Ureteric transection secondary to penetrating handlebar injury

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Abstract

Ureteric trauma is rare, occurring in <1% of all traumas. We present a unique case of a 13 year old female who sustained a penetrating abdominal injury from a bicycle handlebar. Upon initial examination there was herniation of bowel through the abdominal wound, so exploratory laparotomy was performed. A serosal injury of the colon and bleeding mesenteric veins were encountered; the retroperitoneum was not explored at that time. Postoperative course was remarkable for a doubling of the serum creatinine, increasing abdominal distention and pain. Computed tomography on postoperative day five demonstrated a large amount of intra-abdominal fluid. The patient was taken for re-exploration. The left ureter was found to be completely transected. It was repaired over a double-J stent. This case demonstrates the need for a high index of suspicion in the diagnosis of ureteric injury.

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were not obtained. A cystogram was obtained which did not demonstrate injury to the bladder. The patient’s postoperative course was notable for a doubling of the serum creatinine from 0.6 mg/dL (53.04 μmol/L) to 1.2 mg/dL (106.08 μmol/L). She also experienced ongoing abdominal pain, increasing distention and nausea. A retroperitoneal ultrasound was unremarkable except for large volume ascites. A non-contrast repeat CT of the abdomen and pelvis on postoperative day five demonstrated a large amount of ascites with a density of simple fluid.

The patient underwent repeat laparotomy. Upon entry to the abdomen three liters of fluid was drained, and intraoperative analysis revealed a fluid creatinine of 4.6 mg/dL (406.64 μmol/L). The left ureter was found to be transected near the middle third with the two ends approximately 2.5 cm apart. Ureterogram was performed via the transected ends to confirm anatomy (Fig. 1). Primary repair over a double-J stent was performed with 5-0 Vicryl and a drain left in place in the retroperitoneum.

Post-operatively the patient recovered well and was discharged five days later after the operative drain was removed. The double-J stent was removed at postoperative week six with concurrent cystoscopy and retrograde ureterogram demonstrating a normal ureter with no evidence of stricture.

**Discussion**

Most bicycle-related incidents described in the literature deal with head trauma. Handlebar injury is also an important mechanism of bicycle-related trauma, and the associated morbidity is underappreciated. Most cases described in the literature are secondary to blunt trauma. The most common injuries described include bowel perforation, solid organ injury, and traumatic abdominal wall hernia [1–4]. In a retrospective review by Nadler et al., 31% of children sustaining direct-impact handlebar injuries required operative intervention.

Ureteric injuries account for <1% of all urologic traumas [6], with the majority being a result of penetrating trauma. Table 1 data compiled from the National Trauma Database shows the varying mechanisms of ureteric injury [7]. The most common mechanism by far for injury to the ureter is gunshot wound. The diagnosis of ureteric injury is challenging and often delayed or missed. Urinalysis results are unreliable and highly variable. One case series found only 44% of patients with ureteric injury had hematuria on the initial admission urinalysis [8], and most studies demonstrate a rate of hematuria between 40 and 75% [6,9,10]. Imaging studies are also frequently unreliable. A retrospective review of traumatic ureteric injury by Medina et al. found that only 40% of patients with ureteric injury had positive findings on preoperative imaging studies [9]. Computed tomography is often used in trauma, however the timing of IV contrast utilized for most trauma evaluations does not adequately visualize the ureters [10]; delayed phase images must be included if there is any suspicion of ureteric injury. Cystoscopy with retrograde ureterogram/pyelogram is historically the most accurate way of identifying ureteric injury, but may not be feasible in a hemodynamically unstable trauma patient.

Due to a high rate of concomitant injuries many ureteric injuries are diagnosed intra-operatively during exploration for other reasons. This can pose a challenge for the surgeon as hemorrhage or spillage of intestinal contents can make detecting leakage of a small amount of urine difficult. Evidence of violation of the retroperitoneum should raise concern for possible ureteric injury. Approximately 60% of injuries occur in the proximal ureter [8]. The type of operative repair varies based on the location of the injury.

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**Fig. 1.** Intraoperative ureterogram. (A) extravasation of contrast at mid portion of ureter. (B) Post-repair image showing placement of double J stent.
Regardless of the location of injury, the basic tenets of repair always involve debridement to healthy tissue and tension-free anastomosis over a stent with absorbable suture.

Conclusions

A high index of suspicion is necessary for timely diagnosis of ureteric injuries. Computed tomography imaging may be useful but must include delayed phase imaging to properly evaluate the ureters. Cystoscopy with retrograde ureterogram is the most reliable method of identifying a ureteric injury. Intra-operative discovery of retroperitoneal violation warrants further exploration, with identification of ureteric trauma prompting an appropriate repair based on the location of the injury.

References

[1] I. Karaman, A. Karaman, M.K. Aslan, D. Erdoğan, V.H. Cavuşoğlu, O. Tütün, A hidden danger of childhood trauma: bicycle handlebar injuries, Surg. Today 39 (7) (2009) 572–574.
[2] E.P. Nadler, D.A. Potoka, B.L. Shulz, K.E. Morrison, H.R. Ford, B.A. Gaines, The high morbidity associated with handlebar injuries in children, J. Trauma 58 (6) (2005) 1171–1174.
[3] J. Goliath, V. Mittal, J. McDonough, Traumatic handlebar hernia: a rare abdominal wall hernia, J. Pediatr. Surg. 39 (10) (2004) 20–22.
[4] T.D. Clarnette, S.W. Beasley, Handlebar injuries in children: patterns and prevention, Aust. N. Z. J. Surg. 67 (6) (1997) 338–339.
[5] S.B. Brandes, M.J. Chelsky, R.F. Buckman, R.M. Hanno, Ureteral injuries from penetrating trauma, J. Trauma 36 (6) (1994) 766–769.
[6] J.C. Presti Jr., P.R. Carroll, J.W. McAninch, Ureteral and renal pelvic injuries from external trauma: diagnosis and management, J. Trauma 29 (3) (1989) 370–374.
[7] S.M. Siram, S.Z. Gerald, W.K. Greene, et al., Ureteral trauma: patterns and mechanisms of injury of an uncommon condition, Am. J. Surg. 199 (2010) 566–570.
[8] Pereira BM T, M.P. Ogilvie, J.C. Gomez-Rodriguez, et al., A review of ureteral injuries after external trauma, Scand. J. Trauma 18 (6) (2010).
[9] D. Medina, R. Lavery, S.E. Ross, D.H. Livingston, Ureteral trauma: preoperative studies neither predict injury nor prevent missed injuries, J. Am. Coll. Surg. 186 (1998) 641–644.
[10] L.S. Palmer, R.R. Rosenbaum, M.D. Gershbaum, E.R. Kreutzer, Penetrating ureteral trauma at an urban trauma center: 10-year experience, Urology 54 (1999) 34–36.

(see Table 2)[8]. Regardless of the location of injury, the basic tenets of repair always involve debridement to healthy tissue and tension-free anastomosis over a stent with absorbable suture.