

Post-traumatic renal artery thrombosis secondary to blunt abdominal trauma: a rare case report



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ABSTRACT

Background: Blunt abdominal trauma is one of the leading causes of morbidity and mortality among populations worldwide. However, renal artery injury due to blunt abdominal trauma is a rare occurrence. In this case, a patient who suffered multiple trauma was found in the emergency department, including blunt abdominal trauma, after a motor vehicle accident.

Case report: A 13-year-old boy with multiple trauma was referred to our emergency department, with the primary consideration being to lose consciousness 3 hours before admission due to a traffic accident. After receiving examination, there was no evidence of abdominal bruising, whereas the results of the head CT scan show epidural hemorrhage. After four days of treatment, the urea and creatinine serum levels increased, abdominal CT scan shows right renal infarction suggestive of right renal arterial rupture. The patient was diagnosed with a moderate head injury and right renal trauma AAST grade IV. The patient was referred to the interventional radiology unit. The endovascular revascularization techniques were performed with renal artery stent placement and vasodilator (nitroglycerin) flush into the renal artery before stent placement. Renal artery stenting placement performed on main right renal artery demonstrates the absence of intraluminal defects and substantially blood flow was established, abdomen CT Scan shows an enhancement on right renal parenchyma which mean right kidney vascularization appears to be improved with the return of glomerular filtration rate to normal value at the time the patient was discharged.

Conclusion: Traumatic renal artery thrombosis is a rare occurrence with devastating consequences if any imaging is missed. Endovascular therapy plays a significant role in the treatment of renal artery thrombosis with a better prognosis.

Keywords: Abdominal blunt trauma, renal artery injury, renal artery thrombosis.

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INTRODUCTION

Abdominal trauma can be divided into blunt and penetrating trauma. Blunt abdominal trauma is one of the leading causes of morbidity and mortality among populations worldwide. Blunt trauma can affect any intraabdominal organ, and the injuries may not always be apparent clinically. This condition is especially the case in severe polytrauma. The renal is the most commonly injured organ in children and adolescents, accounting for more than 60% of genitourinary injuries and 10–20% of blunt abdominal injuries. Most renal trauma in children is minor and occurs after the age of 5 years, but increasing age is associated with worsening severity of injuries and multisystem injuries.^{1,2}

Renal artery thrombosis is a rare pathology that may be overlooked when evaluating impaired renal function post-

trauma. It is the formation of a blood clot in one or both of the arteries supplying blood to the kidneys, leading to decreased renal perfusion and may result in kidney injury or failure. This case report describes that the prompt and accurate diagnosis is essential

in such patients, hopefully resulting in timely treatment and rapid recovery with minimal or no morbidity.^{2,3} The radiologist's role is critical in assessing patients with renal artery thrombosis and establishing accurate diagnoses.

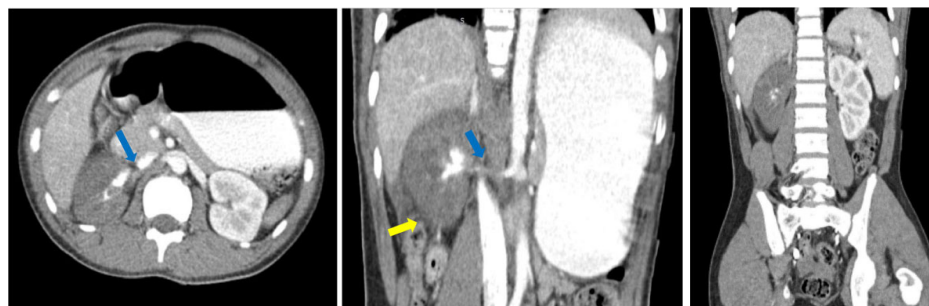


Figure 1. Contrast-enhanced multi-detector CT during an arterial phase on axial, coronal and coronal with reconstruction position. The CT scan showed a significantly lower enhancement of the right renal artery (blue arrow). The absence of the nephrogram phase revealed a thrombus in the right renal artery and renal subcapsular hematoma (yellow arrow).

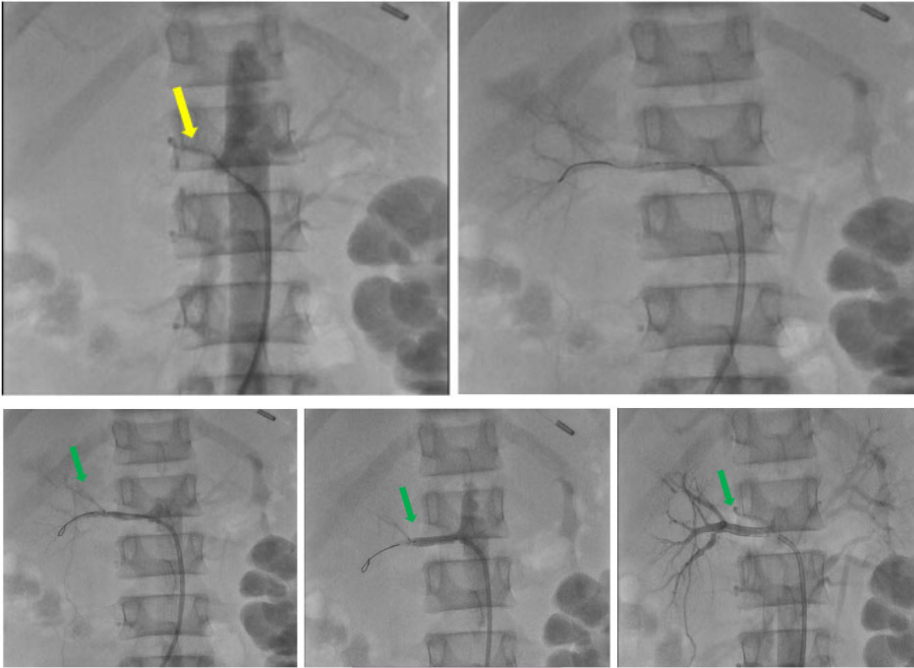


Figure 2. Angiography of a right kidney showing a flow-obstruction in the right renal artery (yellow arrow). Angiography after successful embolization with stenting of the right renal artery (green arrow). Perfusion of the right kidney is demonstrated with patency of the main renal artery.

CASE REPORT

A 13-year-old boy with multiple trauma was referred to our emergency department with the primary consideration was losing consciousness 3 hours before admission due to a traffic accident. After receiving examination, there was no evidence of abdominal bruised, whereas the results of the head CT scan show epidural hemorrhage. After four days of treatment, the ureum and creatinine serum levels increased, abdominal CT scan shows right renal infarction suggestive of right renal arterial rupture (Figure 1). The patient was diagnosed with a moderate head injury and right renal trauma AAST grade IV.

The patient was referred to the interventional radiology unit. The endovascular techniques with revascularization were performed with renal artery stent placement and vasodilator (nitroglycerin) flush into the renal artery before stent placement (Figure 2).

Renal artery stenting placement performed on the leading right renal artery demonstrates the absence of intraluminal defects and substantial

blood flow. Abdomen CT Scan shows an enhancement on right renal parenchyma, which means right kidney vascularization appears to be improved with the return of glomerular filtration rate to expected value when the patient was discharged (Figure 3).

DISCUSSION

The kidney is the third most common abdominal organ to sustain an injury, with renal trauma evident in approximately 1–5% of all trauma cases. Trauma is either blunt representing almost 80% of traumatic renal injuries such as motor vehicle accidents, falls and sports accidents or penetrating trauma due to stab wounds and gunshot wounds.⁴ The primary mechanism in blunt trauma is the exertion of a deceleration force on the renal parenchymal tissue, major renal blood vessels, and renal collecting system, which thrusts the kidney against the vertebral column or rib cage, causing contusion, laceration, hemorrhage or avulsion of the renal pedicle.⁵ Penetrating trauma leads to the crush of tissue struck by the bullet/knife (the permanent

cavity) with the associated stretch of the surrounding tissue (the temporary cavity).⁶ Iatrogenic trauma, e.g., renal biopsy, can cause arteriovenous fistula by injuring an artery and a vein, creating an abnormal communication between them.⁵ According to the AAST (American Association for the Surgery of Trauma) organ injury severity scale, traumatic renal injuries should be classified (Table 1).⁷

There is currently a debate in academic circles regarding imaging criteria, especially in children with blunt trauma, whether or not they can be equated with imaging criteria in adult patients.⁸ Studies have shown that microscopic hematuria in children does not require imaging investigations. Pediatric blood pressure is also unreliable for referral for imaging because of the high risk of hypotension in pediatric patients with hypovolemia. To date, there have been no studies of pediatric patients with kidney injury evaluating the sensitivity and specificity of hematuria as diagnostic parameters. Then it is hoped that clinically significant pediatric kidney injury patients will not be missed if there is a hematuria examination in a pediatric patient with blunt trauma resulting from >50 red blood cells/high power field and indicates it for imaging examinations.⁹ Thus, radiographic evaluation can be performed on children with blunt trauma who are hemodynamically stable if the urine analysis shows gross hematuria or >50 red blood cells/high power field.⁷

Patients with the suspected renal vascular injury can undergo imaging evaluation with the first imaging modalities, namely abdominal ultrasound (US) and computed tomography (CT) scan. CT scan can provide information equivalent to US kidney, but the higher spatial resolution on CT scan will provide a more detailed picture.⁴ In addition, CT scanning also provides an advantage compared to the US, which can evaluate the anatomy of the kidney vasculature more comprehensively with reconstructive and multiplanar imaging modes without operator dependence. In situations where the renal injury is suspected, an ideal evaluation with spiral CT with contrast is ideal. Contrast administration can be done orally, but oral administration is not always necessary. Unfortunately,

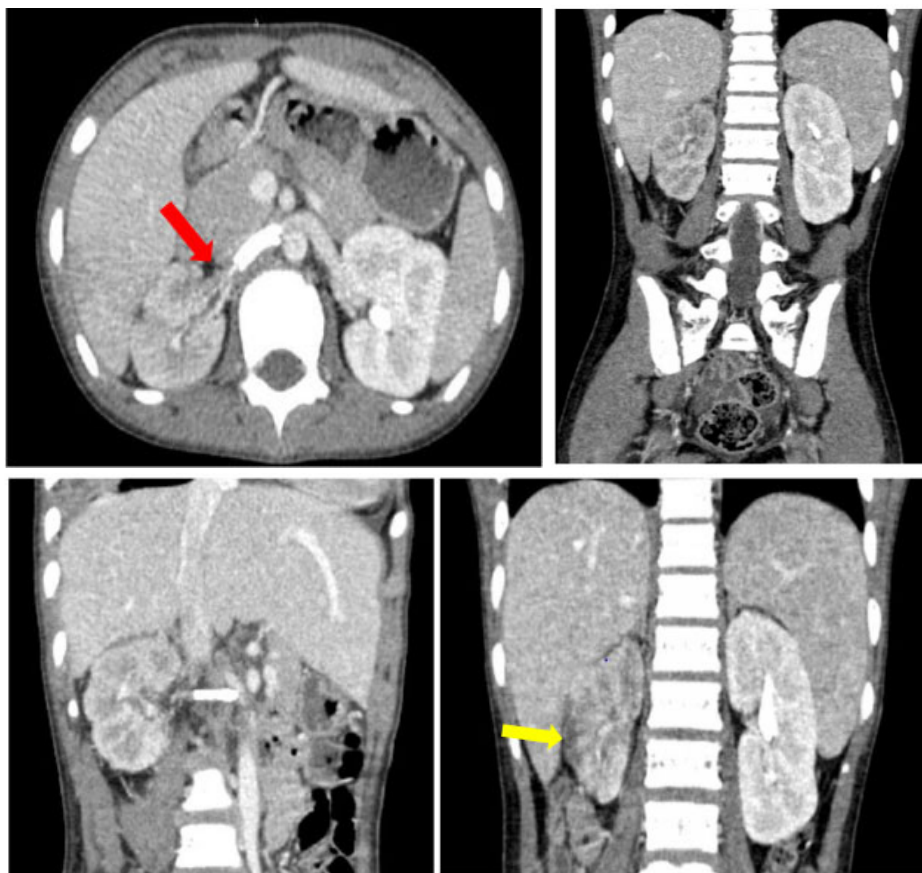


Figure 3. Contrast-enhanced multi-detector CT during a corticomedullary phase, a month after revascularization with stent placement in the right renal artery (red arrow), showed that parenchyma is beginning to enhance. Note the renal subcapsular hematoma (yellow arrow).

Table 1. The AAST organ injury severity scale.³

Grade	Type	Description
I	Contusion	Microscopic or gross hematuria
	Hematoma	Subcapsular, non-expanding with no parenchymal laceration.
II	Hematoma	Non-expanding peri-renal hematoma
	Laceration	Less than 1 cm of parenchymal depth with no collecting system injury or urine extravasation.
III	Laceration	More than 1 cm of parenchymal depth with no collecting system injury or urine extravasation.
IV	Laceration	Parenchymal laceration involving renal cortex, medulla and reaching collecting system.
	Vascular	Main renal artery or vein injury.
V	Laceration	Complete shattered kidney.
	Laceration	Avulsion of renal hilum with subsequent devascularization of the kidney.

Advance grade by one for bilateral injuries up to grade III.

a non-contrast spiral CT examination may miss the presence of bowel injury that accompanies kidney injury. The

assessment resulting from the spiral CT evaluation can determine injuries to other abdominal organs and its ability to

provide information quickly. The most important thing is the technique on spiral CT. Spiral CT can be performed in various phases. However, the recommended phase is the excretory phase (1-3 minutes after contrast injection) when compared to the corticomedullary (CM) or nephrographic (NP) phase, which can occur in cases of severe renal pathology. There is a reduction in the need for specific indications for renal evaluation with the increasing use of CT scanning to evaluate blunt abdominal trauma. Total hematuria may not be found in UPJ injuries, and it is supported that half to a quarter of patients with renal pedicle injury do not have hematuria.⁵

Renal artery stenting is a revolutionized percutaneous renal revascularization technique. The guiding catheter technique is the procedure of choice with the lowest intervention and radiation time. Selective catheterization of the renal artery is usually performed through the guiding catheter using a steerable hydrophilic guidewire with a flexible tip.¹⁰

The technique of trans-catheter renal intervention is usually straightforward. The renal artery is catheterized using a femoral approach. A 6 French (6F) vascular sheath is placed in the desired artery using the modified Sledinger technique. A 4 or 5 F C2 Cobra catheter is inserted in the renal artery directly, and super-selection of the targeted vascular thrombus can be achieved using microcatheters.¹⁰ In this case, we inserted drug-eluting stents for renal application.

After treatment, several complications might be shown in the local area, such as contrast-induced acute renal failure (mild or severe), atheroembolic renal failure, rupture of the renal artery, dissection of the renal artery, thrombotic occlusion of the renal artery, renal artery spasm and in puncture site such as hematoma, hemorrhage or vessel tear, pseudoaneurysm, arteriovenous fistula. Renal artery stenting is an up-and-coming revascularization technique, but further studies are needed to prove its superiority over medical treatment alone, achieve an earlier diagnosis, and select the appropriate treatment considering the patient's overall prognosis.¹⁰

CONCLUSION

Traumatic renal artery thrombosis is a rare occurrence with devastating consequences if any imaging is missed. Endovascular therapy plays a significant role in the treatment of renal artery thrombosis with a better prognosis.

DISCLOSURE

Conflict of Interest

The authors have no potential conflict of interest to disclose.

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Author Contribution

HGN and LS contributed to concept, design, searching the literature, data analysis, manuscript preparation, editing, and reviewing. EBA and H contributed to clinical studies, data acquisition, data analysis, and manuscript review. DKD contributed to data acquisition, data analysis, and manuscript review. PA contributed to the design, searching the literature, data analysis, manuscript preparation, editing, and reviewing.

Ethical Consideration

Ethical Commission of Dr. Hasan Sadikin Hospital has permitted this case report with ethical letter number No: LB.02.01/X.6.5/94/2021.

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