

When Conservative Management Fails: Traumatic Renal Pseudoaneurysm with Urinary Extravasation Treated by Embolization

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Abstract

Case Report

Renal trauma is usually managed conservatively, but complications may require intervention. The association of urinary extravasation and renal pseudoaneurysm is uncommon. We report a 33-year-old man with an AAST grade IV right renal injury after a road traffic accident. Initial CT showed collecting system injury with urinary extravasation and a 10 × 9 mm pseudoaneurysm of the superior segmental artery. He was treated with resuscitation, blood transfusion, antibiotics, and double-J ureteral stenting, with initial improvement. One month later, he re-presented with gross hematuria and severe anemia (Hb 5 g/dL). CT urography demonstrated a large partially thrombosed hematoma fed by the superior segmental artery and a massive bladder clot. Selective angiography confirmed pseudoaneurysm rupture, and selective arterial embolization achieved complete exclusion, followed by endoscopic clot evacuation. The patient was discharged in stable condition. This case emphasizes the risk of delayed, life-threatening hematuria after high-grade renal trauma and supports early consideration of selective embolization when a post-traumatic pseudoaneurysm is suspected.

Keywords: Renal injury, Pseudoaneurysm, Hematuria, Embolization, Conservative treatment.

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INTRODUCTION

Renal trauma represents approximately 1–5% of abdominal injuries. Most cases are managed conservatively; however, selected complications may require targeted intervention. Urinary extravasation and renal pseudoaneurysm are well-described complications of renal trauma, usually reported separately, and their association remains uncommon.

Urinary extravasation reflects injury to the collecting system and may require urinary diversion most commonly with a double-J ureteral stent to reduce pressure, facilitate drainage, and promote healing. Renal pseudoaneurysm is a vascular complication that typically presents with delayed hematuria, which can be massive and life-threatening. Selective arterial embolization is considered the treatment of choice.

We report a case in which these two complications occurred together following high-grade renal trauma, managed sequentially with internal urinary diversion and selective embolization, and we highlight the key clinical lessons drawn from this observation.

CASE PRESENTATION

A 33-year-old man (M.M.), with no significant past medical or surgical history, was brought to the emergency department by ambulance after a road traffic accident (motorcyclist struck by a car). On arrival, he was hemodynamically unstable and had right-sided flank ecchymosis. His temperature was 38.8°C.

Initial resuscitation was started immediately. Contrast-enhanced whole-body CT demonstrated a severe right renal injury (Figure 1A–1B), with multiple lacerations involving the mid and upper poles and several triangular hypodense areas consistent with segmental infarctions. A rounded lesion adjacent to the superior segmental artery measuring 10 × 9 mm was also identified, initially suggestive of a pseudoaneurysm. Delayed-phase imaging showed minimal contrast extravasation into the retroperitoneum through the upper calyceal system, consistent with urinary extravasation. A large retroperitoneal collection with spontaneously hyperdense content (68 HU) was present, associated with a perirenal hematoma measuring approximately 126 × 85 × 91 mm. The injury was classified as AAST grade IV.

Laboratory testing revealed severe anemia with hemoglobin (Hb) of 7 g/dL, while the remainder of the blood workup was unremarkable. The patient received blood transfusion and was managed conservatively with

placement of a double-J ureteral stent, intravenous antibiotics, and close monitoring. The clinical course was favorable, with no major complications, and he was discharged in stable condition.

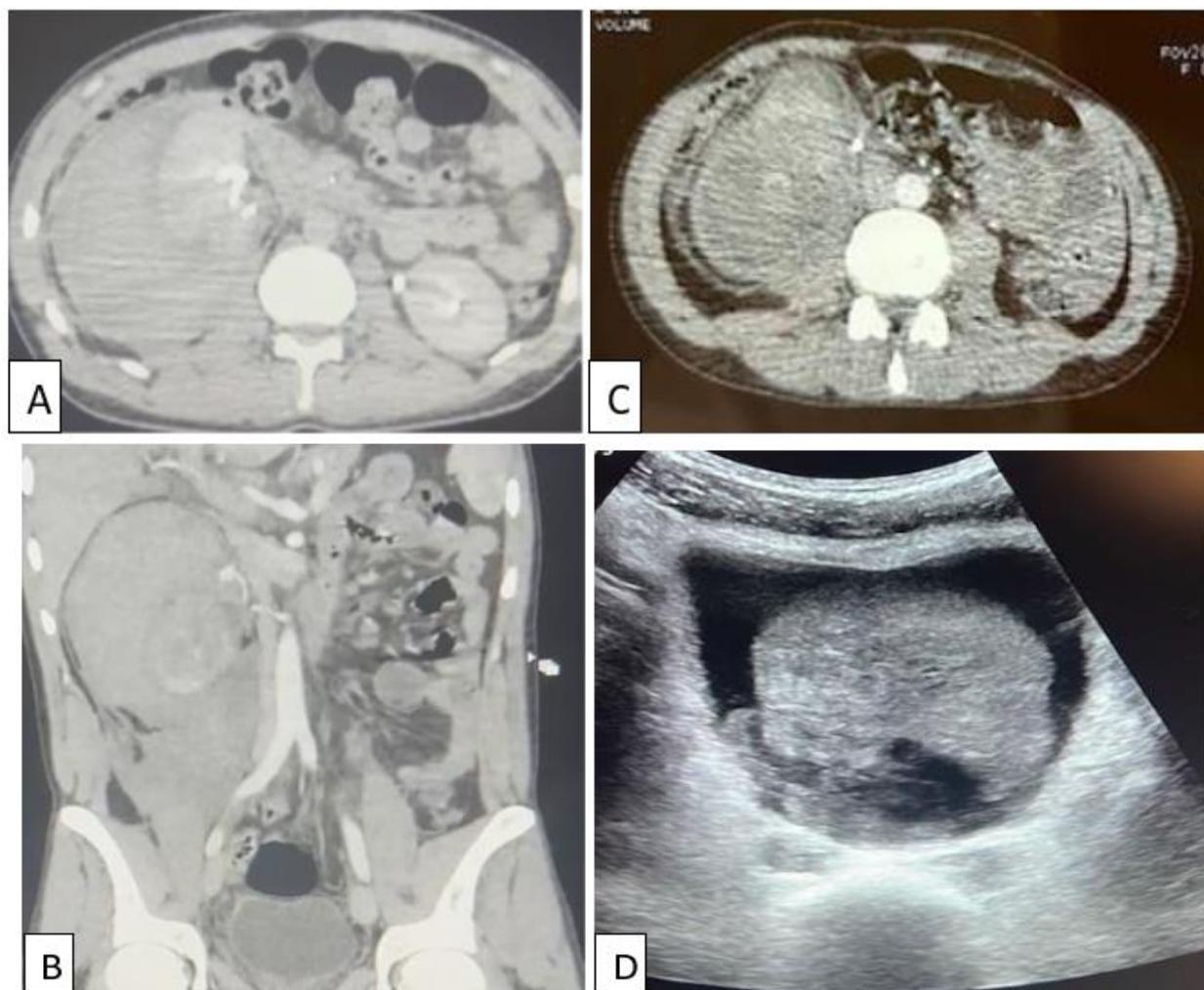


Figure 1: Imaging findings:

- A:** Axial contrast-enhanced CT scan showing the renal pseudoaneurysm.
- B:** Coronal (frontal) CT reconstruction demonstrating the renal injury associated with the pseudoaneurysm.
- C:** Axial CT scan showing the double-J ureteral stent.
- D:** Ultrasound image demonstrating a massive intravesical clot (bladder clot).

One month later, he re-presented with gross hematuria and profound anemia (Hb 5 g/dL). CT urography (Figure 1 C) demonstrated a severely damaged right kidney and a large partially thrombosed hematoma measuring 116 × 110 mm, supplied by the superior segmental artery, consistent with a pseudoaneurysm-related lesion. The distal end of the double-J stent projected into the hematoma. A large hypodense intravesical collection was also seen, consistent with a bladder clot (Figure 1 D).

After stabilization with blood transfusion, selective renal angiography confirmed rupture of a pseudoaneurysm arising from the superior segmental artery. Selective arterial embolization was successfully performed, with satisfactory post-embolization control angiography (Figure 2). Three days later, the patient underwent endoscopic evacuation of bladder clots. He was discharged after a total hospital stay of 10 days, hemodynamically stable and with clinical improvement.

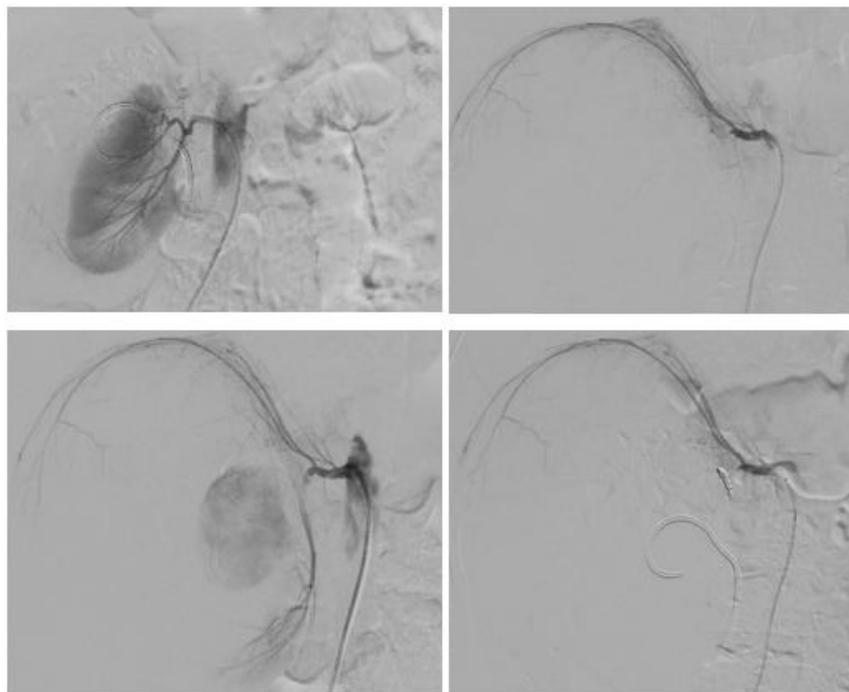


Figure 2: Renal arteriography and selective embolization of the superior segmental artery pseudoaneurysm

DISCUSSION

Blunt trauma related to high-velocity deceleration accounts for the vast majority of renal injuries (around 90%), whereas penetrating trauma (gunshot and stab wounds) represents approximately 1.4% to 3.3%; however, these proportions vary considerably by geographic region. The kidney is relatively well protected within the retroperitoneum, yet it remains vulnerable during major trauma because it is primarily secured by the vascular pedicle and the renal pelvis at the ureteropelvic junction. As a result, forceful impacts associated with rapid deceleration can generate significant renal damage. In adults, the most frequent blunt mechanisms include assault, falls from height, skiing accidents, and road traffic collisions. Penetrating injuries may involve the kidney, particularly when the upper abdomen is affected. Compared with blunt trauma, renal vascular injuries are more frequently encountered in penetrating trauma, while isolated penetrating renal injuries remain uncommon. Overall, up to 90% of renal injuries in both adults and children are minor and involve segmental vessels or the renal parenchyma. Isolated renal artery transection or intimal disruption is a rare and distinct entity, typically occurring after rapid deceleration [1].

A true aneurysm corresponds to a focal, rounded dilatation involving the vessel wall, whereas a pseudoaneurysm is a contained vascular rupture in which the surrounding tissues confine the hemorrhage, forming a perfused hematoma with turbulent flow [2]. In other words, pseudoaneurysms develop at the site of arterial injury but do not represent a true aneurysmal dilatation of the vessel wall. Unlike true aneurysms, pseudoaneurysms do not involve all layers of the arterial

wall; their containment depends on periarterial tissues and, over time, a fibrinous capsule, which is mechanically weaker than a true vessel wall [3, 4].

Most renal artery pseudoaneurysms are iatrogenic, classically following renal biopsy, percutaneous renal procedures, or open/endoscopic urologic surgery. Post-traumatic renal artery pseudoaneurysm is uncommon. When it occurs after trauma, it is thought to result from the effects of deceleration forces on the renal vasculature, leading to focal arterial injury with delayed pseudoaneurysm formation [3, 5]. Clinically, pseudoaneurysms may remain silent or present with delayed gross hematuria that can be severe, as seen in our patient.

Conventional angiography remains the reference standard for diagnosis, while non-invasive modalities such as CT angiography (CTA), MR angiography (MRA), and Doppler ultrasound are also effective for detection and follow-up. In recent years, interventional radiology has largely replaced open surgery in the management of many arterial complications due to its minimally invasive nature and high success rates [6]. For renal pseudoaneurysm, embolization has been shown to be highly effective. The two most commonly used endovascular strategies are selective embolization and stent deployment; the choice depends on pseudoaneurysm morphology (including neck size), vascular anatomy, and the need to preserve downstream renal perfusion [6].

In our case, selective embolization of the upper-pole branch was performed using coils (3 × 5 cm and 2 × 3 cm), achieving complete occlusion of the

pseudoaneurysm on the post-embolization angiographic run. Following embolization, the patient was closely monitored, with cessation of hematuria within 24 hours and improvement of right-sided pain. Consistent with published data, percutaneous embolization represents a safe and cost-effective alternative to surgical exploration in traumatic renal pseudoaneurysm, with the additional benefit of being less invasive and technically straightforward in experienced hands[7]. Nevertheless, potential adverse events should be anticipated, including post-embolization syndrome (nausea, vomiting, fever, leukocytosis, and abdominal pain secondary to renal parenchymal ischemia). Other reported complications include renal failure, transient arterial hypertension, and access-site hematoma [8].

CONCLUSION

Although renal artery pseudoaneurysms are rare, they represent a serious and potentially life-threatening complication of renal trauma, as illustrated by this case. Renal artery embolization is a minimally invasive technique that allows both confirmation of the diagnosis and definitive treatment. While CT is useful for identifying and characterizing pseudoaneurysms, angiography-guided embolization enables immediate therapeutic management. Prompt recognition and early involvement of interventional radiology are essential to prevent complications such as ongoing hemorrhage, severe anemia or hemodynamic instability, and loss of renal function.

DECLARATIONS

Ethics approval and consent to participate: Written informed consent was obtained from the patient for the publication of this case report.

Consent for publication: Written informed consent for publication of the clinical details and images was obtained from the patient.

Declaration of interests: The authors declare that they have no known competing financial interests or personal

relationships that could have appeared to influence the work reported in this paper.

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