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Short communication

Renal artery embolization in a child with delayed hemodynamic instability from penetrating knife wound

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ABSTRACT

Penetrating laceration injury in the pediatric population may present as an acute or delayed life-threatening injury. Although emergent intra-arterial embolization is commonly utilized in adults, few cases have been reported for children. Surgical treatment for severe renal laceration injuries may require complete nephrectomy; an unfortunate outcome for a pediatric patient if a renal-preserving alternative is feasible. We present a case of penetrating renal laceration in a 10-year-old boy treated with intra-arterial embolization of the lacerated dominant renal artery and subsequent renal perfusion by an uninjured accessory renal artery allowing for renal preservation.

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1. Introduction

Traumatic renal injuries can present as serious acute life-threatening emergencies with potentially serious long-term health impacts. In France, traumatic renal injuries occur in 8–12% of all trauma patients, with the majority presenting after blunt force trauma and approximately 2% following penetrating trauma [1,2]. Grading classification and subsequent triage recommendations for traumatic renal contusion, hematoma and laceration are done according to the American Association for the Surgery of Trauma (AAST) (Table 1) [3]. Management is predominantly nonoperative [4] unless injury results in life-threatening hemorrhage. Cases of persistent or large-volume hemorrhage may be definitively managed by emergent nephrectomy or selective intra-arterial embolization.

Emergency embolization for traumatic injuries to abdominal solid organs has been well documented in adults [5]; however, this minimally invasive organ-preserving management is only recently emerging as an alternative management technique within the pediatric trauma population. To our knowledge, only six papers on renal embolization have been reported in the literature for

pediatric trauma victims, all but one of which have been performed after blunt trauma (Table 2) [6–12]. We present a case of renal arterial embolization (AE) after a penetrating stab wound injury in a 10-year-old boy, with notable preservation of renal perfusion and function using an accessory renal artery.

2. Case report

A 10-year-old boy presented with hemodynamic instability after multiple stab wounds to the torso and extremities (heart rate 136 bpm, blood pressure 95/64, hemoglobin 9.5 g/dL). CT imaging revealed a left-sided grade 4 renal injury (AAST) with voluminous perirenal hematoma (Fig. 1A), abundant free fluid in the abdomen, gastric perforation and pancreatic tail injury (AAST grade 2). Immediate emergent management was initiated with abdominal exploration, whereupon surgical hemostasis of the pancreas tail laceration was achieved and the gastric laceration was repaired. During the surgery, the patient received 12 units of packed red blood cells (PRBCs), 11 units of fresh frozen plasma (FFP) and 3 units of activated platelet transfusion (APT). As hemodynamic stability was achieved during the exploratory laparotomy, retroperitoneal nephrectomy was not pursued in favor of conservative nonsurgical management of the renal laceration. There was no active bleeding on the left renal artery. Open

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Table 1
AAST Organ Injury Severity Scale for the Kidney.

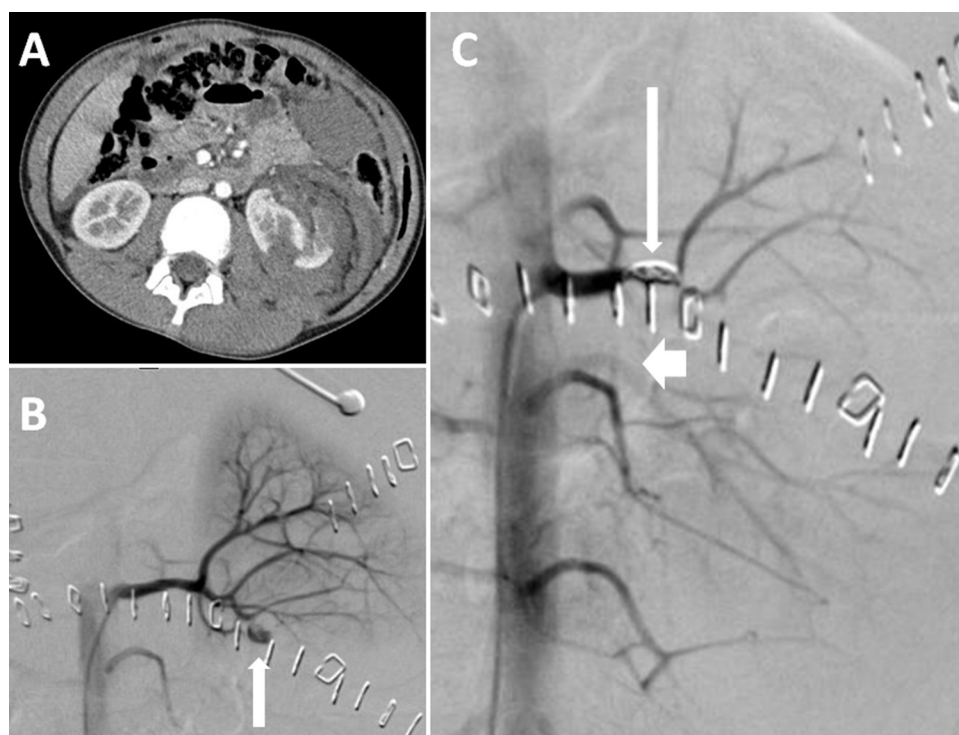
Grade	Type	Description of injury
I	Contusion	Microscopic or gross hematuria
	Hematoma	Subcapsular, nonexpanding without parenchymal laceration
II	Hematoma	Nonexpanding perirenal hematoma confined to renal retroperitoneum
	Laceration	< 1 cm parenchymal depth of renal cortex without urinary extravasation
III	Laceration	> 1 cm parenchymal depth of renal cortex without collecting system rupture or urinary extravasation
IV	Laceration	Parenchymal laceration extending through the renal cortex, medulla, and collecting system
	Vascular	Main renal artery or vein injury with contained hemorrhage
V	Laceration	Completely shattered kidney
	Vascular	Avulsion of renal hilum which devascularizes kidney

AAST: American Association for the Surgery of Trauma.

Table 2
Literature review of angiographic embolization after renal trauma in children.

Author	Type	Mecanism	Number of patients	Age (years)	AAST Grade	Cause for embolization	Delay for embolization	Year
Halachmi et al.	Case report	Blunt trauma	1	11	III	Pseudoaneurysm	7 days	2003
Kiankhooy et al.	Cases review	Blunt trauma	7	12.3–3.7	IV	Pseudoaneurysm	Unknown	2010
Saad et al.	Cases report	Blunt trauma	2	11, 15	Unknown	Pseudoaneurysm	14 days–36 months	2005
Xue & al.	Case report	Renal biopsy	1	7	Unknown	Pseudoaneurysm	27 days	2013
Schuster et al.	Review & cases	Blunt trauma	7	14.4–1.4	IV–V	Acute bleeding	Immediately in all cases	2013
Van der Zee et al.	Case report	Blunt trauma	1	3	Unknown	Acute bleeding	2 days	1995

AAST: American Association for the Surgery of Trauma.

**Fig. 1.** Patient presentation and endovascular treatment. A. Initial contrast-enhanced CT demonstrates renal laceration. B. Selective angiogram within dominant renal artery demonstrates active extravasation (arrow). C. Partially selective subtracted angiogram at origin of dominant renal artery during coiling (long arrow: initial coil placement, short arrow: partial opacification of accessory renal artery).

intravesical lavage was performed to alleviate urinary retention secondary to blood clots that originated from the renal laceration.

The patient remained stable for 4 days postoperatively, but then developed sudden hematuria and acute hemodynamic instability prompting transfusion of 5 units of PRBCs, 6 units of FFP, and 1 unit of APT. CT imaging with IV contrast demonstrated active extravasation of contrast media from an upper renal artery. Upon consultation with the interventional radiology department, an emergent renal angiography was performed, as the surgical alternative was complete nephrectomy. Aortic angiography

demonstrated a dominant renal artery and a diminutive accessory renal artery to the inferior pole. Selective renal angiography demonstrated active extravasation from the proximal aspect of the dominant renal artery (Fig. 1B). No contrast extravasation was seen on selective angiography of the accessory renal artery. Selective embolization of the dominant renal artery was performed with pushable microcoils spanning the site of injury as a life-saving therapy (Fig. 1C). Postembolization selective angiography of the accessory renal artery confirmed persistent perfusion to the inferior renal pole without extravasation. Radiation exposure was

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