Surgical Management of Urologic Trauma and Iatrogenic Injuries

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KEYWORDS

• Trauma • Kidney • Bladder • Urethra • Ureter • Genitalia

KEY POINTS

- Trauma patients requiring urologic-specific evaluation must be identified.
- The most efficient means of diagnosing urologic trauma should be determined based on the mechanism of injury.
- The optimal management strategy is based on the location and degree of urologic injury and patient stability.

INTRODUCTION

Genitourinary injuries may be seen as a sequel to both blunt and penetrating trauma occurring in approximately 10% of all patients admitted to an emergency department. Trauma is the number one cause of death in patients aged 1 to 44 and accounts for more than 120,000 deaths per year in the United States, 10% of which have a concomitant component of genitourinary origin with the kidney as the most frequently involved organ.[1,2] These injuries may be quite elusive, concealed anatomically in the relatively nonresponsive retroperitoneal and pelvic locations where even intravenous (IV) contrast computed tomography (CT) might not identify them clearly. Urogenital trauma is rarely fatal, but may ultimately become the basis for significant short- and long-term morbidity, if not recognized early during its course. The major causes of genitourinary trauma are motor vehicles accidents, deceleration injuries, and penetrating firearm assault violence, all of which are on the increase.[3]

Blood in the urine signifies a urogenital injury. However, this is neither specific for location of injury nor a prognosticator for the severity of injury.[4,5] Blunt trauma with associated hematuria requires evaluation of both the upper and the lower genitourinary system, as forces associated with high-speed motor vehicle collisions can

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produce significant injury to the entire genitourinary system. Hematuria in patients suffering penetrating abdominal trauma indicates possible urologic injury to the kidneys, ureters, or bladder.

Genitourinary trauma usually occurs in the setting of multisystem trauma. Timely evaluation and management of the trauma patient have the potential to minimize urologic morbidity and mortality. In what follows, each of the major urogenital organs is treated separately. New imaging modalities and a growing emphasis on nonoperative expectant management of both upper and lower urinary tract injuries have changed the field of urologic trauma. Concomitant injury to both the upper and the lower urinary tract is rare, but careful evaluation is critical to identify these devastating injuries.

RENAL INJURY

Initial Evaluation

Blunt renal trauma constitutes the most common genitourinary organ injury and is the result of motor vehicle collision, falls from heights, a sustained direct blow to the flank, lower rib fractures, or a complication of elective renal surgery from percutaneous stone surgery or partial nephrectomy. In a large population study, the incidence of trauma patients in the United States who had renal injuries was 1.2% with 14,000 patients hospitalized in the United States with renal trauma alone.[2] In addition, 24% of all solid abdominal organ injuries involve the kidneys.[6]

The presenting signs and symptoms of blunt trauma may include flank or abdominal pain and bruising, hematuria, hemodynamic instability, flank hematoma (expanding and pulsatile), and sepsis or ileus from urinary extravasation, which may not be recognized initially and may require delayed recognition and intervention.

Penetrating abdominal injuries as a result of gunshot or stab wounds should always alert the physician to possible renal injury. A thorough physical examination of the abdomen, chest, and back must be performed because gunshot wounds may be misleading because of the small entrance defects and may not initially reveal the extent of tissue damage. To identify the location and extent of the penetration with imaging, a paper-clip marker may be placed at the entrance and exit sites to help define the damage during all imaging techniques, because most penetrating injuries will require surgical exploration.[7]

Contrast CT with delayed imaging of the ureters is the gold-standard imaging modality to evaluate the entire urinary tract as well as the anatomy and function of the kidney. The American Association for the Surgery of Trauma (AAST) Organ Injury Scale is used to classify blunt and penetrating renal injuries and corresponds closely to the appearance of the kidney on CT (**Table 1**).[8] Renal injuries may be classified as renal contusions, renal lacerations with or without collecting system injury, renal pedicle avulsion, and vascular disruption, renal artery thrombosis, injury to the renal pelvis or ureteropelvic junction disruption.

CT should be performed in all cases of suspected renal trauma in hemodynamically stable patients. The standard protocol includes helical (spiral) CT with a portal venous phase (from the diaphragm to the ischial tuberosities) to survey lower genitourinary structures or the presence of active arterial bleeding, followed after 10 minutes by delayed images to identify the presence of urinary contrast extravasation. CT should not be used as the primary evaluation tool in hemodynamically unstable patients, because these patients should be managed operatively, and other diagnostic tests, such as diagnostic peritoneal lavage or ultrasound, should initiate the evaluation because the critical need of immediate surgical control of bleeding is crucial.

Most blunt renal injuries are minor with contusions that account for 64% to 81% of cases. Wessels[9] in a multicenter study of 6892 patients with renal trauma found

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