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STONE, TUBERCULOSIS OF THE KIDNEY, AND PERINEPHRIC ABSCESS¹

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STONE may exist in the kidney or ureter without infection, although it is probable that infection occurs sooner or later in the large majority of cases; and infection, tuberculous or septic, may and probably in the majority of cases, does occur without the presence of stone. Either of these factors may act as the causative agent of the other — pus, or blood clot, or bacteria may form the nucleus or furnish the colloid material for building up a stone; a stone, by wounding or irritating the tissues about it, may furnish the atrium of entrance or produce the locus minoris resistentiæ for pathogenic organisms.

Thus, we often get stone and suppuration together. Beyond what has been stated and the belief that the urinary salts are deposited in excess because there is a lack of balance between ingestion and assimilation, ingestion of too much nitrogenous food with too little exercise and imperfect oxidation of the nitrogenous products, little definite is known as to the etiology of calculus. Heredity seems to be important. It is claimed that sudden chilling of the body may cause precipitation of the solid material from a saturated urine in the renal tubuli, forming a calculus in the parenchyma; or, being washed farther on, it forms the nucleus of a stone in the pelvis of the kidney. According to the size of the particles, the precipitate is known as sand, gravel, or stone. The composition is uric acid, urates, calcium oxalate, calcium carbonate, ammoniomagnesium phosphate, and rarely cystin or xanthin.

Primary calculi are usually composed of uric acid and oxalate of calcium, one or both, and are found in acid urine; secondary calculi are composed of phosphate and carbonate of calcium and phosphate of magnesium, usually deposited on a nucleus composed of a primary stone or of mucus, pus, blood clot, hair, or other foreign matter, in alkaline urine.

Symptoms. The symptoms of stone in the

kidney are caused by infection, or the mechanical action of the stone; hence, if there is no infection, and if the stone is situated so as not to produce obstruction or laceration, there will be no symptoms. The most reliable symptoms are pain, renal colic, the presence of blood, pus, or gravel in the urine, and oliguria, or symptoms of suppression of urine. The pain is usually felt in the lumbar region of the affected side and may be aggravated by motion. It may extend along the ureter to the bladder, testicle, penis, thigh, foot, and may be referred to the sound kidney. Palpation or percussion over the kidney may cause pain. Often the first sign of calculus is an attack of renal colic caused by the stone blocking or traveling along the ureter, characterized by excruciating pain along the ureter, and often into the testicle and inner side of the thigh, frequent micturition with a little blood in the urine, vomiting, and sometimes chill and fever.

If the symptoms end suddenly, the stone has either dropped back into the kidney pelvis, or has completed its journey to the bladder; and careful examination of the urine should be made for two or three weeks, or the bladder may be cystoscoped for the stone.

If, instead of suddenly ceasing, the symptoms of renal colic merely subside to a subacute condition, it means impaction of the calculus in the ureter; and, if it continues beyond 24 hours there are likely to be fever, and pus may be formed in the urine. The point of impaction in the ureter may often be determined by the location of the greatest pain and tenderness. Statistics would indicate that the most frequent site of lodgment is the juxtavesical portion; next, the juxtapelvic; and last, the portion at the brim of the bony pelvis. Sometimes the ureter is so completely blocked by the calculus, that nothing passes through it to the bladder; then it is that cystoscopy and ureteral catheterization are of the greatest

¹ Read before the American Surgical Association, May 5, 1908.

value; also the use of the Roentgen-ray, especially when the symptoms have been referred to both kidneys.

The retention of the stone in the kidney leads to infection and to various destructive changes in the organ — most frequently, perhaps, to pyelitis or pyonephrosis — sometimes to hydronephrosis and to pyelonephritis. The symptoms of renal calculus in the absence of renal colic are pain in the lumbar region which varies in character and severity, often a dull, heavy ache which may be aggravated by stooping, bending, or jarring. There are frequent micturition, pyuria, tenderness on palpating the affected kidney, and sometimes an appreciable enlargement of the kidney. Casper and others use phloridzin and cryoscopy in order to test the functional activity of the kidneys and to compare one kidney with the other. Phloridzin injected under the skin, gram .01, produces diabetes which lasts about three hours. If one kidney is crippled by reason of a stone, tuberculosis, or other cause, the urine from that kidney shows a smaller amount of sugar than the urine from the healthy kidney. Also, on freezing the urine collected from the two kidneys separately, it is found that the urine from the crippled kidney contains less solid matter in solution and therefore freezes at a higher temperature (less degree of cold) than that from the healthy kidney.

If the disease last long, constitutional symptoms, fever, chills, and loss of flesh, come on.

TUBERCULOSIS OF THE KIDNEY

The consensus of opinion to-day is that tuberculosis of the kidney is, as a rule, of hæmatogenous origin and often unilateral, being primary in the kidney in about 15 per cent of cases (Watson, Tuffier, quoted by Walker), and secondary, in the majority of cases, to tuberculous foci in other parts of the body, as the bronchial and lumbar glands (Walker). Very rarely it is secondary to tuberculosis of the bladder. Sometimes the organ is invaded from an adjacent tuberculous vertebra.

It seems that injury of the kidney, as by blows or the presence of stone, and the various inflammations, including gonorrhœal, predispose to the occurrence of tuberculosis; the age during which most patients are affected is from

20 to 45, but the limits are from 3 months to 70 years; as to sex, women slightly predominate; and the right kidney suffers more frequently than the left. The ureter is said to be affected in 10 or 12 per cent of cases. The sound kidney is usually enlarged by hypertrophy. The tissues surrounding the kidney are not infrequently involved and perinephric abscess may result,

Symptoms. These may be frank or insidious, and may be divided into urinary, vesical, renal, and general.

Urinary symptoms. The first symptom is usually polyuria, which may last a month or so, with no change in the composition of the urine, except that it is low in specific gravity. Blood and pus soon appear — the former usually intermittent and in small quantity, requiring a microscope for its detection; at other times the quantity may be considerable.

Pus may be small in quantity but is usually found early and in abundance, often forming a large precipitate up to one-half the urine by volume. Crumbling caseous particles occur in the urine and in them tubercle bacilli are often found. Tubercle bacilli are found in the urine in 70 to 80 per cent of cases, if careful examination is made (Casper). The phloridzin and cryoscopy tests are valuable.

Vesical symptoms. Frequent and painful micturition is nearly always present, the frequency varying from every two or three hours to every ten or fifteen minutes, night and day, and the pain from a slight, uneasy sensation to one of severe burning and tenesmus. These symptoms are not due to tuberculous ulcers in the bladder, but simply to irritation from the tuberculous urine. The cystoscope shows injection of the bladder mucous membrane, and especially a red inflamed elevation around the mouth of the ureter on the affected side — occasionally tuberculous ulcers near the ureteral mouth.

Renal symptoms. Rarely no pain is felt in the region of the kidney. Usually there is pain of a dull, aching or sharp lancinating, character, intermittent or almost continuous, sometimes radiating to the groin, testicle, penis, or umbilicus, or even to the shoulder. In perhaps 30 per cent of cases, a mass can be felt and in the majority there is tenderness on deep

pressure — occasionally the thickened ureter can be recognized by palpation.

General symptoms. There are chills, fever, sweats, loss of flesh, vomiting, and uræmia. The fever is seldom noticed as an early symptom, later it is well marked, may be irregular, intermittent, moderate, high, and associated with chills or chilly sensations, and profuse sweats. The pulse corresponds. Anoræxia, indigestion, anæmia, and loss of flesh soon follow and a cachæxia is established. Uræmia usually means that both kidneys have been invaded.

The course of the disease varies, death may result within a few months or a year after its inception, or it may be much longer delayed, and the patient may have fairly good health for several years.

PERINEPHRIC ABSCESS

Perinephric abscess is the result of infection of the tissues immediately surrounding the kidney. Casper makes three divisions, namely, peri-, epi-, and para-nephritis — the first meaning inflammation of the fibrous capsule, the second that of the fatty capsule, and the third that of the retroperitoneal mass of fat behind the kidney. Usually it is not possible to differentiate between them, and the term perinephric abscess is used here to mean a collection of pus in the fat surrounding or adjacent to the kidney — so often of doubtful origin and difficult of explanation.

The abscess may be *primary*, as the result of traumatism or of hæmatogenous infection; but far more frequently, it is *secondary* to some infection of the kidney or other organ, such as the appendix, gall-bladder, spleen, lung, pleura, bones, prostate, bladder, or rectum. As it is sometimes impossible to discover any other primary focus, it is thought that infection may take place through the unbroken walls of the colon. The affection is more frequent in men and on the right side, but is occasionally bilateral. The abscess may be single or multiple, and the pus may be odorless, or it may have a fæcal or urinous odor. The abscess may be partly within and partly without the kidney, and is usually behind that organ, but may be above, below, or in front of it. The pus may burrow in any direction

— behind the peritoneum and break into the rectum, bladder, vagina, urethra, kidney, or ureter; it may follow the iliac vessels to Poupert's ligament, or pass through the sacrosciatic foramen and point in the gluteal region; it may break into the stomach, liver, intestine, pericardium, or peritoneal cavity; but the most common places for pointing are in the lumbar region (Pettit's triangle), and the pleural cavity (White and Martin).

DIFFERENTIAL DIAGNOSIS BETWEEN STONE IN THE KIDNEY, TUBERCULOSIS OF THE KIDNEY, AND PERINEPHRIC ABSCESS

	Stone in the Kidney.	Tuberculosis of the Kidney.	Perinephric Abscess.
Pain.	Dull, aching, burning, sharp, lancinating, intermittent. Renal colic common.	Dull, aching, more apt to be continuous. Renal colic rare.	Dull, aching, continuous. Renal colic rare.
Tenderness.	Usually present.	Well marked.	Well marked.
Mass or Tumor.	Seldom felt.	Often felt, defined and moveable with respiration.	Usually felt, irregular, not moving with respiration.
Hæmaturia.	Occurs early, intermittent, small quantity.	Occurs early, small quantity — may be large.	Not present.
Polyuria.	No.	In earliest stage.	No.
Pyuria.	Intermittent, may not be present.	Nearly always present in abundance.	Sometimes present.
Micturition.	Frequent.	Frequent.	Often not affected.
Cystoscopy and ureteral catheterization.	Perhaps pus or blood from ureter.	Pus from one or both ureters, ulceration of the bladder or cystitis.	May be negative, unless secondary to kidney disease, or abscess communicates with ureter. May follow either of the other diseases.

The Roentgen-ray may show a stone in the kidney; its negative evidence is not always reliable. The tuberculin test may establish the presence of tuberculosis.

Symptoms. Pain, tenderness, chill, fever, and a palpable mass are the chief symptoms. Pain is felt in the loin and is aggravated by pressure or motion, so that the muscles are contracted in such a way as to diminish pressure and prevent motion; thus the patient lies on his back with the thigh flexed and adducted, and the spine flexed with the cavity towards the affected side. Pain may be felt along the ureter, in the genitalia, the inner side of the thigh or the foot, and the latter may show œdema or swelling. The area of dullness in

the loin is increased and a tender, irregular, diffused mass, fixed and motionless on respiration, is felt. (Edema and fluctuation may be present. The urine may contain pus when the kidney is sound, if the abscess communicates with the ureter. (See case 2.)

Other symptoms may be sweating, vomiting, anoræxia, and leucocytosis.

Treatment. A stone in the kidney should be removed as soon as possible, whether or not it is causing trouble, as trouble would inevitably occur in time and the safest time for removal is before infection or inflammation sets in. A stone impacted in the ureter should be removed, after a reasonable delay to see if it is able to reach the bladder. Reasonable delay cannot be exactly given in time, as it depends on the symptoms and circumstances. As a rule, 48 hours is long enough to wait, but sometimes it may be advisable to wait a week. The longer the delay, the greater the danger of damage to the kidney and ureter. To prevent the recurrence of stone in the kidney after operation, is a great desideratum.

The use of the drainage tube, until all infection has disappeared, is important. The diet and habits of the patient should be regulated in order to get the proper adjustment between ingestion and assimilation. Alkaline salts, lithium citrate and acetate, for uric acid stone, and oxalic acid for phosphate stones, are used.

The question often comes up as to the propriety of removing a kidney which has continued to reproduce calculi. This should not be done as long as there is any hope of saving the kidney. In cases where the kidney has been destroyed and only a pus sac remains, and in pyelonephritis with multiple abscesses and continued suppuration in spite of treatment, nephrectomy is advisable.

Tuberculosis of the kidney, if recognized when it is limited to one kidney, should be treated by nephrectomy. If the ureter is affected, it should be removed with the kidney. The best incision for nephrectomy is the Morris incision, passing obliquely downward and forward between the last rib and crest of the ilium. It may be continued on to a point just above the external abdominal ring when it is necessary to expose the ureter as far as, and part way into, the pelvis. For calculi impacted in the

vesical portion of the ureter, the mouth of the ureter may be dilated or cut from within the bladder, through speculum, or cystoscope, or suprapubic section. Stone in the juxtavesical portion of the ureter in the female may be removed through the vagina, or in the male by an incision through the posterior part of the ischio-rectal fossa (Rigby, *Annals of Surgery*, November, 1907).

If both kidneys are tuberculous and suppurating, nephrostomy and free drainage should be provided. Proper hygienic and climatic treatment, are of course, essential.

Perinephric abscess should be treated by incision and drainage as soon as possible, and the origin should be ascertained and treated appropriately.

Below are reported a few selected cases, illustrative of the conditions discussed.

1. Patent Urachus — Stones in Both Kidneys — Four Operations within Two Years and a Half.

This was a healthy looking man, 40 years old, who was operated on, June 25, 1904, for patent urachus, the urachus being dissected out down to the bladder. About six years previous to this operation, the patient began to have attacks suggesting stone in the right kidney; and, a little later, pain began to occur in the left kidney. He had several attacks of severe pain in the region of the kidneys — sometimes renal colic. Two months after recovery from the operation on the urachus, he was taken with severe pain in the right loin, extending along the course of the ureter, bloody purulent urine, chill, vomiting, delirium, pulse 120 to 140, temperature 104, face and feet slightly swollen.

The right kidney was exposed and opened from its convex border to the pelvis, evacuating urine and pus and removing a round, smooth, dark-brown calculus about 13 m.m. in diameter. (See fig. 1.) The kidney pelvis was considerably dilated, evidently from obstruction by the stone, but no abscesses in the parenchyma were found. A rubber tube for drainage was fastened in the kidney. Recovery in one month, and no further trouble until February, 1905, when he had an attack of renal colic on the left side and passed several small calculi. A month later he had a similar attack with chill, fever (106), oliguria, and delirium, from which he soon recovered. Examination in April, about a month after this attack, showed hardness and tenderness in the region of the left kidney; and operation was recommended and performed, May 1, 1905, using the oblique incision and removing the 12th rib, as it was in the way. (See fig. 4.) Before opening the kidney, two stones could be felt in the lower part of the organ. Incision through the convex border to the pelvis was made and the two stones removed from two separate calices or infundibula. (See figure 2.) Other small fragments were felt and one was removed; and the parts irrigated with salt solution

STONES FROM KIDNEYS OF A. WILLIAMS



13.5 mm.

Fig. 1.

Stone removed from right kidney, August 21, 1904.



15 mm.



12 mm.

Fig. 2.

Stones from left kidney, May 1, 1905.



25 mm.



20 mm.



12 mm.



8.5 mm.



9 mm.



5.33 mm.



3.5 mm.

Fig. 3.

Stones from left kidney, December 6, 1906.



Fig. 4.

Bone in box.

in the hope of washing the fragments out. There was no obstruction at that time, the kidney was about normal in size, but much congested and no pus or urine was found. The wound in the kidney was closed with catgut around a rubber drainage tube. The tube was worn about 4 weeks and recovery seemed complete in 6 weeks, the patient regaining his appetite, weight, and general feeling of comfort. There was no further trouble for a year, when in June, 1906, he was taken with pain in the left hip and loin, chills, fever — these symptoms lasting some time — no typical attack of renal colic. Four months later, the symptoms returned with considerable pyuria and, December 6, 1906, the left kidney was again operated on. The abscess in the kidney had just reached the surface by a small opening in the lumbar region. The kidney was exposed at a depth of 3 inches from the skin, opened and fully 500 c.c. of thick, creamy pus evacuated. The pelvis and calices were much dilated and a large coral calculus was removed in fragments. (See figure 4.) Strong adhesions existed everywhere. The cavity was irrigated with salt solution and two rubber tubes were sewed in place. The patient recovered with his usual promptness, and by the end of January, 1907, had gained 20 pounds in weight and seemed in perfect health. There has been no further trouble up to this time, 16 months after the last operation.

Remarks. The number of operations in a short space of time is unusual, and the promptness and facility with which the patient recovered from every operation remarkable. The history may be summed up thus:

First operation, June, 1904 — excision of patent urachus.

Second operation, August, 1904 — stone removed from right kidney.

Third operation, May, 1905 — 2 stones removed from left kidney.

Fourth operation, December, 1906 — coral stone removed from left kidney.

It is probable that the urachus became infected through the bladder from the kidneys, and it was this leakage of foul-smelling urine and pus from his navel that induced the patient to have the urachus excised. The right kidney seems to have been first affected with stone. At the operation only one stone was found, it was removed and this kidney has given rise to no further symptoms for nearly 4 years. On the other hand, the left kidney when first operated on contained some fragments and it is not certain that all were removed. This may account for the recurrence of stone and pus, requiring a second operation on the left kidney in about 18 months after the first.

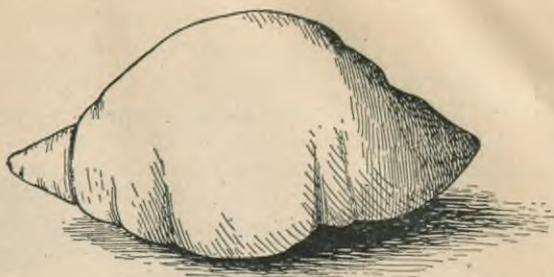


Fig. 5. Stone from right ureter bladder end of Mrs. Shultz, November 4, 1907. Weight, 915 grains; length, $2\frac{1}{2}$ inches; circumference, $4\frac{1}{2}$ inches.

2. *Enormous Stone in the Juxtavesical Portion of the Right Ureter — a Small Stone in the Vesical Portion — a Large Perinephric Abscess Draining into the Ureter.*

A woman, 33 years old, was referred to me by Dr. S. L. Owens, and was admitted to Georgetown University Hospital with the following history: Three years before she had been operated on for stone in the right ureter by a median abdominal incision and made a good recovery. Had articular rheumatism, January, 1907, affecting knees, ankles, and tarsal joints, and lasting about a month. Her present trouble began about a month ago with an attack of renal colic on the right side. At first, the pain was sharp and intermittent. After a few days, it became continuous, less severe, but with exacerbations, requiring morphine frequently. These symptoms, with frequent urination, chills, fever, and blood and pus in the urine, have continued to the present time.

Examination shows rigidity of muscles and tenderness over the right side of the abdomen. By vagina a hard mass, about as large as a hen's egg, could be felt anterior and to the right of the cervix uteri, and was thought to be a stone in the ureter or just outside of the ureter. An incision was made in the vagina and a large stone removed from the ureter. (See figure 5.)

The removal of the stone was followed by the discharge of a quantity of foul-smelling pus and urine. The ureter was much dilated and admitted the passage of a large bougie, No. 20, as far as the brim of the pelvis. There was free discharge of urine and pus, and the patient did well for a week, when pain in the region of the right kidney became troublesome — a continual, dull, aching pain, and the temperature and pulse rose again. The urine from the bladder was clear — that from the ureterovaginal fistula contained pus in abundance. Pyelitis or pyelonephritis was thought to exist, with obstruction of the lower end of the ureter, and it was decided to open the kidney and explore the ureter. A sound, passed into the bladder, readily detected a stone in the mouth of the right ureter. This was removed by passing the little finger of one hand into the bladder, through the urethra, and two fingers of the other hand into the vagina. By this means the little stone was worked into the bladder and then out through the urethra. The stone is represented



Fig. 6. Tuberculous kidney.

in figure 5 as the sharp-pointed fragment attached to one end of the large stone. An oblique incision was then made to expose the kidney, when a large abscess, capacity about 750 c.c., was opened. The abscess was situated above and behind the kidney, and the latter had been displaced downward until its upper pole corresponded with the middle of the space between the last rib and the crest of the ilium. No communication could be found with the kidney, and the kidney looked and felt normal, but it was opened by an incision through its convex border into the pelvis and the finger was inserted into the pelvis. Nothing abnormal was found. The wound in the kidney was closed without drainage and the muscles and skin were closed, leaving room for drainage of the abscess by tube and gauze. Recovery was rapid and in four weeks the patient was discharged well, except for a slight leak from the uretero-vaginal fistula which soon closed spontaneously.

Remarks. The interesting features about this case were: 1. The enormous size of the calculus, weighing 61 grams (915 grains), measuring 7 c.m. ($2\frac{3}{4}$ in.) in length and 11.5 c.m. ($4\frac{1}{2}$ in.) in circumference. It was whitish in color and irregularly spindle-shaped; 2. The occurrence of a large perinephric abscess, communicating at some point with the ureter, but



Fig. 7. Tuberculous kidney and ureter.

apparently having no communication with the kidney. The abscess probably originated from the kidney while occupied by the stone without leaving any macroscopic evidence of the fact, and as it grew in size finally ruptured into the ureter behind the calculus.

3. *Pyelonephritis of the Left Kidney with Calculi and Pyelitis of the Right Kidney — Probably of Gonorrhœal Origin — Removal of the Left Kidney and Ureter — Later Operation on and Drainage of the Right Kidney.*

A man, aged 26 years, gave a history of gonorrhœal urethritis 4 years before and had continued to discharge pus from the urethra ever since. Pain in the region of the left kidney had been almost continuous, with occasional pain in the right side. He had been treated by internal medication and vesical irrigation, but the pus continued to flow and his health to decline. Chills and fever have been frequent and micturition averages once an hour, day and night. Patient had lost about one-third of his normal weight and was thin and sallow. Pulse 80 to 94, temperature 98.4 to 99.4. Thickening and tenderness were detected in the left loin. No gonococci or tubercle bacilli were found in the urine.

The left kidney was exposed by an oblique incision, and was found converted into a multilocular pus sac, the parenchyma having been destroyed, containing some pus and about a teaspoonful of gravel and small calculi. The ureter was thickened and dilated its entire length, its lumen admitting the index finger.

The kidney was removed and the ureter to within 2 or 3 inches of the bladder, making a second incision in front from near the crest of the ilium, inward and downward to a point just above the internal abdominal ring. The stump of the ureter was stitched to the skin in the inguinal region. Much improvement followed this operation, but urine continued to flow through the stump of the ureter, when in March, 1906, about 18 months later, it was decided to open and drain the right kidney. This was done and a suppurative pyelitis was found. The kidney was opened from convex border to pelvis, and then sewed up around a rubber drainage tube, which was left in place one month and a half, when the urine was nearly all passing to the bladder. The fistula left by the tube soon healed and that from the ureteral stump healed a few months later, the patient gained his normal weight and returned to his work six years from the beginning of his disease, and after two years continuous stay in hospital. When seen recently, the patient was in fair health, up to his normal weight, attending to his business but was still passing some pus with his urine and the ureteral fistula had opened again.

4. *Tuberculosis of the Right Kidney and Ureter — Nephro-Ureterectomy — Death.*

A woman, 28 years old, the mother of one child, was taken sick in February, 1904, with cold, cough, frequent urination, cessation of menstruation, and pain in the right loin. In April, pus was found in the urine and she went to bed with fever, 98 to 104, nausea, occasional vomiting, and rapid loss of flesh. Examination 3 months after the disease began, showed a very sick woman, suffering much pain in the right loin, frequent urination, and pulse 120, temperature 97.2 to 102. A

nodulated tender mass could be easily felt below the ribs on the right side and extending into the iliac fossa. Tubercle bacilli found in the urine. The kidney and the ureter to a little below the brim of the pelvis were removed through the oblique incision. Death, three days later during a convulsion. It was impossible to ascertain the quantity of urine passed, as it was passed involuntarily. The kidney was studded throughout with small tuberculous nodules and abscesses. The ureter also was very much thickened and diseased. (See figures 6 and 7.)

Remarks. No doubt, both kidneys were diseased and after the operation the remaining one was unable to keep up the work of elimination to a viable degree. The patient was doomed and had no chance of cure under any method of treatment.

5. *Perinephric Abscess Communicating with the Kidney, Result of Catheterization in a Patient with Fractured Spine.*

A man, 32 years old, had a laminectomy performed, March, 1902, on account of fracture of the 11th and 12th dorsal vertebrae. After six months of catheterization, the patient had chill, fever, sweats, pain in the right loin, pus in the urine, and a tender mass could be felt in the region of the right kidney.

Operation showed a large perinephric abscess behind the kidney and communicating with its lower portion. The abscess was drained and the patient recovered in six weeks. Seven months later death occurred from acute intestinal obstruction.