

Transplant Renal Artery Stenosis Recognition and Management

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Background

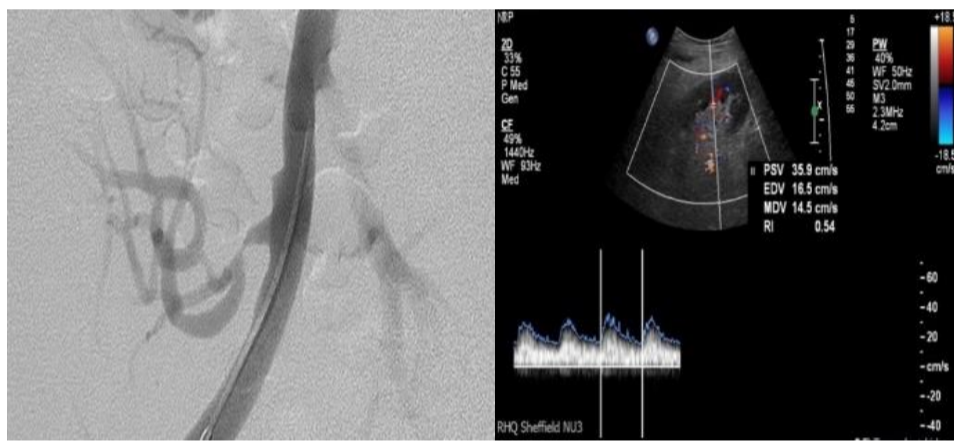
Currently transplant renal artery stenosis (TRAS) is recognizable as the most important source of both allograft dysfunction and failure. Prompt recognition, correct treatment, and prevention of TRAS notably influence the recipient graft's continued normal function and other clinical symptoms. TRAS commonly emerges between 3 months to 24 months with the highest frequency befalling in the initial 6 months. Nevertheless, it may appear at any point in time. Graft dysfunction, hypertension, and a murmur around the allograft are common clinical symptoms.

Learning objectives

The objective is to present TRAS and a feasible means of management.

Keywords: Graft dysfunction, Stents, Contrast-induced AKI, Doppler Ultrasonogram, CT-Angiography, TRAS, Hypertension.

Case scenario: A 55years old male transplanted, 10 days prior. Initially, with a good decline in creatinine which later sealed at 234 $\mu\text{mol/L}$.



Radiological findings

The above angiogram shows severe short segment TRAS in the proximal transplant renal artery. The corresponding duplex scan with waveforms from an intrarenal artery shows normal patterns with no parvus tardus. There is a discrepancy between the angiogram and the doppler scan here. The renal angiogram clearly has significant transplant renal artery stenosis, but the doppler waveforms are normal. This may happen on occasion as the doppler scan is not the "gold standard" and may generate a false negative result.

Colour doppler is a well-acknowledged assessment technique used upon TRAS suspicion and a reliable device with skilled hands. In the graft parenchyma, tardus parvus waveform irregularities are observed. It is crucial to track the transplant artery up to the anastomotic site of the iliac artery by holding the probe at an optimal angle for an accurate assessment(1,2).

TRAS – Comparison of non-invasive investigations (3).

| Investigations | Pros | Cons |
|---------------------------------|---|--|
| Doppler scan | Sensitivity 87% to 94%. Specificity 86% to 100% | Technically demanding and operator reliant |
| Isotope renogram | 75% sensitivity | 67% specificity (Low) |
| Computed tomography angiography | Precise imaging with 3D detail | Radioactivity, contrast use |
| Magnetic resonance angiography | 3D detail, sensitivity 67% to 100%. Specificity 75% to 100%. No contrast use and no radioactivity | Gadolinium use, Difficult in claustrophobic patients and expensive |

TRAS – Gold Standard Investigations

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|--|
| Computed tomography angiography |
| Digital subtraction angiography (DSA) with or without 3D |

Clinical presentations of TRAS

Transplant renal artery stenosis is fairly common and it is correctable. Allograft dysfunction and refractory hypertension occurs in 1% to 5% of recipients and constitutes 75% of all vascular complications in the post

transplantation period. TRAS prevalence fluctuates depending on the investigative procedures from 1% to 23%.

Transplant renal artery stenosis commonly presents with refractory blood pressure and/or allograft dysfunction in the absence of graft rejection, infectivity, or obstruction. Spells of flash pulmonary oedema could occur rapidly with TRAS. Recipients are mostly asymptomatic between the spells of pulmonary oedema. Elevated blood pressure may be the only persistent clinical sign. Physiological turbulence in the iliac-femoral arteries is probably prolonged by amplified blood perfusion adjacent to the anastomosis and could be the source of bruit. Existence of a bruit is non-specific. Nevertheless, major TRAS could occur in the absence of a noticeable bruit. However, it is vital to acknowledge that a bruit from the iliac arteries may be clinically significant as a bruit from the transplant renal artery. Asymptomatic stenosis may well be discovered while investigating other clinical symptoms(3).

Investigations and Treatment options

Computed tomography angiography (CTA) offers high-quality imaging of transplant renal artery which has a low predisposition to artefacts compared to ultrasound and Magnetic resonance imaging. However, it necessitates intravenous contrast and holds a risk of decline in graft function. With the suspicion of severe TRAS, CTA with intra-arterial usage of diluted contrast medium (ultra-low volume) could be implemented for a comprehensive evaluation of TRAS at an appropriate time, ahead of an intravascular technique such as stent insertion.

Digital subtraction angiography (DSA) with or without 3D imaging is the golden standard for the evaluation of TRAS. This technique requires a moderately high volume of intra-arterial iodine contrast which increases the risk of contrast-induced acute kidney injury (CI-AKI). However, DSA which is achieved with CO₂ as a negative contrast eliminates this added risk. The key drawback of DSA is its inability to adequately image non-vascular problems with sufficient detail. Nonetheless, stent insertion may possibly mitigate the risk of restenosis of the transplant renal artery.

Recently transplanted recipients are considered unsuitable for angioplasty and surgery is indicated. Graft dysfunction and difficulty in controlling blood pressure with the progression of stenosis are appropriate indicators for percutaneous transluminal angioplasty (PTA) with stenting. This procedure lowers the relapse rate to less than 10%. Lesions at the anastomosis site or in the early post-transplant period stenosis like in this index case recover well after the surgical procedure. Lesions proximal to the transplant anastomosis reduce the blood flow to the graft which produce signs and symptoms which resemble TRAS. This may be related to the observed claudication and signs of limb hypoperfusion. These lesions requires correction. There is a high incidence of graft failure if TRAS happens early (4-7).

Modalities of Treatment

- Medical therapy - In stable graft function without haemodynamically significant TRAS
- Revascularization and stenting as a prime treatment with refractory hypertension and deteriorating graft function
- Open revision surgery - early post-transplant period stenosis, rescue therapy if angioplasty fails

Conclusion

The doppler ultrasound is a routine screening tool. In a questionable report, CTA or magnetic resonance angiography (MRA) are performed. However due to its limited specificity, a verification is required. The further diagnostic process includes MRA (with or without contrast), CTA (including intra-arterial CTA with an ultra-low volume of contrast medium) or DSA. Angioplasty in the early post-operative period is not advisable as it disturbs the anastomotic site. After discussing the pros and cons with the patient, the transplant surgeon and the interventional radiologist, the ideal choice is open revision surgery to save the transplanted kidney as the transplant surgery was done only 10 days ago.

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