Abstract

Transplant renal artery stenosis (TRAS) is a relatively frequent, potentially curable cause of refractory hypertension and allograft dysfunction and usually becomes apparent between 3 months and 2 years after renal transplantation. Depending on the hemodynamic significance of stenosis it can be treated conservatively or by revascularization. Here we describe a case of TRAS which was treated successfully with angioplasty and stenting and then we will have a review on its etiology, natural history, diagnosis and therapy.

Keywords: Transplanted Renal Artery • Stenting • Angioplasty
Case history

A 32-year-old man was referred to our center with the diagnosis of refractory hypertension and renal artery stenosis 10 months after kidney transplant from a living donor. He had a history of operation of patent ductus arteriosus (PDA) that presented with infective endocarditis 4 years ago. After operation he had developed progressive renal failure and had been treated with hemodialysis. He had received a kidney transplant 10 months earlier. He had a stable condition until last month when his physician noticed progressive hypertension and a systolic thrill at right lower quadrant of his abdomen. Sonography and CT angiography (Fig 1) confirmed transplanted renal artery stenosis. Serum creatinine level was between 1.2 to 1.4 mg/dl. He was admitted for angioplasty and stenting of transplant renal artery stenosis. After hydration of the patient, abdominal aortography and selective right external iliac artery angiography were performed that showed a hazy discrete lesion with more than 90% diameter stenosis at anastomosis site of the transplanted renal artery (Fig 2). With a contralateral femoral artery approach a 0.014 BMW guidewire (Boston Scientific)™ was advanced and a balloon 4 × 10 mm was used to dilate the artery (Fig 3) and finally a 7 × 15 mm peripheral stent was deployed at stenosis site. Final injection showed good result with no residual stenosis (Fig 4). His hypertension was resolved soon and during 4 years follow up his creatinine level is less than 1.3 mg/dl and he is no longer hypertensive.

Fig 1- CT angiography of the iliac arteries, showing severe stenosis at anastomosis site of transplanted renal artery and internal iliac artery

Fig 2-Angiogram of right iliac artery showing stenotic transplanted renal artery

Fig 3- Dilatation of the lesion with a balloon 4 × 10 mm
**Discussion**

Transplant renal artery stenosis (TRAS) is a relatively frequent, potentially curable cause of refractory hypertension and allograft dysfunction that accounts for approximately 1 to 5% of cases of post transplant hypertension and at least 75% of all post transplant vascular complications. In a report where all patients were screened by Doppler examination immediately after the operation, monthly during the first year and then annually, the incidence was reported to be 12.4%. It usually occurs during the first 2 years after transplantation. Its incidence varies, depending on the definition and diagnostic techniques used, from 1% to 23%. The most common cause of stenosis is ‘technical’, where the stenosis is usually located at the anastomosis and especially at the end-to-end anastomosis as in our case. The other ‘technical’ causes reported were vessel lesions during preservation or due to vascular clamps and torsion, kinking or angulation of the artery. Stenosis can also occur due to donor or recipient atherosclerosis. Immunological injury is also proposed as the possible cause, especially in diffuse and multiple stenoses. Stenoses occurring later, sometimes several years post transplant, usually reflect atherosclerotic disease either of the transplant renal artery or of the adjacent proximal iliac artery. The higher incidence of stenosis in cadaver than in living-related transplants has been taken to suggest that prolonged cold ischemia may cause vascular damage and fibrosis.

Measuring plasma renin activity, either in basal conditions or after administration of a short-acting ACE inhibitor (ACEi), is less informative than in unilateral renal artery stenosis of native kidneys. For years, isotope renography (basal or after renin angiotensin system stimulation) has been the most popular non-invasive screening procedure for TRAS. However, despite relatively good sensitivity (75%), the procedure is seriously limited by its poor specificity (67%). Color Doppler ultrasonography is easily accessible, relatively inexpensive, and does not require radioactive tracers. It has progressively replaced renal scintigraphy because of its superior performance (87 to 94% sensitivity; 86 to 100% specificity), the only limitation being that the results strongly depend on the operator’s individual experience and skill. Since identification of the renal artery is time-consuming and may be difficult in patients with multiple arteries, the operator should consult the surgery report to know whether or not multiple arteries or anastomosis problems had been present. MR angiography has quickly gained popularity as an alternative to CT and sonography. Arteriography provides the definitive diagnosis of renal artery stenosis. The major drawback is the need for relatively large amounts of radio-contrast medium that may precipitate acute renal failure, particularly in patients with renal dysfunction. Because of the substantial risks and the relatively high costs, renal angiography cannot be considered a screening procedure, but it is electively indicated when a stenosis is suspected on the basis of non-invasive tests. An additional, practical feature of the procedure is that, as soon as the diagnosis is established, the stenosis can be immediately corrected by transluminal angioplasty followed by the deployment of a stent. The effectiveness of the intervention can then be immediately verified by a second angiographic evaluation. When renal function is stable and Doppler parameters exclude hemodynamically significant stenosis, no specific intervention is indicated and pharmacologic treatment is usually enough to control BP. When BP can no longer be controlled, renal function progressively deteriorates, or noninvasive...
procedures suggest the progression of the stenosis, a diagnostic arteriography should be performed combined with angioplasty and stenting when indicated. Depending on each center’s experience and on the type of lesion, percutaneous transluminal renal angioplasty (PTA) can restore kidney perfusion in 70 to 90% of cases. In general, the percentage of success is highest for short, linear stenoses relatively distal from the anastomosis, for which angioplasty and stenting are first-choice therapies. The procedure is less frequently effective and carries a higher risk of complications for stenoses at the anastomosis line. These cases are better treated by a surgical approach. With PTA alone, however, the disease may recur in 10 to 33% of cases over 6 to 8 mo. Recent reports, however, show that the risk of recurrence may be substantially decreased when the angioplasty procedure is combined with the placement of a stent. Although angioplasty with stenting is generally safe, complications occur in up to 10% of cases. Many of these are minor and relate to the puncture site. With improved equipment and the use of antispasmodics and heparin, more serious complications, such as arterial dissection, rupture, or thrombosis, occur in less than 4% of cases. Surgery is indicated for patients with unsuccessful angioplasty or with very severe stenoses that are inaccessible to PTA. The described case presented with progressive hypertension 9 months after surgery and TRAS was diagnosed based on Doppler and CT angiography findings. Angiography showed a 90% stenosis at the anastomosis site. Successful angioplasty and stenting of the stenotic site was performed with favorable results. At four years follow-up patient remains well, with controlled blood pressure and good transplanted kidney function.

References