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Traumatic Intimal Tear of the Renal Artery Treated by Insertion of a Palmaz Stent

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Abstract

A renal artery intimal injury induced by blunt trauma in a 23-year-old man was treated by percutaneous placement of a Palmaz endovascular stent. The patient was placed on anticoagulation for 2 months following stent insertion. Nuclide renal scans demonstrated recovery of normal renal function on the affected side at 9 months postprocedure.

Key words: Renal arteries, injuries—Trauma—Stents, prosthesis

Renovascular injuries from blunt abdominal trauma are uncommon. They occur in approximately 1%–4% of patients with renal injury [1]. Once diagnosed, the management of renal arterial injury remains controversial. Surgical intervention with vascular repair has met with limited success, partly because these patients are so frequently polytraumatized and ill-equipped to tolerate major surgery and prolonged general anesthesia [2–4]. Intimal tears occurring during renal arterial angioplasty have been treated by deployment of metallic stents [5]. We report a case in which a Palmaz stent was employed to treat a renal artery intimal tear induced by blunt trauma.

Case Report

A 23-year-old man was referred to our level I trauma center from a community hospital. He had been ejected from an automobile during a high-speed collision approximately 12 hr earlier. He sustained a closed head injury, a right pneumothorax, an avulsion fracture of the right anterior superior iliac spine, and a fracture of the body of the left scapula. He was hemodynamically stable at the referring hospital and during transport.

A contrast-enhanced computed tomography (CT) scan of the abdomen (Fig. 1A) from the referring hospital demonstrated markedly decreased perfusion and no significant excretion of contrast from the left kidney. Aortography showed an eccentric linear intimal defect in the left renal artery 3 cm from the origin, narrowing the lumen by 90%. The distal renal artery and its branches were normal. Initial laboratory tests revealed a creatinine of 180 umol/L (range 50–120 umol/L), a BUN of 7.6 mmol/L (normal range 3–7 mmol/L), microscopic hematuria and a hemoglobin of 127 g/L (normal range 135–170 g/L). A radionuclide renal scan (Tc99m-DTPA) showed decreased renal perfusion and extraction on the left, with this kidney contributing only 27% to total renal function (Fig. 1B).

In view of the clinical and imaging findings, endovascular repair was attempted. A 5 Fr renal catheter (Cook, Bloomington, IN, USA) was introduced through an 8 Fr sheath (Terumo, Tokyo, Japan), and selectively placed in the proximal left renal artery. An arteriogram confirmed the intimal flap (Fig. 2). Heparin (2000 U) and nitroglycerine (100 g) were administered via the catheter. A 0.035-inch angled glidewire (Terumo) was advanced past the flap and the angiographic catheter was advanced over the wire to the distal renal artery. The glidewire was removed and a 0.035-inch Rosen 1.5-mm guidewire (Cook) was inserted. A P154 Palmaz stent (Johnson & Johnson, Warren, NJ, USA) was then loaded on a 6 mm $\times$ 2 cm angioplasty balloon (Cordis, Miami, FL, USA) which had been inserted into an 8 Fr Lumax guide catheter (Cook). This was then inserted over the wire and postioned so that the stent/balloon straddled the intimal tear in the renal artery. The guide catheter was withdrawn over the stationary balloon catheter and the stent was deployed by inflation of the balloon. Angiography via the guide catheter showed complete obliteration of the flap and a fully patent lumen (Fig. 3). When the activated clotting time fell below 200 sec, the sheath was withdrawn and hemostasis was achieved. Four hours later the patient was placed on intravenous heparin and started on coumadin, with the latter maintained for 2 months.

A contrast-enhanced spiral CT scan the day following stent placement demonstrated some improved perfusion to the left kidney (Fig. 4A). A repeat DTPA scan 8 days following stent placement demonstrated no significant change in renal function. However, subsequent DTPA scans performed post-discharge showed improvement in function of the left kidney with that kidney contributing 36% of total renal function at 20 days and 45% of total renal function at 9 months post stent placement (Fig. 4B). The serum creatinine decreased to 158 μmol/L the day following stent placement and subsequently decreased to 116 μmol/L 6 days post stent placement.

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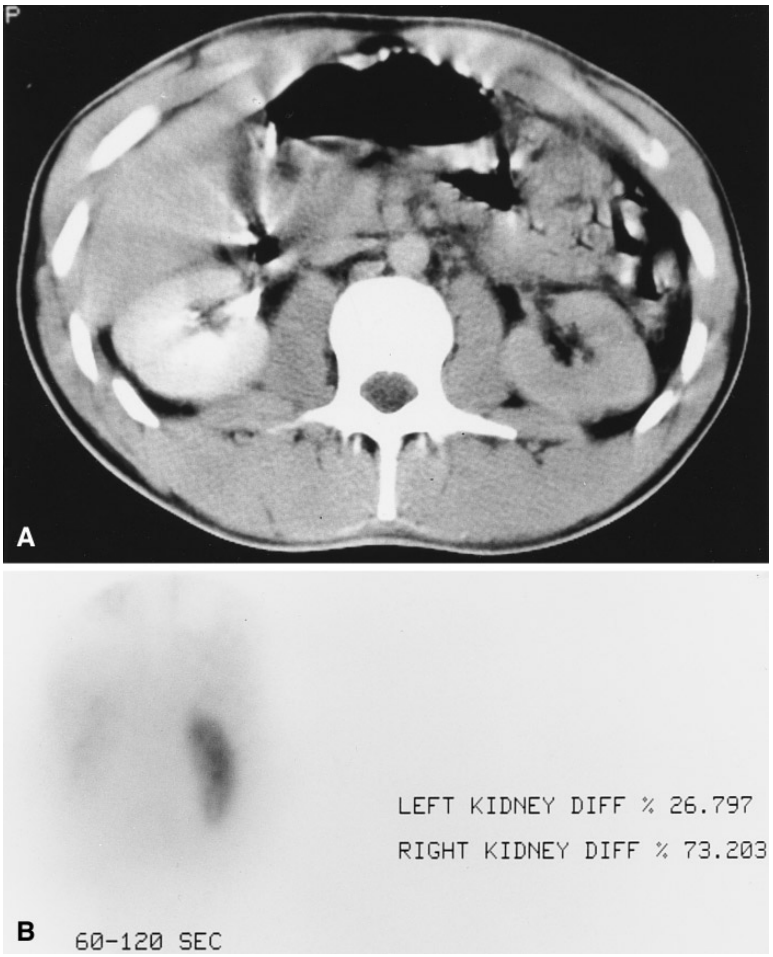

Fig. 1. A Contrast-enhanced CT scan of the abdomen prior to stent placement shows decreased perfusion to the left kidney which demonstrates no excretion of contrast. **B** A nuclide scan 9 days after left renal artery stenting shows 27% uptake on the left. This was unchanged from the present scan, but the hard copy of that scan was lost.

Discussion

Renal artery injuries are a relatively unusual form of renal trauma with renal parenchymal injury being far more common [2–4]. Renal arterial injury may be induced by both blunt and penetrating trauma [2–4]. The majority of injuries consist of thrombosis or complete disruption of the vessel. Less commonly the patient presents with an intimal flap in the main renal artery without thrombosis [3].

The management of renal arterial injury is controversial, especially in the case of blunt trauma. Most of the patients have multiple serious injuries and the renal salvage rate even with surgical intervention is poor [2–4]. The management of the subset of patients with an intimal flap in the main renal artery without thrombosis is unclear. In a discussion of 2 cases by Kaufman et al. [3], the authors advocate observation of unilateral injuries. Surgical intervention is considered with development of arterial thrombosis or renal infarction. They based this recommendation on their 2 cases and the observation that many balloon angioplasty patients who develop intimal defects do not require repair. An editorial comment by Dean [6], however, recommends surgical intervention in these cases because of the risk of subsequent thrombosis, which may be difficult to recognize within a reasonable length of time. The possibility of percutaneous intervention is not mentioned. By lessening operative risk, percutaneous stent placement may allow the benefits of intervention to outweigh the risks. We elected to perform primary stenting rather than balloon angioplasty alone because in our experience this kind of linear protruding flap returns as soon as the balloon is deflated.

Deployment of the Palmaz stent in the treatment of a renal artery intimal injury following blunt trauma has been reported by Whigham et al. [7]. There are several similarities between this previously reported case and the present case. Both renal artery injuries were induced by blunt trauma in young patients without previous history of renal disease. The intimal defects were similar in morphology with grossly normal-appearing distal perfusion. In each case the intimal defects were eliminated with an endovascular stent with mainte-

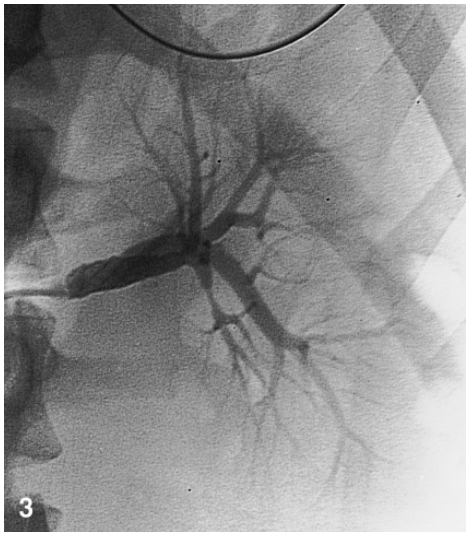

Fig. 2. Selective left renal arteriogram just prior to stent placement shows an intimal flap narrowing the renal artery lumen by 90%.

Fig. 3. Selective left renal arteriogram immediately post-stent placement shows complete obliteration of the intimal flap with no residual stenosis and normal distal perfusion.

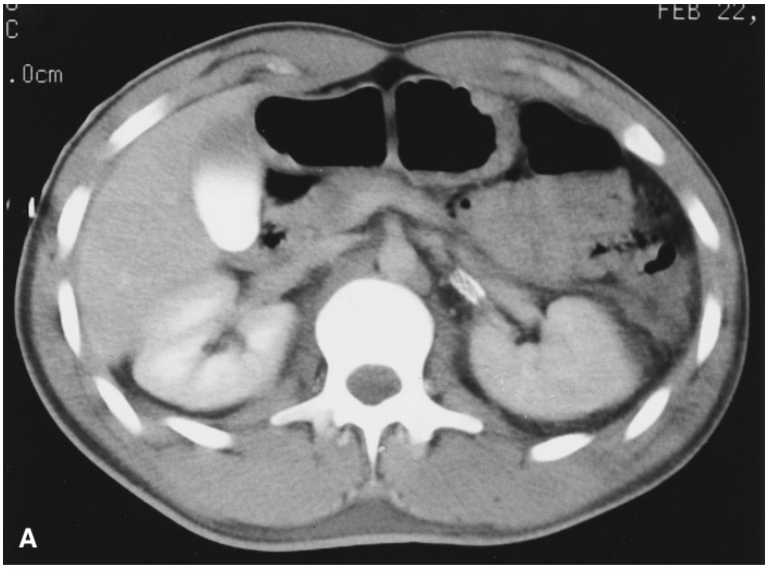

Fig. 4. A Contrast-enhanced CT scan of the abdomen post-stent placement demonstrates the Palmaz stent in situ in the left renal artery and improved perfusion to the left kidney. **B** A nuclide scan 9 months following stent insertion shows no significant differential uptake between right and left kidneys.

nance of good distal flow. In both patients the serum creatinine was normal within a week following stent placement.

Some differences between the 2 cases are evident. In the previous case, the CT scan demonstrated multifocal infarctions with areas of normally perfused kidney. In our patient, there was a global decrease in perfusion on both CT and the radionuclide renal scan. The use of anticoagulants also differed. During placement of the stent in our case, 2000 U of heparin were administered intraarterially through the angioplasty balloon catheter just prior to deployment of the stent. We decided that the increased risk of bleeding due to heparin was outweighed by the risk of thrombosis during stenting. Over the long term, our patient was treated with therapeutic heparin and then coumadin to maintain a therapeutic international normalized ratio (INR) for a 2-month period. Our patient did not suffer any significant complication from anticoagulation during the treatment period. The anticoagulation was carried out with the hope of preventing renal artery thrombosis during the period of endothelialization of the stent. Currently, we no longer place patients on long-term anticoagulation post endovascular stent placement. Therefore, if we were to repeat this procedure today we would not place the patient on long-term anticoagulation, especially considering his traumatized state. In Whigham's [7] patient, concerns over anticoagulation in the setting of trauma resulted in the use of aspirin instead of heparin or coumadin in the post-stent period. In our case we have been able to obtain follow-up radionuclide renal scans that have demonstrated gradual improvement in renal function in the affected kidney.

A renal scan at the referring institution showed diminished perfusion of the affected kidney, but considerable perfusion was still present. The scan was repeated here to determine whether that perfusion was still present after transfer. When it became clear that no further deterioration had occurred, we decided to intervene in order to prevent thrombosis, which, in view of the severity of the stenosis, seemed likely. We were convinced from the appearance of the arteriogram and the CT scan that this was purely an intimal tear. However, we were careful to size the balloon so as not to stretch the artery beyond its normal diameter, to avoid the possibility that a full thickness tear which had spontaneously closed would reopen by overdilatation.

In summary, we have presented a case of traumatic renal artery intimal injury treated percutaneously with a Palmaz stent. The result has been favorable at 9 months post-procedure. We feel that in patients with isolated intimal tears and no arterial occlusion, the deployment of endovascular stents should be considered. The use of these stents potentially saves renal function with minimal patient morbidity.

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