

Genitourinary Tract Injuries

Introduction

Genitourinary injuries constitute approximately 5% of the total injuries encountered in combat. Their treatment adheres to established surgical principles of hemostasis, debridement, and drainage. Proper radiographic evaluation prior to surgery may replace extensive retroperitoneal exploration at the time of laparotomy in the diagnosis of serious genitourinary injuries.

Genitourinary wounds, aside from injuries of the external genitalia, are typically associated with serious visceral injury.

Renal Injuries

- Most renal injuries, except for those of the renal pedicle, are not acutely life-threatening. Undiagnosed or improperly treated injuries, however, may cause significant morbidity.
- Although the vast majority of blunt renal injuries will heal uneventfully with observation and conservative therapy, a significant number of renal injuries in combat will come from penetrating wounds and require exploration.

The evaluation of a suspected renal injury is based on the type of injury and physical examination.

- Hematuria is usually present in patients with renal trauma, and gross hematuria in the adult patient is concerning for a significant injury. **The absence of hematuria, however, does not exclude renal trauma.** Renal injury must be suspected in patients who have sustained significant concurrent injuries, such as multiple rib fractures; vertebral body or transverse process fractures; crushing injuries of the chest or thorax; or penetrating injury to the flank, chest, or upper abdomen.

<p>RENAL INJURY Penetrating renal injury = Abdominal exploration</p>	<ul style="list-style-type: none">• Blunt Trauma All patients with gross hematuria (regardless of initial SBP) and those patients with microscopic hematuria, whose initial SBP is <90 mm Hg, should undergo contrast-enhanced CT scan if/when they become hemodynamically stable.• Renal Injury Grading Grade 1: Subcapsular hematoma. Grade 2: Small parenchymal laceration. Grade 3: Deeper parenchymal laceration without entry into the collecting system. Grade 4: Laceration into the collecting system with extravasation; vascular injury with contained hemorrhage. Grade 5: Shattered kidney or renal pedicle avulsion.• Hemodynamically stable patients can usually be managed without operation.• Vascular repair is indicated for salvageable kidneys with renal artery or vein injury (see vascular CPGs for more details).• Ureteral stent may need to be placed for persistent urinary extravasation.
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CPGs: Clinical Practice Guidelines; SBP: systolic blood pressure.

- Adult patients who present with gross hematuria require further evaluation of their kidneys.
- CT provides excellent staging of renal injuries and aids in the decision whether or not to explore the injured kidney.
- Renal trauma is categorized by the extent of damage to the kidney.
 - **Minor injuries.**
 - ◆ Consist of renal contusions or shallow cortical lacerations.
 - ◆ Most common after blunt trauma and usually resolve safely without renal exploration.

- **Major injuries.**
 - ◆ Consist of deep cortical lacerations (with or without urinary extravasation), shattered kidneys, renal vascular pedicle injuries, or total avulsion of the renal pelvis.
 - ◆ There is an 80% incidence of associated visceral injuries with major renal trauma. Most cases will require a laparotomy for evaluation and repair of concurrent intraperitoneal injuries.
 - ◆ Operative intervention includes debridement of nonviable renal tissue (partial nephrectomy), closure of the collecting system, and drainage of the retroperitoneal area.
 - ◆ Kidney preservation should be considered if at all possible, although total nephrectomy may be required for the severely damaged kidney or the unstable patient. An attempt for verification of the presence of contralateral kidney by palpation should be attempted prior to nephrectomy.

Vascular control of the renal pedicle can be obtained prior to opening the perirenal fascia, when control of hemorrhage from the kidney requires exploration of the retroperitoneum.

- **Operative technique.**
 - Total nephrectomy is immediately indicated in extensive renal injuries when the patient's life would be threatened by attempted renal repair. The preferred approach in these situations is mobilization of the kidney by medial visceral rotation. This approach has been shown to be faster and is associated with less blood loss, compared with attempting vascular control of the renal pedicle prior to exploration.
 - When partial or complete renal salvage is planned, obtain vascular control from a periaortic approach to the renal vascular pedicle.
 - ◆ The small intestine is retracted laterally and superiorly, and the posterior peritoneum is incised over the aorta.



Fig. 18-1. Exposure of the left renal hilum.

- ◆ The left renal vein, crossing anterior to the aorta, must be mobilized to gain control of either renal artery.
- ◆ Atraumatic vascular clamps are used to occlude the appropriate artery.
- Although vascular control in this fashion may provide the safest approach against renal hemorrhage and reduce the likelihood of nephrectomy, it is not a commonly performed maneuver by either urologists or general surgeons. Direct reflection of the colon to expose the kidney is feasible (Fig. 18-1). A kidney pedicle clamp should be readily available for this approach.
- Damaged renal parenchyma can be locally debrided (Fig. 18-2), excised in a partial nephrectomy (Fig. 18-3), or removed in a total nephrectomy, depending on the degree of injury and the condition of the patient.

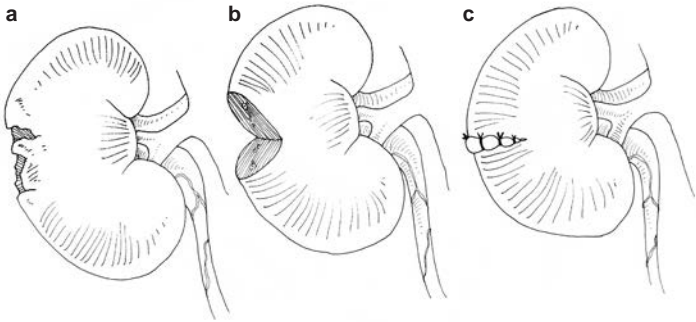


Fig. 18-2. Steps in renal debridement.

Damage control management may require nephrectomy for major renal injuries as a life-saving measure.

- Watertight closure of the collecting system with absorbable suture prevents the development of a urine leak (Fig. 18-3b).
- ◆ Urinary diversion is typically unnecessary if formal renal reconstruction is accomplished.
 - ◇ For the sake of expedience or in the presence of associated injuries of the duodenum, pancreas, or large bowel, diversion may be required.
 - ◇ Tube nephrostomy, ureteral stent, or ureterostomy may be utilized.

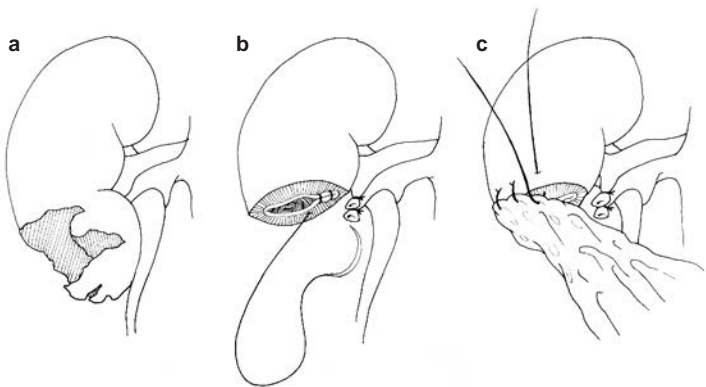


Fig. 18-3. Steps in partial nephrectomy.

- The reconstructed kidney should be covered by perirenal fat, omentum, or fibrin sealant (see Fig. 18-3c).
- A closed-suction drain should be left in place.

Ureteral Injuries

Ureteral injuries are rare, but are frequently overlooked when not appropriately considered. They are more likely in cases of retroperitoneal hematoma and injuries of the fixed portions of the colon, duodenum, and spleen.

- Isolated ureteral injuries are rare and usually occur in conjunction with other significant injuries. They can represent a difficult diagnostic challenge in both the preoperative and intraoperative settings.
 - Hematuria is frequently absent.
 - Blast injury to the ureter may produce significant delayed complications even when the CT is normal and the ureter appears visibly intact. Placement of an indwelling stent is reasonable when a high-velocity or blast injury occurs in proximity to the ureter.
 - If a ureteral injury is initially missed and presents in a delayed fashion, urinary diversion with a nephrostomy tube and delayed repair at 3–6 months is a safe approach.
- Operative technique.
 - Intraoperative localization of the ureteral injury is facilitated by IV injection of indigo carmine/ methylene blue or direct injection into the collecting system under pressure.
 - Basic principles of repair.
 - ◆ Minimal debridement and mobilization.
 - ◆ Primary tension-free, 1-cm spatulated anastomosis using an interrupted single-layer absorbable suture (4-0 or 5-0) closure technique.
 - ◆ Internal (double J ureteral stent) and external drainage.
 - ◆ Lengthening maneuvers.
 - ◇ Ureteral mobilization.
 - ◇ Kidney mobilization.
 - ◇ Psoas hitch (Fig. 18-4).
 - ◇ Boari flap.

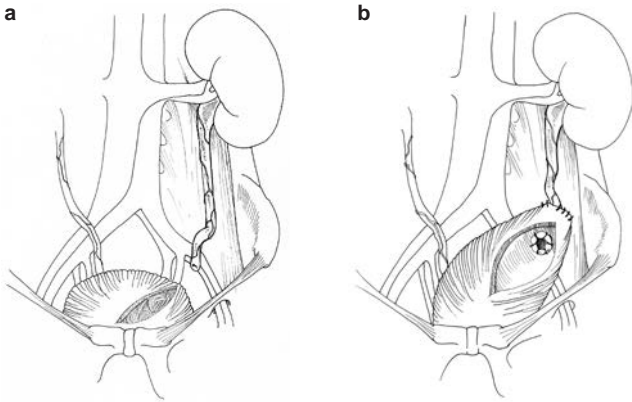


Fig. 18-4. The psoas hitch.

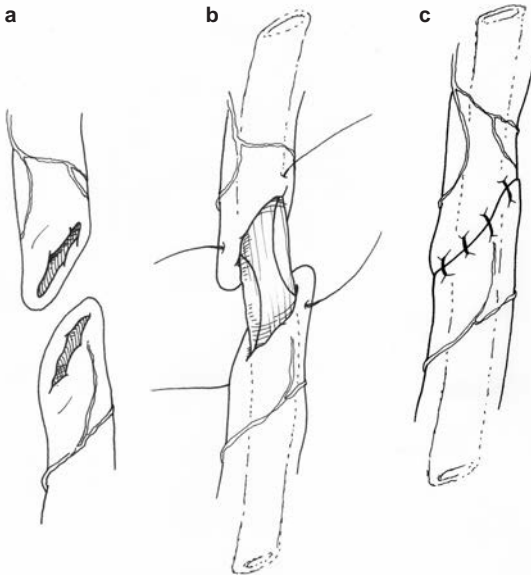


Fig. 18-5. Ureteroureterostomy.

- ◆ Isolate repairs with omentum or posterior peritoneum.
- The type of repair is based on the following:
 - ◆ Anatomical segment of the traumatized ureter (upper, middle, and lower third).
 - ◆ Extent of segmental loss.
 - ◆ Other associated injuries.
 - ◆ Clinical stability of the patient.
- Upper or middle ureteral injuries.
 - ◆ Short segment loss/transaction: Perform a primary ureteroureterostomy over stent (Fig. 18-5).
 - ◆ Long segment loss: May require a temporizing tube/cutaneous ureterostomy with stent placement or ureteral ligation with tube nephrostomy.
- Lower ureteral injuries.
 - ◆ When the injury occurs near the bladder, a ureteroneocystostomy should be performed (Fig. 18-6). This is typically completed by fixing the bladder to the fascial covering of the psoas muscle using permanent suture, such as 2.0 or 3.0 PROLENE. A transverse cystostomy assists in elongating the bladder to that location and facilitates the construction of a tension-free anastomosis.

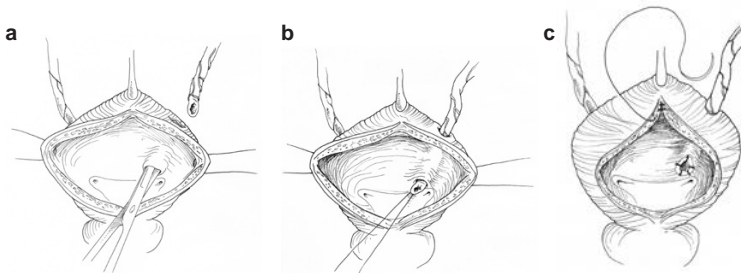


Fig. 18-6. Ureteroneocystostomy.

- ◆ When a distal ureteral injury is associated with a rectal injury, ureteral reimplantation is not recommended; temporary diversion should be performed.

