

Urologic Trauma

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Summary/Objective

This section is meant to serve as a practical “pocket guide” for trainees who are/will be fielding urologic trauma consults. This is not a comprehensive chapter on the diagnosis, evaluation, and management of urologic trauma as there are 2 additional Core Curriculum sections (Upper and Lower Tract) devoted to this information. [AUA Urotrauma Guidelines](#) should also be reviewed and utilized.

Common case presentation

A 45-year-old female is taken to the trauma bay by EMS after a motor vehicle collision at high speed. She is fortunately conscious and hemodynamically stable, but is found to have flank ecchymosis and seat belt sign on physical exam and also rib fractures seen on initial radiographs. She is able to void, but does have microscopic hematuria on her urinalysis. CT Urogram shows an AAST Grade 3 left renal injury. Urology is consulted for management recommendations.

I. Receiving the Phone Call and Initial Thoughts

- a. **Urologic injuries usually occur in the setting of multisystem trauma. Isolated urologic injuries are less common. The kidneys, ureters, and bladder are generally well protected within the abdomen and pelvis and the penis and testes are physically mobile. Urologic organs are involved in approximately 10% of all abdominal traumas.**
- b. **Where is the patient currently located?**
As with most consults, brief clinical and historical information is obtained initially. However, due to the emergent nature of many trauma consults, determining if this is a consult from the operating room or emergency department will frame many of the questions.
- c. **Is the patient hemodynamically stable?**

On arrival to the emergency department, the trauma team will perform a primary survey to achieve initial stabilization of the patient and assess for life-threatening injuries.

d. What is the mechanism of injury?

If the patient is alert and responsive, details of the injury can be obtained directly from the patient. If the patient is incapacitated, details should be obtained from the paramedics, other first responders, and/or witnesses, if available. Urologic trauma can be blunt or penetrating in nature. Initial evaluation and management can be significantly influenced by the mechanism of injury. Understanding the bodily location/s of injury and mechanism will help guide the necessary next steps of trauma care. In many cases, by the time that the urology team is consulted, many of these initial questions are already answered, which can help the urologist determine potential urologic organ involvement.

II. Differential Diagnosis

a. The differential diagnosis is usually guided based on the anatomic body area injured.

- i. Upper tract injuries typically occur in the setting of injuries to the chest or abdomen.
- ii. Lower tract injuries typically occur in the setting of injuries to the lower abdomen or pelvis.

b. The injury is also categorized by the mechanism of injury

- i. **Blunt mechanism:** Results from the collision of an object into the person. Common mechanisms include: motor vehicle accidents, falls, sports injuries, and pedestrian injuries.
- ii. **Penetrating mechanism:** Results from the impact of an object entering (penetrating) the person. Common mechanisms include: gunshot wounds, stab wounds, and impalement.
- iii. **Blast mechanism:** Results from the forces of an explosion and can include elements of both blunt and penetrating injuries.

c. Because any structure in the urinary system can be injured, the differential diagnosis includes: kidney, ureter, bladder, anterior and posterior urethra, and genitalia.

d. The heterogeneous types of injuries can include: contusions, lacerations, transections, avulsions, amputations, bites, and burns.

III. Evaluation

See **AUA Urotrauma Guideline (2020)**

a. Physical Examination

- i. Gather the details of the circumstances of the injury from the treating team and first responders, if available.
- ii. Evaluate the patient's vital signs and for the presence of shock to assess hemodynamic stability, which will influence management decisions.
- iii. The focused physical exam includes evaluation of the chest, flank, abdomen, genitalia, and rectum (as appropriate).
 - 1. Careful attention should be paid to evidence of rapid deceleration, significant blow

to flank, rib fracture, significant flank ecchymosis, penetrating injury of abdomen, flank, or lower chest. These findings raise concern for upper tract injuries.

2. Pelvic instability and ecchymosis or genital ecchymosis can be concerning for pelvic fracture and possible bladder or urethral injury.
3. Gross hematuria in the setting of a pelvic fracture is concerning for bladder injury. Gross or microscopic hematuria in the presence of penetrating pelvic injuries also raises concern for bladder injury.
4. Blood at the urethral meatus in the setting of a pelvic fracture or the presence of a penetrating pelvic or genital injury is concerning for urethral injury.

iv. Penile fracture is diagnosed mainly by history and physical examination.

1. Snapping or cracking sound during intercourse followed by rapid detumescence and severe swelling and ecchymosis of the penis.
2. Penile pain and angulation can also occur.

b. Laboratory data

i. Although it is common for many trauma patients to have a comprehensive laboratory panel drawn in the trauma bay at initial presentation, there are minimal necessary labs specifically for urologic trauma.

1. **Urinalysis:** Microscopic hematuria is of particular importance in the trauma setting. For example, microscopic hematuria + hypotension in a blunt trauma raises concern for renal injury and should prompt further radiologic evaluation if patient is hemodynamically stable.
2. **Hemoglobin/Hematocrit:** It is valuable to establish baseline levels. In patients with renal injury or ongoing gross hematuria, trending serial H/H can assist in determining the presence of ongoing blood loss and the need for/timing of future intervention.
3. **Creatinine/BUN:** It is also valuable to establish baseline levels for renal function and trend accordingly, especially with injuries involving urine leak and when the urinary tract is dependent on temporary catheters/tubes for optimal drainage.

ii. In patients with isolated genital trauma, labs are generally not required.

c. Radiologic Studies

i. Renal and Ureteral injuries

1. Cross sectional imaging in the form of an IV contrast enhanced abdominal/pelvic CT with immediate and delayed images is indicated when there is suspicion for renal or ureteral injury.
 - a. Early arterial phase allows for detection of intravascular contrast excretion, and the delayed images allow for detection of renal collecting system injury.
 - b. Renal injuries are staged based on CT findings using the AAST organ injury scale, which has been validated as predictive of morbidity and the need for intervention.
 - c. For intraoperative consults when the patient did not have a preoperative CT

scan performed, a “one-shot IVP” can be performed with 2 mL/kg IV bolus of contrast followed by a single abdominal radiograph 10-15 minutes later to establish the presence or absence of a contralateral kidney.

2. When there is concern for ureteral injury, the delayed phases of the CT (classically a 10 minute delay) are even more critical to properly evaluate the ureters.
3. Follow-up CT imaging is recommended for high-grade renal trauma injuries after 48 hours or sooner if complications develop.

ii. **Bladder injuries**

1. Retrograde cystogram (plain film or CT) is the standard for evaluating bladder trauma.
 - a. Instillation should be a minimum of 300 mL of contrast.
 - b. Passive filling or “catheter clamping” is inadequate.
 - c. CT cystogram is performed with dilute water-soluble contrast.
2. The radiologic findings determine management based on whether the bladder injury is extraperitoneal or intraperitoneal.

iii. **Urethral injuries**

1. Retrograde urethrogram is the standard.
2. In most cases, the RUG should be performed prior to attempted catheter placement in patients with blood at the urethral meatus.
3. Ideally, the patient is placed in an oblique position for the study, if possible, to properly visualize the urethra radiographically.

iv. **Genital injuries**

1. In patients with equivocal findings of penile fracture, penile ultrasound can assist with establishing the diagnosis. MRI can also be considered if the ultrasound and physical exam are inconclusive.
2. Scrotal ultrasound is helpful in patients with concern for testicular injury as physical examination can be limited due to scrotal swelling, ecchymosis, and pain.

IV. Management

a. Initial management

- i. In all injured patients, hemodynamic stabilization is the **first step**.
- ii. Managing life threatening injuries is the **second step**.

iii. Renal and Ureteral injuries

1. Staging the renal injury is critical and helps drive management.
2. For blunt renal injuries in stable patients, active surveillance is appropriate in the vast majority of cases.
3. Unstable renal trauma patients with no or transient response to resuscitation should undergo immediate intervention in the form of surgery or percutaneous angioembolization.

4. Penetrating renal or ureteral injuries are more likely to be surgically explored at the time of initial presentation.
5. In patients with a ureteral injury or renal collecting system injury, the primary concern is adequate drainage and diversion of the urine. This can be accomplished with either retrograde ureteral stent and/or percutaneous nephrostomy tube and may need to be augmented with a percutaneous perirenal/periureteral drain.

iv. **Bladder injuries**

1. Extraperitoneal bladder injury: urinary drainage alone is the recommended management if the injury is uncomplicated.
 - a. In the setting of complex injuries (i.e. exposed bone spicules in the bladder lumen, concurrent rectal or vaginal lacerations, bladder neck injury, patient undergoing ORIF surgery or surgical repair of other abdominal injuries), operative repair with urinary drainage should be performed or, at the very least, strongly considered.
2. Intraperitoneal bladder injury: operative repair of injury with urinary drainage is the recommended management.

v. **Urethral injuries**

1. Most urethral injuries are initially managed with urinary drainage, either urethral catheter or suprapubic tube depending on the severity, location, and details of the injury.
2. Uncomplicated penetrating injuries to the anterior urethra should be repaired surgically at time of initial presentation.

vi. **Genital injuries**

1. Penile fracture should undergo prompt surgical exploration and repair.
 - a. Evaluation for urethral injury should be concurrently performed in a patient with blood at the urethral meatus, gross hematuria, inability to void, or bilateral corporal body fracture.
2. Penetrating scrotal injury and blunt testicular fracture should undergo exploration and repair with intent of testicular salvage, when possible.
3. Traumatic penile amputation should undergo prompt surgical reimplantation. The amputated appendage should be transported to the hospital in a two-bag system (appendage wrapped in saline-soaked gauze in the first bag, which is then placed on ice in a second bag).

b. **Potential complications**

i. **Acute complications**

1. **Upper tract**

- a. Ongoing blood loss – Renal injury should be monitored with serial measurements of H&H to ensure stability.
- b. Urine leak – Both severe renal injury and ureteral injury should have urine appropriately diverted at time of injury. Any ongoing complications of urine

leak should prompt re-evaluation with repeat cross-sectional imaging and consideration for augmented urinary drainage.

2. Lower tract

- a. Urine leak – Inadequate urinary drainage of a bladder injury or a poorly functioning drainage tube (urethral catheter or suprapubic tube) should prompt re-evaluation.
- b. Ongoing blood loss – If due to a bladder injury, it will likely require operative exploration and repair.

ii. Long term complications

1. Upper tract

- a. Loss of renal function – Regular measurements of serum creatinine can be performed to ensure stability of renal function.
- b. Hypertension – Periodic blood pressure measurements in the first year post renal injury may uncover renovascular hypertension.

2. Lower tract

- a. Urinary obstruction – Urethral stricture formation can occur secondary to urethral trauma and patients should be followed for at least one year post injury with uroflowmetry, RUG, and/or cystoscopy.
- b. Erectile dysfunction – Potential complication, especially in patients with pelvic fracture urethral injury.
- c. Urinary incontinence – Potential complication in patients with bladder neck injury or pelvic fracture urethral injury.

3. Genital injury

- a. Erectile dysfunction – Especially in patients with severe penile injury or penile fracture.
- b. Peyronie's disease – Especially in patients with severe penile injury or penile fracture.
- c. Hypogonadism – In patients with complete testicular loss secondary to bilateral testicular injury.

Key Takeaways

1. Urologic injuries usually occur in the setting of multisystem trauma and urologic organs are involved in approximately 10% of all abdominal traumas.
2. Hemodynamic stability status and details on the mechanism of injury will help drive acute management decisions.
3. Physical exam and pertinent radiologic studies are crucial to determining proper diagnosis and treatment.
4. It is important to develop a multidisciplinary approach with the Trauma team to ensure optimal patient care.

Presentations

Urologic Trauma Presentation

References

- 1 ☆ Morey AF, Brandes S, Dugi DD 3rd et al: Urotrauma: AUA guideline. J Urol 2014, 192: 327. Published 2014; Amended 2017, 2020