



Trauma and reconstruction

## Delayed diagnosis of isolated ureteral injury from blunt trauma

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### Introduction

The ureter is an uncommonly injured organ in the setting of trauma, accounting for less than 1% of all non-iatrogenic injuries to the urinary tract. Low incidence of traumatic injury is secondary to the narrow diameter, mobility, and retroperitoneal location of the ureter with protection provided by surrounding structures including the psoas muscle, variable amounts of adipose, and the spine. Ureteric injuries are graded according to the American Association for Surgery of Trauma Organ Injury Scale (AAST-OIS), ranging from a grade I hematoma or contusion to complete avulsion with devascularization (grade V).<sup>1</sup> The majority of external ureteral injuries are from penetrating gunshot wounds. Blunt ureteric injuries are less common, and typically involve hyperextension or deceleration mechanisms, often in a child in pedestrian versus motor vehicle accident or fall from significant height. While ureteral injuries resulting from external trauma are rare, delayed diagnosis can result in significant morbidity including urinoma with septic complications, stricture, and renal loss.<sup>2</sup>

### Case presentation

A 61 year-old woman with chronic back pain presented to the Emergency Department (ED) with worsening left-sided pain following a seizure and possible fall from standing. Urinalysis with microscopy was notable for 2 + hematuria with > 300 red blood cells per high power field. Computed tomography (CT) scan of the abdomen and pelvis with IV contrast demonstrated a fracture of anterior superior left L3 vertebral body (Fig. 1A) with a small retroperitoneal hematoma. Neurosurgery was consulted, a spinal MRI obtained which confirmed fracture/ruled out epidural hematoma, and the patient was discharged after 24 hours of observation without further imaging or intervention.

Ten days later the patient presented to the ED with worsening abdominal pain; repeat CT scan revealed a delayed left nephrogram with

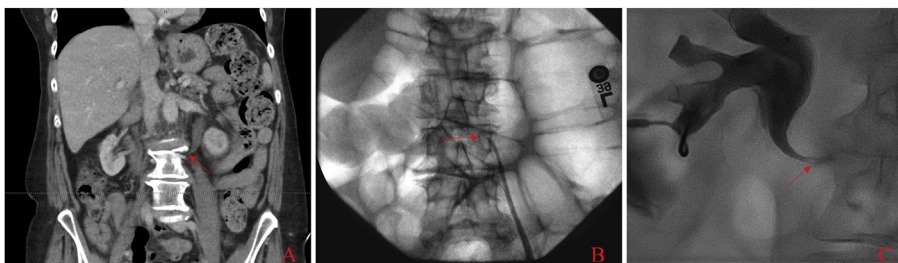
extensive urinoma and extravasation from the left ureter. Urinalysis was negative for blood. Creatinine was 1.1 mg/dL, increased from her baseline of 0.6. Retrograde pyelogram revealed abrupt termination of contrast at the L3 level (Fig. 1B) with inability to advance a wire beyond the level of obstruction. A percutaneous nephrostomy tube was placed and the retroperitoneal fluid collection was also drained. Antegrade injection of contrast confirmed complete obstruction just inferior to the left ureteropelvic junction (Fig. 1C) and attempts to cannulate the ureter were again unsuccessful.

The patient underwent open repair via a midline approach one month after initial presentation and 3 weeks after diagnosis. A left ureteral open-ended catheter was placed endoscopically to assist with identification. The ureter was mobilized both proximally and distally, and then sharply transected at the L3 level where it was noted to be densely adhered to the vertebral body (Fig. 2). A tension-free uretero-oureterostomy was performed with placement of a double J ureteral stent. Postoperative course was unremarkable with both the nephrostomy tube and Foley catheter were removed prior to discharge. Ureteral stent was moved 4 weeks later, and patient has been asymptomatic since that time. Renal ultrasound 8 weeks postoperatively revealed residual trace pelviectasis (Fig. 3) and creatinine returned to baseline.

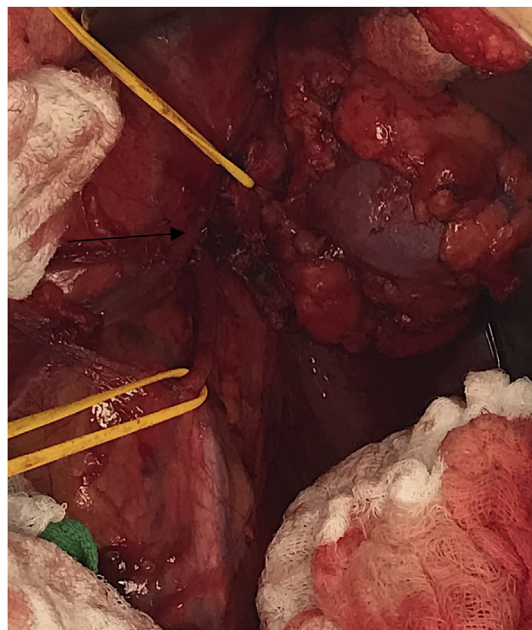
### Discussion

Traumatic ureteral injuries are graded according to the AAST-OIS and managed depending on the extent and type of injury. Grade I injuries are contusions or hematomas and grades II–V involve varying degrees of laceration from less than 50% transection to complete avulsion with devascularization.<sup>1</sup> Blunt ureteral injuries are infrequent owing to their protected location, and most cases are associated with multisystem trauma.<sup>2</sup> A high index of suspicion is warranted as there are no pathognomonic signs or symptoms of ureteral injury, and

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**Fig. 1.** CT scan at initial presentation revealed a fracture of anterior superior left L3 vertebral body (arrow) (A). Retrograde pyelogram performed 10 days later, which demonstrated abrupt termination of contrast at the L3 level (arrow) (B). Antegrade nephrostrogram revealed complete obstruction just inferior to the ureteropelvic junction (arrow) (C).



**Fig. 2.** Intraoperative image of the left ureter (encircled with vessel loop), densely adhered to the spine at the level of the L3 fracture (arrow). The proximal ureter was re-anastomosed to the renal pelvis in a tension free manner.



**Fig. 3.** Retroperitoneal ultrasound 4 weeks following double J stent removal demonstrated trace pelviectasis (arrow).

significant damage can occur even in the absence of overt trauma.<sup>3,4</sup>

The AUA recommends contrast enhanced abdominal/pelvic CT with 10 minute delayed images for accurate ureteral evaluation. Ureteral injury is suggested on CT by the presence of contrast extravasation, delayed pyelogram, hydronephrosis, and lack of contrast in the ureter distal to the site of suspected injury.

Many ureteral injuries are left undiagnosed and identified after complications such as urine leaks, urinoma formation, sepsis, periureteral abscess, ureteral fistula, and stricture develop.<sup>4</sup> In these cases, the use of a nephrostomy tube and/or stent to divert urine until delayed surgical repair is recommended. Basic reconstruction of large ureteral injuries includes a tension-free, water-tight anastomosis, debridement of devitalized tissues, spatulation of both ends, isolation of the ureteral repair from associated injuries, and adequate retroperitoneal drainage.<sup>2</sup> While genitourinary injury is relatively uncommon, the morbidity and mortality associated with such injuries is significant, and the prognoses of ureteral trauma has been directly correlated with time to diagnosis. In our case, the patient returned with persistent pain 10 days following her injury, resulting in diagnosis/management prior to permanent loss of renal function.

## Conclusion

Traumatic ureteral injury can be misdiagnosed in the absence of delayed CT images. While uncommon, blunt ureteral injury can result in the absence of other intra-abdominal trauma, emphasizing the need for a high index of suspicion allowing for prompt and appropriate diagnostic imaging.

## Declarations of interest

None.

## Appendix A. Supplementary data

Supplementary data related to this article can be found at <http://dx.doi.org/10.1016/j.eucr.2018.04.010>.

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