Traumatic Dissection of a Renal Artery Branch After Blunt Abdominal Trauma: A Case Report and Review of the Literature

Wei-Che Lee¹, Ming-Chen Paul Shih², Hsing-Lin Lin¹, Yuan-Chia Cheng¹

We present a 22-year-old man who suffered a contusion on the left side of his back in a motor scooter accident. Traumatic segmental infarction of the right kidney was found on computed tomography scan. A subsequent angiogram showed right renal artery branch dissection and an expandable stent was deployed across the stenosis. Stent treatment proved successful at the four month follow-up. Enhanced abdominal computed tomography imaging is indicated in patients with microhematuria associated with spinal fracture. Conventional stenting is a promising treatment option following angiography and it can reduce the infarct and prevent further renal damage.

Key words: computed tomography, renal angiography, renal artery, thrombosis, stent

Introduction

Renal injury occurs in 8-10% of all blunt and penetrating abdominal injuries⁴. Blunt trauma following motor vehicle collision, falls, and assault, constitutes 90% of the cause. The incidence of blunt renal artery injury is estimated incidences ranging between 0.05% and 0.08% among blunt trauma patients². Renal infarctions occur as a result of embolic or thrombotic occlusions of renal arteries. Blunt trauma is an infrequent cause of this phenomenon, although it is being detected more frequently because of the increasing use of computed tomography (CT) and angiography in evaluating multiple trauma patients⁴. We present a unique case with delayed presentation of isolated traumatic dissection of a renal artery branch, which was treated successfully with an endovascular approach by placement of a conventional stent.

Case Report

A 22-year-old male scooter rider sustained a high-speed lateral impact to his left side as a result of a motor vehicle collision. He was transported to a rural hospital where his hemodynamics were stable. The initial physical assessment was significant because it revealed an acutely tender left flank hematoma. Serum chemistry tests and the hematocrit were within normal limits, but urinalysis demonstrated microhematuria. Anteroposterior conventional radiography of the lumbar spine demonstrated fractures of the left transverse process of the third lumbar vertebrae. No further examinations were done and he was discharged with normotension and lessened torso pain after a 24 hour stay. He visited our emergency department on the fifth day after injury because of persistent and worsening left flank pain. The abdomen was
soft without peritoneal signs but mass bruising from the left back to the lower abdomen was found. His vital signs were normal. The laboratory examination showed creatinine level of 1.0 mg/dL, blood urea nitrogen level (BUN) of 10.7 mg/dL, and hemoglobin level of 12.1 g/dL. Two to five red blood cells per high power field were seen on urinalysis. A contrast-enhanced CT of the abdomen not only showed details of the lumbar vertebra fractures but a lack of contrast enhancement in the upper pole of the right kidney. This was initially mistaken for kidney laceration or contusion with compromised vasculature (Fig. 1A). A radiologist and urologist reviewed the images and there was suspicion of renal artery branch damage. Renal angiography was done to determine the etiology and sequential therapeutic treatment. A small infarction over the upper part of the right kidney was seen in the arterial phase, with confirmation of a localized intimal dissection in one branching artery from the right main renal artery (Fig. 1B). Endovascular stenting was performed to stabilize the intimal flap and avoid retrograde dissection. A 2.5 mm × 23 mm Flexmaster F1 flexible balloon-expandable stent (Abott, Ulestraten, Netherlands) at 12 atmospheres pressure was then deployed across the stenosis. Post-stenting radiography showed a uni-luminal artery with a smooth intimal surface and good flow crossing the stented segment. The patient recovered uneventfully 10 days after the accident. At the 4 month follow-up, the patient had normal BUN and creatinine levels. CT angiogram (CTA) showed successful endovascular stenting in the renal artery branch (Fig. 1C, D). Renal scintigraphy using $^{99m}$Tc-labeled DTPA tracer demonstrated mildly reduced function of the right kidney and reduced activity in the upper pole on the right side.

Fig. 1  (A) Post injury day 5 CT scan showing the lack of contrast uptake in the upper part of the right kidney (arrow). (B) Renal arteriography showing an intimal flap (arrow) transversing the entire lumen of the artery branch. (C) The upper pole perfusion defect is relatively small in size (arrow) in the 4-month follow-up CT angiogram. (D) There is no evidence of restenosis at the stent site or further retrograde dissection. The branching artery remains patent (arrows)
Discussion

Hematuria is a characteristic sign of renal trauma, despite a poor correlation with severity of injury. About 95% of significant renal injuries are associated with hematuria. Nevertheless, less than 1% of patients with only microhematuria have substantial renal injury. Therefore, microhematuria alone is not an absolute indication for imaging. However, if no radiographic evaluation is done in patients with traumatic microhematuria associated with lumbar vertebrae transverse process fracture, severe renal injuries can be missed.

The most frequent etiologies of lumbar vertebrae transverse process fracture are blunt trauma due to motor vehicle collisions and falls from a height. Patients with transverse process fractures can also have injuries to the abdominal viscera, genitourinary system, and diaphragm. Genitourinary damage is the most common associated injury. In our patient, the left transverse process fractures may have resulted from a direct blow, while a probable traction force placed on the right kidney may have caused arterial stretching, which then produced intimal injury with subsequent segmental infarction. Traumatic segmental infarction is an uncommon form of renal injury occurring as a result of occlusion of renal artery branches. The precise incidence of this type of injury after blunt flank injury is unknown. This is contrary to the conventional algorithm for blunt renal trauma with microscopic hematuria. Most clinicians feel that if the patient is stable, further imaging is not needed, since it usually only reveals a contusion. CT scan and intravenous pyelogram (IVP) are the imaging studies of choice in the initial assessment. IVP is indicated if CT is unavailable or if a transfer to a higher level of care is not possible. On CT scanning, careful inspection of the abdominal viscera, diaphragm and retroperitoneum is needed to identify additional injuries. We suggest every patient with a spinal fracture and microhematuria and no shock after blunt trauma needs further enhanced-CT scan study in avoiding such a missed injury.

A streak-like enhancement pattern with wedge shape infarction of the kidney on an initial enhanced CT scan should raise suspicion of renal artery branch damage. Catheter angiography and CTA are possible to image the affected vessels. CTA is mainly focused on major vessel problems such as aortic dissection, or patients already known to have vascular-related problems. There may be limited information provided to determine etiology acutely, since segmental infarction was discovered in advance. Renal angiography was done to determine the etiology and sequential therapeutic treatment.

Some authors have advocated that segmental infarction occurring after blunt trauma which is not complicated by significant renal function or delayed renal hemorrhage should be managed non-operatively. However, the intimal flap creates a reciprocating and variable resistance to flow in the true and false lumina. This turbulent flow may cause retrograde dissection. The retrograde dissection process of the renal artery branch into the main renal artery may cause whole kidney damage. To eliminate the retrograde flow and occlusion of the false lumen, we inserted a balloon-expandable stent into the injured vessel. At the 4-month follow-up, renal scintigraphy and CTA demonstrated successful interval endovascular stenting without further advancement of retrograde intimal dissection.

When there is microhematuria associated with transverse process fractures of the lumbar vertebrae in blunt abdominal injury, early enhanced CT imaging helps in diagnosing and detecting severe renal injuries. Once blunt injury to the renal vasculature is ascertained by CT scan, timely endovascular intervention may determine etiology
and sequential therapeutic treatment to diminish further renal damage. To our knowledge, successful interval endovascular stenting in the delayed management of traumatic dissection of a renal artery branch has not been previously documented in the English language literature.

References

腹部钝伤后肾动脉分支的外伤性剥离：
一个病例报告与文献回顾

李维哲¹ 石明诚² 林杏麟¹ 郑渊隆¹

我们提出遭受机车事故导致左肩后腰部挫伤的22岁的男性。电脑断层扫描发现右肾钙的创伤性局部梗塞。随后血管造影术显示右侧的肾动脉分支剥离并且我们置放了一可膨胀的支架横跨此血管狭窄处。四个月后随访显示了成功的血管支架作用。在有微血尿与骨髓骨折的患者应施行具显影剂的腹部电脑断层扫描检查。常规的血管内支架撑开术对这种伤害是一个很有希望的治疗选择，可以减少梗塞和防止进一步肾功能损害。

关键词：电脑断层，肾动脉摄影，肾动脉，血栓，支架