dissected off with the including membrane. Subdural exploration in the neighborhood failed to show any bony depressions. So far as could be told the lesion was confined to the region of operation. Pressure on the pia-arachnoid forced out the edema. The brain itself looked normal. Dura sutured loosely and the skin closed allowing for a rubber tissue drain. No shock.

SOME CONCLUSIONS BASED ON A STUDY OF ONE HUNDRED AND THIRTY-FOUR CASES OF CALCULUS IN THE URETER. WITH A REPORT OF THREE NEW CASES.

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CASE I. Reported through the courtesy of Dr. J. W. Elliott. Female, thirty years of age, previously operated on for gallstones and later for adhesions about the pylorus.

Sixteen days before entering the Massachusetts General Hospital she had a severe attack of pain in the region of the right kidney, extending down the right leg, not entirely relieved by a grain of morphine. The next day she passed bright red blood in her urine. Subacute pain was present all the time, and she was under the influence of morphine most of the time.

On examination some resistance and tenderness was found in the right flank. Urine was brownish-red in color and showed a slight trace of albumen, and the sediment contained considerable pus and red blood corpuscles.

The x-ray plate showed a shadow in what would be apparently the course of the right ureter, one and a half inches above the crest of ilium.

Operation, Feb. 5th, 1901. Patient on left side. Long incision across loin, dissection carried down to kidney. The kidney and ureter were exposed, and the ureter was found dilated about two inches below the pelvis. A calculus was felt at the lower end of the dilatation. Ureter cut and calculus removed. Ureter sutured with interrupted silk intestinal sutures. Wick of gauze left in for drainage.

Feb. 12, patient complained of blindness and had four convulsions. Passed 15 oz. of urine on the day previous with 6 gm. of urea. No vomiting—able to swallow. The patient became comatose and died during the day.

At autopsy—a hemorrhage was found under the capsule into a small cyst in the right kidney. Cavity in kidney showed no definite lining. Capsule adherent. Cortex 5 mm. thick, and pale. Renal calices and pelvis slightly dilated. Complete healing apparently taken place at point of incision in the ureter. No stones found anywhere. Left kidney showed a number of small cysts filled with a gelatinous straw-colored material. Renal substance presented no other lesion worthy of note.

CASE II. For the privilege of reporting this case, I am indebted to Dr. J. F. Thompson of Portland, Me.

Female, aged twenty-seven. Came to the Maine General Hospital in June, 1901. She gave a history of pain in the left side, paroxysmal in character, which began in the region of left kidney and extended down along the line of ureter into her pelvis. Pain had been present several months. Urine showed red blood corpuscles and an occasional white cell. There was also tenderness on pressure. Provisional diagnosis, stone in kidney.

At operation the kidney and pelvis were thoroughly explored and no stone found. The ureter was not examined. Capsule was slit and the kidney replaced without drainage. Pain was entirely relieved for several months, but returned.

She came to the hospital again in May, 1902, with severe pain in the region of the left ovary and very little pain in back. Hysterectomy was advised and performed by another surgeon, but no relief followed the hysterectomy.

Her attacks of pain continued till February, 1903, when the pain suddenly ceased, and within a few days she passed a calculus the shape of a beechnut, about one-quarter inch in longest diameter. Since then she has had no pain.

CASE III. Personal.

Female, thirty-six. Nurse. In 1893 a double ovariectomy was performed in Washington, D. C., after seven years of invalidism. The details of this I have not been able to get from the surgeon. Her recovery from the operation was slow, but she steadily improved until December, 1901.

In 1899 she had an attack of colic in the right side, which was supposed to be due to "congestion of the liver." December, 1901, she had an attack of renal colic in the left side, lasting from 8 A.M. till the next day, during a part of which she was delirious.

She had an attack in March, 1902, and again in August and November. Previous to the attacks of colic she noticed that she passed less urine than usual, and after the attacks there was always an increased quantity for twenty-four hours.

During the attacks the pain extended downwards into the bladder, but was never referred to any other location than the urinary tract. Nausea always followed the attacks. She usually had a time of "not feeling just right" for an hour or so before the colic began.

Following the attack of December, 1901, she had some hematuria. At time of examination, January, 1903, her urine was 1002, clear, and showed almost no sediment with the centrifuge, but there were a few epithelial cells and some red and white blood corpuscles. There was decided tenderness along the line of the left ureter, from the left of the umbilicus down. Vaginal and rectal examinations showed nothing abnormal except marked tenderness at en-

trance of left ureter into the bladder. An attempt was made to catheterize the ureters without anesthesia, but the posterior wall of the bladder was held back so that the orifices of the ureters could not be made out, even with knee-chest position. An x-ray examination was suggested, but refused by the patient. Provisional diagnosis—intermittent obstruction of the ureter probably due to stone. Operation Jan. 14, 1903. Dr. H. M. Chase assisting.

Incision posterior to border of external oblique. Kidney exposed—normal color and about double normal size. Walls of pelvis and of ureter decidedly thickened. No stone or other obstruction found within reach of hand.

The skin incision was continued downwards along the line of ureter and a second opening through the muscles made by separating their fibers over the point where the ureter crosses the iliac artery. The ureter was lifted up with the peritoneum, but quickly isolated by means of intermittent traction on the kidney through the upper opening.

Following the ureter from the upper to the lower incision the fingers met without discovering anything abnormal. Following the ureter into the pelvis, a nodule was felt an inch below the point of crossing the iliac artery.

After considerable manipulation the nodule was pushed up and followed along the ureter into the pelvis of the kidney, from which it was removed through a small incision. It was intended to pass a catheter through the pyelotomy wound into the bladder, but the ureteral catheters had been boiled, and it did not seem advisable to pass such ragged instruments, so the ureter was followed down with the fingers to its insertion in the bladder wall and no further obstruction was found. The pyelotomy wound was closed with a catgut suture. The lower abdominal incision was closed up solidly, and a wick of gauze was left in through the upper incision for drainage. The stone measures 1 cm. long, 8 mm. wide and 5 mm. thick. It is very rough and shows a groove on one flattened surface.

Seven hours after operation she was catheterized and four and a half ounces of smoky urine, with a large trace of albumen, was withdrawn.

Her convalescence was uneventful, except that on the 21st day she had a sharp attack of colic which lasted for about two hours and following this there was again a passage of smoky urine. No crystal was seen at this or any subsequent time. Her urine has been examined at least once a month up to July, 1903, and has shown neither blood or albumen since Feb. 22d.

In spite of the rarity of these conditions there is already a considerable literature on the subject. An article by Dr. Benjamin R. Schenck, in Vol. X of the Johns Hopkins Hospital Reports, closes with a very accurate table of 101 cases, nearly all of which have been verified from the original reports. To this list I have been able to add thirty-three cases, which appear in a table at the end of this article.

One very striking thing in connection with the detailed history of these cases is that a large proportion of patients had been previously operated upon for some other condition. In at least four cases gallstones were removed, in two cases operation was performed for extra-uterine pregnancy, in one case a varicocele was operated on, in several cases appendices were removed, but the most frequent previous operation was ovariectomy. Probably very few of these were operations for mistaken diagnosis, as abnormalities undoubtedly existed in the organs previously approached, and yet this suggests the difficulty of diag-

nosis between the symptoms produced by an impacted ureteral calculus and certain other pelvic and abdominal conditions.

Seventy-four of these cases were females and fifty-eight males, the sex not being stated in two cases.

SYMPTOMS.

The suffering and shock from an attack of colic may be sufficient to produce vomiting, fainting, delirium, temporary paralysis of the intestines, and be followed by very great physical prostration, or it may be described as a discomfort or heavy sensation in the side. The pain is felt in the loin, in the pelvis, in the urethra, in the testicles, and, in one case, was referred to the inner side of the thigh.

Between the attacks there is usually a period of freedom from pain, which may last for a few hours or for months. The pain seems to come on when the urine is dammed up behind the stone, or when the calculus is moving from one location to another. Preceding the attack there is sometimes a period of discomfort, with a diminished excretion of urine, which the patient learns to recognize as a warning. Following the attack a polyuria amounting to some pints within a few hours may appear. These symptoms of an intermittent hydronephrosis are reported in many of the cases. There is nothing about the pain which in a single attack will surely differentiate it from some other abdominal conditions, but the history of repeated attacks of the same or similar character makes the pain and its location valuable aids to diagnosis.

Another symptom is the presence of blood in the urine. Tuffier¹ considers that red blood corpuscles in the urine after physical exertion, and a history of recurrent attacks of colic, make sufficient evidence on which to base a diagnosis of stone above the bladder. This condition of recurring pain with slight hematuria may persist for years without causing further symptoms. In one case the attacks of pain extended over a period of thirty years, but it is unlikely that a stone of sufficient size to produce real obstruction can remain so long without causing damage to the urinary tract above its location.

Most of the writers on this subject agree that the symptoms of stone in the ureter are not often to be distinguished from those of stone in the kidney. This seems to be especially true where the stone is located above the brim of the pelvis. With the stone located below this point, the pain is more apt to be referred to the bladder—sometimes to the testicle in the male and sometimes to the urethra in either sex.

LOCATION.

The location of these stones in the ureter has been in a general way in one of three places which correspond to the points of narrowing described by recent writers on the anatomy of the ureter.

The first point of narrowing is about 7 cm.

¹ Tuffier: *Appareil Urinaire*. Duplay et Reclus; *Traité de Chirurgie*. 1899.

down, the second just above or below the brim of the pelvis and the third as the ureter enters the bladder wall.

Henry Morris² and Byron Robinson³ practically agree in giving the diameters of these three points of narrowing; the first being about 3.2 mm., the second 4 mm. and the third about 2½ mm.

The number of stones in this series of 134 cases caught in the different locations corresponds very nicely to these diameters—35 being caught in the first isthmus, 18 in the second and 73 in the third. In the other cases the location is not definitely given.

DIAGNOSIS.

Guyon,⁴ in a recent article, insists on the great importance of the recurring pain located on one side of the genito-urinary apparatus, coming on with a sort of aura for some hours before the real pain begins, and the hematuria, which is greater after exercise and less after rest. He is certain that neither the kidney nor the ureter is sensitive to the presence of smooth concretions which do not obstruct the flow of urine, and that some such concretions do reach the bladder without causing pain enough to be noticed.

Abdominal palpation seldom gives information beyond localizing the tenderness on one side along the course of the ureter. In one case only has the stone been felt through the abdominal wall, and this in a very thin subject.

The presence of a tense or fluctuating tumor from hydro- or pyelo-nephrosis or hydro-ureter indicates an obstruction of some sort below such tumor which may or may not be stone.

Morris states that a calculus within two and a half inches of the bladder may be felt through the vagina, and through the rectum if within one and a half inches. Sometimes if a stone cannot be felt through the vagina or rectum, the presence of tenderness in the lower part of the ureter is of value, as indicating some trouble in the ureter higher up.

A stone may be felt in any part of the ureter after opening the abdominal cavity, and the diagnosis has been made in this way in fourteen cases.

The cystoscope gives information of value where the stone is impacted in the bladder wall or projecting into the bladder. When it is higher up, the ureteral orifice may be seen to be reddened and itself projecting into the bladder. In two cases the absence of the urinary jet from one ureter has led to the diagnosis of complete calculous obstruction.

The waxed bougie described and used by Kelley⁵ of Baltimore may be of value, but has been little used in these cases. Guyon thinks the results of its use are dependent on too many conditions, and considers the sensation conveyed

² Morris: *Calculus in the Ureter*. *Lancet*, Dec. 10, 1899; *Surgical Diseases of the Kidney and Ureter*.

³ Robinson: *Annals of Surgery*. December, 1902.

⁴ Guyon: *Am. des Maladies des Org. Gen. Urinaire*. July 15, 1903.

⁵ Kelley: *Journ. of the Am. Med. Assn.* May 11, 1901.

to the fingers through a gum elastic catheter to be more trustworthy.

Without doubt the x-ray is a most valuable aid to diagnosis. It gave a shadow in fifteen of these cases, and no shadow in one. Noble⁶ reports a case in which two negatives, taken by an expert at an interval of some days, showed a distinct shadow in the pelvis and in which no stone was felt at operation.

Kreissl⁷ reports a case with the symptoms of calculus in the ureter and a shadow on the x-ray negative, in which the ureteral catheter from the bladder and a bougie passed downwards from the kidney, failed to discover any obstruction.

Examination of the urines from the two kidneys separately should give useful information in many cases, but the mechanical damage produced by the instrument or some other lesion in the supposedly healthy kidney may confuse the observer.

With all these aids to diagnosis, the fact remains that recurring attacks of colic referred always to the same side and with pain radiating downwards along the genito-urinary tract accompanied by hematuria, with usually a diminished quantity of urine before and during the attack and an increased quantity after the attack, are the most reliable indications of a stone impacted somewhere between the kidney and the bladder.

The exact location of a stone can often be determined by some of the methods given before operation, and if the stones were invariably single they would be very satisfactory, but it does not seem from the history of these cases, nearly 12% of which had more than one calculus, that we are justified in closing a wound made for the purpose of extracting a stone, without complete exploration of the pelvis of the kidney and the ureter by passing a full-sized ureteral bougie, or by external palpation of the ureter, or both.

NATURAL HISTORY.

Before considering the treatment of this condition it is worth while to consider what may happen without treatment. A calculus may pass into the bladder after some time, and may pass out through the urethra, or remain in the bladder to serve as a nucleus for a larger vesical stone. It is impossible to tell in what proportion of cases this occurs.

If the calculus remain in the ureter it may produce a hydronephrosis. Morris says that in 32 cases of hydronephrosis collected by Sir William Roberts a calculus was found in the ureter in 11, and in three more he considered the condition due to a calculus, although none was found. In five cases it was due to a stricture in the region of the vesical end.

The theory, advanced some time ago, that many cases of stricture of the ureter are due to the irritation produced by a previously impacted calculus, is interesting in this connection.

⁶ Noble: *Am. Med.* Sept. 27, 1902.

⁷ Kreissl: *Medical Brief*, St. Louis. July, 1903.

In another series of 18 cases of hydronephrosis, referred to by Morris, a calculus was found in the ureter in 11. Israel,⁸ after detailing some experiments and some operative accidents, says that "clinically and experimentally a complete closure of the ureter will not produce a hydronephrosis, but a partial obstruction lasting for a long time will produce this condition."

Another result of the presence of a calculus in the ureter may be an acute pyelitis or pyelonephrosis. I have found no statistics bearing on this point, but at least 15 of these cases were operated upon for one or the other of these conditions.

The third and perhaps most serious result of letting nature take its course is complete cessation of the functions of both kidneys. Morris, in a collection of 47 cases of anuria with stone in the ureter, reports their location as follows:

Upper end of ureter	30
About middle	7
Lower end	10

He reports 9 others in which the stone was in the pelvis of the kidney.

He quotes Legueu's collection of 23 cases of anuria due to calculous obstruction of the ureter. The location of the calculus as found at autopsy was as follows:

Calculus at upper extremity of ureter	13
Calculus at some intermediate point	4
Calculus at the vesical end	6

He found 7 more with calculus in the pelvis of the kidney.

In the 21 cases of anuria which appear in the combined list of Schenck and myself, the stone was found

High up in	11 cases
About the pelvic brim in	3 cases
Low down in	4 cases
Not stated in	3 cases

These figures would indicate that the danger of anuria decreases after the calculus passes the first constriction and increases again slightly after the calculus reaches the vesical end.

Another possible result is the breaking through of the calculus into the abdominal cavity, or the retroperitoneal space, resulting, in the first case, in a general peritonitis, and, in the second case, in a retroperitoneal abscess. Two cases of the latter condition are reported.

These serious results which have occurred without surgical interference indicate that a calculus in the ureter can produce more disastrous consequences than even the frightful attacks of pain and periodic disability.

MORTALITY AFTER OPERATION.

Of these 134 cases of calculus in the ureter, 12 were relieved by proceedings which did not involve a cutting operation. The calculus was discharged through the urethra naturally or was extracted with forceps, or broken up with a lithotrite, after being pushed out of the orifice of the ureter.

⁸ Israel: *Chirurgische Klinik der Nierenkrankheiten*.

⁹ Freyer: *Lancet*. Aug. 29, 1903.

Of the 122 cases upon which a cutting operation was performed, 98 recovered and 23 died,—in one the result is not given,—and it has seemed interesting to ascertain the conditions preceding death in the fatal cases.

Eight were operated upon while suffering from total anuria and 3 from partial anuria, making a mortality of 11 deaths in 21 cases, or 52% operated upon for anuria.

Seven out of the 15 cases which were distinctly stated to be suffering from fever and pus in the urine at the time of operation died, making an apparent mortality of 47% in cases operated upon for pyelitis or pyelonephrosis. Probably there were more than 15 cases, but I have included only the cases in which these facts were distinctly stated.

In the 19th case the bladder was opened above the pubes and the ureteral orifice slit, opening into the general peritoneal cavity. "The patient became maniacal, passed no urine on the 12th day, died on the 13th; never had any fever, but extremely rapid pulse."

The 20th case died of uremia, and an autopsy showed a cystic degeneration of both kidneys.

The 21st case was under chloroform anesthesia nearly two hours, and showed fatty degenerated heart muscle at autopsy.

The 22d case had two hours' chloroform and ether anesthesia, and also showed fatty degenerated heart muscle at autopsy.

In the 23d case the cause and time of death are not stated. Of these 23 deaths a large proportion was unavoidable, whether the patient were operated upon or not. If we subtract the 21 cases of anuria and the 15 cases of pyelonephrosis or pyelitis, we have left 85 cases operated upon for stone in the ureter, apparently without grave complications, and in which the results are stated. In these 85 cases there were 5 deaths, giving a mortality of a little less than 6%. Even this mortality rate is higher than it will be in the future, as diagnosis will be made and operation performed before secondary changes have taken place in the kidneys and in the general system.

OPERATION.

As to the choice of operation, there are several things to consider. The transperitoneal route gives access to all parts of the ureter; it does not give opportunity for complete examination of the kidney or renal pelvis, and it does open the abdominal cavity to an extra source of infection. It has been but little used, and is partially responsible for one death. Only one writer argues in favor of this route, but neither his argument nor his figures are convincing.

On the other hand, the kidney and the whole extent of the ureter, including that portion which is in contact with the bladder, are quite as accessible extra-peritoneally as through the abdominal route.

According to the figures of these 134 cases, we may expect to find the stone within an inch of one of three definite points, but we ought not

only to make sure of the removal of one stone, but to demonstrate the absence of others which might cause trouble later.

If a patient is sick enough to call for operation, and especially if operation is decided upon during the earlier attacks of colic, it seems to me that the kidney and its pelvis should be thoroughly explored, and the same incision which exposes them makes the first point of narrowing in the ureter accessible. If nothing abnormal be found through this incision, a full-sized ureteral bougie should be passed into the bladder. If obstruction be found, or if it seems desirable to follow the ureter down with the fingers, the incision may be extended as advocated by Israel, Morris and others, forward and downward to the outer border of the rectus muscle two inches above the pubes, and this incision may be carried straight through all the muscular layers down to the peritoneal fat in which the ureter lies. This cut is from twelve to twenty inches long, and crosses the upper half of the external oblique and upper two-thirds of the internal oblique and transversalis at right angles to their fibers. It must weaken the wall, and in one case at least has resulted in a hernia.

The other method is to make a new incision entirely separate from the one which exposes the kidney. This incision should correspond to the lower end of the long cut before described, and the center of the incision should come over the point where the ureter crosses the iliac artery.

After going through the skin the muscular layers can be separated by dissection between their fibers, and the ureter can be identified by gently twitching it from above. Once found, it is easily separated from the peritoneum, and the fingers passed through the upper incision can meet the fingers passed in through the lower. The ureter can now be traced along the wall of the pelvis and down to the point where it enters the bladder wall.

Some writers advise pushing the stone down into the bladder, but the small size of this constriction as compared with the upper isthmus makes this suggestion difficult if not dangerous to carry out unless the orifice be already dilated. There is so little danger in taking the calculus through the ureteral wall that it seems wiser to remove it directly, with as little manipulation as possible, provided it cannot be easily pushed up to the most accessible point.

Extra-peritoneal ureterotomy has been done 34 times, with five deaths. Three of the five were suffering from anuria when operated; one showed cystic kidneys at autopsy; and the fifth had a dilated and fatty heart.

CONCLUSIONS.

Intermittent pain on one side, with varying amounts of red blood in the urine, are constant symptoms of stone in the ureter.

Though the best means of locating stones, the x-ray cannot yet give evidence *sufficient in itself*

to warrant us in operating or refusing to operate on certain cases.

If a calculus starts from kidney to bladder, it is likely to catch within an inch of one of three places, all of which are accessible to the surgeon through extra-peritoneal openings.

A single calculus is the rule, but the exception occurs, according to these cases, about once in eight times.

The opening in the ureter or kidney pelvis for removal of the calculus should be sutured if

possible. Both sorts of suture materials have been used with equally good results, and wounds in both locations apparently heal equally well. The recovery is only delayed if sutures are not used.

A calculus in the ureter is a menace not only to health but to life, and its removal is an operation of low mortality, provided it is undertaken before secondary changes appear in the kidneys.

¹⁰ Young: *Am. Med.*, Aug. 9, 1902; *Annals of Surgery*, May, 1903.

¹¹ Cabot: *Annals of Surgery*, October, 1903.

	Sex and Age.	CHIEF SYMPTOMS.	Situation—How Recognized.	Character of Stone.	OPERATION.	RESULT.
Louveau. <i>Ann. des Maladies Genito-Urinaire</i> , p. 1165, Aug. 1, 1903.	Male 64	Previous attack colic, ending in passing stones. Hard tumor in left flank appeared after left-sided colic.	Cavity filled with 5 liters yellow colorless fluid, was found communicating with a tear in renal pelvis. Ureter catheter showed a calculus low down.		Lumbar incision. Nephrectomy, ureterectomy.	Recovery
Brewer. <i>Annals of Surgery</i> , 1902, vol. xxxvi, p. 780.	Male 12	Pain in right side every two or three months, often with fever—seldom vomiting.	Tumor in right flank. No disease found by urinary examination.	3 months later stone was removed from prostatic urethra.	Nephrectomy with ureterectomy to brim.	Recovery
Deaver. <i>Annals of Surgery</i> , 1902, vol. xxxvi, p. 94.	Male 65	Severe abdominal cramp one week before. Severe pain in right flank, testicles and pelvis, with two days of anuria.	Tenderness in region of right kidney.	Stone near bladder found at autopsy.	Lumbar nephrotomy. Drain left in kidney.	Death in 3 days from uremia.
Ferguson. <i>J. Am. Med. Ass'n</i> , July 5, 1903.	Male 8	Anuria, renal pain on left side 35 days after right nephrectomy.	X ray shadow 2 inches down.	Stone later removed from bladder and urethra.	Nephrotomy, stone pushed up.	Recovery
Boldt. <i>Am. Jour. Obstet. and Dis. of Women</i> , Dec., 1903.	Female	20 years of ill-health with intermittent pain. Tumor in left flank.	Cystoscope did not show urine coming from left ureter. Calculus in upper portion.	Stone impacted, causing complete obstruction.	Nephrotomy, stone pushed up.	Not stated.
Suarez de Mendoza. Reported by Bazy, <i>Ann. des Maladies des Org. Gen. Urin.</i> , May, 1903, No. ix, p. 673.	Female 58	Nephritic colic every 3 or 4 months for 7 years, right side. Four attacks of colic on left side, with diminished urine. Complete anuria 11 days.	Upper end; multiple; slight tenderness over normal-sized left kidney; right enlarged and tender.	23 mm. long, and size of last phalanx of little finger.	Nephrotomy. Right kidney sutured without drain.	Recovery
Tufter. <i>Semaine Med.</i> , Aug. 9, 1899, p. 265.	Female 36	Renal colic, right side; loss of flesh; red and white corpuscles in urine.	Low down.		Nephrotomy. Calculus pushed into bladder by catheter.	Recovery
Jacobs. <i>Ann. de Gyn. et d'Obstetrique</i> , Feb., 1903.	Female 44	Crisis of pain in left pelvis sharply localized. Each attack followed by 3 or 4 months purulent urine. After attack urine became clear. Pain had existed in left pelvis over 30 years.	Hard tumor felt high up in left pelvis.	Calculus of urates and phosphates, situated 3.9 cm. below pelvic brim, 7½ cm. long, 4 cm. thick and 3½ cm. wide. Weight 44 gm.	Transperitoneal ureterotomy. Suture.	Recovery
Mannierre. <i>Chilcago Med. Recorder</i> , March, 1899.	Female 50	Pain in right side 8-10 years. Pus and blood in urine. Mass felt in region of kidney.	Two previous operations for renal calculus and persistent fistula. Below brim.		Extra peritoneal ureterectomy, low.	Recovery
Hawkes. <i>Annals of Surgery</i> , 1902, vol. xxxv, p. 519.	Female 33	Pain and hematuria 3 years before, followed by passage of small calculus. Six months later symptoms were supposed to be due to chronic nephritis. Pus and alb. in urine.	Tenderness in lower abdomen. Mass felt per vaginam posterior and to right of uterus.	Stone found near bladder by laparotomy. Weight 158 gr., 2½ in. long.	Extra peritoneal ureterotomy. Drained from loin.	Recovery
Freyer. <i>Lancet</i> , Aug. 29, 1903, p. 585.	Male 28	Hematuria, with recurring renal colic for 14 months, left side.	2 inches below kidney.	Size of date-stone.	Ureterotomy. No suture.	Recovery
Elliot.	Female 30	Renal colic, followed by hematuria next day.	Resistance—tenderness in right flank. X-ray shadow.	Stone 9x7x4 mm.	Lumbar ureterotomy. Stone felt 2 in. down. Ureter dilated above.	Death 8th day from uremia. Both kidneys cystic.
Noble. <i>American Medicine</i> , Sept. 27, 1902.	Male 35	Colic 2 years; blood in urine; pain in left kidney, testicle, bladder.	Below pelvic brim. X-ray shadow.		Iliac ureterotomy. Suture.	Recovery
Freyer. <i>Lancet</i> , Aug. 29, 1903, p. 585.	Female 18	Left renal colic with hematuria 18 months.	Para vesical; felt per vaginam.		Iliac ureterotomy. Silk suture.	Recovery
Young. <i>Annals of Surgery</i> , 1903, vol. xxxvii, No. 5, p. 704.	Male 25	Dull ache with times of acute colic, always on right side, for five years. Previous passage of calculus.	No tenderness; no tumor; loss urea from right kidney; obstruction to ureteral catheter; x-ray shadow.	Stone 8x4 mm., pushed up from juxta vesical to iliac portion.	Iliac ureterotomy. Suture.	Recovery

	Sex and Age.	CHIEF SYMPTOMS.	Situation—How Recognized.	Character of Stone.	OPERATION.	RESULT.
Legueu. Bull. et Memoirs de la Soc. de Chirurgie de Paris, 1902, vol. xxviii, p. 1132.	Female 37	Intermittent colic for 7 years with hematuria. Urine clear in the intervals. Left kidney and lower ureter tender.	Lumbar nephrectomy. Stone felt in pelvic part of ureter.		15 days later iliac ureterotomy. Stone close to bladder.	Recovery
Tenney.	Female 36	Recurring pain, recognized as renal colic, for 2 years. 10 years previously double ovariectomy.	Microscopic blood in urine, tenderness over lower end of ureter. Intermittent hydro-nephrosis.	Stone just below pelvic brim on left side. Stone rough, 10x8x5 mm.	Lumbar and iliac incisions. Stone pushed up and removed through pelvis of kidney. Suture.	Recovery
Stimson. Annals of Surgery, 1902, vol. xxxv, p. 518.	Female	Severe pain in lower part of abdomen.	Nodule felt in roof of vagina, apparently calculus in left ureter.	Small, slender stone, probably branched.	Suprapubic cystotomy and ureterotomy.	Recovery
Freyer. Lancet, Aug. 29, 1903, p. 585.	Male 43	Left renal colic, hematuria, frequent urination.	Cystoscope showed protrusion of left ureter.		Suprapubic cystotomy.	Recovery
Bishop. Edinburgh Med. Journal, 1899, I, p. 47.	Male 13	Vesical symptoms.	Projecting into bladder. Felt with stone searcher.		Suprapubic cystotomy.	Recovery
Newman. British Med. Jour., April 21, 1900.	Male 35	Colic for 3 years. Blood in urine.	Mass seen to project into the bladder. Cystoscope.		Suprapubic cystotomy.	Recovery
Newman. British Med. Jour., April 21, 1900.	Male 54	Pain in side and bladder. Blood in urine.	Mass projected into bladder. Cystoscope.		Suprapubic cystotomy.	Recovery
Le Fillatre. Ann. des Maladies des Organes Genito-Urinaires, Feb. 15, 1903, p. 313.	Male 50	Vesical symptoms, pain, hematuria, pyuria.	Vesical and urethral stone found with metallic sound. Both removed by suprapubic cut.	Two weeks later more pain, and a second suprapubic section found a calculus 3½ cm. long, 3¼ cm. wide.	Suprapubic cystotomy.	Recovery
Noble. American Medicine, Sept. 27, 1902.	Female 59	Frequent and painful urination for 9 years; blood and pus in urine.	Mass felt per vaginam near left ureteral orifice.		Suprapubic section ureteral orifice slit.	Recovery
Freyer. Lancet, Aug. 29, 1903.	Female 42	Left renal colic 2 weeks.	Felt per vaginam. Left ureteral orifice projecting.		Vaginal ureterotomy. No suture.	Recovery
Morris. Surg. Diseases of Kidney and Ureter, 1901, vol. II, p. 470.	Female 28		Two inches above orifice left ureter. Vaginal touch.	Size of hazelnut, ends faceted.	Para sacral incision.	Recovery
Morris. Surg. Diseases of Kidney and Ureter, 1901, vol. II, p. 470.	Female		Kidney and upper part of ureter previously removed for calculus disease.	Four calculi, each larger than dice.	Para sacral incision.	Recovery Died 4 months later probably from calculus disease of other kidney.
Willcox. N. A. Jour. Hom., July, p. 428.	Male 47	Left renal pain.	X-ray shadow 2 inches above bladder.	Abdominal exploration showed nothing.	Stone pushed into bladder after locating the ureter extra peritoneally	Recovery
Newman. British Med. Jour., Apr. 21, 1900.	Female 26	Pain on right, blood in urinary sediment.	Orifice right ureter, red and projecting into bladder. Cystoscope.		Dilatation ureteral orifice per urethram. Stone 1 in. up.	Recovery
Newman. British Med. Jour., Apr. 21, 1900.	Female 21	Pain in back intermittent, hydro-nephrosis left side.	Probably at pelvic brim.	Size of lentil.	Massage t. i. d. for 9 days. Calculus passed into bladder.	Recovery
Thompson.	Female 27	Pain in left side, paroxysmal in character for several months.	Blood and occasional pus in urine.	Size of beechnut.	Kidney and pelvis thoroughly explored; capsule slit; ureter not carefully examined. Stone passed 20 mos. later per urethram.	Recovery
Perkins. Denver Med. Times, 1902, p. 481.	Male 22		Mass about right kidney found by laparotomy.	Stone 7x½ in. passed later itself.	Lumbar nephrotomy. Stone passed after some weeks per urethram.	Recovery
Cabot. Ann. of Surgery, Oct., 1903, p. 603.	Male 57	15 years of intermittent pain in right lumbar region, extending to right groin—with blood in urine. 2 yrs. intermittent pain on left.	Probably low down. Had passed small stones. X-ray showed nothing. Anuria.	Three small stones, the largest crushed and evacuated later from bladder.	Lumbar nephrotomy, ureter stripped downwards; nothing found, but anuria was relieved and stones passed later.	Recovery