Modern Surgery - Chapter 36. Diseases and Injuries of the Genito-Urinary Organs - Diseases and Injuries of the Kidney and Ureter

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of sugar than this being taken as an evidence of renal difficulty (Watson and Bailey, in "Report of Boston City Hospital for 1902"). The sugar is separated from the phloridzin in the epithelium of the glomeruli and tubules of the cortex of the kidney. The drug seems to be entirely harmless.

It is because phloridzin is acted upon by the kidney-epithelium that this test is better than the methylene-blue test. The latter does not really measure the excretory power of the kidney-epithelium; it merely shows to what degree the kidney is permeable in the mechanical sense. Personally, I should not be disposed to set aside older and more thorough methods of urinary analysis for the phloridzin test, although I believe that it has a range of distinct usefulness.

The Methylene-blue Test (the method of Achard and Castaign).—When methylene-blue is injected hypodermatically it normally appears in the urine within half an hour and disappears in from thirty-six to forty-eight hours. If the blue color is not manifest in the urine for an hour or more, there is impairment of renal permeability. Accuracy in the test is not possible unless the amount of the methylene-blue actually passing into the urine in a given time is determined. The dose given hypodermatically is 0.05 gm. in 1 c.c. of sterile water. The test is unreliable and the blue color may appear in the urine in half an hour in some cases of marked kidney disease.

Cryoscopy (Korayni's Method).—By cryoscopy is meant a study of the freezing-point of the blood and of the urine. This method is complex and difficult of application, and requires a considerable amount of blood. The examiner determines the point in degrees centigrade at which blood and urine freeze. The point at which each freezes having been determined, the difference between this and the freezing-point of distilled water is the figure we seek in each case. Healthy blood has a freezing-point of about 0.56° C. When it is below 0.60° C., it is held that operation is unsafe. Insufficiency of the kidney is indicated when the freezing-point of urine is 0.9° C.

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Tumors of the Kidney.—Tumors, innocent or malignant, may arise in the kidney. Among the innocent tumors are fibroma, lipoma, angioma, and adenoma. A malignant tumor may be either sarcoma or carcinoma. Sarcoma is most common in the young, and may reach an enormous size. A malignant tumor of the kidney produces hematuria, the urine often containing blood-casts of the ureter, kidney, and pelvis, and sometimes, though rarely, characteristic cells. Pain is often present in the loin and thigh, and there may be colic-like attacks when clots are passing through the ureter. Emaciation is rapid and pronounced. A tumor can usually be detected. The only possible treatment for a malignant growth is early nephrectomy. In some few cases an innocent tumor can be removed by a partial nephrectomy. A malignant tumor requires a complete nephrectomy. In making a diagnosis of renal tumor use the cystoscope. If blood is coming from a ureter, note if it is from only one or from both. Blood from both would contraindicate nephrectomy. Before removing a kidney it is necessary to be sure that the patient is possessed of two kidneys. Note if urine flows from each ureter, or, if uncertain, catheterize the ureters.
Nephroptosis, Prolapse of the Kidney, or Mobile Kidney.—

There are two forms of this condition: (1) movable kidney, which is an organ freely moving back of the peritoneum, either within the cavity of its fibro-fatty capsule or entirely without its capsule (this condition is acquired); and (2) floating or wandering kidney, an organ having a mesonephron and lying within the peritoneal cavity (this rare condition is always congenital).

Keen states that there may be drawn a clear theoretical distinction between movable and floating kidney, but practically there is no rigid line of demarcation, as a movable kidney may have as large a range of movement as a floating kidney. The kidney is normally somewhat mobile, and nephroptosis is considered to exist only when the range of movement exceeds distinctly what is normal. Normally, on inspiration the kidney descends about half an inch. It is seldom that a normal kidney can be palpated in men, but in most women the right kidney can be palpated, and in some women the left organ can also be felt. Harris ("Jour. Amer. Med. Assoc.," June 1, 1901) describes three degrees of movable kidney. In cases of the first degree, one-half of the organ can be distinctly grasped and the kidney can be made to recede. In cases of the second degree both hands can be brought together above the kidney. In cases of the third degree the kidney has descended as low as the pelvic brim or has moved to or beyond the umbilicus. The organ may drop below the brim of the pelvis, may cross the vertebral column, or may reach the anterior abdominal wall. When a movable kidney becomes fixed in an abnormal situation, the organ is spoken of as dislocated.

Women more often suffer from movable kidney than do men. Küster estimates that 4.41 per cent. of women examined in general surgical practice have movable kidney. Edebohls finds it in 20 per cent. and Harris in 56 per cent. of cases in gynecological practice. In about one-half of the cases it gives rise to little or no trouble. A movable kidney is found in the great majority of cases upon the right side. Floating kidney is always congenital. The condition is occasionally, but rarely, found in children. Tuffier has reported 3 cases in children six, nine, and ten years of age respectively, and J. Cromby reported 18 cases of floating kidney in children, the youngest patient being three months of age (quoted by Harris in "Jour. Amer. Med. Assoc.," June 1, 1901). Among the assigned causes of the movable condition are to be named traumatisms; strains; abdominal-wall laxity from pregnancy, removal of a tumor or tapping for ascites; absorption of peritoneal fat from wasting disease (Edebohls); tight lacing; uterine displacements; and enteroptosis leading to traction on the transverse mesocolon. The condition is certainly often associated with ptosis of the other abdominal viscera (enteroptosis, gastroptosis, etc.).

Traumatism is rarely the immediate and essential cause of a true movable kidney. In some cases people assert that pain began immediately after a blow, an attack of coughing, violent vomiting, lifting, straining at stool or in parturition, or a fall. In such cases the kidney may have been mobile before the accident. Again, pain is not proof of the inauguration of movability. It is probable, however, that traumatism may loosen the kidney and that mobility may subsequently develop. Gutterbock says that a kidney in normal relations cannot be rendered mobile by a simple fall or a trivial force. Loosening can only be induced by rupturing surrounding tissues;
Movable Kidney

and if this happens symptoms of a distinct nature will indicate the seat of injury. Harris makes out a strong case for the view that the condition is due to the relation existing between the location of the kidney and the body form. He divides the body into three zones. The upper zone contains the lungs and heart. The middle contains the liver, stomach, spleen, pancreas, and the greater part of each kidney. The lower contains the intestinal canal and the lesser part of each kidney. When there is a naturally small or a diminished capacity of the middle zone the kidney is displaced downward. The right kidney is pressed upon by the heavy liver, which drives it down; the left kidney is pressed upon by the comparatively small spleen. Hence, movable kidney is more common on the right side than on the left. The upper pole of the kidney is first pushed forward and then the entire organ descends (M. L. Harris, in "Jour. Amer. Med. Assoc.," June 1, 1901). Harris maintains that the amount of mobility depends upon the degree of contraction of the middle zone and upon internal traumata (lifting, straining, coughing, etc.).

Symptoms of Both Forms.—There may be no discomfort whatever, or the patient may be a confirmed invalid. The usual symptoms are epigastric pain (just to the left of the middle line), which disappears when the kidney is replaced, dragging pain in the loin, and paroxysms like nephritic colic. Sudden attacks of violent pain in the kidney or stomach may occur, attacks which are accompanied by nausea, vomiting, great weakness or collapse, vertigo, chills, and subsequently elevated temperature (Dietl's crises). Dietl's crises are due to kinking or twisting of the ureter or renal vessels or to inflammation of the kidney. They may be caused by physical exertion or indiscretion in diet and may be followed by hydronephrosis or strangulation of the renal vessels. Usually, in a case of movable kidney there is a sense of a moving body in the abdomen, and the patient has aggravated indigestion, often accompanied by vomiting. Constipation is the rule, and violent attacks of cardiac palpitation are common. Most subjects of this kidney-mobility are extremely nervous, many of them hysterical or hypochondriacal. Temporary jaundice is not uncommon. There is frequently irritability of the bladder. Vertigo and insomnia are present in many cases. The patient cannot sleep when lying on the sound side (Goelet). In women the sexual organs are almost invariably deranged, and menstruation aggravates the pain and discomfort. All the symptoms are intensified by exertion and are modified by rest. The urine is normal, except after violent exercise, when it may contain blood. The proof of the existence of movable kidney is the finding of a tumor (movable on respiration, change of position, and palpation) shaped like that organ, pressure upon which occasions no sensation or causes pain or a sickening feeling. A "lumbar recess" (Morris) may be found, and percussion over the loin gives resonance. In some cases a movable kidney can be readily detected when the patient stands up, but is difficult to find when he is recumbent. Franks's method of examination is very satisfactory. The patient is placed recumbent. If dealing with a right kidney, the surgeon stands to the right side and pushes four fingers of his left hand in the loin below the twelfth rib, and rests the thumb lightly in front just below the ribs. The patient takes a full breath and holds it a moment, and just before he empties his lungs the surgeon presses his thumb up deeply below the ribs. During expiration the thumb follows the liver, and the fingers press
toward the front. If with the right hand the kidney can be felt entirely below the left hand, the case is one of movable kidney. If such a condition is detected, press hard with the right hand, and gradually loosen the grasp of the left hand, and the kidney will slip between the fingers and ascend. A normally mobile kidney descends so that its lower end can be felt, but it moves back during expiration.*

Goelet uses Kendall Franks's method of examination, but has the patient stand, with the weight resting on the leg of the sound side and with the leg of the sound side slightly flexed and resting on the toes. The body leans a little forward. A movable kidney must not be mistaken for a distended gall-bladder, a tumor of the mesentery, stomach, or omentum, a phantom tumor, an ovarian tumor, or a cancer of the pancreas. A distended gall-bladder can be pushed upward, but not backward, and not downward unless the liver is movable; it is extremely tender, and cannot be pushed out of reach. A kidney can be pushed upward and backward—in fact, in all directions. An enlarged gall-bladder can always be palpated. A movable kidney which is not enlarged can be felt at times and not at others (Henry Morris). A movable kidney may pass between the examiner's fingers, and if pushed into the loin it tends to remain; but if a distended gall-bladder is pushed into the loin, it springs out as soon as pressure is relaxed (Henry Morris). It is important to remember that in about one-half of the cases of movable right kidney the left kidney is also movable, but to a less degree. Appendicitis is more frequent in individuals with movable kidney than in those who do not suffer from it. Sometimes a movable kidney endangers life, rupture of the kidney, twisting or rupture of the ureter, or strangulation of the renal vessels occurring, the ultimate cause of death being albuminuria, uremia, or hydronephrosis.

Treatment.—Mobile kidney is treated as follows: (1) The rest-treatment of S. Weir Mitchell may be tried; it often markedly mitigates the symptoms, but does not seem to cure. (2) Mechanical support should always be tried. The most satisfactory mode of applying it is by the corset recommended by Gallant ("Amer. Jour. Obstet.," July, 1901). This corset is long and straight in front, and when applied fits firmly over the hips and lower abdomen, less firmly at the waist, and least firmly above.

Gallant directs that the patient lie down, the head being on a pillow and the knees drawn up. While in this attitude the corset is put on and it is laced from below up. If the attempt to apply the corset develops tenderness, keep the patient at rest in bed until it can be applied without pain.

(3) Nephorrhaphy or nephropexy is the operation employed in many instances (page 949). It is the author's experience that if the patient has had marked nervous symptoms for a long time, nephorrhaphy will rarely cause them to permanently pass away, even though the kidney remains firmly anchored. (4) Nephrectomy is necessary only in very rare cases; it may be done for dislocated kidney, when kidney disease exists, or when nephorrhaphy has failed in a case of great severity.

Injuries of the Kidney.

Injuries of the Kidney.—Laceration or rupture is caused by falls and by blows upon the back or the belly.

Symptoms.—In some cases the parenchymatous structure is torn, but the capsule is not torn, and in consequence urine and blood are not extravasated into the perineal connective tissue or into the peritoneal cavity. In other cases the parenchyma and capsule are both torn and urine and blood are extravasated. The laceration may be trivial, may be considerable, or may tear the kidney apart. The symptoms depend on the gravity of the injury. A slight tear without involvement of the capsule may produce practically no symptoms at all. A more severe injury produces shock, and, if profuse bleeding occurs, the general symptoms of hemorrhage. In intraperitoneal rupture there is profuse and usually fatal hemorrhage. In laceration of the kidney there is severe pain in the loin, which shoots into the testicle, and lumbar tenderness. If there is considerable perirenal bleeding the loin will be full, and dull on percussion, and if the hemorrhage is large a palpable mass will form after a time and after some days the skin will become discolored. There is frequent and painful micturition and sometimes suppression of urine. Hematuria occurs in renal laceration unless the rupture was intraperitoneal or the ureter was torn, in which case there are evidences of profuse internal hemorrhage, abdominal rigidity, etc. (Daniel N. Eisendrath, "Jour. Amer. Med. Assoc.," Oct. 25, 1902). It is important to remember that hematuria can arise from simple renal contusion, and that kidney damage does not of necessity cause bloody urine. If there is hematuria, the use of the cystoscope or catheterization of the ureters, or the employment of Harris's segregator will demonstrate from which kidney the blood comes. A kidney-laceration may be followed by secondary hemorrhage, perirenal suppuration, hydronephrosis, or pyonephrosis, and may cause kidney displacement.

Treatment.—In an intraperitoneal rupture laparotomy should be performed because of abdominal hemorrhage. As a rule nephrectomy is necessary, but it may be possible to arrest hemorrhage by packing. If the shock is pronounced and if there is increasing fulness in the loin, whether hematuria exists or not, or if blood comes profusely from the ureter, whether or not there is much shock or lumbar fulness, make an exploratory lumbar
incision and stop the bleeding by packing, or by a purse-string suture (Figs. 550, 551), or, if necessary, perform partial, or even complete, nephrectomy. Ordinarily, when there is not great shock, increasing lumbar swelling or severe hematuria, treat by rest in bed and by feeding with liquid food or by nutritive enemata to prevent vomiting. Opium, tannic acid, or gallic acid may be used. Apply ice-bags to the loin and the side of the abdomen, and after bleeding ceases strap the loin and apply a binder. If large blood-clots in the bladder cause pain or retention of urine, introduce a catheter and inject the bladder with boric acid, or use the tube and evacuator of a Bigelow apparatus. If this procedure fails, open the bladder by a suprapubic incision and drain.

**Results of Operation.**—Up to 1894 there had never been a case of intraperitoneal rupture operated upon; since then 6 have been operated upon and all recovered (Daniel N. Eisendrath, "Jour. Amer. Med. Assoc.," Oct. 25, 1902). Küster collected 47 cases of nephrectomy, and 83 per cent. recovered. Keen estimates the mortality of primary nephrectomy for rupture at 20 per cent. and of secondary nephrectomy at 38.5 per cent. Without operation intraperitoneal rupture is inevitably fatal. Six recorded cases operated upon recovered. Of extraperitoneal ruptures, 70 per cent. recover without operation (Eisendrath). Francis S. Watson ("Boston Med. and Surg. Jour.," July 16, 1903) has collected 660 cases of subparietal injury of the kidney. The following statistics are of interest: Treated expectantly: 273 cases with 81 deaths, a mortality of 29.6 per cent. Treated by operations other than nephrectomy: 99 cases with 7 deaths, a mortality of 7.7 per cent. Treated by nephrectomy: 115 cases with 25 deaths, a mortality of 21.7 per cent.

**Perforating wounds of the kidney**, if purely posterior, do not involve the peritoneum; if anterior, they do. The symptoms are escape of blood and urine by the wound; hematuria is usual, but not invariable; pain as in rupture; the patient may be unable to micturate; and nausea, vomiting, and constitutional signs of hemorrhage exist. Traumatic peritonitis, perinephric abscess, or general sepsis may ensue. Confirm the diagnosis by exploration with the finger. Extraperitoneal injuries give a good, and intraperitoneal a bad, prognosis.
Renal Calculus

Treatment.—If the wound in perforated kidney is extraperitoneal, enlarge it to permit of drainage, and arrest hemorrhage by packing and hot water, or by a purse-string suture (Figs. 550, 551). Asepticize the wound, insert a drainage-tube down to the kidney, dress often with bichlorid gauze, keep the patient in bed on a low diet, and give gallic acid and opium. In some cases nephrectomy, partial or complete, will be required. In intraperitoneal wounds perform an abdominal section and, as a rule, remove the damaged organ (see Nephrectomy).

Wounds of the Ureters.—Rupture from external violence is an extremely rare accident. There are 3 undoubted cases on record (Daniel N. Eisendrath, "Jour. Amer. Med. Assoc.," Oct. 25, 1902). A rupture or wound from accidental violence is almost invariably associated with other serious injuries. The ureter may be wounded by the surgeon accidentally during the performance of an abdominal operation, or it may be wounded intentionally, as in Morris's cases, in which a malignant growth was incorporated with the ureter. There is particular danger of injuring the ureter in operations upon intraligamentary growths, because the ureter is displaced and often resembles an adhesion. The rule of surgery is, that when working about the ureter the surgeon neither clamps nor cuts any structure without a careful preliminary examination. Rupture causes severe shock and extravasation of urine around the kidney or into the peritoneal cavity. In extraperitoneal rupture a palpable mass forms in the loin. When the ureter is divided in an operation, a flow of urine is seen.

Treatment.—The upper three-fourths of the ureter can be reached by an extraperitoneal incision, which is a prolongation of the incision for lumbar nephrectomy, running from the twelfth rib downward, and forward to one inch anterior to the anterior superior spine of the ilium, and then parallel to Poupart's ligament until a point is reached above its middle (Fenger). Israel's incision begins at the anterior edge of the erector spinae muscle one finger's length below the twelfth rib, is taken forward parallel with the rib until it reaches the line of the rib's tip, and is then carried toward the middle of Poupart's ligament until the line for ligation of the common iliac artery is reached, and is then taken toward the middle line as far as the outer border of the rectus muscle. The lower one-fourth of the ureter can be reached by abdominal section or by sacral resection (Cabot). If it seems probable that the ureter is wounded or ruptured, explore, and if this is found to be the case endeavor to restore the continuity of the tube (Fenger). A longitudinal cut can be sutured with fine silk. If the ureter is cut across near the bladder, implant the proximal end into the bladder and ligate the distal end (Van Hook, Penrose, Kelly). If it is cut above the bladder portion, perform lateral implantation by Van Hook’s method (page 950).

A longitudinal wound of the ureter inflicted during an abdominal operation should be sutured, but if the duct cannot be readily reached, simply make a posterior incision and drain, as the longitudinal wound will heal by granulation if no sutures are inserted (Van Hook). In a case of transverse division perform uretero-ureterostomy or vesical implantation; or, if neither of these methods is feasible, make a urinary fistula, or perform nephrectomy.

Renal Calculus.—A stone in the kidney is formed by the precipitation of urinary salts into the renal epithelial cells and the gluing together of these
salts and cells by material from mucus or blood-clot, this mass serving as a nucleus on which accretion takes place. Most calculi escape when small as gravel. The cause is a highly acid urine, which induces catarrh of the renal tubes. Such high concentration of urine is favored by a sedentary life, by the ingestion of much alcohol or nitrogenous food, by constipation, by an inactive skin, and by a torpid liver. The children of poverty are liable to calculi because of the use of unsuitable foods and the formation of great amounts of nitrogenous waste. Males more often suffer than do females; certain locations favor the development of the malady, and a family tendency sometimes exists.

Symptoms.—The symptoms of stone in the kidney may not appear for years, but generally they are manifested early. The patient usually complains of pain in the loin, and sometimes of pain in the iliac region. Deep percussion over the kidney causes pain in the loin, even when pressure is painless (Jordan Lloyd’s symptom). Pain is aggravated by exercise. The urine is often somewhat albuminous, and may from time to time contain blood. Frequency of micturition is noted during the day, but not at night. The urine may be purulent. Nephritic colic is due to the washing of a calculus into the orifice of the ureter, which it blocks, tears, or distends. The pain is either sudden or gradual in onset, is fearful in intensity, and runs from the lumbar region down the corresponding thigh and spermatic cord (the testicle being retracted) and into the abdomen and back. There are nausea, vomiting, collapse, sometimes unconsciousness or convulsions. Frequent attempts at making water are productive of pain, but of little urine. The urine is usually, but not always, smoky from blood. After a time the pain vanishes, the stone having passed into the bladder or having fallen back into the pelvis of the kidney. A calculus retained in the kidney eventually excites pyelitis, pus appears in the urine, and soreness or pain in the loin exists. Kelly says: Even if pus is found we are not always sure from which kidney it came. Pain or swelling may point to one side, but we are not sure that the other organ is not also affected. If able to pass the renal catheter into one ureter, attach a syringe, and by making suction draw out any pus which may be present. In renal calculi cases this fluid is apt to contain fragments of uric acid. By using a renal bougie coated with dental wax it may be possible to make scratches on the instrument when it comes in contact with a concretion.* Slight attacks of colic occur from the passage of small stones or of plugs of mucus. When a stone is impacted in the pelvis the point of greatest tenderness on pressure is below the last rib, by the edge of the erector spine muscle. In many cases a stone in the kidney or ureter can be skiagraphed. Nephrolithiasis may cause death by exhaustion, by sepsis, by rupture of a hydronephrosis, or by amyloid degeneration.

Treatment.—For the gravel of the uric-acid diathesis use alkalies, especially the liquor potassii citratis, and reduce the amount of nitrogen in the diet to a minimum, at the same time washing out the organs by copious draughts of Poland water or Londonderry lithia. Piperazin, in doses of gr. v to gr. viij three times a day, is highly commended. Exercise is to be insisted on. When gravel is phosphatic, order strychnin, the mineral acids, and

Calculus in the Ureter

rest at the seaside. When oxalate of lime is found, restrict the diet, use the mineral acids, recommend travel or rest amid new surroundings, and give an occasional course of sodii phosphas, 3s three times a day, drunk in Buffalo lithia water. Nephritic colic is relieved by hypodermatic injection of morphin and atropin, the hot bath, diluent drinks, or the inhalation of ether. After the attack wash out the bladder with an evacuator. If a stone impacts in the ureter, perform the operation of ureterolithotomy. The diagnosis of this impaction is in many cases aided by the x-rays, but is sometimes possible only after exploratory laparotomy. If the symptoms point to stone in the kidney, medical treatment having been used without avail, always take a skiagraph. If this shows a stone, and if there are no evidences of organic disease of the other kidney, operate. If in doubt in spite of the skiagraph, make an exploratory lumbar incision; feel the surface of the kidney with the finger, sound the inside of the organ with a needle, and if a stone is detected, incise the kidney and remove the stone. Keen is of the opinion that operation should not be performed if the urea is below 1 per cent. If, after nephrolithotomy, suppression of urine occurs, cut into the other kidney, as in half of all cases a stone will be found lodged there.

Calculus in the Ureter.—A ureteral calculus comes from the kidney, sometimes dropping, but more often being forced, into the tube. A stone may be arrested just below the renal pelvis, at the pelvic brim, or near the opening into the bladder.

Symptoms.—Attacks of violent pain of the nature of renal colic, and not unusually a rigor with the attack and fever after it. Such an attack may be followed by hematuria. Tenderness can be developed at the point of impaction, the point of greatest tenderness being in the loin below the level of the kidney or in the iliac region (Perkins). If a stone partly obstructs the ureter, the urine is pale, of low specific gravity, and free from albumin. Impaction near the bladder causes symptoms similar to stone in the bladder (Jordan Lloyd). Impaction near the kidney is accompanied by hematuria and pyuria. In stone in the ureter pain is not developed by pressure in the loin at the level of the kidney. Complete obstruction of the ureter causes hydronephrosis or pyonephrosis. In some cases a stone acts as a ball-valve, plugs the ureter for a time, during which a lumbar mass develops, and then allows the urine to flow. A copious flow of urine is accompanied by disappearance of the lumbar mass.

In a woman, a stone lodged in front of the broad ligament may be felt by a finger in the vagina. Back of this region and up to the pelvic brim a stone may be felt by a finger in the rectum. A cystoscopic examination, in unusual cases, may show a portion of stone projecting from a ureter (Kelly). If a ureteral catheter tipped with wax is introduced, a calculus will make distinct scratches upon it (Kelly). The x-rays are very valuable in diagnosis.

Treatment.—During a painful paroxysm give morphia and use hot packs. The attack may pass away not to return, because the calculus passes. If such an attack does pass away, the urine should be examined after every act of micturition to see if the stone is voided from the bladder. After a day or two, if the stone does not appear, the Bigelow evacuating apparatus must be used. Otherwise, the retained fragment will enlarge and give trouble subsequently. If the stone is impacted, operate. The extraperi-
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toneal operation is to be chosen. Even when the stone is impacted below the pelvic brim, it is better to do the extraperitoneal operation, stripping the peritoneum and reaching the ureter from behind. (See Ureterolithotomy.)

**Abscess of the kidney** is caused by traumatism, by calculus, by stricture of the urethra, by disease of the bladder, by the union of miliary abscesses, or by pyemia.

The **symptoms** are pus in the urine (this is usual, but not invariable), hematuria in traumatic cases, and pain running into the groin. The urine is usually alkaline. Constitutional symptoms of suppuration exist, the fever being far higher than that usually met with in renal tuberculosis. The bladder should be examined with a cystoscope to determine that the turbid urine flows from a ureter and to identify the diseased side. It is well, if possible, to catheterize the ureters.

The **treatment** in the early stage is rest, morphin, purgation, anodynes, an ice-bag to the loin, followed in forty-eight hours by hot fomentations. When the diagnosis is clear incise the loin, open and stitch the kidney to the abdominal wall, or, if the organ be badly damaged, remove it.

**Pyelitis** and **pyelonephritis**, which usually affect only one gland, are caused by urethral stricture, by stopping of the ureter by blood-clot, by vesical paralysis, by stone in the bladder or in the kidney, and by enlargement of the prostate gland.

**Symptoms.**—A patient who has, or who has had, retention of urine develops high fever, often preceded by a chill, and headache, stupor, and dry tongue are noted. Unlike acute Bright’s disease, there is neither edema nor dry skin, convulsions do not occur, and the urine is plentiful and contains pus and but rarely blood. The **prognosis** is very bad.

The **treatment** is to remove the obstruction if possible. If the urine be acid, give liquor potassii citratis; if alkaline, give benzoic acid. Gallic acid, eucalyptol, and small doses of copaiba or cubebs are recommended. Venice turpentine, camphor, and opium may be given in pill form. Quinin is used to stimulate the patient. The bladder is to be washed out every day with boric-acid solution (gr. iiij to 3j of water). Cups, dry or moist, and hot sand-bags or bran-bags are to be applied to the loin. Alcohol may be sparingly administered. Urotropin is a useful drug.

**Perinephritis** is an inflammation of the perinephric fatty tissue produced by cold, febrile disease, slight traumatism, or the spread of inflammation from another part.

The **symptoms** of this condition are rigidity of the spine, the inclination being toward the affected side, flexion of the thigh, pain in the loin and iliac region, and often pain in the knee. The symptoms resemble those of hip-joint disease in the second stage. Suppuration may or may not take place.

The **treatment** is wet cups to the loin, ice-bags to the loin, rest, purgation by salines, morphin for pain, and, after the acute stage, potassium iodid internally and ichthyol locally.

**Perinephric Abscesses.**—An abscess in the perinephric fat is known as a perinephric or perirenal abscess. **Primary abscess** is caused by chills, acute febrile disturbances, or by pus flowing from some other part, as the spine. Slight traumatisms by producing hemorrhage make the perinephric
Hydronephrosis is a condition of the kidney in which an impediment to the outflow of urine is caused by obstruction in the ureter, the bladder, or the urethra, the calyces of the kidney becoming over-distended with urine and the glandular tissue being absorbed by pressure. It has been asserted by Albaran that secretion of urine ceases in a kidney whose ureter is blocked, distention being due purely to congestion. Hydronephrosis may be congenital, due usually to twisting of the ureter, or to valve-formation obstructing the ureter at its point of junction with the pelvis of the kidney, the valve being produced because the ureter passes into the kidney pelvis at an unnatural angle. Occasionally imperforate meatus produces hydronephrosis of both kidneys. The causes of the acquired form are the pressure of pelvic growths or pregnancy, inflammation or tumor of the bladder, stone in the bladder, kidney, or ureter, twisting or kinking of the ureter of a movable kidney, enlargement of the prostate gland, and stricture of the urethra. Acquired hydronephrosis may involve both kidneys, all of one kidney, or only a part of a single gland.

Symptoms.—Hydronephrosis is most frequent in females. When a lumbar tumor is absent there may be no symptoms, or there may be pain in the back and abdomen, frequent micturition, a persistent or intermittent diminution in urine, or even occasional anuria. A tumor may be found in the loin, which growth is dull on percussion and may come and go, a large urinary flow occasionally occurring when it disappears. Hydronephrosis may last a long while if only one kidney be involved, but death is not far distant if both glands suffer. Death occurs from uremia, from pressure on adjacent organs, or from rupture into the peritoneal cavity. The diagnosis is aided by the use of the cystoscope and by catheterizing the ureters.

Treatment by aspiration may cure, but the operation may have to be done repeatedly. Tapping on the left side is performed just below the last intercostal space; on the right side the tap is made midway between the last rib and the crest of the ilium. Some few cases have been cured by catheterizing the ureter (Pawlilk). The proper operation in most cases is nephrotomy, stitching the edges of the cut kidney to the surface. After the kidney has been opened explore the ureter by means of a uterine sound or an elastic bougie. A healthy ureter will permit the passage of an instrument of the size of from No. 9 to No. 12 of the French scale (Fenger). If
the opening of the ureter into the pelvis cannot be found, open the pelvis or open the ureter. A valve should be slit longitudinally (Fenger). If a permanent suppurating fistula ensues or if the organ is found extensively damaged, nephrectomy is to be performed, provided the other kidney is in reasonably good condition.

**Pyonephrosis** or **surgical kidney** is a condition in which the pelvis and the calyces of the kidney are distended with pus or with pus and urine. The whole kidney may be destroyed. This condition has the same causes as has hydronephrosis, for it is in reality usually an infected hydronephrosis. In some cases the inaugural malady is pyelitis, which causes blocking of a ureter. Watson, of Boston, has reported two cases associated with obliteration of the ureter by a mass of fibrous tissue (stricture of the ureter).

**Symptoms.**—At first the symptoms are those due to the obstructing cause, plus pyelitis. Pus may appear in the urine in incomplete obstruction, or it may intermittently come and go. Constitutional symptoms of suppuration are soon manifest. A tumor may appear in the loin, like the tumor of hydronephrosis. If only one kidney is involved, and if the disease is due to blocking of a ureter, recovery is to be expected. The diagnosis is rendered more certain by the use of the cystoscope and by catheterizing the ureters.

The **treatment** in the early stages comprises removal, if possible, of the cause of obstruction and the employment of measures directed to the cure of the pyelitis. If obstruction is not complete, palliative measures may be employed for the tumor. If fever is continued, if there is great visceral derangement, if pain is severe and constant, and if the tumor continually grows, perform a nephrotomy, stitching the organ to the surface if possible, or removing it if it is hopelessly disorganized and the other kidney is in a good or a fairly good condition.

**Chronic Tuberculosis of the Kidney.**—This condition may begin in one kidney, no other area of infection existing in the body. In such cases the bacteria were deposited from the blood. Even when the bacteria are deposited from the blood there is, in most cases, a causal focus of tuberculosis somewhere in the body. The other kidney is usually involved subsequently, the process in the first kidney affecting the bladder and secondarily the other kidney. The important point is that tuberculosis of the kidney arising in this manner is at first a unilateral disease.

Tuberculosis of the kidney is seldom a primary disease and usually arises secondarily to tuberculosis of the prostate, bladder, or epididymis. In such a condition the kidney disease is bilateral. Renal tuberculosis is particularly common in the third and fourth decades of life, and is more frequent in males than in females.

**Symptoms.**—Renal tuberculosis of arterial origin may exhibit no symptoms until the disease is far advanced. Renal tuberculosis secondary to disease of the bladder or prostate always presents symptoms.* A very common symptom of renal tuberculosis is the sudden onset of polyuria and frequent micturition. The patient is annoyed day and night, and in some cases micturition is distinctly painful. Paroxysms of renal pain are not unusual. The urine is acid, and may contain pus or blood. Tubercle bacilli may be found in the urine or in the sediment, but they may be absent. Repeated

examinations should be made before it can be stated certainly that bacilli are absent. The presence of bacilli proves the diagnosis, but their absence does not negative it (Willy Meyer). If bacilli are not found, inject some of the urinary sediment into a guinea-pig, and note if tuberculosis arises in the animal. Czerny has shown that in cases of tuberculous kidney in which bacilli are not found in the urine, the administration of tuberculin will cause great numbers to appear. This agent will also cause a marked febrile reaction if tuberculosis exists. The urine may or may not be albuminous.

In many cases the kidney is obviously enlarged, and the renal area is frequently tender and occasionally painful. The patient loses flesh, and there is nocturnal fever followed by sweating. The use of the cystoscope furnishes important information. It shows from which ureter turbid urine is coming. Catheterization of the ureters should be practised by some one who is accustomed to employ it. Always examine carefully to determine if one or both kidneys are involved, if the bladder is diseased, and if the prostate gland or seminal vesicles are tuberculous.

**Treatment.**—Nephrectomy is not justifiable in the very beginning of a case, because such a patient may be cured by a combination of medical and hygienic treatment, and the weakening effect of the operation of nephrectomy may cause the other kidney to rapidly develop tuberculosis. Tell such a patient to lead an outdoor life. Brown recommends camp-life in the Adirondacks during the summer, and sends such patients South during the winter. If a patient cannot go to another climate, urge upon him the necessity of being much out of doors. Insist upon the taking of plenty of nutritious food. Order courses of creasote or guaiacol carbonate.

If the kidney is markedly enlarged, if there is profuse hematuria, if the fever is high and persistent, if only one kidney is involved, and if the bladder and prostate are free from disease, perform nephrectomy. In cases with involvement of the other kidney or of the genito-urinary tract lower down, nephrectomy is not justifiable, although nephrotomy for drainage may greatly benefit the patient for a time.

**Operations on the Kidney and Ureter.**—Operation for Chronic Nephritis.—In 1897 Mr. Reginald Harrison advocated puncture of the kidney to relieve tension in cases of albuminuria, and in 1901 advocated incision of the true capsule of the kidney and puncture of the gland to accomplish the same purpose (“Brit. Med. Jour.,” Oct. 19, 1901). Alexander Hugh Ferguson, in March, 1899, reported two cases of interstitial nephritis cured symptomatically by decapsulation and multiple punctures (“Jour. Amer. Med. Assoc.,” March 11, 1899). Dr. Geo. M. Edebohls observed between 1892 and 1897 that in certain cases of movable kidney with albuminuria the albumin and casts disappeared after nephropexy. Rose, Wolff, and Ferguson have observed the same fact. Harrison believes that renipuncture removes the symptoms by abating tension, but Edebohls concludes that nephropexy relieves the condition and possibly cures it by establishing vascular adhesions which carry an additional supply of blood. He proposed to operate for Bright’s disease in 1899 (“Med. News,” April 22, 1899). Edebohls deliberately operated for chronic nephritis and claims 8 complete recoveries from chronic Bright’s disease (“Med. Record,” Dec. 21, 1901).
There can be no doubt whatever that operation is sometimes followed by polyuria, disappearance of edema and other symptoms, and apparent cure. But in some cases the disappearance of symptoms has been too rapid to permit of the assumption that new vessels have caused it. In such cases it seems much more probable that relief of tension is the real curative factor. Edebohls says that the polyuria begins about the tenth day after operation; that improvement begins in one month and is gradual; that the cure is due to vascular adhesions; that the adhesions contain more arteries than veins; that the free blood-supply absorbs exudate and products of inflammation; frees the tubes and glomeruli from pressure and constriction, causes the re-establishment of a normal circulation and the regeneration of epithelium ("Med. Record," Dec. 21, 1901).

The exact status of the operation is not as yet determined. It does, however, seem to be proved that operation is in some cases followed by apparent cure or great amelioration of the condition. Whether permanent cure is ever thus obtained is doubtful, and the part played by rest in bed and drugs in effecting an improvement must not be lost sight of. Cases with pain and bloody urine are often much improved by incising the capsule. Post-operative suppression and the anuria of acute infectious diseases may be favorably influenced by the operation. An important fact which Rovsing maintains and Edebohls proves is that chronic nephritis may be for some time a unilateral disease. (Read the views of Schmidt in "Med. Record," Sept. 13, 1902; of Rovsing, of Copenhagen, in "Mittheilungen aus den Grenzgebieten der Medizin und Chirurgie," vol. x, 1902, and editorial in "Jour. Amer. Med. Assoc.," Jan. 11, 1902.)

The operation as practised by Edebohls may be done on both kidneys at one sitting or in two sittings. In some cases only one kidney is subjected to operation. Edebohls takes a very radical view and would operate on any case free from incurable complications—if an anesthetic can be given and if the life-expectancy without operation is not less than one month ("Med. Record," Dec. 21, 1901). Ether is given or nitrous oxide and oxygen. Lay the patient prone with an air-cushion under the belly and expose the kidney by a vertical incision at the edge of the erector spinae mass, which cut does not open the sheath of the muscle. Remove the fatty capsule from the true capsule, continuing the dissection around each pole until the pelvis of the kidney is reached. The kidney is extruded from the wound, the true capsule is incised along the convex border and around each pole, is separated from the kidney, and is cut away close to its junction with the kidney pelvis. The kidney is then returned to its bed of fat, and the wound is closed. (See "Med. Record," Dec. 21, 1901.) Edebohls does not drain unless there is considerable edema. Edebohls reports 18 operations without a death. In 9 of the cases the operation was done more than one year ago, and 8 of them are said to be cured.

**Nephrotomy.**—Nephrotomy means incision of a kidney, but the term is sometimes, though wrongly, applied to the exploratory exposure of the kidney without incision. The operation is employed to evacuate infectious material, relieve tension, permit of the removal of a calculus or exploration of the ureter, and for diagnosis of renal disease. The instruments required are scalpels, a blunt-pointed bistoury, dissecting-forceps, toothed forceps, a grooved direc-
Nephrolithotomy

...tor, hemostatic forceps, spatula, metal retractors, a fountain syringe, an Allis dissector, Hagedorn needles, and an Abbe needle-holder. If looking for a stone, have a large harelip-pin to sound with, forceps and a scoop to remove the stone, and a periosteum-elevator to scrape away adherent calculi. The patient lies upon the sound side, a sand-pillow being placed under the loin. The incision is made half an inch below the last rib and close to the outer border of the erector spinae mass, and runs obliquely downward and forward toward the iliac crest for three inches, the incision being enlarged later if required. Divide the skin, the superficial fascia, the fat, the external oblique, the posterior border of the internal oblique, and the outer edge of the latissimus dorsi. This incision exposes the lumbar fascia. Push aside the last dorsal nerve and incise the lumbar fascia, when the perirenal fat will bulge into the wound. Two distinct layers of fat exist. Tear this fat through with dissecting-forceps or with an Allis dissector to expose the kidney, which can now be opened while it is forced into the wound by the hand of an assistant making abdominal pressure.

Kocher's incision for nephrotomy is begun in the angle between the sacrolumbalis muscle and the twelfth rib, and is carried downward, forward, and outward to the axillary line (Fig. 141). This incision divides the skin, subcutaneous tissues, lumbar fascia, the latissimus dorsi, and the serratus posticus inferior muscles.

Edebohls's method enables the surgeon to most thoroughly explore the kidney, because this organ is brought outside of the body. The patient lies prone, with a large cylindrical inflated rubber pad beneath his abdomen. A vertical incision is made close to the border of the erector spinae muscle, from just below the last rib to just above the iliac crest. The sheath of the muscle is not opened. The fibers of the latissimus dorsi are separated by blunt dissection. The iliohypogastric nerve is found and retracted. The transversalis fascia is incised and the fatty capsule reached. The two layers of the fatty capsule are torn through and the kidney exposed. The fatty capsule is well separated from the kidney front and back. The patient is pulled by the legs toward the foot of the table, the pad remaining stationary. This change of position brings the pad beneath the chest, abdominal respiration takes place, the kidney is forced out of the wound, and can be thoroughly examined.

Nephrolithotomy.—In this operation the incision is the same as in nephrotomy. If the kidney is not much enlarged, it can be brought out by Edebohls's method. Feel the kidney for a stone, or, if this procedure fails, explore with a needle or a pin. If no stone is found, open the pelvis, let an assistant grasp the pedicle with his fingers or with a pair of forceps, each blade of which is covered with a bit of rubber tube, while the surgeon opens into the kidney and explores with the finger. If a stone is detected by a pin or by palpation, open the kidney-tissue, loosen the calculus with the nail, and remove it with the finger, with a scoop, or with forceps. After removing the stone suture the incision with catgut, and release the pressure on the pedicle. Hemorrhage will rarely occur. If in spite of this plan bleeding occurs, take out the stitches and apply pressure and hot water, or in some cases plug with iodoform gauze for twenty-four hours. When hemorrhage ceases, put a large drainage-tube down to the kidney. Close
the wound in the muscles and integument and dress antiseptically. The dressings must be changed frequently and the tube should be shortened daily.

**Nephrectomy.**—Nephrectomy is the removal of a kidney. There are two methods of nephrectomy, the **lumbar** and the **abdominal**. Before performing nephrectomy ascertain the competence of the kidneys. If at least 1 per cent. of urea is not being excreted, it is very unsafe to operate. Be sure the patient possesses two kidneys. Examination of the bladder by cystoscope will show the ureteral orifices, a strong indication that both kidneys are present. Nevertheless, when we reflect that a horseshoe kidney has two ureters the proof is not absolute. Catheterization of the ureters is advisable if it can be performed, but it will probably require a specialist to perform it. Proof absolute of the presence of two kidneys consists in feeling both of them. If in doubt as to the question, and if uncertain as to the competence of the organ which is to be left, feel each kidney during the operation and before removing either, or perform a preliminary exploratory laparotomy.

**Lumbar Nephrectomy.**—The instruments required for this operation are scalpels, a blunt-pointed bistoury, forceps as used in the preceding operation, a clamp, retractors, spatula, blunt hooks, an aneurysm-needle, a pedicle needle, a grooved director, stout silk, an Allis dissector, sharp spoons, and a Paquelin cautery. The patient is placed on the sound side and a pillow is placed under the loin. Several incisions have been proposed. In many cases the oblique incision is first made to permit of exploration. This incision is begun half an inch below the last rib and by the edge of the erector spinae muscle, and is carried downward and forward toward the iliac crest. In some cases a kidney can be removed through this cut. In other cases the cut must be enlarged. It can be enlarged by extending the cut downward. Morris enlarges it by adding to it a vertical incision, which begins one inch below the origin of the oblique cut. König's incision for nephrectomy consists of a vertical cut by the edge of the erector spinae, carried almost to the iliac crest, from which point it is curved forward toward the umbilicus, and is carried to or even through the rectus muscle. After thorough exposure lift the kidney, and separate it from the peritoneum; if possible, with the finger; clamp the pedicle; pass an armed aneurysm-needle between the vessels of the pedicle; ligate in two places; cut between the threads; and arrest hemorrhage by ligature or by the cautery. If the ureter be healthy, ligate it with silk and drop it back; if it be foul and purulent, scrape it with a sharp spoon, wash it with corrosive sublimate, and touch it with pure carbolic acid, and then either ligate it and drop it back or sew it into the wound. If hemorrhage persists from the wound, plug with gauze. Insert a drainage-tube and close the wound. If the peritoneum be accidentally opened, close it with Lembert sutures. Kocher’s method is excellent, and enables the surgeon to feel the opposite kidney before removing the one which is known to be diseased. The incision is begun as described on page 947, and is carried forward so as to expose the reflection of the peritoneum onto the colon in the posterior axillary line (Fig. 141).* At this point the peritoneum is opened, and the surgeon’s hand is inserted into the abdominal cavity and feels the other kidney. If another kidney exists and it is found to be healthy, the diseased organ may be removed.

* Kocher’s "Text-book of Operative Surgery."
Abdominal nephrectomy is more dangerous than the lumbar operation. The same instruments are required as are used in the preceding operation. The position is supine. The incision is that of Langenbeck—four inches long in the linea semilunaris, its center corresponding to the umbilicus. Open the abdomen, introduce a hand, feel the kidneys, and if both show serious disease do not perform nephrectomy. If we decide to remove one kidney, keep the small intestine away by sponges, push the colon toward the umbilicus, incise the outer layer of the mesocolon, and bare the kidney. Strip off the peritoneum from the kidney and its vessels, and ligate the vessels by passing strong silk through the center of the pedicle with an aneurysm-needle. Ligate the ureter if healthy, and cut. If the ureter is septic, fasten it to an opening made in the loin by cutting onto forceps pushed to the outer edge of the quadratus lumborum. Stop bleeding, irrigate the belly-cavity, and dress as usual, employing drainage only when septic matter has gotten into the peritoneal cavity or when oozing is persistent.

Nephrectomy in Children.—The operation is proper in certain non-malignant troubles. Jepson did a successful nephrectomy for a congenital cystic kidney on a patient four months and fourteen days of age. Rovsing did it successfully for congenital hydronephrosis, the patient being nine months old. Roswell Park did a successful nephrectomy for congenital cystic kidney on a child twenty-three months of age. The value of nephrectomy for sarcoma is more than doubtful. The operation never really cures, and if an operative recovery is obtained, the disease appears after a time in the other kidney. Jessup performed nephrectomy in eleven children and every case died within two and one-half years of the operation. The operation often prolongs life and relieves discomfort, but does not cure.

Partial Nephrectomy.—This operation may be performed in some cases for wounds, cysts, and innocent tumors. After removing the damaged or diseased part bleeding points are ligated with catgut. The wound-surfaces are approximated as well as possible by catgut sutures. Drainage is introduced. The value of partial nephrectomy in some cases seems certain, and we should apply it when possible instead of the complete operation,* except in cases of malignant disease.

Renipuncture.—This is an operation devised by Reginald Harrison for the relief of albuminuria due to elevated tension. The kidney is exposed in the loin, the capsule is incised, and punctures are made in the kidney. Simple incision of the capsule will usually relieve nephralgia. (See Operations for Chronic Nephritis.)

Nephrorrhaphy (or nephropexy) is fixation of a mobile kidney. The kidney is exposed in the loin as detailed in the section on Nephrotomy. The best incision is vertical. After exposure the kidney is forced out of the wound by Edebohl’s method. The fibrous capsule is incised longitudinally and a cuff is turned down on each side. Sutures traverse the kidney-substance and two layers of capsule on each side. The upper suture catches the peristome of the last rib, the lower sutures catch the lumbar fascia. Drainage is not required. The suture-material is kangaroo-tendon or chromicized catgut. Many surgeons simply pass sutures through the

uncut capsule and kidney-substance, and fasten the kidney to the lumbar fascia. Other surgeons split the capsule, pull it into the wound, and pass sutures through the capsule and wound-edges. After nephorrhaphy keep the patient in bed for three weeks. A kidney which has been anchored will not unusually loosen at some future time.

**The Elder Senn’s Operation.**—Many surgeons feel that it is not desirable to pass sutures through the kidney-substance, and I have entirely abandoned the use of them in operations for movable kidney. Urinary fistula has followed suturing. Again, the value of such sutures is very doubtful. The kidney is a very soft organ, and if it is suspended by sutures they are certain to cut out. Senn’s operation fixes the kidney without using sutures.

The kidney is held in place by an assistant. A vertical lumbar incision is made, the perirenal fat is exposed and is torn through until the kidney is reached. The kidney is usually brought out of the wound. The posterior fatty capsule is cut away, and also the anterior fatty capsule up to the hilum. The true capsule of the kidney is scarified. I always have packing prepared by suturing together with fine catgut the ends of two pieces of iodoform gauze. Two such strands are prepared. One piece of iodoform gauze is placed under the upper end of the kidney, and another piece under the lower end, the catgut stitch in each instance being directly under the kidney. The kidney is replaced and will then lie in a sling, composed of two pieces of gauze, the ends of which protrude from the wound. Gauze is packed into the opening over and about the kidney, and over this the two long pieces are tied. A large gauze pad is placed upon the abdomen over the anterior surface of the kidney, and the lumbar wound is dressed with gauze. The dressing and gauze pad are held in place by a binder. In about ten days the gauze is well soaked with salt solution and the packing is removed and the granulating surface is lightly packed with gauze. At this time the catgut is destroyed and the gauze can be easily pulled out. If a continuous piece of gauze was used, ether must be given before removal is attempted. By this operation the kidney is surrounded with granulations, which are converted into scar-tissue, and the organ becomes encased in a box of fibrous tissue.

**Ureterolithotomy.**—If the stone is impacted in the upper two-thirds of the tube, make the incision advised for wounds of the ureter (page 939). The operation is extraperitoneal. The tube is opened by a longitudinal incision. The stone is removed. The ureter is explored by means of a sound. It is not necessary to suture the ureter. The tissues above the ureter are sutured and a drainage-tube is carried to the duct (Fenger). Whenever possible, and usually it is possible, reach the ureter by the extraperitoneal route, and even well below the brim of the pelvis the peritoneum can be stripped and the ureter opened from behind. In a woman a stone near the vesical opening can be reached by a vaginal incision. If the stone cannot be reached by the extraperitoneal method, open the peritoneal cavity and incise the ureter. After removing the stone suture the wound in the ureter with silk inversion-sutures, fasten an omental graft over the suture-line (Fenger), and drain.

**Uretero-ureterostomy (Van Hook’s Operation).**—In this operation ligate
the lower end of the divided ureter with silk or catgut. About one-fourth of an inch below the ligature make an incision in the long axis of the tube. This incision is in length equal to twice the diameter of the tube. Each end of a piece of fine catgut is threaded to a fine needle. This thread is passed through the upper end of the ureter (Fig. 552). The needles are made to enter the lower end of the tube through the door made by the surgeon. They are pushed through the wall of the ureter one-half an inch below the door (Fig. 552). Traction upon the strings causes invagination and the ligature-ends are tied. If the operation is intraperitoneal, the ureter is wrapped about with peritoneum.

Intestinal Implantation of the Ureters.—This operation may be employed in exstrophy of the bladder and in vesical cancer, in which it is necessary to remove the bladder. After this operation there is danger of infection of the ureters and consequent ascending ureteritis, and pyelonephritis, and the presence of urine in the bowel usually causes inflammation of the rectum, and incontinence of urine may take place.

Maydl asserts that a piece of the bas fond should be removed with the ureter, and implanted with it into the intestine, the flange hanging free in the lumen of the gut. If this is done, the relations of the ureter to the muscular coat of the bladder are not interfered with, stricture is less likely to occur, ascending infection is antagonized, and suppurative conditions arise at the margin of the flange, rather than, as in other methods, directly in the cut ureter. Maydl has collected the records of fourteen cases operated upon by this method, with two deaths.* In vesical exstrophy Peterson transplants a vesical flap containing both ureteral orifices into the descending colon.

Cystoscopy.—Cystoscopy is the employment of the cystoscope for the study of the interior of the bladder, the prostate, the ureteral orifices, and the appearance of the fluid coming from each kidney. In order to use the

Diseases and Injuries of the Genito-urinary Organs

cystoscope satisfactorily the urethra must admit instrument No. 24 of the
French scale. The bladder must hold at the very least 100 c.c. of fluid.
Examination is either impossible or unsatisfactory if the prostate is greatly
enlarged. The following are the contraindications to cystoscopy (Follen Cabot
and Henry G. Spooner, in "Med. Record," July 11, 1903): When it is ob-
vious that operative intervention would be useless; when there is a very large
tumor; in acute cystitis; in tuberculosis in which the diagnosis is evident
without the cystoscope. The bladder may be dilated with air, Bransford
Lewis's cystoscope being used (Fig. 548), or with fluid, the instrument
of Nitze being employed (Fig. 553). The Nitze-Albarran instrument is a
very useful catheterizing cystoscope.

To arrest bleeding during the examination, it may be necessary to fill
the bladder with a 1:10,000 solution of adrenalin chlorid and retain it for
three minutes.

In order to use the Nitze instrument, it is rarely necessary to give ether,
and as a rule cocain can be used. The bladder is irrigated with boracic-
acid solution until the fluid emerges clear and is then filled with boracic-
acid solution. The cystoscope is sterilized in formalin vapor, washed off
in salt solution, and lubricated with lubricondrin. The current is turned
on for a moment to see that the lamp works properly. In the Nitze instru-
ment a light of 32 candle-power is sufficient, and a rheostat is always em-
ployed. The current is turned off, the instrument is introduced, the current
is turned on again, and the exploration is carefully made. If blood obscures
the transparency of the fluid, withdraw the instrument, empty the bladder,
fill it with adrenalin, withdraw the adrenalin in three or four minutes, fill
the bladder with boracic-acid solution, and reinsert the cystoscope. If this
fails, use the irrigating cystoscope, an instrument which continually changes
the fluid while the examination is being made. The cystoscope is an instru-
ment of great value in the hands of an experienced man, but is practically
Diseases and Injuries of the Bladder

useless when employed by a novice. In using a cystoscope the mucous membrane may be burned with the lamp. This causes inflammation, and if an eschar forms it will be cast off, exposing a granulating surface. Schmidt calls attention to this injury, speaks of the condition as *ulcer cystoscopicum*, says it is in the fundus, has the shape of the instrument, and heals in from fourteen to twenty-one days ("Jour. Amer. Med. Assoc.," July 19, 1902).

Disinfection of Catheters.—Metallic instruments are cleansed by boiling. Soft-rubber and elastic catheters can be sterilized by mechanical cleansing with soap and water and boiling for five minutes. The common custom of immersing a soft-rubber or elastic catheter for five minutes in a 1:2000 solution of corrosive sublimate is a useless waste of time, as such a procedure will not sterilize an infected instrument. Of course, a catheter coated with varnish or resin cannot be boiled in water or placed in steam. The best method of sterilization for woven or varnished catheters is formalin vapor. Catheters, after being cleansed mechanically, should be placed in a glass cylinder the bottom of which is perforated like a sieve. This jar is placed for twenty-four hours in the vapor of formalin. After sterilization the instruments are kept ready for use in a glass cylinder containing calcium chloride (R. W. Frank, in "Berliner klin. Woch.," No. 44, 1895). Before using, the catheters are washed in sterile water. Guyon prefers to scrub catheters with soap and water, dry them outside and inside, and place them in the vapor of sulphurous acid for forty-eight hours.

DISEASES AND INJURIES OF THE BLADDER.

Retention of Urine.—By this term is meant an inability to empty the bladder. The retention may be complete, not a drop emerging, or it may have been complete, a dribbling setting in after a time, due to paralysis of the bladder, which viscus becomes unable to contain more fluid, expulsion of the overflow from the ureters being produced by atmospheric pressure. This condition is known as the engorgement, the overflow, or the incontinence of retention. There may be partial retention from enlarged prostate, a portion only of the urine being voided. Retention may be caused by (1) obstruction, resulting from urethral stricture, hypertrophied prostate, inflamed prostate, occluded meatus, impacted calculus, urethral tumor, rupture of the urethra, perineal abscess, complete phimosis, fecal impaction and pressure from a large tumor, or by (2) defective expulsion, resulting from paralysis, disease or injury, atony, reflex inhibition, shock, muscular weakness of the fevers, and the action of such drugs as belladonna, opium, or cantharides.

Symptoms.—In acute retention there is an agony of desire to urinate, the patient making acutely painful straining-efforts, during which feces are often passed. There are severe pain and aching in the abdomen, thighs, perineum, and penis. All the symptoms rapidly increase, a typhoid state is inaugurated, and death closes the scene unless relief be given. If retention is from time to time alleviated by the passage of a little water, the symptoms are slower in evolution and are less intense, and the case is said to be chronic. Some cases of gradual onset, due to atony, are very insidious, the patient feeling no particular pain and complaining only of the dribbling, which is