*Indian Journal of Transplantation 2012 July–September*
*Volume 6, Number 3; pp. 83–87*

**Review Article**

# Experiences regarding intervention in renal transplantations by nephrologists

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## ABSTRACT

Vascular complications after kidney transplantation occur at a rate of 1–4% cases. The commonest of these complications is graft artery stenosis. It is often detected following difficult to control hypertension and/or graft dysfunction. If detected early usually with the help of duplex Doppler ultrasonography it can be successfully treated by endovascular intervention by suitably trained specialists.

Interventions are also needed for post graft biopsy hemorrhage or arterio-venous fistula (AVF). Percutaneous transcatheter fibrated platinum coil embolization super selectively in the artery supplying the AVF can be life saving. It may improve blood pressure control and graft function in selected cases. Other endovascular interventions performed in transplanted kidneys are graft renal angioplasty with or without stenting and placement of covered stent graft.

Technological advances in noninvasive imaging like CT angiogram, contrast enhanced Doppler ultrasound and MR angiography have simplified diagnosis and follow up of these patients without compromising safety.

At our institute since January 2007, we encountered 8 cases of transplant renal artery stenosis, 6 arteriovenous fistulas and a case of extra and intrarenal pseudo aneurysm. All patients with transplant renal artery stenosis underwent angioplasty and stenting successfully both in terms of anatomical correction and improvement in blood pressure control as well as graft function. One patient had arterial stenosis and arteriovenous fistulas both and he underwent simultaneous stenting and coil embolization. Three patients with fistulas who had significant bleeding underwent successful coil embolization while 2 patients who were asymptomatic are under close surveillance. One patient each who had extra and intrarenal pseudo aneurysm underwent successful endovascular covered stent grafting and multiple coil embolization respectively. Vascular interventions in renal allograft by experienced nephrology unit can achieve good success with minimal complications.



***Keywords:*** *Transplant renal artery stenosis, Vascular complications, Pseudo aneurysm, Arteriovenous fistula, Endovascular intervention*

## INTRODUCTION

Vascular complications in renal transplant recipients are important causes of graft dysfunction associated with high morbidity and mortality. Intervention plays a major role in the management of vascular complications in renal transplants, including arterial stenoses, arteriovenous fistulas (AVF), pseudo aneurysms (PA), and thromboses. Although color Doppler ultrasonography and gadolinium enhanced magnetic resonance angiography (MRA) are useful diagnostic screening methods, conventional angiography not only remains the gold standard procedure for final diagnosis, but also enables endovascular treatment at the same sitting.

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Received: 10.7.2012; Accepted: 24.7.2012; Available online: 9.8.2012
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http://dx.doi.org/10.1016/j.ijt.2012.08.002

Currently the practice of nephrology interventions in the country is divided among Nephrologists, Cardiologists and Intervention specialists. Central venous dialysis catheter insertions both tunneled and non-tunneled are done by Nephrologists while other endovascular interventions like angiography and/or angioplasty with or without stent are directed to cardiologists or interventional specialists depending on the availability. At our institute in Nadiad nephrologists perform all interventional procedures, including endovascular procedures are carried out by nephrologists. We believe that this happens only in our institute in India.

## TRAS

Transplant renal artery stenosis (TRAS) is the most common vascular complication of transplanted kidney, which results in difficult to treat hypertension and often results in allograft dysfunction. Transplant renal artery stenosis (TRAS) usually becomes apparent from 3 months to 2 years after transplantation.[1]

The prevalence ranges widely from 1 to 23% in different series, reflecting the heterogeneous criteria used to establish the diagnosis, the different manner of preservation of the graft, and surgical expertise.[2]

Three different locations of transplant stenoses are anastomosis, distal to the anastomosis, and recipient iliac artery. Each type has particular predisposing causes, which include operative, hemodynamic, and immunological factors. Although surgical techniques for renal Transplantation vary by institution, transplant renal vessels are anastomosed to the recipient external (end-to-side) or to the internal iliac artery (end-to-end) and to the recipient external iliac vein (end-to-side). The vast majority of TRAS occurs within 1 cm of the anastomosis and is directly related to the surgical technique. Distal donor artery stenoses are less common and are thought to be caused by intimal injury or rejection, with the typical angiographic appearance of beaded intrarenal vessels. Recipient iliac artery stenoses are rare and result from vascular clamp injury or native atherosclerotic disease.[3]

Kinking of renal artery can also mimic a stenosis. This is mostly seen when the right kidney is transplanted due to short renal vein and long renal artery.[4]

Patients often experience accelerated hypertension of either sudden or insidious onset that is refractory to multiple drug regimens and is associated with progressive renal insufficiency in the presence of excessive diuretic use or treatment with angiotensin-converting enzyme inhibitors in the absence of rejection, ureteric obstruction, or infection. The presence of a bruit is nonspecific and may be heard in healthy transplant patients.[5]

Since more & more kidney transplantations are performed in patients at increased risk of peripheral artery disease (such as older patients and diabetic patients) the possibility of previously unsuspected proximal iliac artery disease that mimics TRAS (pseudo-TRAS) should always be taken into consideration.[6]

Laboratory studies like PRA, hypokalemia and metabolic alkalosis are nonspecific to TRAS. Doppler ultrasound though dependent on sonologist's ability and experience is the first noninvasive imaging modality of choice. Peak systolic velocity (PSV) of more than 2.5 m/s and the ratio of PSV in the transplant main renal artery and external iliac artery of $>1.8$ is highly suggestive of hemodynamically significant stenosis. The transplant renal artery is often tortuous hence there is often difficulty in obtaining a precise spectral quantification. Another, parameter which is less, operator dependent is to determine the intrarenal waveform. The intrarenal waveform shows flattening of systolic peak. This is called parvus-tardus waveform. This is however, not always present.[4,6]

Isotope renography (basal and after renin angiotensin system blockade) has been the most popular noninvasive screening procedure for TRAS. However, despite relatively good sensitivity (75%), the procedure is seriously limited by its poor specificity (67%).[7]

If Doppler ultrasound is positive or highly suspicious of TRAS the diagnosis can be established by either multi slice helical CT scan (MSCT) or MR Angiography (MRA). MSCT compare to MRA has advantage of better imaging but risk of radio-contrast induced nephropathy. If there is a strong suspicion of TRAS on clinical parameters and Doppler imaging patient can be subjected directly to digital subtraction angiography (DSA) and intervention if indicated can be performed simultaneously. This approach can minimize the volume of & repeated exposure to radio-contrast and avoids repeat arterial puncture. Stenosis with luminal diameter less than 70% of the proximal vessel are usually considered hemodynamically significant. It is essential to perform nonselective aorto iliac arteriography, to rule out significant disease in the proximal iliac vessel, which can mimic TRAS.[4,6]

Three different treatment modalities are available for patients with TRAS: (I) medical management is indicated if the degree of stenosis is not considered hemodynamically or clinically very significant ($<70\%$) and/or renal function has not been deteriorated significantly; (ii) surgical revascularization is indicated for cases of unsuccessful PTA or when the stenosis is not accessible to PTA; or requires surgery simultaneously for other vascular reconstruction; (iii) PTA accompanied by stent implantation (PTAS)