

AMSER Case of the Month

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47-year-old male with penetrating left ureteral injury
after abdominal gunshot wound

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Patient Presentation

- 47-year-old male with no significant PMHx presenting as a Level I trauma for GSW to the abdomen and left forearm
- Hypotensive on arrival (SBPs in 80s), diaphoretic, but alert and oriented
- FAST exam positive in the RUQ, concerning for hemoperitoneum
- Taken emergently to OR for exploratory laparotomy with small bowel resection, left medial visceral rotation, and temporary abdominal closure
- Postoperative CT abdomen/pelvis with IV contrast obtained with concern for left ureteral injury

Pertinent Labs

- WBC: $21.50 \times 10^3/\mu\text{L}$ (high)
- Hemoglobin: 10.5 g/dL (low)
- Creatinine: 0.68 mg/dL

What Imaging Should We Order?

Select the applicable ACR Appropriateness Criteria

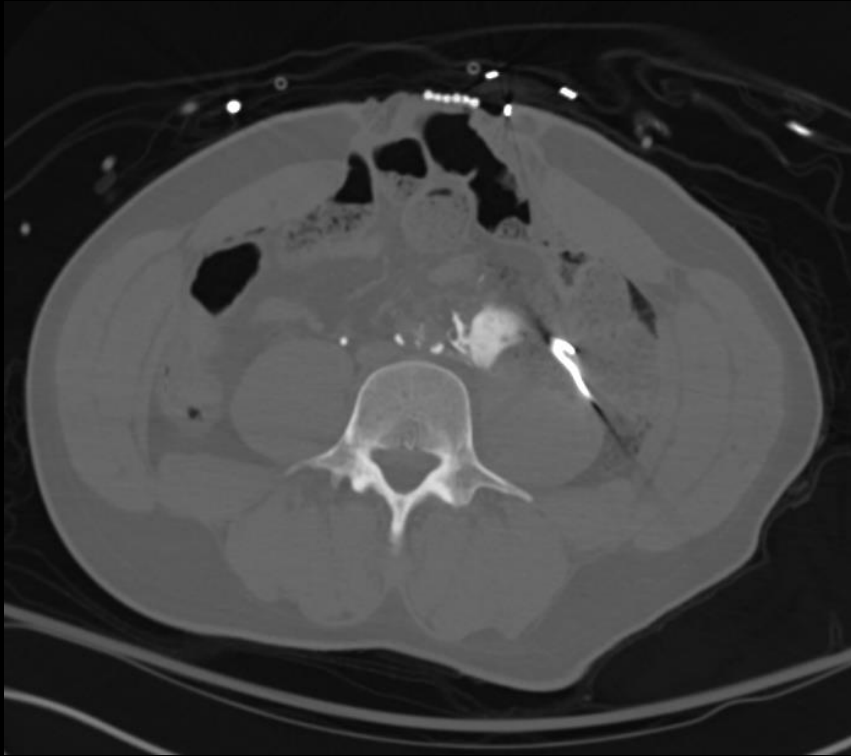
This imaging modality was ordered by the trauma physician



Variant: 1 Adult. Penetrating trauma, abdomen and pelvis. Suspected upper urinary tract trauma. Initial imaging.

Procedure	Appropriateness Category	Relative Radiation Level
CT abdomen and pelvis with IV contrast	Usually Appropriate	☼☼☼
CTU without and with IV contrast	Usually Appropriate	☼☼☼☼
CT abdomen and pelvis without IV contrast	May Be Appropriate	☼☼☼
CT abdomen and pelvis without and with IV contrast	May Be Appropriate	☼☼☼☼
US kidneys and bladder retroperitoneal	Usually Not Appropriate	○
Radiography intravenous urography	Usually Not Appropriate	☼☼☼
MRI abdomen and pelvis without and with IV contrast	Usually Not Appropriate	○

Findings (unlabeled)

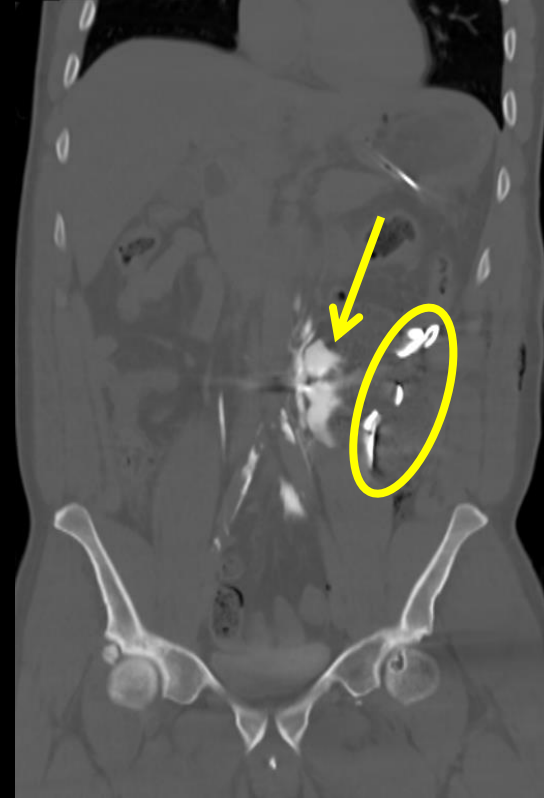
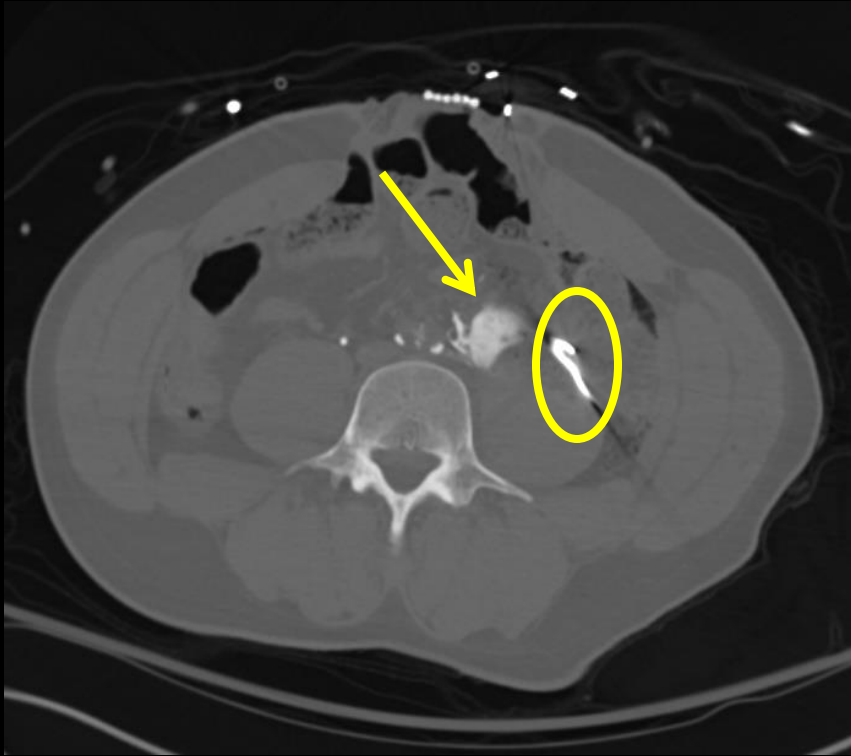


Axial CT pyelogram



Coronal CT abdomen pelvis with IV contrast

Findings (labeled)



Contrast extravasation (yellow arrow) from the left mid-ureter into the left retroperitoneum and hyperdense surgical packing (yellow circle).

Findings (unlabeled)



Maximum Intensity Projection

Findings (labeled)



Contrast extravasation (arrow)
Hyperdense surgical packing (circle)

Bullet (box)

Normal contralateral ureter (arrowhead)
Duplicated collecting system (asterisk)

Final Dx:

Penetrating left mid-ureteral injury secondary to
gunshot wound

Case Discussion

- **Epidemiology**

- Ureteral injury is uncommon, representing <1% of urologic trauma, largely because the ureters are small, mobile, and retroperitoneal^{2,3}
- Occurs in roughly 3 per 10,000 trauma admissions, mostly in young males⁴
- Penetrating trauma, especially gunshot wounds, causes the majority of external ureteral injuries^{2,3}
- GSWs can produce a blast effect injuring tissue up to 2 cm from the bullet path³
- Associated injuries to bowel and vasculature are common^{4,5}

- **Clinical presentation**

- Hematuria is absent in up to 55% of ureteral injuries, making it an unreliable screening tool⁵
- Diagnosis is often delayed or made intraoperatively⁶
- This case was further complicated by a duplicated collecting system, a common urinary tract anomaly that affects procedural planning⁷

Case Discussion

- CT urogram (CTU)
 - CTU is recommended for evaluating suspected ureteral injury^{1,2}
 - 3 phases in CTU: noncontrast, nephrographic, and pyelographic (~10 min post-contrast)
 - The pyelogram phase allows evaluation of the collecting systems and ureters and helps identify urinary contrast extravasation at the site of injury^{2,5}
- When CT is equivocal, retrograde pyelography remains the most definitive diagnostic study⁵

Case Discussion

- **Treatment**

- Management depends on the location, severity, timing, and hemodynamic status^{2,3}
- For incomplete injuries found in a delayed fashion, ureteral stent placement should be attempted to divert urine across the injury⁵
- If stenting fails, a percutaneous nephrostomy can be used for temporary diversion before definitive repair³
- Complete transections usually require operative repair, such as ureteroureterostomy for injuries above the iliac vessels or ureteroneocystostomy for injuries below the iliac vessels⁵
- In unstable patients, damage-control management may involve ureteral ligation with nephrostomy for urinary diversion⁵

- **Prognosis**

- Stented repairs have favorable long-term outcomes, although follow-up is needed to monitor for delayed complications such as ureteral stricture^{2,6}

References:

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3. Coccolini F, Moore EE, Kluger Y, et al. Kidney and uro-trauma: WSES-AAST guidelines. World J Emerg Surg. 2019;14:54.
4. Siram SM, Gerald SZ, Greene WR, et al. Ureteral trauma: patterns and mechanisms of injury of an uncommon condition. Am J Surg. 2010;199(4):566-570.
5. Johnsen NV, Wessells H, Archer-Arroyo K, et al. Best practices guidelines for the management of genitourinary injuries. American College of Surgeons; 2025.
6. Palmer LS, Rosenbaum RR, Gershbaum MD, Kreutzer ER. Penetrating ureteral trauma at an urban trauma center: 10-year experience. Urology. 1999;54(1):34-36.
7. Fernbach SK, Feinstein KA, Spencer K, Lindstrom CA. Ureteral duplication and its complications. Radiographics. 1997;17(1):109-127.