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The EM Educator Series

The EM Educator Series: GU Trauma Worth Knowing

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Cases:

#1: A 42-year-old male is brought in by EMS after MVC with severe pelvic trauma. He has evidence of external injury to genitalia, and urine output is dark red.

#2: A 12-year-old lands directly on some monkey bars. She is complaining on pelvic pain and difficulty urinating.

Questions for Learners:

1) What are the mechanisms of GU injury?
2) What should you consider regarding renal injury?
3) What about ureter injuries?
4) What types of bladder injuries can occur, and how are they diagnosed and managed
5) What do you need to know about urethral injuries?
6) How do you manage external genitalia injuries?

Suggested Resources:

- ✓ Articles:
  - emDOCs – Genitourinary Trauma: Presentations, Evaluation, and Management Updates
  - LITFL – Trauma! Genitourinary Injuries
  - Emergency management of renal and genitourinary trauma: best practices update
  - Genitourinary trauma
  - Imaging Genitourinary Trauma
- ✓ Podcasts:
  - FOAMcast – Episode 65 – Contrast-Induced Nephropathy and Genitourinary Trauma

Answers for Learners:

1) What are the mechanisms of GU injury?

Approximately 10% of trauma patients sustain injury to the genitourinary (GU) system. Penetrating injuries, most commonly gunshot and stab wounds, account for 15% of all GU injuries.

Blunt trauma is the leading cause of traumatic renal injury. While penetrating renal injury is responsible for only 16% of renal trauma, its incidence is increasing due to the rise in civilian gunshot wounds (GSWs) in the United States. Despite this, renal injury is a relatively uncommon complication of trauma and is seen in only 3.5% of victims of gunshot wounds, 2.2% of motor vehicle collisions (MVCs), 1.9% of bicycle accidents, 1.5% of pedestrian accidents, 0.8% of stab wounds, and 0.5% of falls. Ureteral trauma most commonly occurs in penetrating trauma, most frequently due to GSWs.

Bladder injuries are most commonly caused by blunt trauma, the attributable cause in 51-86% of cases. Among penetrating injuries, GSWs account for 88% of injuries despite the fact that bladder injury is noted in only 3.6% of abdominal gunshot wounds. Urethral trauma occurs most commonly due to blunt trauma. Straddle injury is frequently implicated in urethral injuries.

2) What should you consider regarding renal injury?

Among those with penetrating trauma, the role of renal imaging is to assess the severity and extent of injury, assess the injured kidney for underlying parenchymal abnormalities, the condition of the opposite kidney, and if there is significant trauma to surrounding structures.

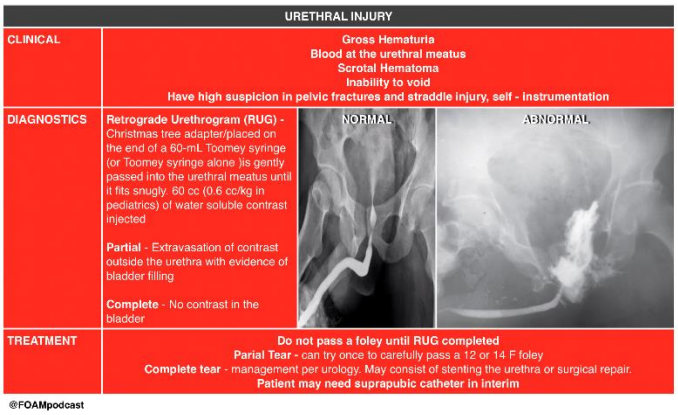
RENAL INJURY	
CLINICAL	**BLUNT INJURY is most common cause -** deceleration injuries (MVC, fall from heigh, direct blow) **PENETRATING INJURIES -** often more severe **HEMATURIA -** Gross hematuria may or may not be present and does not correlate to degree of severity.
DIAGNOSTICS	**adult blunt trauma patients without gross hematuria, significant deceleration injury, or systolic blood pressure <90 mm Hg and pediatric blunt trauma patients with <50 RBCs/hpf may be discharged from the ED if admission not otherwise indicated** **Urinalysis** - hematuria may be absent in penetrating renal injuries **CT with IV contrast**
TREATMENT	**RENAL INJURIES ARE STAGED - I** (least severe) **to V** (most severe) I - Simple subcapsular laceration (non-operative) II - Laceration <1 cm deep and nonexpanding hematoma (non-operative) III - Laceration >1 cm deep without urinary extravasation IV - Laceration through the cortex, medulla, or collecting system or artery/venous injury with contained hemorrhage V- completely shattered kidney with avulsion (operative)

@FOAMpodcast

3) What about ureter injuries?

Despite advances in imaging, ureteral injury is difficult to diagnose on initial presentation. Multi-Detector CT is thought to be the most sensitive imaging modality for ureteral injury. CT findings suggestive of ureteral injury include extravasation of contrast from the ureter or partial or complete ureteral obstruction. The delay between injection of contrast and obtaining MDCT images dictates the site of opacification and/or enhancement. In circumstances where ureteral injury is of high clinical suspicion, a 10-minute delay between injection of contrast and obtaining images allows contrast to

enter the renal excretory phase. Due to the rarity of ureteral injury, the sensitivity and specificity of CT for ureteral injury in trauma is not known. For this reason, in circumstances where there is a high index of suspicion a repeat, CT scan hours to days later may be beneficial as it may demonstrate a fluid collection where urine has accumulated. IVP has little use in diagnosing ureteral trauma due to a high (33%) false-negative rate.



4) What types of bladder injuries can occur, and how are they diagnosed and managed

Due to the high probability of bladder injury, bladder imaging is indicated in trauma patients with both pelvic fracture and gross hematuria. If there is blood at the meatus or if a urethral injury is suspected, a retrograde urethrogram to assess the integrity of the urethra must be conducted prior to evaluation of the bladder.

MDCT of the abdomen without cystography, even with a clamped foley and distended bladder, is insufficient to detect bladder injury. Cystography is the testing modality of choice to detect bladder injury. Conventional cystography involves obtaining either a minimum of three x-rays or use under fluoroscopy. An initial x-ray of the bladder is performed for comparison. 300-350ml of contrast material is then instilled retrograde into the bladder via a catheter and clamped. A second x-ray is obtained at that point. The catheter is then unclamped, and the patient is asked to void, at which point a third x-ray is obtained. Injury is confirmed by the extravasation of contrast material. Approximately 10% of bladder injuries may identified on the post drainage alone. Conventional cystography has an accuracy of 95-100% in diagnosing bladder rupture compared with conventional CT accuracy of 50-60%. CT Cystography involves a similar protocol, wherein an initial CT of the abdomen and pelvis is obtained. Thereafter 300-350ml of contrast material is instilled into the bladder retrograde through a catheter and clamped. A repeat CT of the pelvis is then obtained. The catheter is then removed or unclamped, and a third CT of the pelvis is obtained post-void. Like conventional cystography, CT cystography demonstrates injury to the bladder via extravasation of contrast. One study compared CT cystography and conventional cystography and found identical sensitivity (95%) and specificity (100%) in detecting and characterizing bladder injuries.

Management

- Urology consult
- Bladder contusion and hematomas can be observed
- Intraperitoneal rupture requires laparotomy and surgical repair

- Extraperitoneal rupture can often be managed with simple catheterisation (usually about 10 days**)**

5) What do you need to know about urethral injuries?

There is insufficient evidence to utilize CT to exclude urethral injury. However, CT may be obtained before a retrograde urethrogram is performed and may demonstrate findings suggestive of urethral injury. These common findings include obscuration of the urogenital diaphragmatic fat plane (88% of cases), hematoma of the ischiocavernosus and/or obturator internus muscles (88% of cases), obscuration of the prostatic contour (59% of cases), and obscuration of the bulbocavernosus muscle (47% of cases).

Imaging of the urethra is indicated in all trauma patients presenting with blood at the urethral meatus, inability to void, or in whom there is concern for urethral injury. The absence of blood at the urethral meatus, gross hematuria, and pelvic fractures cannot exclude urethral injury. Additionally, female urethral injuries may present atypically as vaginal bleeding or incontinence and therefore may be easily overlooked.

Imaging of the urethra is obtained by performing a retrograde urethrogram (RUG). A RUG should be obtained before attempting to catheterize the patient due to the risk of converting a partial urethral tear into a complete tear. A RUG is performed either as a series of 3 to 4 x-rays or under fluoroscopy. To perform a RUG the patient is positioned supine with the fluoroscopic C arm or x-ray collimator positioned in the vertical plan at 45 degrees above pelvis with the center just below the symphysis pubis. A 16- or 18-French Foley catheter (some utilize 6- to 10-French catheters) is flushed with radiopaque contrast to remove any air bubbles. The penile glans and urethral meatus should be cleaned with antiseptic. The catheter is then placed with sterile technique just inside the urethral meatus so that the catheter balloon rests in the fossa navicularis. The catheter balloon in filled with 1-2 ml of radiopaque contrast, saline, or water. The balloon should not be overfilled, as this can cause distal urethral rupture. The operator then pulls the penis laterally to straighten the urethra, grasping the penis as distally as possible, and distal to the inflated balloon. A scout film is then obtained before 20-30 ml of radiopaque contrast is gently infused with a catheter tip syringe through the catheter and into the urethra while additional films are obtained. A normal study demonstrates retrograde flow of contrast from the catheter through the anterior and posterior urethra and into the bladder. Extravasation of contrast or failure of contrast to reflux into the bladder signifies injury. Incomplete urethral tears will show extravasation along with reflux of contrast into the bladder as contrast flows past the defect in the urethra. Complete urethral tears will prevent reflux of contrast past the defect. Injuries are often described as involving the anterior urethra (consisting of the penile and bulbar urethra) or the posterior urethra (consisting of the membranous and prostatic urethra). Typically, if a RUG is indicated, the physician will perform a RUG, and if no abnormalities are found, advance the catheter and perform a conventional cystogram to exclude bladder injury.

6) How do you manage external genitalia injuries?

Scrotal Injuries

- Urology consult
- Reduce a dislocated (luxed) testicle in the ED (i.e. replace it into the scrotal sac)
- Surgical repair for testicular rupture, hematocoele, non-reducible testicular dislocation and scrotal degloving.

Penile Amputation

- Urology consult
- Apply direct pressure to bleeding stump (avoid tourniquet!), provide analgesia and wrap the amputated part in dry sterile gauze before placing in ice (avoid direct contact of the amputated part with ice)
- Surgical reimplantation (ideally <6 hours warm ischemic time) or reconstruction

Penile Fracture

- Urology consult
- Surgical repair