INFERIOR EPIGASTRIC ARTERY USE IN KIDNEY TRANSPLANTS FOR UPPER POLAR ARTERY VASCULARIZATION: A CASE REPORT

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ABSTRACT

Minimizing number of anastomoses by arterial reconstruction is critical in grafts with multiple arteries to reduce implantation warm ischemia (RWI), delayed graft function (DGF) and its complications. We report a case of successful transplantation of a donor kidney with three arteries, 2 hilar, and the third entering the upper pole. The kidney was implanted with the ureter up allowing the upper polar artery (UPA) to be vascularized by the inferior epigastric artery (IEA) after de-clamping, avoiding extra RWI. A 29-year-old male with bilateral multiple renal arteries donated to a 37-year-old male recipient. The right kidney had 2 arteries with 3 arteries on the left, but since the right renal vein was deemed short, it was decided to use the left kidney. A single lumen was created for the two larger hilar arteries and the UPA appeared appropriate for end-to-end anastomosis to IEA. The kidney was implanted upside down, with the ureter up, placing the upper pole laterally in proximity to the dissected IEA. The kidney was perfused after completing the single lumen anastomosis to the external iliac artery (EIA). The UPA was then anastomosed to the IEA with immediate graft function. This can be a viable option in grafts with multiple arteries including a UPA, to ensure global perfusion without prolonging RWI and avoiding DGF.

Keywords: Multiple Donor Arteries; Living Donor Kidney Transplantation; Upper Polar Artery; Inferior Epigastric Artery

INTRODUCTION

The use of donor kidneys with three or more arteries is challenging, with an inherent reluctance to use them due to concerns over technical complications.[1] The use of grafts with multiple arteries is avoided because of a potentially longer RWI and a higher incidence of delayed graft function (DGF) compared to grafts with single arteries.[2] Grafts with 3 or more arteries are less common, and technically more challenging.[3] The use of the IEA in cases with lower polar arteries is well known, not the UPA.[4] We report the successful transplantation of a kidney with 3 arteries, the 2 hilar arteries on a single lumen were anastomosed to the EIA followed by de-clamping, and the UPA was then vascularized using the IEA by implanting the kidney with the ureter up. Global intra-operative perfusion was achieved with immediate graft function.

CASE REPORT

A living donor kidney from a 29-year-old altruistic donor (weight 65kg) became available to a panel-reactive antibody negative, 37 year old male transplant candidate (weight 74kg) with end-stage renal disease secondary to hypertension. Both donor kidneys had multiple arteries, 2 on the right and 3 on the left. Since the right renal vein was short, we opted for the left kidney. A small 3mm or less caliber artery was the first off the aorta, followed by a 6mm main artery entering the superior aspect of the hilum and a 4mm third coming off near the aortic bifurcation and entering the hilum below the pelvis of the ureter (Figure 1). This donor kidney was recovered laparoscopically with a warm ischemia of 5minutes. Both hilar arteries were mobilized, and a single lumen was created by approximating their medial walls with interrupted sutures of 7/0 polypropylene. The implantation strategy was to place the kidney upside down with the ureter up so that the upper pole would lie laterally, in proximity to the IEA. End to side venous anastomosis was followed by an end to side single lumen arterial anastomosis to the EIA, and clamps were removed with graft perfusion except area supplied by UPA. This UPA was then anastomosed to the IEA with interrupted sutures of 6/0 polypropylene perfusing the upper pole (Figure 2). A palpable thrill was noted in the 2 hilar arteries and a visible pulse in the polar artery. The ureter was implanted using the extravesical technique with 6/0 PDS and stented. The recipient received anti thymocyte globulin

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(ATG) and methylpredinsolone induction and graft function was immediate, with a cold ischemia time 120 minutes and a rewarming time of 44 minutes. Doppler ultrasound on day 7 confirmed global graft perfusion (Figure 3a, and Figure 3b). Maintenance immunosuppression included tacrolimus, mycophenalate mofetil, and prednisolone. He has remained well since, with an SC of 1.4mg/dl (reference normal <1.5) 3 months after transplantation.

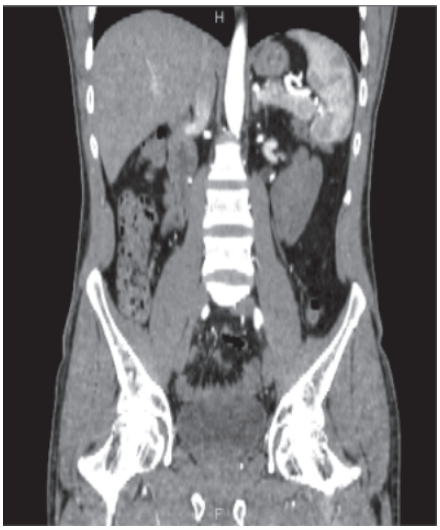

Figure 1A. Coronal donor CT angiogram showing the arterial supply of the left kidney. All 3 arteries are evident in this image, the most proximal small upper polar artery (turquoise arrow), the main hilar artery (orange arrow) and the distal hilar artery arising from the lower aorta (yellow arrow).

Figure 1B. Sagittal donor CT angiogram showing the arterial supply of the left kidney. All 3 arteries are evident in this image, the proximal most small upper polar artery (turquoise arrow), the main hilar artery (orange arrow) and the distal hilar artery arising from the lower aorta (yellow arrow).

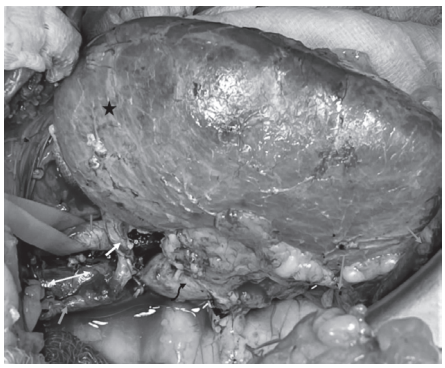

Figure 2. Post perfusion image of globally perfused graft. This kidney was implanted flipped over, with the ureter up (green arrows), placing the upper polar minor artery (white arrow) in proximity of the inferior epigastric artery (orange arrow) for anastomosis. Distal external iliac artery (blue arrow), vein (yellow arrow) and donor renal vein (curved black arrow) are also visible. Note the color of the upper pole (black star) and the rest of the kidney, confirming good perfusion.

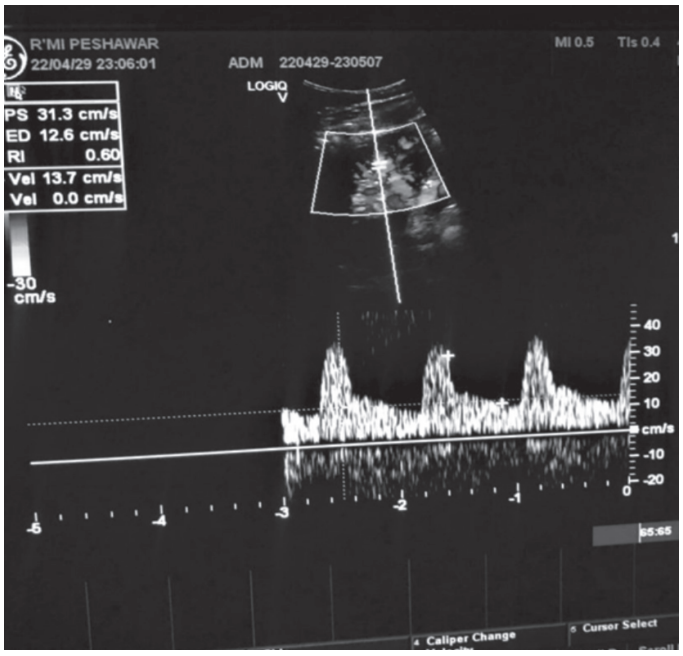

Figure 3A. Day 7 Doppler US of perfused kidney with 3 arteries, shows normal RIs.

Figure 3B. Doppler US showing cortical outline of entire kidney with good perfusion in area of probe lying over upper pole.

DISCUSSION

Organ shortage increased acceptability of kidneys that were previously considered to be unsuitable for transplantation, including kidneys with multiple renal arteries (MRAs).[5] Using grafts with MRAs are challenging, with a potential to increase RWI, DGF and is an independent risk factor for acute rejection and graft loss.[6] Smaller polar arteries can be connected to the IEA which are uniquely suited for lower polar arteries, with the advantage of being done after de-clamping, to avoid extra RWI. Polar arteries are generally smaller in caliber (2-3mm), and, end to end anastomosis to the IEA gives the best results in lower polar arteries.[7] In cases with UPAs, the easiest way to bring the IEA and UPA close enough for anastomosis is to place the graft upside down, to bring the upper pole to lie laterally, near the IEA. Since urine is propelled by peristalsis, placing the graft upside down is without risk, except that the ureter must be long enough. Polar arteries generally supply 5-10% of the polar parenchyma and every effort must be made to preserve this. In our case, the only other option available to us would be to implant this UPA end to side to the external iliac artery. This would increase RWI because, this is only possible before de-clamping, and the small lumen would be a risk for thrombosis. We decided to place the graft upside down to enable the UPA IEA anastomosis, to preserve the cortex supplied by the UPA without additional RWI. We believe this is the first report of a UPA being successfully anastomosed end to end to the IEA after declamping. We believe this is a viable and safe option in cases with MRAs with UPAs.

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Author's Contribution

MH conceived the idea and wrote the manuscript. QI, IM, TR, and TK contributed in write up of the manuscript. Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. All authors made substantial intellectual contributions to the study.

Conflict of Interest

Authors declared no conflict of interest

Grant Support and Financial Disclosure

None

Data Sharing Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.