

TRANSPLANT RENAL ARTERY STENOSIS AFTER REPEAT RENAL TRANSPLANTATION: A CASE REPORT OF SUCCESSFUL ENDOVASCULAR STENTING

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ABSTRACT

Background. Transplant renal artery stenosis (TRAS) is an important vascular complication after kidney transplantation and may present with graft dysfunction and hypertension. Early recognition is important because a hemodynamically significant lesion may be amenable to endovascular treatment. **Case presentation.** A 45-year-old man with chronic kidney disease diagnosed in 2016 underwent a preemptive ABO-compatible renal transplant from his wife in May 2017. In 2024, he developed uremic symptoms and required hemodialysis twice weekly. He subsequently underwent an ABO-incompatible renal transplant in September 2024. The immediate postoperative course was satisfactory, with adequate urine output and a serum creatinine of 1.3 mg/dL by postoperative day 10; he was discharged on day 12. Three months later, he developed hypertension with a rise in serum creatinine to 4 mg/dL. Transplant-kidney Doppler ultrasonography demonstrated a peak systolic velocity (PSV) of 330 cm/s, reduced resistive index (RI) of 0.4, and a parvus et tardus waveform in the transplant renal artery. CT angiography demonstrated a focal 3-mm segment with approximately 70% stenosis. Endovascular renal arterial stenting was performed. Following the procedure, serum creatinine decreased to 2 mg/dL. Follow-up Doppler showed PSV 112 cm/s, RI 0.78, and a normal waveform. **Conclusion.** TRAS should be considered in a transplant recipient who develops new or worsening hypertension with deterioration of graft function. Doppler ultrasonography can provide an important screening signal, while cross-sectional or angiographic imaging can define the lesion. In clinically significant focal stenosis, endovascular treatment can improve arterial flow and graft function.

Index Terms—transplant renal artery stenosis, renal transplantation, Doppler ultrasonography, CT angiography, renal artery stenting, graft dysfunction, hypertension

I. INTRODUCTION

Transplant renal artery stenosis (TRAS) is a recognized vascular complication following kidney transplantation. It can compromise allograft perfusion and may manifest as worsening or refractory hypertension, fluid retention, and deterioration of graft function. Published reviews describe the highest frequency of presentation during the first months after transplantation, although TRAS can occur at any time. Duplex Doppler ultrasonography is commonly used as an initial investigation, with angiographic imaging providing definitive assessment when intervention is contemplated [1–4].

We present a case of focal TRAS occurring three months after repeat renal transplantation, diagnosed by Doppler ultrasonography and CT angiography and treated successfully with endovascular stenting. The case highlights the value of correlating clinical findings with Doppler parameters and anatomic imaging in a transplant recipient with new hypertension and rising serum creatinine.

II. CASE PRESENTATION

A 45-year-old male patient was diagnosed with chronic kidney disease in 2016 and was initially managed conservatively. He underwent a preemptive ABO-compatible renal transplantation in May 2017, with his wife serving as the donor. In 2024, he developed uremic symptoms and was started on hemodialysis twice weekly. He subsequently underwent an ABO-incompatible renal transplantation in September 2024.

The early postoperative course after the second transplantation was satisfactory. The patient had adequate urine output, and serum creatinine had decreased to 1.3 mg/dL by postoperative day 10. He was discharged on postoperative day 12.

Three months after transplantation, the patient presented with hypertension and deterioration of graft function, with serum creatinine rising to 4 mg/dL. In view of the clinical presentation, Doppler examination of the transplant kidney was performed.

III. INVESTIGATIONS

Transplant-kidney Doppler ultrasonography demonstrated a peak systolic velocity (PSV) of 330 cm/s in the transplant renal artery, a reduced resistive index (RI) of 0.4, and a parvus et tardus waveform. These findings raised suspicion for hemodynamically significant transplant renal artery stenosis.

CT angiography subsequently demonstrated a focal short-segment stenosis measuring approximately 3 mm in length with approximately 70% luminal stenosis. The combination of new hypertension, worsening graft function, abnormal Doppler parameters, and a focal lesion on CT angiography supported the diagnosis of clinically significant TRAS.

IV. CLINICAL TIMELINE

Time point	Clinical event
2016	Chronic kidney disease diagnosed; initially managed conservatively.
May 2017	Preemptive ABO-compatible renal transplantation; wife was the donor.
2024	Uremic symptoms developed; hemodialysis initiated twice weekly.
September 2024	ABO-incompatible renal transplantation performed.
Postoperative day 10	Adequate urine output; serum creatinine 1.3 mg/dL.
Postoperative day 12	Discharged from hospital.
Three months after transplantation	Hypertension and rise in serum creatinine to 4 mg/dL; Doppler suggestive of TRAS.
After CT angiography	Focal 3-mm segment with approximately 70% stenosis identified; renal arterial stenting performed.
After intervention	Serum creatinine decreased to 2 mg/dL; patient discharged stable.
Follow-up	Doppler PSV 112 cm/s, RI 0.78, with normal waveform.

V. TREATMENT

Considering the rising serum creatinine, hypertension, abnormal transplant-renal-artery Doppler findings, and CT angiographic evidence of approximately 70% focal stenosis, the decision was made to proceed with endovascular renal arterial stenting.



Figure 1. Pre-stenting angiographic image of the transplant renal artery lesion.



Figure 2. Post-stenting angiographic image following endovascular treatment.

VI. OUTCOME AND FOLLOW-UP

Following renal arterial stenting, the patient remained clinically stable. Serum creatinine decreased from 4 mg/dL before intervention to 2 mg/dL after the procedure, and the patient was discharged. On follow-up Doppler ultrasonography, the transplant renal artery PSV was 112 cm/s, the RI was 0.78, and the waveform was reported as normal. These findings were consistent with improved arterial flow following intervention.

VII. DISCUSSION

TRAS is an important, potentially reversible cause of graft dysfunction after renal transplantation. The reported clinical pattern includes worsening or refractory hypertension and deterioration in allograft function. The timing in this case—three months after transplantation—is within the period in which TRAS is frequently reported [1–4].

Duplex ultrasonography is widely used as the initial non-invasive investigation. Elevated PSV in the transplant renal artery, a high transplant-renal-artery-to-external-iliac-artery PSV ratio, reduced intrarenal RI, and a parvus et tardus waveform may support the diagnosis. Published sources commonly cite PSV values above approximately 200–300 cm/s as suspicious, although diagnostic thresholds vary among studies and depend on technique and clinical context [1,4,5]. In the present case, the PSV was 330 cm/s and RI was 0.4, accompanied by a parvus et tardus waveform.

CT angiography demonstrated a short, focal lesion with approximately 70% stenosis. In the broader literature, angiography is generally considered the definitive diagnostic modality when an intervention is required, while CT or MR angiography can provide anatomic delineation before invasive treatment in selected patients [2,4,5].

The etiology of TRAS is multifactorial. Reported mechanisms include technical factors at the anastomosis, vascular injury related to procurement or transplantation, recipient or donor atherosclerotic disease, kinking or twisting of the artery, and less commonly immune-mediated or other vascular processes.

Treatment depends on severity, symptoms, anatomy, and graft function. Conservative management may be appropriate in selected patients with non-significant stenosis, preserved graft function, and controlled blood pressure. For clinically significant TRAS, percutaneous transluminal angioplasty, with or without stent placement, is commonly used as an endovascular treatment. Systematic reviews have reported generally favourable technical and clinical outcomes, although the evidence base consists largely of retrospective series and heterogeneous observational studies [1,3,6].

In this case, the decision to stent was based on the combination of hypertension, rising serum creatinine, markedly elevated PSV, reduced RI, abnormal waveform, and a focal 70% lesion on CT angiography. The subsequent reduction in serum creatinine from 4 to 2 mg/dL and normalization of follow-up Doppler parameters provide a clinically meaningful response to revascularization. The case illustrates the importance of early recognition of TRAS in a transplant recipient with otherwise unexplained graft dysfunction and hypertension.

VIII. LEARNING POINTS

- TRAS should be considered when a renal transplant recipient develops new or worsening hypertension together with deterioration in graft function.
- Duplex Doppler ultrasonography is a useful first-line screening investigation; markedly elevated PSV, low RI, and a parvus et tardus waveform can raise suspicion for significant stenosis.
- Anatomic imaging is useful to characterize a suspected focal lesion and plan intervention.
- Endovascular treatment can be effective in appropriately selected patients with clinically significant TRAS.
- Post-intervention Doppler and renal function assessment are useful for documenting restoration of graft perfusion and clinical response.

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REFERENCES

- [1] Chen W, Kayler LK, Zand MS, Muttana R, Chernyak V, DeBoccardo GO. Transplant renal artery stenosis: clinical manifestations, diagnosis and therapy. *Clin Kidney J.* 2015;8(1):71–78. doi:10.1093/ckj/sfu132.
- [2] Pini A, Faggioli G, Pini R, Mauro R, Gallitto E, Mascoli C, et al. Assessment and Management of Transplant Renal Artery Stenosis. A Literature Review. *Ann Vasc Surg.* 2022;82:13–29. doi:10.1016/j.avsg.2022.01.011.
- [3] Hinojosa-Gonzalez DE, Salgado-Garza G, Torres-Martinez M, Villegas-De Leon SU, Bueno-Gutierrez LC, Herrera-Carrillo FE, et al. Endovascular Treatment of Transplant Renal Artery Stenosis: A Systematic Review and Meta-analysis. *J Endovasc Ther.* 2022;29(2):294–306. doi:10.1177/15266028211038593.
- [4] Leonardou P, Gioldasi S, Pappas P. Transluminal Angioplasty of Transplanted Renal Artery Stenosis: A Review of the Literature for Its Safety and Efficacy. *J Transplant.* 2011;2011:693820. doi:10.1155/2011/693820.
- [5] Baird DP, Williams J, Petrie MC, Smith JR. Transplant renal artery stenosis. *Kidney Int Rep.* 2020;5(12):2399–2402. doi:10.1016/j.ekir.2020.09.041.
- [6] Chen LX, De Mattos A, Bang H, Vu CT, Gandhi M, Alnimri M, et al. Angioplasty vs stent in the treatment of transplant renal artery stenosis. *Clin Transplant.* 2018;32(4):e13217. doi:10.1111/ctr.13217.

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