

Delayed Endovascular Treatment of Renal Artery Dissection and Reno-Vascular Hypertension after Blunt Abdominal Trauma

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Introduction

As a rare complication of blunt abdominal trauma, dissection of the renal arteries can be observed among other severe complications [1, 2] and necessitates immediate surgical or endovascular intervention to prevent significant ischemic organ damage. If successful intervention cannot be performed immediately, patients are prone to develop renovascular hypertension over time through the activation of the renin-angiotensin-aldosterone system (RAAS). However, they still may benefit from a delayed surgical reconstruction of the vessel or percutaneous endovascular treatment. If recovery of kidney function and reversal of renovascular hypertension before the intervention is in doubt due to prolonged delay of revascularization, percutaneous endovascular treatment may be the first option because complication rates can be kept reasonably low.

We report a case of a successful but delayed endovascular treatment of a traumatic renal artery dissection and reversal of consecutive renovascular hypertension after blunt abdominal trauma.

Case Report

A 46-year-old man who had experienced a mild motorcycle accident initially presented with subcutaneous hematoma

and pain in his right flank. For initial diagnostics, the patient underwent contrast-enhanced computed tomography (CT) scans of his abdomen and pelvis at a smaller district hospital. In contrast to a contrast-enhanced CT scan of the abdomen 5 months before, which was performed routinely as a follow-up after necrotizing pancreatitis, a new stenotic lesion of the right renal artery with delayed and inhomogeneous contrast enhancement of the right renal parenchyma as well as a hematoma of the right adrenal gland (Figs. 1, 2) could be observed. The following digital subtraction angiography (DSA) showed only a weak perfusion of the proximal right renal artery and a high-grade stenosis in the middle part, suggesting a traumatic renal artery dissection. Unfortunately, a guidewire passage of the renal artery stenosis for angioplasty could not be established at primary intervention. A subsequently performed functional renal scintigraphy, with 108 MBq technetium-99 m-MAG3 of the kidneys, revealed almost no function on the right side (approximately 2%) in contrast to adequately compensating renal function on the left side. Within days after trauma, the patient developed sudden onset hypertension with blood pressure up to 200/100 mmHg and additionally suffered from recurrent headache episodes.

Twenty days after trauma, the patient presented to our hospital for potential treatment of the filiform renal artery stenosis. The highly suspected renovascular cause for sudden onset hypertension was verified by selective venous blood sampling from both renal veins as well as from inferior vena cava (IVC) before renal artery intervention: elevated renin activity in IVC (2.22 ng/ml/h; normal range, 0.12–1.59 ng/ml/h) due to highly elevated renin activity in the right renal vein (5.67 ng/ml/h), renin activity in left renal vein almost equal to systemic, i.e., IVC levels. Right common femoral artery access was established with a 4-F

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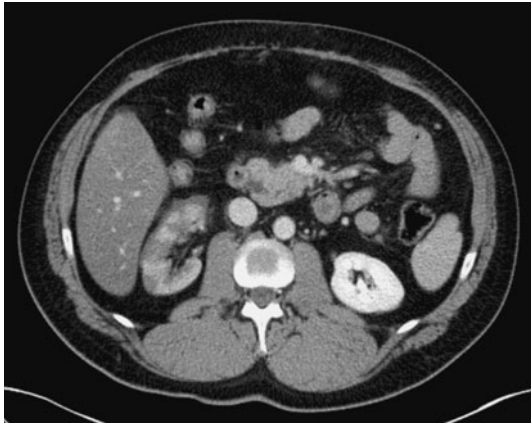


Fig. 1 Contrast-enhanced CT scan immediately after trauma revealed ischemic regions and renal infarction of the right kidney due to renal artery dissection (Courtesy of the Radiology Department of the Schwarzwald-Baar Hospital Villingen-Schwenningen, Germany)

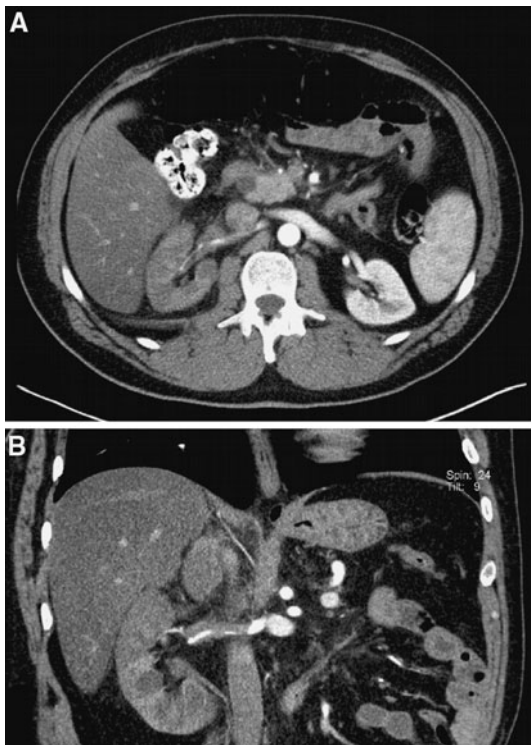


Fig. 2 Two days after trauma, the perfusion of the right kidney parenchyma is worsened and a stenotic lesion highly suspicious for a right renal artery dissection is apparent (A). Moreover, inhomogeneous right adrenal mass was observed suggestive of traumatic hematoma of the right adrenal gland (B) (Courtesy of the Radiology Department of the Schwarzwald-Baar Hospital Villingen-Schwenningen, Germany)

introducer sheath and angiography using a cobra catheter revealed a filiform lesion of the right renal artery highly suspicious of a renal artery dissection (Fig. 3). The distal parts of the right renal artery and the renal parenchyma

demonstrated in the upper and middle parts a delayed but significant contrast enhancement most likely due to a residual filiform lumen and small caliber collaterals. Subsequently, the right common femoral artery access was changed to a 5-F RDC sheath and an initial attempt to cross the dissection with a 0.018-inch Terumo guidewire was not successful. After changing to a 0.035-inch Terumo guidewire, the dissection was successfully passed and percutaneous transluminal angioplasty (PTA) was then performed with an angioplasty balloon (Fox plus 4 mm/20 mm, Abbott Vascular). Although the right renal artery presented with significantly improved flow dynamics after the intervention, a residual dissection and disturbed flow pattern with indication for artery stenting were still present. A balloon-expandable stent (6 mm/18 mm, Tsunami Terumo) was placed over the dissection flap distant to the artery's origin. Good patency with improved renal artery flow was obtained after intervention (Fig. 3). For 2 days after intervention, heparin was used for anticoagulation followed by Clopidogrel p.o. (75 mg/day) for 10 weeks and ASS 100 mg as a lifelong therapy (loading dose before intervention: 300 mg Clopidogrel and 500 mg ASS). Renovascular hypertension was normalized within days after intervention and the patient was no longer suffering blood pressure-related headache episodes. Although adequate perfusion of the right kidney was established after the intervention, creatinine levels were still elevated (1.8 mg/dl) throughout the in-hospital stay, which indicated an impaired right renal function. The function of the right kidney recovered partly within 4 weeks after the intervention (right/left: 6.9%/93.7% at functional renal scintigraphy). Systemic renin activity decreased to the normal range: 1.47 ng/mg/h and creatinine levels improved but were still elevated (1.4 mg/dl and GFR-MDRD of 54.6 ml/min/kg) within 3 months follow-up. A contrast-enhanced CT scan 3 months after intervention showed a patent stent in the right renal artery as well as delayed perfusion and elimination of contrast media of the right kidney (Fig. 4).

Discussion

Dissection of the right renal artery due to blunt abdominal trauma is a rare but important complication because it might be the cause for sudden onset of renovascular hypertension [1]. Sudden deceleration of the body or contusion between abdominal wall and spine result in subintimal tears, which mostly affect the left renal artery [3, 4]. This might lead to a subintimal dissection with thrombosis and consecutive stenotic lesion or total occlusion of the renal artery. The reduced blood flow activates the RAAS and leads to elevated blood pressure levels due to the Goldblatt-effect, which can be verified by selective venous

Fig. 3 Digital subtraction angiography reveals a filiform stenosis of the right renal artery in the middle third with residual perfusion of the right kidney parenchyma through the filiform lesion and small arterial collaterals (A). After placement of a balloon-expandable stent in the right renal artery, the perfusion of the right kidney is significantly improved without residual stenosis (B)

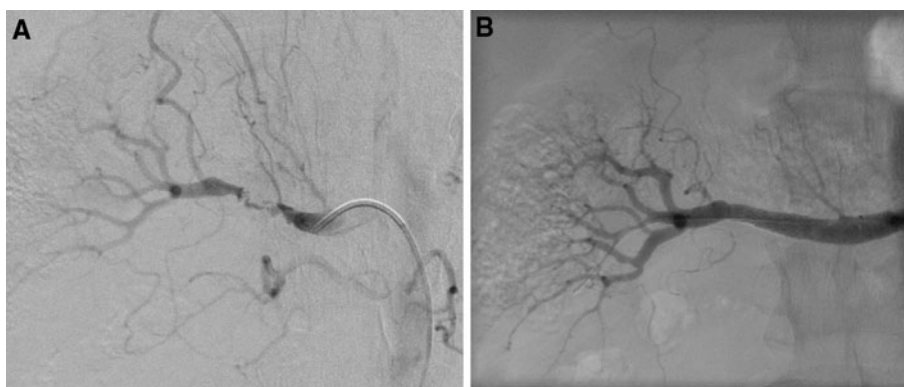
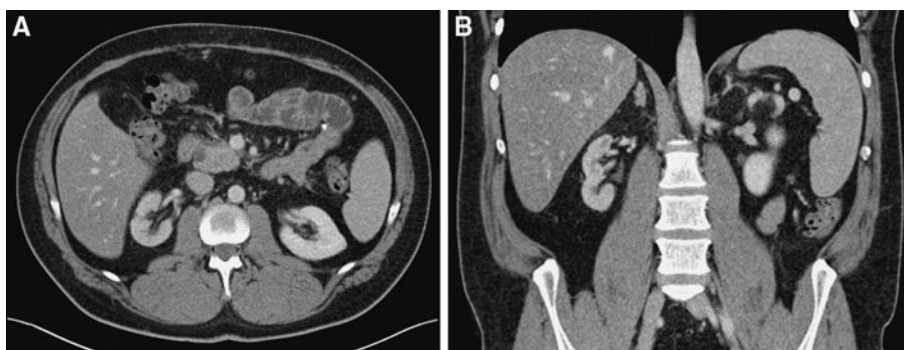


Fig. 4 A contrast-enhanced CT scan 3 months after intervention showed a patent stent in the right renal artery as well as delayed perfusion and elimination of contrast media of the right kidney (A). The hematoma of the right adrenal gland has partially resolved (B)



blood sampling as performed in this case. Due to the activation of the RAAS, the patient developed marked hypertension within days after trauma and suffered from recurrent headache episodes.

Usually the residual perfusion is insufficient to prevent ischemic damage of the renal parenchyma and immediate intervention is necessary. Published literature reports that success of endovascular treatment of renal artery lesions and restoration of kidney function is improved the earlier an adequate perfusion can be reestablished [5–8]. In the presented case, percutaneous intervention was initially not successful but residual perfusion was preserved by a tight lumen of the dissected renal artery as well as by small arterial collaterals. However, despite residual perfusion, the stenotic lesion of the renal artery led to elevated creatinine levels and reduced overall renal function.

Although late recanalization of dissected arteries is technically challenging, in the presented case revascularization with subsequent adequate perfusion of the renal parenchyma could be established 25 days after trauma. This might have been possible because of the filiform lumen remaining, which prevented definitive ischemic cell death. After interventional therapy, blood pressure levels dropped to normal values within days with no need for antihypertensive medication. Headache episodes also were no longer present. Adequate perfusion of the right kidney

was still present 3 months after intervention and right renal function slightly recovered.

Conclusions

This case report emphasizes the need for complete diagnostic workup after blunt abdominal trauma with special attention to possible dissections of the aortal branches. However, if stenotic arterial lesions due to subintimal dissections cannot be treated immediately, the patient might nevertheless benefit from delayed percutaneous intervention even if a slight residual perfusion through collaterals and stenotic lesions is still present.

Conflict of interest The authors declare that they have no conflict of interest.

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