

fibrous capsule. Experience has proved that nephropexy is quite as successful without decortication as with it. But pain is the surgeon's bugbear. In these neurotic patients it is quite conceivable that pain may be due to forcing the kidney too high in the loin, to attaching it too firmly (as by decortication or numerous sutures) in any position, or to the presence of silk sutures. Therefore the ideal operation is to reef the fascial capsule, after removal of the perirenal fat, so that the kidney is left relatively free in a confined space. But the capsule-reefing operations lack the confirmation of time, and, therefore, I prefer to support the kidney by packing gauze beneath it, a procedure certain to hold the kidney in place and likely to leave it surrounded by less adhesions than any of the suture methods. On the other hand, if the kidney has to be incised for hydro-nephrosis or stone, it is obviously appropriate to retain it in place by suture through the reflected capsule.

CHAPTER XXXV

INJURIES TO THE KIDNEY—ANEURYSM OF THE RENAL ARTERY

SUBPARIETAL INJURIES—RUPTURE

THE subparietal injuries of the kidney are often classified as contusions and ruptures; but inasmuch as with every rupture there is contusion, and with almost every contusion at least a partial rupture, while clinically contusion and rupture exhibit the same symptoms and demand the same treatment, they need not be distinguished.

Subparietal injury of the kidney, though more frequent than any other form of renal trauma, is rare. Among 13,455 autopsies there occurred only 31 instances of ruptured kidney (Morris and Herzog¹). Güterbock,² however, encountered 36 ruptured kidneys among 925 autopsies, and 9 such cases among 9,500 patients admitted to St. George's Hospital. Among 198 cases collected by Tuffier, 136 occurred in adult men, and in only two were both kidneys injured. Two hundred and eighty-one of Küster's 306 cases were males. Of 272 in which the particulars are stated, 142 occurred on the right and 118 on the left side, 12 being bilateral (Morris).

The kidneys may be contused by a variety of accidents, such as kicks, buffer accidents, falls, and even simple muscular effort. The lower ribs may be broken and driven into the organ, and many of the accidents are explicable only on the theory that the kidney is burst by the impact of the floating ribs compressing it against the spine.

MORBID ANATOMY

Subcapsular Hemorrhage.—Morris relates two instances of extravasation of blood under the fibrous capsule of the kidney, caused by slight muscular exertion and producing severe pain. Calculus was suspected, but nephrotomy revealed only a subcapsular hematoma,

¹ Morris, *op. cit.*

² Die chirurgischen Krankheiten der Harnorgane, Leipzig u. Wien, 1898, iv, 900.
531

the evacuation of which effected a cure. He believes that this form of rupture is not uncommon, and that the compression of the parenchyma, perhaps increased by repeated small hemorrhages, explains the irregular and protracted course of the symptoms in some cases, until ultimately the capsule gives way, the blood and disorganized parenchyma escape into the perirenal space, and this late hematoma demands operation which reveals a disorganized kidney. Such cases are usually classified as *subcapsular lacerations of the kidney substance*.

Laceration of the Parenchyma.—The kidney substance may be lacerated in any direction and to any extent (Fig. 138). Portions

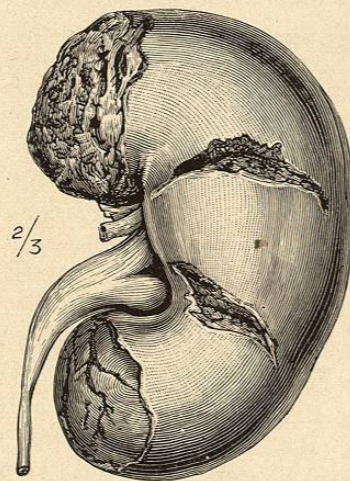


FIG. 138.—RUPTURED KIDNEY (Morris).

of the organ may be lopped off, or the whole kidney may be reduced to a pulp or torn away from its vessels and ureter. If the capsule and ureter remain intact the primary reaction is often slight; but usually one or both are torn, and as a result blood and urine are immediately poured into the perirenal space, at first distending it and forming a tumour in the loin, and later escaping from the orifice at the lower part of the perirenal fascia (or through any tear in it) to form a more or less generalized subperitoneal infiltration. This extravasation of blood and urine is more or less rapid in proportion to the size of the ruptured vessels.

The blood also pours down the ureter into the bladder and is expelled therefrom (hematuria).

Associated Lesions.—Laceration of the perirenal fat may occur alone or in connection with rupture of the kidney. It is unimportant. Fortunately laceration of the peritoneum is rare. In the adult there is a distinct layer of fat between the kidney and the peritoneum, which permits complete disintegration of the former without any injury to the latter; but in children this layer of fat is not developed, and, therefore, rupture of the peritoneum permitting rapidly fatal hemorrhage is more frequent in them than in the adult. Rupture of the renal artery and vein is also rare. Rupture of the liver occurred in 10 out of Morris's 12 cases (an unduly large proportion). Rupture of the spleen is a less frequent complication, though, in either case, the free hemorrhage from the intraperitoneal

organ is likely to make the renal lesion a secondary consideration. Fracture of the lower ribs and puncture of the diaphragm, the pleura, and the lung are among the less frequent associated lesions.

The Process of Repair.—Slight injuries of the renal parenchyma may heal promptly with but slight associated inflammation,¹ and perirenal hematoma of some size may disappear within a few weeks by diffusion and absorption. Yet the usual outcome of rupture of the kidney—if the patient survives the immediate results of the injury—is infection of the urohematoma, suppuration throughout the wound in the kidney, and gangrene of such portions of the organ as have been partially or completely torn away. The urinous, purulent collection burrows in various directions until the patient succumbs or the surgeon intervenes.

SYMPTOMS

Apart from the systemic shock and the local pain and ecchymosis due to the bruising of the abdominal wall, there are four cardinal symptoms of rupture of the kidney directly referable to the organ itself. These are, hematuria, variations in the quantity of urine excreted, tumour, and pain.

Hematuria.—The passage of bloody urine after a contusion of the loin is the most characteristic symptom of ruptured kidney. Yet the hematuria may occur when the kidney is not ruptured,² and, on the contrary, there may be no hematuria, even though the kidney is ruptured. Thus the blood cannot reach the bladder if there is (1) subcapsular rupture, (2) occlusion of the ureter by clot, or (3) avulsion of the kidney from the ureter. Yet hematuria was a feature in 65 of the 71 cases collected by Maas.

The course of the bleeding is very irregular. The blood usually flows freely for several days, and then ceases, either because the hemorrhage has stopped, or because the ureter becomes obstructed by clots. Blood cells and albumin may persist in the urine for many days, and recurrence of bleeding is not uncommon. Exceptionally there is no hematuria for the first few days. The blood passed has the characteristics of kidney blood (p. 419), and is usually eliminated in sufficient quantity to dye the urine a deep red. Yet, as a rule, the actual amount of blood passed is not alarming.

¹ Cf. Yarrow, N. Y. Med. J., 1900, lxxi, 1.

² Morris gives a long list of exceptional causes of hematuria after contusion of the loin, such as slight contusion of the kidney, renal congestion, thrombosis of the renal vessels, stone, malaria, villous tumour of the bladder. But the only feature of clinical importance is the persistence of bleeding. Uncontrollable bleeding, from whatever cause, demands operation.

Variations in the Quantity of Urine.—During the first day after the injury there is oliguria, perhaps anuria, from shock. Continued anuria indicates rupture of both kidneys, or else the incapacity of the opposite kidney (if there be one) to act, and is therefore an indication for immediate nephrotomy (p. 593). But usually a polyuria replaces the primary oliguria, and lasts two or three days or longer. There may be reflex dysuria or retention.

Tumour.—The extravasation of blood and urine about the kidney develops a tumour in the loin. This swelling may appear immediately, or its advent may be delayed several days, or no tumour may ever appear. The tumour is usually quite diffuse, filling the whole loin and perhaps extending even to the groin. The swelling is elastic, but fluctuation cannot be made out. A general abdominal tension from the accumulation of flatus and from the tenderness of the bruised parietes may obscure a large perirenal hematoma.

Pain.—The pain of a ruptured kidney is an inconstant symptom. The superficial contusion produces local pain and tenderness; the passage of clots through the ureter may evoke renal colic, and the distention of the kidney, or its compression by effused blood, may produce an active pain radiating chiefly to the groin and testicle, and perhaps causing retraction of the latter.

Course of the Disease.—1. *The injury is slight.* There is some shock, a temporary oliguria, and hematuria. After a few days the urine becomes quantitatively and qualitatively normal. No notable tumour appears in the loin, and the patient is well within ten days or so.

2. *The injury is apparently slight,* but the symptoms, instead of growing less, or perhaps after an apparent remission, become more severe. The lumbar tumour grows larger, pulse and temperature run high, the digestive functions are not properly established, the abdomen remains distended and tympanitic, there is constipation, anorexia, perhaps vomiting, the tongue is dry, the patient listless and irritable. This clinical picture indicates progressive urinary toxemia and sepsis, and calls for prompt nephrotomy if the patient is to be saved. The presence of pleurisy, pneumothorax, or edema of the lung must not be overlooked.

3. *The injury is severe.* At first the patient is dazed, unconscious, or in a state of collapse. Hematuria and hematoma develop rapidly. He may fail rapidly and die of shock, of internal hemorrhage, of suppression, or later, of septic complications. Or the hematoma may be gradually absorbed, and recovery may occur after a prolonged and severe illness.

4. In the most serious cases *the renal rupture is only one among*

several visceral injuries. Rapidly fatal intraperitoneal hemorrhage may occur from the kidney, liver, or spleen. The triple infliction of shock, hemorrhage, and peritonitis can be combated only by immediate abdominal section with slight hope of success.

DIAGNOSIS

While slight injuries to the kidneys may be overlooked, especially if overshadowed by more important lesions of the other viscera, a kidney rupture of any great significance always manifests itself by loin tumour, usually associated with hematuria and oliguria or anuria.

The use of instruments of precision, such as the cystoscope or ureteral catheter, in the diagnosis of these injuries must be deprecated, for any renal rupture that cannot be diagnosed by the symptoms above narrated is either mild enough to deserve expectant treatment or severe enough to require immediate exploratory section.

TREATMENT

The treatment of shock is of the first importance. The patient is put to bed, surrounded by hot-water bottles and stimulated with alcohol, strychnin, and nitroglycerin, according to his needs. In extreme cases an intravenous saline infusion is admirably efficacious. Opium must be sparingly employed for fear of masking the symptoms. To check hemorrhage cold may be applied locally, and ergot or gelatin injected subcutaneously by those who put faith in them. Food should be of the lightest description, and the bowels should be moved by mild laxatives if possible, since active peristalsis is said to encourage hemorrhage from the kidney. The catheter should be employed with the most minute antiseptic precautions, for the bloody vesical pool is more than usually receptive of infection, and infection is—after the primary shock and hemorrhage have passed—the only noteworthy danger to the patient.

But all the measures detailed above are palliative at best. By them the symptoms are modified, but the essential features of the case—the hemorrhage, the function of the opposite kidney, the infection of the perirenal hematoma—are, to all intents, unaffected. Only by the knife can the surgeon reach these, and thus the momentous questions in the treatment of rupture of the kidney are, Whether to operate? and when to operate?

Immediate operation is required only when the patient fails to rally from his shock, and becomes weaker and weaker in spite of the surgeon's ingenuity. The possibility of intraperitoneal hemorrhage or rupture of some of the other viscera will lead the surgeon

to fortify the patient by a large intravenous infusion, and then to operate, in the desperate hope of averting the fatal issue.

The only other cases that may be subjected to immediate operation are those whose evidence of grave internal injury is associated with so little shock as to encourage the hope that immediate exploration may prevent other and worse evils.

After the first shock is over expectant treatment may be continued on condition that the patient grows progressively stronger. Yet the surgeon must be ready to operate, and the patient and his friends prepared to submit, as soon as any unfavourable symptom manifests itself. The usual indication for operation at this juncture is continued hemorrhage, as evinced by the growing tumour in the loin, for "it is not the visible loss of blood by the bladder, but the easily overlooked but far more dangerous bleeding into the perinephritic tissues, or into the peritoneal cavity, that should receive the chief attention" (Keen¹). Anuria persisting for twenty-four hours is an indication for immediate operation (p. 593). Finally, beginning sepsis, suggested by an unfavourable temperature and pulse, must be prevented by operative drainage.

Although severe wounds in the kidney have been known to heal, the prospects of cases treated expectantly are not good. Thus among Küster's 222 uncomplicated cases there were 67 deaths (30% mortality), while among 84 cases complicated by grave lesions of other viscera, 77 died. Of the former class 30 died of hemorrhage, 27 of suppuration, 5 of shock, 3 of chronic nephritis, 2 of calculus and edema of the lungs. Keen's figures tell the same story. Among 100 uncomplicated cases there were 34 deaths—14 from hemorrhage and shock, 16 from suppuration or peritonitis, the other 4 from coma, anuria, and nephritis. Thus almost one half the cases die of suppuration, which should be preventable, and fully one half die of hemorrhage which can usually be checked by nephrotomy. Yet up to 1896 the mortality after operation was relatively high (Keen), there being 8 deaths attributed to 22 nephrectomies (36.4% mortality), whereas among 78 uncomplicated cases treated expectantly there were 27 deaths (34.5%). Undoubtedly the operative mortality has decreased since then. I have operated on but 3 cases, and they all recovered.

The Operation.—The surgeon employs the incision with which he is most familiar, as speed is all-important. The choice between the abdominal and the lumbar route depends upon whether any other visceral lesions are suspected. Though the abdominal route affords

¹ Annals of Surgery, 1896, xxiv, 138.

quicker control of the renal artery, the lumbar incision is habitually employed. Upon incision of the fascial envelope clots, blood, bloody urine, or pus exudes, and should be quickly washed away. If copious bleeding is encountered, the renal artery must be clamped or tied (p. 642) immediately, though, as a general rule, the hemorrhage may be controlled by suture of the kidney and packing. The earlier operators performed nephrectomy for rupture of the kidney as they did for every other surgical affection of the kidney, but this grave operation is rarely, if ever, necessary. Generous drainage will allow for the expulsion of such detached fragments of kidney tissue as the surgeon overlooks. A final irrigation and plentiful gauze drainage complete the operation. Secondary nephrectomy may be required if prolonged suppuration ensues.

WOUNDS OF THE KIDNEY

Wounds of the kidney (other than ruptures) are extremely rare. Even in military practice they are unusual. Of *incised and punctured wounds* (excluding bullet wounds) there are no instances recorded in the Medical History of the War of the Rebellion. Küster¹ collected 43 cases. In 10 there were severe injuries to other organs, and of these 6 died (60%), while among the 31 uncomplicated cases, there were only 4 deaths (12.9%). Keen records 8 cases with 2 deaths. Among Küster's cases 10 were operated upon (2 primary and 6 secondary nephrectomies) with no deaths; Keen records 4 nephrectomies without a death.

Morris sums up the diagnostic features of the condition as follows: "It may be stated (1) that a wound in the renal region succeeded by the escape of urine through the wound is conclusive of injury to the kidney; (2) that such a wound quickly succeeded by the discharge *per urethram* of urine heavily mixed with blood, or of pure blood, is almost conclusive, if not quite so; (3) that such a wound succeeded by retention of urine, or lumbar or abdominal pain and dysuria, even without hematuria, is highly suggestive of a superficial wound of the kidney, or of a deeper wound and the blockage of the ureter; (4) that hematuria succeeded by traumatic peritonitis is strong evidence of an injured kidney."

The chief clinical features of a penetrating wound of the kidney, other than the symptoms of rupture of that organ, are: (1) External hemorrhage, (2) greater likelihood of infection from particles of clothing and dirt carried into the wound, (3) frequent involvement

¹ Deutsch. Klinik, 1896, lii, 1, 221.

of the peritoneum and of the other abdominal viscera, (4) prolapse of the kidney, if the wound is extensive.

Treatment.—The treatment is much the same as that of rupture, except that exploration of the wound for the purpose of cleansing it, and exploratory abdominal section to insure the safety of the other viscera are more often necessary.

Gunshot Wounds.—Although the recorded cases of gunshot wounds of the kidney show a very high mortality—viz., 59 deaths among 85 cases in the War of the Rebellion, and 8 deaths among 15 cases in the Franco-Prussian War—it is evident that this death-rate is due to associated injuries. (Thus Edler¹ collected 20 uncomplicated cases with 5 deaths, and 18 complicated cases with 15 deaths.) Hence, as Küster remarks, “the danger of a gunshot wound of the kidney increases with the velocity of the bullet.”

The only special features of these wounds are (1) the explosive effect of high-velocity projectiles—similar to that observed in the other semisolid viscera—(2) the advantage of employing the X-rays to locate the bullet in case its extraction is desirable.

ANEURYSM OF THE RENAL ARTERY

Morris has collected 19 instances of aneurysm of the renal artery, of which 12 were traumatic in origin. He calls attention to this very rare condition because, apparently, it is always fatal (if of any size) unless the patient submits to operation.

The *symptoms* are tumour, pain, and hematuria. It is remarkable that pulsation is rarely detected. Morris detected a loud systolic bruit in his case, but no thrill. The *diagnosis* is made by nephrotomy.

The *treatment* is operative. The aneurysmal sac should be disturbed as little as possible until the pedicle is secured. Albert, Hahn, and Keen have operated successfully; Morris unsuccessfully. A transperitoneal operation presents a better field for securing the renal vessels than does the lumbar route.

¹ Arch. f. klin. Chir., 1887, xxxiv, 379.

CHAPTER XXXVI

PERINEPHRITIC EXTRAVASATIONS AND INFLAMMATIONS

EXTRAVASATION

THE extravasation of feces from the intestine or of air from the lung or bowel into the perirenal tissues is an unimportant phenomenon sometimes associated with grave visceral lesions.

Effusions of urine and blood are more frequent, and, since the source of the blood is usually the kidney, they often occur together.

The extravasation consists of blood alone if it results from an injury to the renal artery or to the renal parenchyma without affecting the pelvis or the ureter. (Bilateral retroperitoneal hematoma may also result from rupture of an aortic aneurysm.) If both the kidney and its pelvis are torn a *urohematoma* results, the blood preponderating at first (unless the kidney is hydronephrotic), the urine later; or rather, a lumbar tumour appearing immediately after an injury to the loin, and rapidly increasing in size during the first twenty-four hours is a hematoma; while urinary extravasation (unless preceded by hematoma) produces a slowly growing tumour, which may not be noticed until some weeks after the infliction of the injury. Occasionally the lesion in the pelvis or ureter is so small, and the escape of urine so gradual, that the cellular tissue forms a tense sac about the fluid. The name *traumatic hydronephrosis* has been given to this condition, in spite of the fact that there is no true dilatation of the renal pelvis. True traumatic hydronephrosis results from cicatricial stricture of an injured ureter, and is excessively rare. Sollers (Rattier¹) and Pye Smith (Morris) have reported authentic cases. In Mannasse's case (Rattier, Obs. XXIV) a pseudo-hydronephrosis appeared eighteen months after injury.

Course.—The effusion spreads as long as hemorrhage or urinary leakage continues. As the perineal fascia is usually uninjured,

¹ Des épanchements urinaires d'origine rénale, Paris, 1899, p. 17.