

Successful Transplantation of Kidneys from Living Donors with Renal Artery Aneurysms: Exploring New Avenues

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Abstract

Renal artery aneurysms (RAAs) are rare, mostly asymptomatic, and typically discovered incidentally. The potential to utilize kidneys with incidentally detected RAAs for transplantation remains largely unexplored despite the pressing need to expand the donor pool. We report two successful renal transplantations from altruistic living donors with incidentally detected RAAs, both managed with *ex vivo* surgical reconstruction during bench surgery. Preoperative detailed imaging and renal function studies were performed, and detailed informed consent was obtained from both the prospective donor and recipient prior to transplantation. The RAA was excised in total and reconstructed with the remnant allograft renal artery prior to transplantation. Both recipients had immediate graft function and uneventful postoperative recovery. Renal function remained normal in both donors and recipients over short-term follow-up (6 months). Transplantation using kidneys from altruistic live donors with RAAs is feasible and safe with meticulous surgical planning and *ex vivo* reconstruction. This technique offers a promising avenue for expanding the donor organ pool where deceased donors are scarce.

Keywords: Donor pool expansion, kidney transplantation, renal aneurysm, renal artery aneurysm, transplantation

INTRODUCTION

Renal artery aneurysm (RAA) is a rare clinical entity, defined as a localized dilatation of the renal artery exceeding twice its normal diameter.^[1] The estimated prevalence ranges from 0.01% to 0.09% in autopsy series and up to 0.7% in angiographic studies.^[2,3] RAAs account for approximately 1% of all intra-abdominal aneurysms and are frequently asymptomatic, with detection often occurring incidentally during radiologic evaluation for unrelated conditions, including donor assessment for renal transplantation.^[4]

The typical morphology of RAAs includes saccular (62%), fusiform (24%), and dissecting forms (14%).^[5] While complications such as rupture, thrombosis, or embolic events are rare, their potential justifies careful consideration, especially in women of childbearing age or individuals with aneurysms exceeding 2 cm.^[6]

Kidney transplantation remains the treatment of choice for patients with end-stage renal disease (ESRD). However, the gap between supply and demand for suitable donor organs continues to widen. According to the 2020 Organ Procurement and

Transplant Network (OPTN)/Scientific Registry of Transplant Recipients (SRTR) Annual Report, over 127,000 patients in the United States alone were on the kidney transplant waiting list.^[7] Expanding the donor pool by utilizing kidneys with surgically correctable vascular anomalies, such as RAAs, in voluntary altruistic live donors may be a viable option if safety and long-term outcomes can be assured.

These two cases demonstrate successful kidney transplantations from such living donors with RAAs, where detailed imaging and meticulous back-table reconstruction were used to achieve excellent normal graft functions and overall outcome.

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CASE REPORT

Case 1

A 45-year-old woman with ESRD secondary to chronic hypertension was evaluated for preemptive renal transplantation. Laboratory investigations revealed serum creatinine of 8.6 mg/dL, blood urea – 67.4 mg/dL, and an estimated glomerular filtration rate (eGFR) of 08 mL/min/1.73 m².

Her 48-year-old male relative volunteered as a donor. He had no significant past medical history and was medically fit as a donor. Initial renal function tests were within normal range (creatinine: 0.7 mg/dL, urea: 15 mg/dL, and eGFR: >90 mL/min/1.73 m²).

Computed tomography angiography (CTA) revealed a double renal artery on the right side and a single artery on the left side with a small saccular aneurysm of 1.5 cm × 1.6 cm size [Figure 1a] at the hilum. A diethylenetriamine pentaacetate (DTPA) scan showed that the left kidney contributed 52% of the differential function. The left kidney was therefore selected for retrieval.

Surgical approach and bench reconstruction

Left open donor nephrectomy was performed uneventfully. Open nephrectomy was preferred over laparoscopic retrieval due to the RAA. The retrieved kidney was cold perfused with histidine–tryptophan–ketoglutarate solution. The aneurysmal segment of the renal artery was completely excised, and an end-to-end reconstruction was performed with 7/0 polypropylene suture to restore adequate length [Figure 1b and c].

The allograft was implanted in the recipient's right iliac fossa. Vascular anastomosis included the renal vein to the external iliac vein and renal artery to the external iliac artery (end-to-side). The ureter was implanted in the bladder using the Lich–Gregoir technique.

Immunosuppression and outcome

Induction immunosuppression included intravenous methylprednisolone 1 g before reperfusion and basiliximab 20 mg on day 0 and day 4. Maintenance immunosuppression included tacrolimus, mycophenolate mofetil, and prednisolone. Antibiotic prophylaxis with intravenous meropenem was given perioperatively.

The warm ischemia time was 2 min, and the cold ischemia time was 42 min (including 15 min of bench surgery). The recipient

had immediate urine output intraoperatively. By postoperative day 7, serum creatinine had decreased to 0.7 mg/dL, eGFR exceeded 90 mL/min, and urea was 19 mg/dL. Doppler ultrasound confirmed excellent patency of vascular anastomoses and graft perfusion.

The donor had an uncomplicated recovery and was discharged on day 3. The recipient was discharged on day 7. Both had normal renal function at 3-month and 6-month follow-up.

Case 2

A 54-year-old male with ESRD of unspecified etiology was assessed for kidney transplantation. He presented with serum creatinine of 9.2 mg/dL, blood urea – 71.4 mg/dL, and eGFR of 21 mL/min. The donor was a 50-year-old male without comorbidities. His serum creatinine was 0.9 mg/dL, blood urea – 18 mg/dL, and eGFR – 96 mL/min/1.73 m².

CTA showed a dual renal artery on the right side, with a 2 cm × 2.4 cm saccular aneurysm on the main renal artery at its branching point [Figure 2a]. The DTPA scan revealed equal function between the kidneys (50:50), and the right kidney was chosen for donation.

Surgical approach and bench reconstruction

A right open donor nephrectomy was performed in the routine manner. During back-table reconstruction, the aneurysmal portion was completely excised [Figure 2b]. The distal end of the smaller segmental renal artery was anastomosed end-to-side to close the defect in the main renal artery using 7/0 polypropylene suture, effectively reconstructing a single arterial inflow [Figure 2c].

The kidney was transplanted to the recipient's right iliac fossa in the traditional manner. The cold ischemia time was 35 min.

Outcome

Immediate excellent graft function was observed after transplantation. Both the donor and recipient had uncomplicated postoperative course. The donor was discharged on day 3. On day 7, the recipient had a serum creatinine of 0.7 mg/dL. Postoperative surveillance Doppler studies demonstrated normal vascular flow. At 3-month follow-up, renal function was preserved and normal in both.

DISCUSSION

RAAs are a rare finding in potential kidney donors. Their

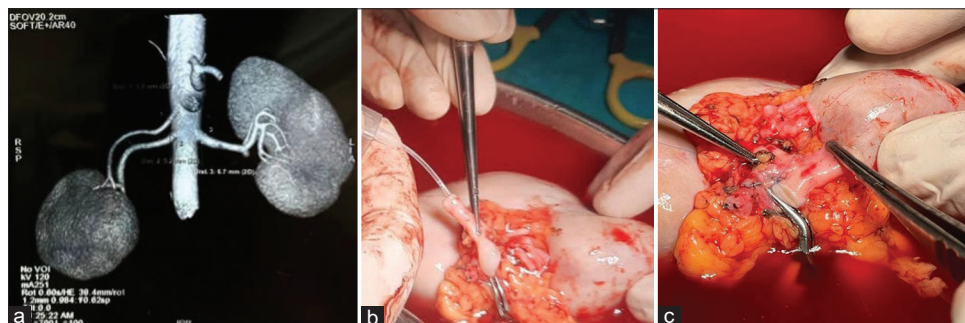


Figure 1: a) CT angiogram showing small RAA in the left renal artery, b) back-table perfusion of the explanted kidney with the RAA, c) complete excision of the aneurysmal segment and end-to-end anastomosis

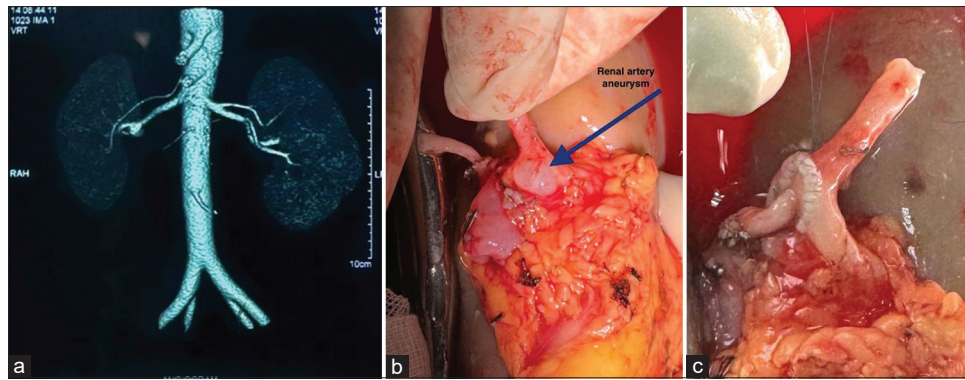


Figure 2: a) CT angiogram showing large saccular RAA in the right main renal artery with a superior accessory renal artery, b) back-table perfusion showing the aneurysmal segment, c) excision of the aneurysmal segment and reconstruction with an end-to-side anastomosis of the accessory renal artery (end) to main renal artery (side)

natural history is usually benign, but complications such as rupture, thrombosis, and distal embolization may occur, particularly during pregnancy or in aneurysms >2 cm.^[6]

RAAs in potential live kidney donors pose a dilemma due to its complexity and the need to bridge the gap between organ supply and requirement, especially where the waiting time for deceased donor organs is prohibitively long. Acceptance of such live donors and reconstruction of the graft arterial pathology allows successful transplantation and outcome in recipients who would otherwise be in the wait-list without any immediate hope of a matched organ from the deceased donor list. Nephrectomy and reconstruction of the said graft arterial aneurysmal segments on the back table offers several advantages, including precise vascular control and optimal visualization.^[5,8]

The literature on renal transplantation from living donors with RAAs remains limited. A few case reports and small series have documented success with bench repair prior to implantation.^[4,8] The decision to proceed should be based on aneurysm size, morphology, accessibility, and relative renal function. The presence of multiple arteries does not preclude transplantation if adequate reconstruction is feasible.

In both of our cases, surgical planning, bench reconstruction, and meticulous technique enabled successful transplantation without complications. Both recipients demonstrated prompt graft function, and both donors remained well during follow-up. These outcomes support the policy of accepting kidneys with asymptomatic RAA from altruistic live donors.

Importantly, the use of such kidneys may not only benefit recipients but also remove a potential future risk for donors. While the natural history of asymptomatic small RAAs in healthy individuals is generally benign, a rare risk of rupture cannot be excluded when left unattended.^[5]

These two cases have shown that kidneys with small asymptomatic RAA can be utilized for live donor renal transplantation albeit after comprehensive preoperative evaluation and surgical reconstruction.

CONCLUSION

Kidneys from voluntary living donors with RAAs can be safely used for transplantation after appropriate *ex vivo* vascular reconstruction. This approach can significantly contribute to expanding the living donor pool in the context of growing demand for kidney transplantation. While short- and medium-term outcomes have been excellent, further studies with long-term follow-up are needed to assess the durability of this practice.

Declaration of patient consent

The authors certify that patient consent has been taken for participation in the study and for publication of clinical details and images. Patients understand that the names, initials would not be published, and all standard protocols will be followed to conceal their identity.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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