Concordance of Ultrasound and Magnetic Resonance Imaging in the vascular workup of patients undergoing renal transplantation

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Introduction

- Patients with end-stage renal disease are at increased risk of vascular thrombosis
- Pre-operative vascular assessment helps to identify anomalous/occluded vessels, which influences the operative approach
- Our aim is to compare the concordance of ultrasound (US) and magnetic resonance (MR) imaging in the vascular evaluation of patients undergoing renal transplantation

Methods

- Retrospective review of patients transplanted from 2013-2018
- Imaging findings were compared to the gold standard of the intraoperative findings
- Patients were retrospectively stratified into high and low clinical risk groups
- High risk patients
  - Increased risk of thrombosis: congenital nephrotic syndrome, clotting disorders, previous femoral lines for haemodialysis/access and previous failed transplant or;
  - Increased risk of anomalous vessels: syndromic (caudal regression syndrome) or congenital (horseshoe kidney)

Results

- 137 transplants were performed, 30 of which had workup with US and MR (one patient had both studies done twice therefore n=31)
- Age range was 1 – 17 years; of which 84 were male and 53 female

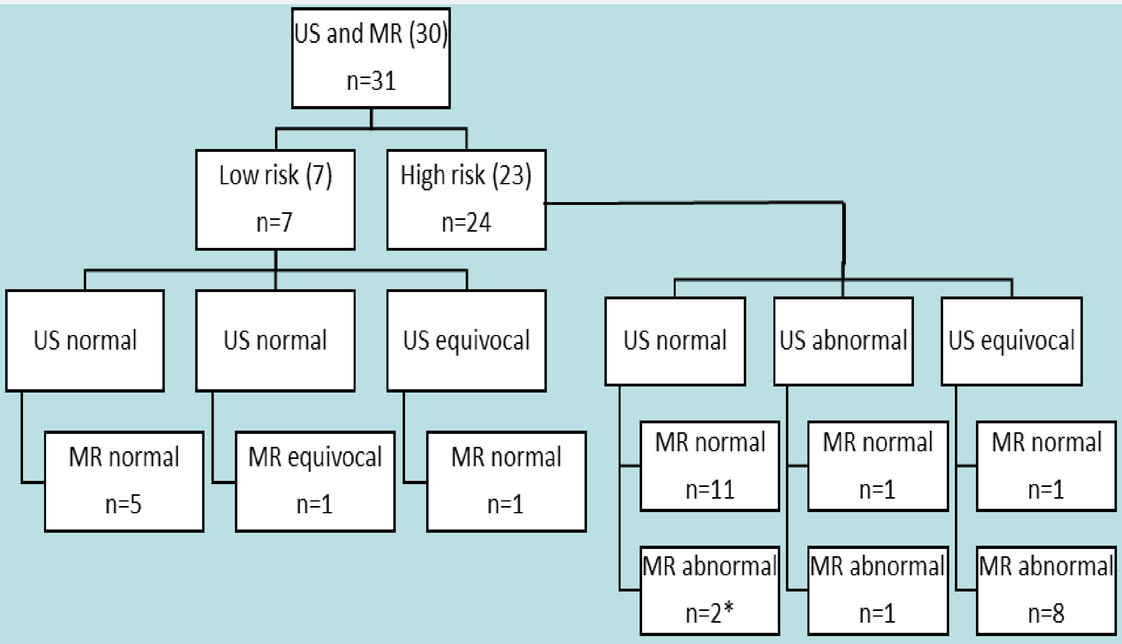
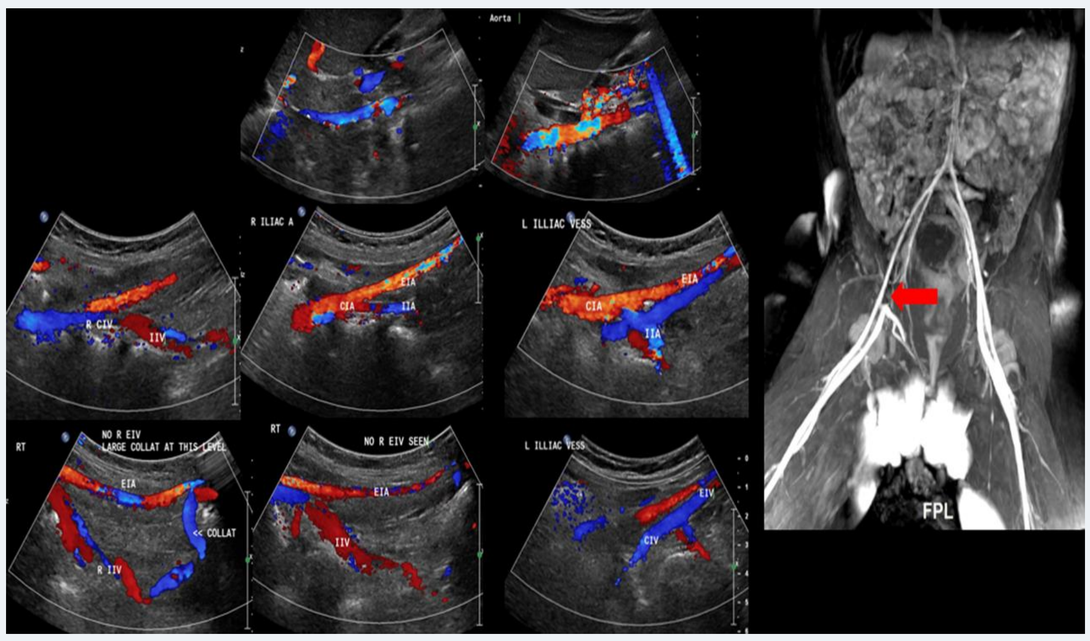


Figure 1: Overall results from the 30 patients screened with US and MR, based on retrospective clinical risk stratification

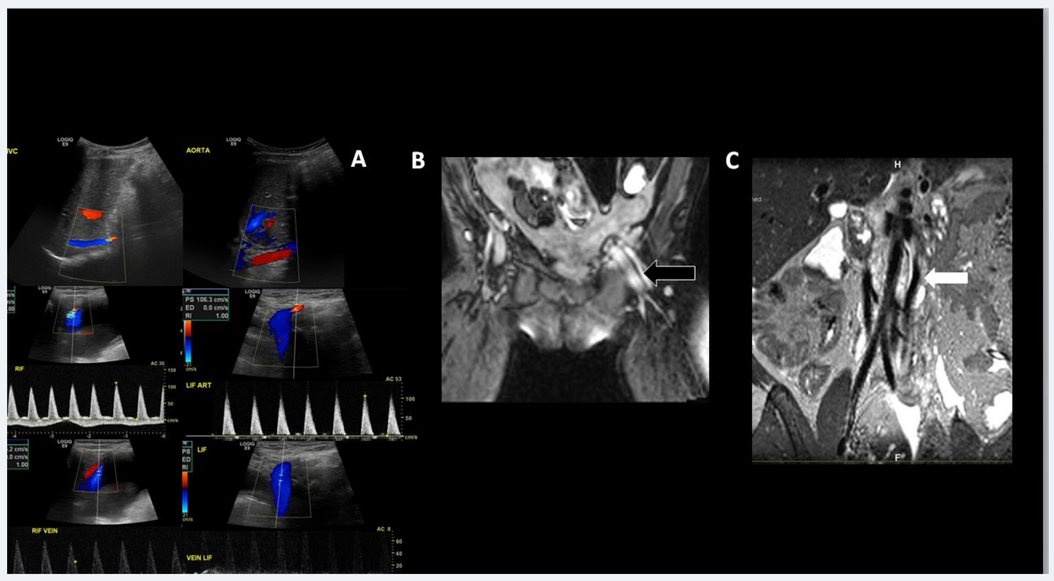
- There was concordance between US and MR in 17/31 studies (55%) – 16 studies demonstrated normal vasculature and 1 demonstrated an abnormality on both modalities [Fig 2]
- No abnormality was demonstrated on MR in low risk patients, who all went onto successful transplantation
- 11/24 (46%) high risk studies demonstrated an abnormality on MR
- The two apparent cases of a normal US and abnormal MR in the high risk group (*) was retrospectively regarded as a discrepancy, one an interpretation error in the US report (should have been reported as abnormal) and the second an interpretation error in the MR report (should have been reported as patent vessels) [Fig 3]. Therefore no US reports were reported as normal that then went on to have an abnormal MR.

Figure 2



Example of concordance between US and MR. Colour Doppler imaging in a 7-year old girl showing a patent aorta, IVC and left iliac vessels but no flow in the right external iliac vein, with a large adjacent collateral draining vessel. The concordant MR also demonstrates occlusion of the right external iliac vein (arrow), demonstrated on the Maximum Intensity Projection images as abrupt cut-off of the vessel.

Figure 3



Colour and pulse-wave Doppler imaging [A] in a 7-year old girl correctly reports the visualised vessels as patent. The corresponding MR incorrectly reports an occluded left external iliac vein, which is demonstrated on the venous time of flight imaging [B] (black arrow), and also fails to note the double IVC [C] (white arrow).

Conclusion

- US is an excellent screening tool in patients undergoing workup before renal transplantation
- An abnormal ultrasound result is a reliable finding
- Clinical risk stratification aids in identifying patients at risk of vascular anomalies
- MR has a role to play if there is any clinical concern or ambiguity

References

Meister, M.G., Olsen, Ø.E., de Bruyn, R., McHugh, K. and Marks, S.D., 2008. What is the value of magnetic resonance venography in children before renal transplantation?. *Pediatric Nephrology*, *23*(7), pp.1157-1162.