

Case Report

Recovery of renal function after delayed percutaneous dilation of a subtotal in-stent restenosis of the renal artery in a left solitary kidney

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Abstract

In-stent restenosis of a previously atherosclerotic renal artery stenosis initially treated with endovascular stenting may progress to subtotal occlusion and loss of renal function. The clinical course of an acute occlusion is mainly acute oligo-anuric renal failure. Therefore, rapid diagnosis and treatment are critical for renal survival. Even after successful endovascular treatment, a close clinical monitoring, and optimized medical treatment including sufficient blood pressure control, lipid lowering and platelet inhibition, is mandatory to prolong the preservation of renal function. Here we present a patient with subtotal in-stent stenosis affecting the left solitary kidney and recovery of renal function 24 h after the revascularization procedure.

Keywords: renal artery in-stent stenosis; renal artery stenosis; renal failure; renal hypertension

Background

Renal artery stenosis is a hallmark of ischemic nephropathy and is associated with renovascular hypertension. Atherosclerosis accounts for 90% of cases of renal artery stenosis and usually involves the ostium and the proximal third of the main renal artery and the perirenal aorta [1]. Treatment options include medication alone or revascularization by angioplasty with or without stent implantation. After endovascular intervention, restenosis ranges from 10 to 21%, as 17 studies with angioplasty and stent placement show [2–5]. Restenosis and occlusion of the stented renal artery compromise kidney function. In patients with a solitary kidney, occlusion of the renal artery causes acute

anuria and renal failure. Rapid diagnosis and treatment are the cornerstones of renal survival.

We present a patient with an anuric renal failure due to an acute in-stent occlusion of the left solitary kidney and recovery of renal function even 24 h after the onset of oligo-anuria.

Case report

A 56-year-old woman with anuria and left-sided flank pain at the day prior to admission presented at the nephrology outpatient clinic. Four years before, a hemodynamically relevant bilateral atherosclerotic renal artery stenosis had been detected and treated by percutaneous balloon angioplasty (PTA) with stenting on both sides. One year after the angioplasty, an in-stent restenosis of the left renal artery occurred and was treated again by PTA. The right kidney function was <10% (nuclear imaging test) 1 year after initial stenting due to a subtotal renal infarction. Another year later, relapsing hypertensive episodes with systolic blood pressures over 200 mmHg and clinical symptoms such as headache, dizziness and dyspnoea occurred with a creatinine level at the upper end of the normal range (creatinine 1.1 mg/dl, urea 47 mg/dl). Oral ramipril and hydrochlorothiazide were added to the patient's treatment regimen of metoprolol, almodipin and clonidin.

On admission, the patient's blood pressure was 190/100 mmHg, the heart rate 65 beats/min and temperature was 36.5°C. Plasma concentrations of creatinine, urea and potassium were above normal (6.6 mg/dl, 170 mg/dl and 6.1 mmol/l, respectively). A full blood count showed leukocytosis (14700/ml), but was otherwise normal. An electrocardiogram was normal. An ultrasonographic examination revealed only a patchy perfusion of the left kidney with a blunted pulsus tardus et parvus waveform (a prolonged systolic acceleration time with decreased peak systolic velocity) and reduced intrarenal resistance indices of 0.38–0.46 raising suspicion of high-grade stenosis or occlusion of the left renal artery.

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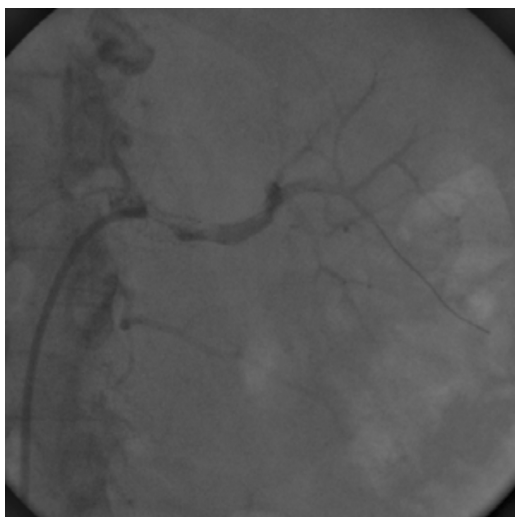


Fig. 1. In-stent restenosis of the solitary left renal artery.



Fig. 2. Result after PTA/stenting of the left renal artery.

Arterial hypertension was initially treated with intravenous urapidil infusion, and 500 mg of acetylsalicylic acid was given for platelet inhibition.

A selective angiography revealed an acute stent occlusion of the left renal artery (Figure 1). Reopening of the occluded vessel by percutaneous angioplasty with stenting and intravenous administration of tirofiban was successful (Figure 2). Immediately after the reopening procedure, a haemodialysis session was performed. After revascularization, blood pressure was controlled with urapidil and hydralazin in addition to metoprolol, ramipril, amlodipine and clonidine. After revascularization, dual platelet inhibition with clopidogrel and aspirin was initiated. The first day post-revascularization showed a homogenous arterial and venous perfusion of the left kidney with intrarenal resistance indices of 0.74/0.75. During the hospitalization, perfusion indices stabilized (0.84/0.80) and renal function recovered. Fifteen days after revascularization, the patient was discharged from hospital. The

creatinine level at discharge was 4.7 mg/dl, and urea 180 mg/dl. At 6-month follow-up, a further recovery of renal function (creatinine 2.2 mg/dl, urea 96 mg/dl) with stable resistance indices of the left kidney and without any indirect signs of a haemodynamically significant in-stent restenosis was noted.

Discussion

The therapeutic management of renal artery stenosis represents a challenge due to its progressive nature and comorbidities, such as severe hypertension or other atherosclerotic diseases.

There are two current therapeutic strategies subject to the symptoms, the degree of stenosis and the extent of renal damage: medical treatment alone and/or balloon angioplasty with or without stent implantation [5]. Medical treatment includes blood pressure control with antihypertensive drugs, lipid lowering with statins and platelet inhibition with aspirin or clopidogrel. The treatment goal is the prevention of progressive ischaemic nephropathy with progressive loss of renal function [6]. Interventional treatment of critical renal artery stenoses itself carries the risk of peri- and postprocedural complications. Besides cholesterol embolism and renal artery dissection, the risk of in-stent restenosis compromises kidney function [7]. The rate of restenosis after angioplasty with stenting is ~20% within 6–12 months [8]. As in our patient, restenosis and progression to occlusion requires immediate diagnostics and therapeutic intervention for the kidney survival. By revascularization of renal artery stenosis the progression of function loss can often be slowed [9]. However, renal function cannot be sustainably improved by revascularization in 30–50% of cases [10]. Up to now, there is only little evidence of the benefit of endovascular treatment of atherosclerotic renal artery stenosis [5]. Therefore, the CORAL trial was initiated, comparing revascularization and medical treatment.

What is specific in our case? The patient had a prolonged ischaemia time since ~24 h prior to the angioplasty the patient experienced oligo-anuria. This demonstrates that within 24 h an interventional procedure may rescue the kidney particularly in patients with longstanding renal artery stenosis and the chance of additional blood supply by small vessels from the renal capsule.

In summary, patients with renal artery stenosis represent a high-risk collective even after treatment. Hence, a close clinical monitoring and ultrasound monitoring are necessary to discover and treat acute occlusions of the renal artery.

Conflict of interest statement. None declared.

References

1. Safian RD, Textor SC. Renal-artery stenosis. *N Engl J Med* 2001; 344: 431–442
2. van de Ven PJ, Kaatee R, Beutler JJ *et al.* Arterial stenting and balloon angioplasty in ostial atherosclerotic renovascular disease: a randomised trial. *Lancet* 1999; 353: 282–286

3. Lederman RJ, Mendelsohn FO, Santos R *et al.* Primary renal artery stenting: characteristics and outcomes after 363 procedures. *Am Heart J* 2001; 142: 314–323
4. Rocha-Singh K, Jaff MR, Rosenfield K. Evaluation of the safety and effectiveness of renal artery stenting after unsuccessful balloon angioplasty: the ASPIRE-2 study. *J Am Coll Cardiol* 2005; 46: 776–783
5. Balk E, Raman G, Chung M *et al.* Effectiveness of management strategies for renal artery stenosis: a systematic review. *Ann Intern Med* 2006; 145: 901–912
6. Watson PS, Hadjipetrou P, Cox SV *et al.* Effect of renal artery stenting on renal function and size in patients with atherosclerotic renovascular disease. *Circulation* 2000; 102: 1671–1677
7. Beek FJ, Kaatee R, Beutler JJ *et al.* Complications during renal artery stent placement for atherosclerotic ostial stenosis. *Cardiovasc Intervent Radiol* 1997; 20: 184–190
8. Uder M, Humke U. Endovascular therapy of renal artery stenosis: where do we stand today? *Cardiovasc Intervent Radiol* 2005; 28: 139–147
9. Harden PN, MacLeod MJ, Rodger RS *et al.* Effect of renal-artery stenting on progression of renovascular renal failure. *Lancet* 1997; 349: 1133–1136
10. Ives NJ, Wheatley K, Stowe RL *et al.* Continuing uncertainty about the value of percutaneous revascularization in atherosclerotic renovascular disease: a meta-analysis of randomized trials. *Nephrol Dial Transplant* 2003; 18: 298–304

Received for publication: 11.1.09; Accepted in revised form: 15.1.09