Catheter-Directed Thrombolysis in a Child with Bilateral Renal Artery Graft Thrombosis

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ABSTRACT

A 5-year-old boy with midaortic syndrome who had undergone aortic bypass and bilateral renal artery grafts presented to the emergency department 1 year after surgery with symptoms of nausea, vomiting, and abdominal pain. Because of delay in diagnosis of bilateral renal artery thrombosis, his condition progressed to anuric renal failure. He underwent catheter-directed thrombolysis 7 days after presentation with administration of tissue plasminogen activator and heparin infusion over a 24-hour period. There was successful resolution of thrombus and complete recovery of renal function to baseline. The patient had normal renal function at 6-month follow-up.

ABBREVIATIONS

BUN = blood urea nitrogen, CDT = catheter-directed thrombolysis, EF = ejection fraction, MAS = midaortic syndrome, PTFE = polytetrafluoroethylene, tPA = tissue plasminogen activator

Renal artery occlusion is a rare but serious condition that can result in end-stage renal failure. Much of the morbidity and mortality is related to delay in diagnosis, as patients often present with vague symptoms, including abdominal or flank pain, vomiting, and nausea (1). If occlusion remains undetected, symptoms can progress to oliguric or anuric renal failure with eventual irreversible renal injury and infarction (2).

An early study by Blum et al (3) found that despite successful renal revascularization therapy with catheter-directed thrombolysis (CDT) in 13 of 14 patients, none had recovery of renal function to normal levels. This finding led the authors to believe that thrombolytic therapy was not indicated when the ischemic tolerance of the kidney was exceeded, which they defined as 90 minutes. More recently, several groups demonstrated successful recovery of renal function after revascularization with CDT alone (4) or combined with renal angioplasty and stent placement (5) in patients in whom treatment was initiated up to 24 hours after onset of symptoms. Although these studies demonstrated recovery of renal function, all patients presented with unilateral rather than bilateral disease (4,5). One group was successful in demonstrating successful renal recovery after treatment of bilateral renal artery occlusions with angioplasty and stent placement up to 7 days after development of oliguria, but this was in the absence of thrombosis and progression to dialysis-dependent renal failure (6). We present a case of a child with midaortic syndrome (MAS) who successfully underwent CDT despite progression to 7 days of anuric renal failure and achieved complete recovery of renal function.

CASE REPORT

A 5-year-old boy had a diagnosis of MAS with involvement of the renal ostia (**Fig 1a**) resulting in severe renovascular hypertension. He underwent surgical correction of MAS via a supraceliac to infrarenal

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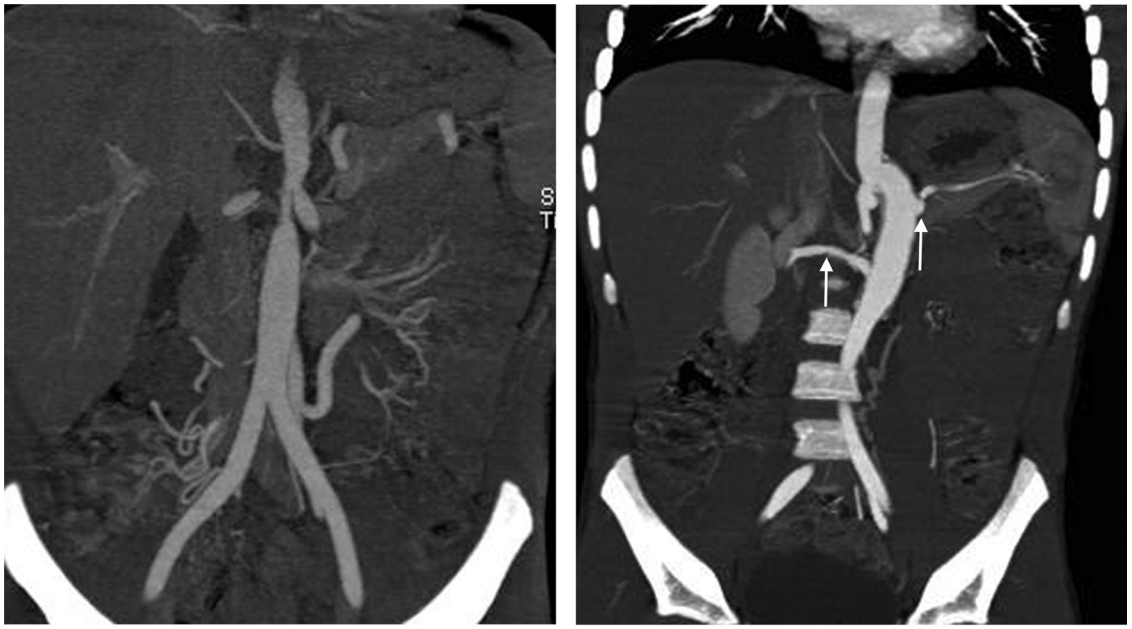

Figure 1. CT angiography. **(a)** Maximum intensity projection image demonstrates midaortic stenosis before surgical bypass. **(b)** CT coronal reformat after aortic bypass graft demonstrates end-to-end anastomosis of renal arteries with extension grafts (arrows) sewn into the bypass graft.

aortic bypass using a 12-mm polytetrafluoroethylene (PTFE) graft. Each kidney was then revascularized with separate 4-mm PTFE grafts from the side of the aortic graft in an end-to-end fashion to the renal arteries (Fig 1b). There was normalization of his blood pressure to 90/60 mm Hg after the procedure, and he no longer required antihypertensive medications. At 9 months after the procedure, computed tomography (CT), echocardiography, and ultrasound revealed patent aortic and renal artery bypass grafts, normal left ventricular ejection fraction (EF), and normal resistive indices of 0.54–0.60 in the right kidney and 0.47–0.60 in the left kidney. The patient's blood pressure was normal at 92/66 mm Hg (normal range, 90–120/55–85 mm Hg). Blood urea nitrogen (BUN) and creatinine were also normal at 14 mg/dL and 0.2 mg/dL, respectively (normal BUN range, 5–18 mg/dL; normal creatinine range, 0.3–0.7 mg/dL).

The patient presented to a local hospital emergency department approximately 1 year after treatment with nausea, vomiting, and abdominal and flank pain. The patient's blood pressure was initially noted to be 139/90 mm Hg, but a second measurement obtained showed a blood pressure of 115/70 mm Hg. Pertinent laboratory studies demonstrated BUN and creatinine levels of 19 mg/dL and 0.65 mg/dL (normal BUN range, 7–20 mg/dL). CT scan of the abdomen and pelvis was performed, which showed all grafts to be patent (Fig 2). The patient was discharged home from the emergency department.

By the next day, the patient's blood pressure had increased to 150–160/100 mm Hg, and he had anuria. The patient returned to the emergency department,

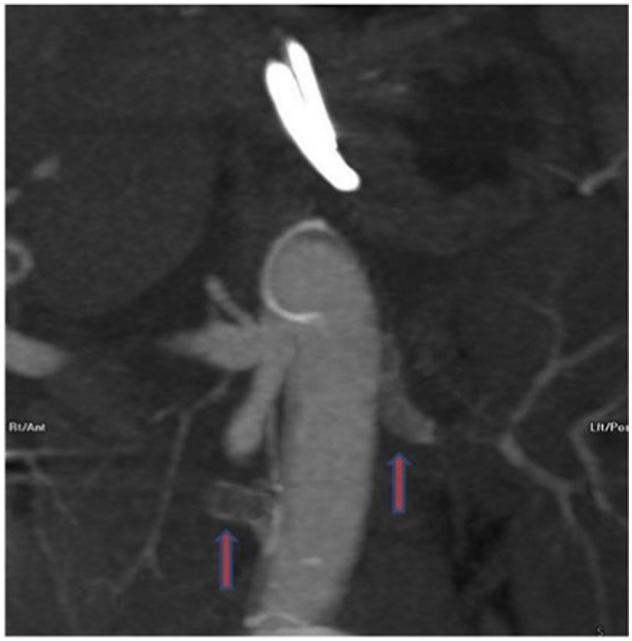

Figure 2. Curved reformat of a CT angiogram of the abdomen and pelvis demonstrates bilateral renal artery thrombosis (arrows) before initiation of CDT.

received fluid resuscitation, and was eventually transferred to a local children's hospital for further management. At the local children's hospital, the patient remained in anuric renal failure with BUN and creatinine levels of 44 mg/dL and 2.5 mg/dL. Echocardiography demonstrated a decreased EF of 37%. The patient was started on milrinone and continuous renal replacement therapy. The initial CT images from the outside

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