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ACUTE UNILATERAL HÆMATOGENOUS INFECTIONS OF THE KIDNEY.*

BY JOHN H. CUNNINGHAM, JR., M.D.,
OF BOSTON, MASS.

Surgeon, Long Island Hospital, Boston; Third Assistant Visiting Surgeon, Boston City Hospital; Consulting Surgeon, Forest Hospital, Chelsea.

SUPPURATION within the kidney parenchyma results from infection by one or another of certain varieties of micro-organisms taking place in one or two ways, either as an ascending infective process from the lower urinary tract or from the blood stream.

As ascending kidney infection is not the subject under consideration, this matter may be dismissed by the simple statement of fact that such ascending infection of the kidney never takes place unless there is some defect in the mechanism of the ureteral orifice which may permit of a reflux of infectious bladder urine into the ureter and kidney.

The acute renal infections of hæmatogenous origin are of two distinct classes: one induced by infective or toxæmic conditions; for example, nearly all of the infections which give rise to general diseases, such as diphtheria, scarlet fever, measles, smallpox, pneumonia, typhoid fever, and other acute general infections. The disturbance within the kidney is due in this class to the action of toxic substances elaborated by the virus of the special disease and which is in part eliminated through the kidneys. While the toxic substances of these acute general diseases conveyed to the kidney by the blood streams do induce cellular necrosis, it is rare that suppuration occurs, and the resulting kidney disturbances remain medical rather than surgical.

It is the second rather smaller, yet more serious, class of kidney infection of hæmatogenous origin whereby the kidney

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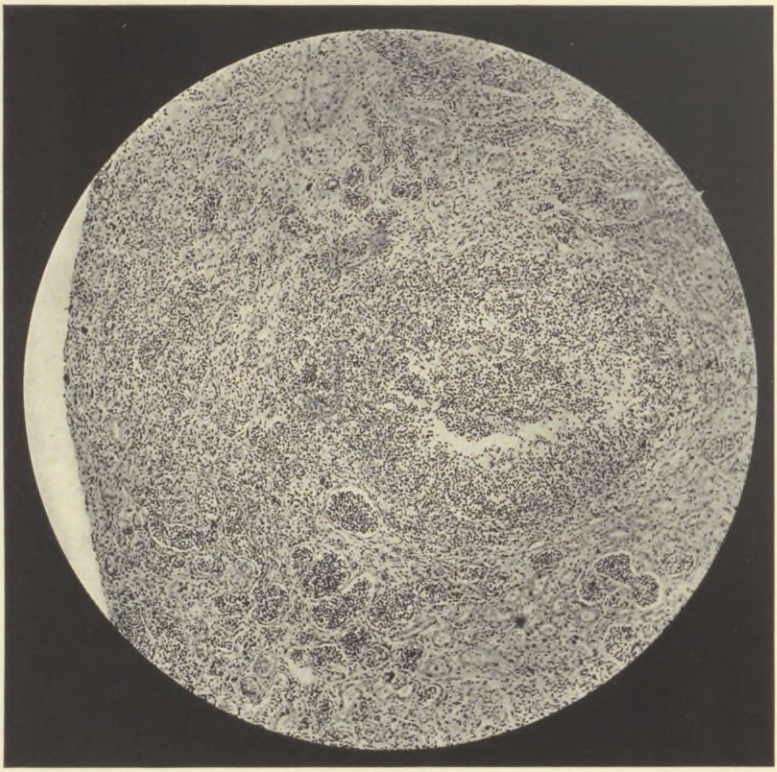
is invaded by the microörganisms themselves, resulting in acute inflammation and suppuration, that commands our attention from a surgical stand-point.

Acute suppurative nephritis of hæmatogenous origin is a condition resulting from the invasion of the kidney by certain microörganisms, in particular by the pyogenic cocci and the colon bacillus. It is theoretically of a metastatic nature, and when encountered in both kidneys is usually consecutive to septic endocarditis or other specific affections elsewhere in the body. When it occurs in but one of the two kidneys the primary focus from which the organisms find their way to the kidney has seldom been determined.

The pathology of acute unilateral hæmatogenous infections of the kidney is quite different from the acute bilateral kidney infections. The latter is an expression of a general septicæmia or pyæmia in which the kidneys may participate. The former, the acute unilateral kidney infections of hæmatogenous origin, is not a part of general pyæmia, but finds its origin in the lodging of a minute embolus carrying one or several organisms alone in the terminal vessels of the kidney. It is probable that as a rule the process is started by a single microörganism. The condition starts not by multiple simultaneous infections throughout the kidney, as the lesions observed in the kidneys removed at operation might suggest, but as a single focus in the cortex of the organ. When the organisms settle in the minute capillary vessels of the glomerulus, an inflammatory reaction is set up around the glomerulus and the surrounding tissue is infiltrated with the products of inflammation. From the primary focus of infection other areas are secondarily involved by the infectious material gaining access to other tubules, to the lymph-spaces and through the vessels in the connective-tissue stroma. The infection thus is more or less rapidly spread through these channels to other parts of the organ.

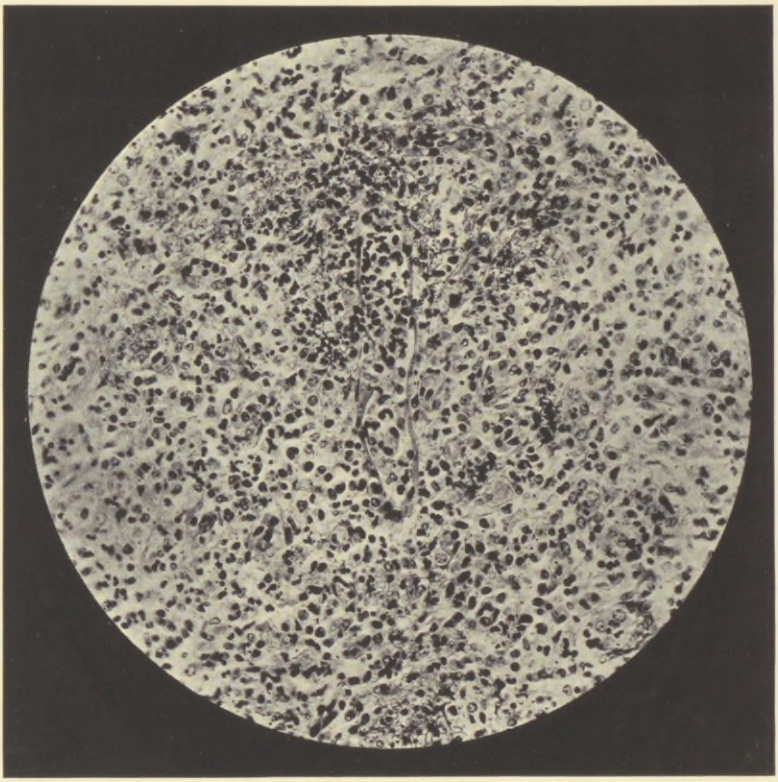
The pathological process originating as above described is of two distinct types: 1. *Abscess formation.* 2. *A diffuse inflammatory process without breaking down of tissue.*

FIG. 1.



Acute inflammation of the kidney, with abscess formation. Note miliary abscess tubules filled with polymorphonuclear leucocytes.

FIG. 2.



Acute inflammation of the kidney of diffuse type. Due to colon bacillus. Note that the lesions consist of inflammatory exudation, endothelial leucocytes with considerable fibrin formation, and few polymorphonuclear leucocytes. The exudation is both in the tubular and between them. There is no tissue solution.

In the former type of the disease, *abscess formation,* the kidney is found somewhat enlarged from congestion, and disseminated through its substance are small separate foci of suppuration or miliary abscesses surrounded by areas of congestion. In the early stages of this disease these minute abscesses are often observed in the cortex just beneath the capsule. From here other parts of the organ are secondarily involved, as just mentioned. If the process continues, these foci may enlarge, coalesce and form abscesses of larger size which may rupture the kidney capsule, invade the perirenal fat, resulting in a perinephritic abscess. For the infection to complete this cycle the resistance of the individual must be great and the virulence of the infecting organism comparatively slight, as the systemic toxæmia from this disease is rapid, and death usually occurs before the process develops to this stage. The organisms producing this form of kidney inflammation are the pyogenic cocci, the *Staphylococcus pyogenes albus* and *aureus,* and the *Streptococcus pyogenes.*

The histology of the condition is seen in Fig. 1.

The second type of the disease, a *diffuse inflammatory process,* spreading through the kidney substance, but not resulting in focal abscesses or solution of tissue, has the same sequence of events in its pathology when of hæmatogenous origin. This type of the disease presents a pathology more commonly the result of an ascending infection, but is encountered as a process of hæmatogenous origin and results not from an infection of the organ by the pyogenic cocci, as does the abscess type, but by the colon bacillus. The difference in the severity of the process depends upon the lesser virulence of the infecting organism. The organ is found to be enlarged from congestion. There may be subcapsular areas of more or less acute reddening, and on section the organ is found to present irregular, circumscribed, acutely reddened or pale-yellowish areas involving the cortex and pyramids, or involving nearly the whole organ, but without solution of tissue. In the early stage of the process these isolated areas are distinct and are seen as irregular, acutely reddened patches, with the edges

streaked downward into the pyramids. As the inflammatory process subsides, these areas lose the acute red color and are replaced by tissue of a paler character. In some instances the whole kidney may present an acutely reddened surface, due to the acute process involving the whole organ. This form of the disease undergoes resolution without focal degeneration of tissues, and when seen after the acute process has subsided, presents paler areas, dependent upon the stage of the connective-tissue repair process. The histology of the condition in the acute stage of this type of the disease is seen in Fig. 2.

By studying the clinical course of these two forms of the disease, it becomes evident that the clinical signs differ in some respects, and each has definite relation with these two different pathological conditions. The subjective and objective signs which the patient presents should suggest the type of process at work in the affected kidney. These two types of infection should be recognized upon inspection of the diseased organ at the time of operation, for experience has shown that these different types of infection do not require the same form of treatment. While the kidney containing numerous focal abscesses requires nephrectomy, less radical measures suffice in the diffuse, non-suppurative form of inflammatory infection.

From the *clinical aspect* of the subject the picture which *unilateral multiple abscess formation* produces is an acute disease which may or may not be ushered in by a chill. There is a rapid rise of temperature to 102° to 105° F., an early acceleration of pulse-rate usually to 120 or higher, occurring often within twenty-four hours following the onset. The picture of sepsis or toxæmia and a high leucocytosis develops rapidly. Pain on the side of the affected organ, abdominal tenderness, muscular rigidity and spasm are found on the affected side. Lumbar tenderness, rigidity and spasm are pathognomonic signs of the disease. The abdominal signs are similar to those occurring in acute affections of the appendix and gall-bladder, for which the disease of the kidney under consideration is often, if not usually, mistaken. Unfortunately, the urine in this disease does not excite suspicion of

the true condition, as it is usually quite normal in its gross and microscopical appearance and generally contains but little albumin and only a small amount of pus- and blood-cells, because the abscesses find no avenue of escape through the collecting tubules, which are either plugged by the product of inflammation or compressed by infiltrated tissue surrounding them.

When the infection is severe, the patient grows progressively and rapidly worse, the toxæmia becomes profound, delirium sets in, and there is a fatal termination within a few days unless the body is rid of the infected organ.

Of this form of the disease the writer has observed four cases.

CASE I.—Woman, 38 years old, entered the Gynecological Service of the Boston City Hospital under the care of Dr. Franklin Newell and Dr. Ernest Young on March 27, 1912. The past history was negative, with the exception that one year ago both tubes, ovaries, and the appendix were removed for acute inflammation.

The illness for which the patient came to the hospital was characterized by severe pains in the right kidney region, chills, fever, and vomiting beginning three days before entrance and gradually increasing in severity. The temperature at entrance was 103.4° and the pulse 120, leucocytosis 28,000. The general condition of the patient was poor. The physical examination showed a flushed face, throat and lungs negative, aphæmic murmur in the heart. The abdomen was not distended, but showed general tenderness in the right half, much more tender than the left. Exquisite tenderness in the right upper quadrant and in the right loin. There were rigidity of the right rectus and lumbar spasms. Vaginal examination was negative. The urine was turbid, 1020, acid, slight trace of albumin, no sugar or bile. The sediment was small in amount and consisted chiefly of pus, an occasional blood-corpuscle, and epithelial cells. The patient's condition became progressively worse during the following two days, and on the third day after entrance to the hospital (six days after onset of the trouble) it was extremely bad. At this time the writer saw the patient in consultation with Dr. Ernest

Young. Her appearance was that of profound sepsis, pulse 130, of poor quality, temperature 103°. There was rigidity of the right side of the abdomen, with marked tenderness over the right kidney in front and in the back. The urine at this time was only turbid and contained but little pus. The leucocytosis was 18,000.

It was believed that the patient had a nephritic or a perinephritic abscess. An operation was advised as the only chance for life, although the risk was considered great.

A lumbar incision was made, the perinephritic mass found infiltrated with cloudy serum but no pus. The kidney was exposed and delivered. It was twice normal size, congested, and over the surface were scattered many focal abscesses from 1 to 5 millimetres in diameter. The pedicle was clamped and the kidney removed. No attempt was made to tie the pedicle on account of the poor condition of the patient, stimulation and salt solution being required during operation. The clamp was left on the pedicle, the wound drained by a spiral tube with gauze and the wound partially closed.

Twenty-four hours after operation the patient's temperature dropped to 100° and the pulse to 110. The improvement in appearance and general condition was perceptible. The clamp was removed from the kidney pedicle on the sixth day. The patient made an uneventful recovery.

The pathological report was acute inflammation of the kidney, with multiple miliary abscesses from which the staphylococcus pyogenes was recovered.

At present (five months after operation) the patient is in good health and the urine negative. The etiological factor producing the kidney infection could not be traced.

Case II.—Woman, 32 years old, seen in consultation with Dr. Albert F. Griffiths and Dr. Nathaniel Thayer at the Swedish Hospital, Brooklyn, New York, on September 27, 1907.

The history is as follows: Previous health excellent. Two days ago began to have pain in right kidney region, chill, rise of temperature to 103°, and urine became cloudy, contained ¼ per cent. albumin and considerable sediment, consisting of pus, normal and abnormal blood, but no casts. The pain became more severe, and her general condition failed rapidly. When seen by the writer the general condition was poor, temperature 103.5°, pulse 108, urine as above mentioned. There was tender-

ness over the whole right side of the abdomen, rigidity of the right rectus, and muscular spasm over the right kidney in front. There was an exquisite lumbar tenderness with spasm. The kidney was approached through a lumbar incision, the perirenal fat found to be œdematous and adherent to the kidney capsule in the central third of the organ. The kidney was freed and delivered, found to be about one-third larger than normal and much congested. In the middle quarter an area about one and one-half inches in length, of irregular surface, slightly harder than normal, was found. This area extended over the anterior and posterior surfaces of the kidney to within about three-quarters inch of the renal pelvis. The kidney was split in the convex border and the area observed on the surface was found to involve the central quarter of the kidney down to the renal pelvis. This area, darker than the surrounding tissue, contained several small foci of purulent material from one to four millimetres in diameter. The remainder of the kidney showed only congestion. A wedge-shaped piece including the centre third of the kidney and passing about one-half inch outside of the infected area was resected. The upper and lower remaining thirds of the kidney were then brought together by mattress sutures and the capsule was united by interrupted catgut sutures. The wound in the back was united around a tube and gauze drain. The temperature dropped to normal on the second day following operation, and the abnormal elements disappeared from the urine. The patient left the hospital fifteen days after the operation with a small, clean, granulating wound. The improvement in general condition was rapid and the patient has remained well since.

The pathological report showed acute inflammation with multiple abscess formation.

Case III.—Woman, 34 years old, presented the following clinical history: About five months ago had an illness characterized by fever, pain in the right side of abdomen and back. It was considered appendicitis by the attending physician. Remained in bed about two weeks, at which time the symptoms had disappeared. An indefinite pain remained in the right kidney region, more noticeable after physical exertion. Three months ago had a similar acute attack.

On August 1, 1906, the patient was again taken acutely ill, and when seen by the writer had a temperature of 101.8°, pulse

110, and a leucocytosis of 18,000. The urine was negative except for a slight trace of albumin and a few pus- and blood-cells. There was severe pain in the right hypochondrium and an acute tenderness and rigidity over the right rectus and in the right costo-vertebral angle. The appendix region was negative. During the following two days the temperature rose to 104, pulse 120, and white count to 22,000. The urine remained the same. The pain, tenderness, and rigidity became more marked and the patient began to look toxic. The diagnosis of acute inflammation of the kidney was made. The kidney was approached through the lumbar region, the perirenal fat found œdematous and the kidney about one-third larger than normal. Beneath the capsule were many small miliary abscesses. The pedicle was clamped, the kidney removed. The pedicle was tied and the wound closed about a rubber tube with gauze.

Within two days the temperature and pulse had fallen to normal, and the general condition of the patient was much improved. The patient, last seen two years ago, was well. The pathological report was acute inflammation of the kidney with abscess formation, areas of scar tissue.

Case IV.—Woman, 33 years old, presented the following history: Previous health excellent. Four days ago she was suddenly taken with severe pain in the right upper quadrant of the abdomen, accompanied by vomiting. Has felt feverish and has had several chills during the past few days. When seen by the writer, November 15, 1908, the temperature was 102.4°, pulse 108, white count 17,200. In the right hypochondrium there was marked tenderness and rigidity. In the costo-vertebral angle exquisite tenderness and muscular rigidity. Urine slightly high in color, 1014, acid with a trace of albumin. The sediment was small in amount and contained many leucocytes, rare normal and abnormal blood-cells, hyaline and brown granular casts, and occasionally fatty renal cells, a few squamous epithelial cells. The patient remained in this condition without much change for four days, when it became evident that the toxæmia was becoming more pronounced. The kidney was approached through the lumbar region, the perirenal fat found œdematous, the kidney somewhat enlarged, and beneath the capsule could be seen many discrete abscesses about two to four millimetres in diameter. A nephrectomy was performed, the

pedicle tied, the wound drained; the temperature and pulse fell to normal on the third day, the abnormal elements disappeared from the urine except for the presence of epithelial cells. The pathological report was acute inflammation of the kidney with abscess formation. The patient has remained well since operation.

The clinical picture produced by a diffuse inflammatory process within the kidney without abscess formation differs from that with abscess formation chiefly in the severity of the symptoms. The onset may be sudden, as in the former type, the temperature rising rapidly to 102 or more, associated with acceleration of the pulse-rate; and a leucocytosis is always present, often high. A chill may accompany the onset. Pain in the loin on the affected side is an early symptom, sometimes indefinite but often severe, varying according to the severity of the process. Tenderness over the kidney in the costo-vertebral angle, with some muscular rigidity and abdominal tenderness and rigidity on the affected side, is a constant sign. The chief feature differentiating this form of the disease from that of abscess formation is the lack of progressive toxæmia and the presence of more abnormal elements in the urine. These patients, while appearing acutely ill, do not have the real progressive toxic course which characterizes the other form of the disease. The illness, after the first few days following the onset, remains more or less stationary and may continue not unlike a beginning typhoid fever. The pain, tenderness, and muscle rigidity may become gradually more pronounced, and the temperature, pulse, and leucocytosis elevated; or the different signs may gradually decline. Remissions in the acute symptoms occur, but indefinite pain on the affected side usually persists indefinitely, and recurrences of the acute symptoms are not uncommon.

The writer has observed four cases in this type.

Case V.—Woman, 43 years old, seen in consultation with Dr. H. W. Baker and Dr. A. W. Tucker, of Lynn. Thirteen years ago the patient had a severe illness, characterized by pain in the right side of the abdomen and back, fever, chills, and

cloudy urine. In bed several weeks. Since that time has had several similar attacks which confined her to bed for from two weeks to three months, and different physicians who cared for her have considered that in these attacks she was suffering from peritonitis. Some advised operation, which the patient refused. Between these attacks there has been a constant pain, varying in severity, in the left kidney region. Several X-ray examinations have shown nothing abnormal. Four years ago the patient had a small amount of blood in the urine during one of these attacks. This occurred again two years ago. It never lasted more than a few days.

On February 2, 1912, the patient was cystoscoped by Dr. H. W. Baker and a collargol injection and radiogram were made of the left kidney. The cystoscopy showed the bladder to be normal in all respects, both ureteral orifices were normal, and the catheters were passed to each kidney. The specimen of urine collected showed that from the right side to be normal, and that from the left to contain a few leucocytes, normal red cells, and caudate epithelial cells. The capacity of the renal pelvis was 14 c.c. The radiogram of the injected kidney pelvis showed it to be normal.

On February 14, 1912, the writer again cystoscoped the patient, and found the condition as previously stated. An injection of six milligrammes of phenolsulphonephthalein showed the dye to appear on the right side in six minutes, on the left in nine minutes. The total amount recovered in two hours was: right 25 per cent., left 10 per cent. On account of the persistent pain an exploratory examination of the kidney was undertaken. Temperature at the time of operation was 102.2°, pulse 100, leucocytosis 8100. The operation was performed February 16, 1912. An anterior incision was made. The peritoneal cavity was opened and explored. Nothing abnormal was found. The peritoneum was closed and stripped toward the median line, exposing the left kidney retroperitoneally. The perirenal fat was found adherent to the kidney capsule. The kidney was but little larger than normal, and several grayish depressed areas were seen beneath the capsule. On section showed many pale-grayish, sclerotic areas, some near the cortex, others in the pyramid. The remainder of the kidney was reddish-yellow, and there were acute red streaks near the apices of the pyramids.

In view of the history these areas were considered to be old resolved foci of acute inflammation. It was believed that the persistent pain following the acute attack was probably to be explained by these contracted areas, and the kidney was therefore removed. The fat about the pedicle was adherent to the vessel, and as they could not be entirely cleaned the pedicle was clamped and the wound closed about the clamp, which was removed on the fourth day. The patient made an uneventful recovery except for an infection which took place in the wound.

Pathological report is as follows: The surface presents several opaque, grayish areas which are depressed and contracted. Some of these areas are surrounded by a small area of injection irregular in outline. On section several similar but smaller opaque areas not surrounded by areas of injection are seen scattered throughout the kidney substance. Near the upper pole is seen an area two cm. in diameter, symmetrical and definite in outline, containing another area which is apparently a blood-clot. The capsule of the kidney strips easily, leaving a red surface in places. Cortex measures six mm., and glomeruli are indistinct. Histological diagnosis is acute, diffuse inflammation of the kidney with healed areas.

Three months after operation the patient was in the best health which she had enjoyed for many years. She was free from pain, and the urine was normal. She had gained 34 pounds in weight. Eight months after operation excellent health continues.

CASE VI.—Man, 31 years old, seen in consultation with Dr. Richard Collins at the Waltham Hospital, January 25, 1910. Since childhood the patient has had a chronic discharge from the right ear. About ten years ago had a severe attack of pain in the right kidney region, the facts regarding which are indefinite. Five years ago had a similar attack and passed a small amount of blood in the urine. Confined to the bed for a short time. Four years ago had a similar attack, associated with frequent urination. Since this attack has had pain in the right kidney region almost constantly. About two years ago he had another attack, associated with fever and frequent urination, and passed small amounts of blood in the urine several times.

Five days ago, after a hearty dinner, patient had a severe attack of pain in the right side, associated with chill and vomit-

ing. Then admitted to the Waltham Hospital, acutely ill, with pain in the right side, temperature 102°, pulse 104. Acute symptoms gradually subsided, but pain in the back persisted. X-ray examination was negative. Seen by the writer February 25, 1910. The patient's condition as above noted. A cystoscopy performed at this time showed the bladder urine to be slightly cloudy and containing fine shreds. This urine was 1020 in specific gravity, acid, and the sediment showed considerable pus, small round and many squamous epithelial cells. There was considerable fresh blood. Trigone was normal. Both ureteral orifices normal in size and character. About three-quarters inch above the right ureteral orifice was seen a group of eight or ten acutely injected areas from which bleeding had taken place and on which were adherent blood-clots. These areas were a little larger than the head of a pin and resembled early tuberculosis of the bladder. The remainder of the bladder was normal. Both ureters were catheterized and the urine collected from both was equal in amount. The examination of the urine from the left side little abnormal, from the right side considerable pus and normal blood-vessels; a few caudate and small round cells. Guinea pigs inoculated for tuberculosis did not develop the disease.

On January 29, 1910, an exploratory examination of the kidney was undertaken on account of the persistent pain and cystoscopy findings. The kidney was exposed through the loin. Perirenal fat was but slightly adherent to the kidney. Kidney delivered and found slightly larger than normal. Beneath the capsule were seen a few grayish-white, contracted areas and a few acutely red areas. Nothing abnormal in the remainder of the kidney or kidney pelvis. The kidney was split in Brödel's line. In the region of the contraction seen on the surface there were hard, grayish areas about one and one-half centimetres in diameter; similar pale, contracted areas were scattered through the kidney tissue. There were two acutely reddened areas in the upper half of the kidney. Believing the persistent pain to be due to these contracted areas, the kidney was removed, the pedicle was tied and the wound drained.

The temperature, which was 101.5° at the time of operation, dropped to normal within 24 hours. The wound healed by first intention.

The pathological report was an acute, diffuse inflammation

of the kidney, with healed areas. The colon bacillus and *Staphylococcus pyogenes aureus* were recovered from the tissues. The last organism may have been a contamination.

The last heard of the patient was about one year following operation, when he reported as well.

CASE VII.—Long Island Hospital. Woman, 24 years old, giving a previous history of syphilis four years ago. Treated with mercury continuously for three years.

On January 7, 1910, laparotomy was performed by another surgeon because of severe pain on the right side of the abdomen, associated with spasm and tenderness over the right rectus muscle. This time the temperature was 102.5°. A few small cysts of the ovary were found and a normal appendix was removed and a thorough exploration of the remaining abdominal organs proved negative. Following operation the pain in the right side persisted, the temperature ranged between 101° and 104° and the pulse around 120. The white count was around 14,000. This condition persisted for about one week, when the temperature returned to normal, the pulse to 100, and the pain and tenderness became much less.

One week later the pain again became severe, the temperature rose to 102°, and the right side of the abdomen and back became very tender. Examination showed marked tenderness and involuntary spasm over the right abdomen and back. White count was 23,000. The patient remained in this condition for about one week, when symptoms again gradually subsided. The urine at this time showed but a trace of albumin, a small amount of pus, single and in clumps. A few small round cells and granular casts.

Two weeks later another acute attack of pain on the right side. Temperature rose to 102°, pulse to 120. The 24-hour amount of urine at this time was 550 c.c. The sediment at this time showed more pus, many small, round epithelial cells and a few hyaline and granular casts. A Röntgen-ray examination was negative.

The writer first saw the patient in this attack. At this time there was general abdominal tenderness and spasm, more marked over the right side. There was exquisite tenderness and spasm in the right costo-vertebral space. The general condition was only fair and suggested toxæmia. The diagnosis of acute inflammation of the kidney was made and operation undertaken.

An anterior incision was made, the peritoneum opened, the abdomen explored and found to be negative. The anterior incision was closed. The kidney was then approached through the loin. The perirenal fat was found adherent to the kidney and a hard nodule about the size of a Concord grape situated in the perirenal fat was removed. The kidney was slightly larger than normal and showed many red areas beneath the capsule. On section of the organ similar areas were found scattered through the kidney substance. Nephrectomy was performed, the pedicle tied and the wound drained.

Four days following the nephrectomy the patient developed a right lobar pneumonia, which a few days later involved the left side, and death occurred 11 days after operation. The wound at this time had healed except for a small granulating area.

The pathological report showed acute inflammation of the kidney, with several areas showing connective-tissue repair. The *Bacillus coli* was recovered from the tissues.

Case VIII.—Woman, 48 years old, seen in consultation with Dr. H. W. Baker, March 2, 1912. The patient presents a history of having had repeated attacks of pain in the left kidney region, associated with fever, chills, and vomiting. These attacks confined her to bed for periods of weeks many times during the past five years. Since the first attack there has been constant pain in the left kidney region, and during the past year the patient has been unable to lie down in bed and has been obliged to sleep sitting up on pillows. On March 1, 1912, the patient was cystoscoped by Dr. H. W. Baker. The bladder was found to be normal. Both kidneys were catheterized. The urine obtained from the right side was acutely red with fresh blood, with a few squamous and large round cells. The fresh blood was believed to have been caused by the catheter. The urine of the left side was slightly cloudy and showed a few pus-cells, single and in clumps, many squamous, polygonal and large round cells, many clumped with fat drops adherent.

The patient was seen by the writer on March 4, 1912. She was a poorly-nourished woman, weighing 110 pounds, and complained of severe pain in the left kidney region. There was tenderness in the costo-vertebral angle. The temperature was 99.4° and the pulse 108. As a result of the consultation it was decided that an exploratory operation of the kidney should be made.

Operation (March 10, 1912).—The kidney was approached

through an anterior incision, the peritoneal cavity opened and explored. Nothing abnormal was found. The peritoneal wound was closed and stripped toward the median line, exposing the kidney. The perirenal fat was slightly adherent to the kidney. This was freed and the kidney delivered. The organ was of normal size and rather pale. The organ was split in Brödel's line. The cut surface showed the tissue everywhere to be paler and firmer than normal, and as there were no focal changes in the kidney tissue and the structure of the kidney was normal, other than for its pale character, it was decided not to remove the organ. The capsule was stripped, the kidney fixed in position, and the wound entirely closed.

The patient made an uneventful recovery. The wound healed by first intention, and two months following operation there is but slight pain of the old character, which comes only after unusual exertion. The urine still contains polygonal and large round cells with a small amount of fat. Six months after operation the old pain had entirely disappeared and the urine contained but a few squamous epithelial cells.

It is believed that the pathological process present in this kidney was a connective-tissue repair of a diffuse inflammation involving the whole kidney. The kidney was left in this patient as more or less of an experiment.

During the past few years the writer has seen five patients in whom all signs pointed to a diffuse acute inflammatory unilateral process of the kidney in whom the symptoms subsided without operation. In two of these cases the colon bacillus was isolated from the affected kidney by means of the ureter catheter. The only sign of the disease remaining in these cases has been an indefinite pain in the region of the affected organ. In but one of these patients is this constant, and in the other four it may be considered absent, except during periods of fatigue. The urine in all shows but little abnormal.

In conclusion, I would like to say a few words in regard to the treatment in these two classes of cases.

In the first class, the single kidney with multiple miliary abscess formation from which malignant toxæmia results, the organ must be sacrificed in order to save the patient's life.

In the second case of this class, mentioned in this report, only the central quarter of the kidney was involved. While this infected area was completely removed by a resection of a middle third of the kidney and the healthy upper and lower third united successfully, and the outcome of the case was most favorable, this procedure must be considered most hazardous and cannot be recommended. Woolsey (ANNALS OF SURGERY, October, 1906) reports a similar instance in which he successfully removed the lower third of the kidney for the same disease. In the other three cases of this class, here recorded, nephrectomy was performed, and it is felt that in each instance it was the only means which could have been employed to save the patient's life. All these patients are living to-day and are free from symptoms, considering themselves well.

While house surgeon at the Boston City Hospital, the writer observed two cases of this form of the disease: one upon whom Dr. Paul Thorndike did a nephrectomy followed by recovery, and one in which Dr. F. S. Watson did a nephrotomy with drainage followed by death from progressive toxæmia.

The proper treatment in the second class, the type of diffuse, acute, unilateral inflammation of the kidney, is not so clear cut and must depend upon the course of the disease in the individual case. As a broad rule, it is felt that palliation, forcing fluids and the employment of urinary antiseptics, fortifying the patient's strength by a nutritious diet and stimulating drugs, should be instituted at the outset, and operative interference should only be undertaken when the symptoms and physical signs give evidence of progression to the point of lowering the general resistance by toxic absorption. The time to operate upon this class of cases requires experience with the disease and judgment in regard to the patient's general condition. Some of these patients recover without operation, as noted by Brewer, Cobb, and the five cases mentioned in this report.

When an operation is undertaken in this class, nephrec-

tomy is not the only procedure to be employed. Favorable results have been obtained by simple decapsulation (Cotton, ANNALS OF SURGERY, November, 1911), by puncture of the infected areas with drainage (Brewer, *Trans. Am. Surgical Association,* vol. xxvi, 1908, and Cobb, ANNALS OF SURGERY, vol. xlviii, 1908), and by splitting the kidney, closing the kidney wound by suture, and decapsulating the organ, as in the fourth case of this class recorded in this report.

On the other hand, when the symptoms and signs are of a distressing nature and the affected kidney is found to be the seat of old as well as new inflammatory processes, or when the acute process is extensive, as in Cases 5, 6 and 7 of this report, nephrectomy is the best procedure.

In closing I desire to express my sincere thanks to Dr. F. B. Mallory, Director of the Pathological Department of the Boston City Hospital, for his help in preparing the pathology of this subject and for most of the pathological reports.