Case Report

Renal transplant anastomotic pseudoaneurysms: Case report of open repair and endovascular management

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Abbreviations & Acronyms
ABO = ABO blood group
AP = anastomotic pseudoaneurysm
CIA = common iliac artery
EIA = external iliac artery
GFR = glomerular filtration rate
IIA = internal iliac artery
KTx = kidney transplant
SA = splenic artery

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Introduction: Anastomotic pseudoaneurysm is one of the rarest vascular complications after renal transplant surgery. Therapeutic options include open surgical repair or endovascular stenting.

Case presentation: Case 1 had pseudoaneurysm involving external iliac artery and was managed by jump graft to allograft using cadaveric donor iliac arteries and patch angioplasty repair of external iliac artery after excising pseudoaneurysm. Case 2 had undergone orthotopic renal transplant with spleno-renal arterial anastomosis and developed a massive pseudoaneurysm proximal to spleno-renal arterial anastomosis. This patient underwent endovascular stenting preserving allograft vascularity and graft function. Outcome in both patients was successful with normalization of renal function to baseline levels.

Conclusion: Treatment of renal transplant anastomotic pseudoaneurysms is difficult and associated with high rates of graft loss. Open surgery is the gold standard providing several possibilities for arterial reconstruction preserving graft and limb circulation. Endovascular treatment should be considered in high-risk surgical patients with favorable anatomy.

Key words: anastomotic pseudoaneurysm, endovascular stenting, jump graft, renal transplant, vascular complication, vascular repair.

Keynote message

AP after renal transplant managed by open repair and endovascular stenting.

Introduction

APs are a rare vascular complication after KTx occurring in 0.3% of cases.[1,2] APs can be due to arterial injury, surgical technique, mycotic infections, and immunological factors.[3] Most of these reported APs and their treatment were associated with high rates of complications including allograft loss, rupture, and loss of limb or death. Some APs can be managed with endovascular stenting depending on the anatomy and the renal allograft artery ostium.[4] Infected or large APs >2.5 cm are best managed by open repair in expert hands.[5] The challenge in these procedures is to save the graft and limb while excising or isolating the pseudoaneurysm.

We present two cases of large APs following KTx. The first case was managed with an allogeneic jump graft to the KTx with excision of pseudoaneurysm and patch graft angioplasty repair of the EIA, preserving the graft and lower limb. The second case required endovascular repair of the splenic artery, as the patient was not amenable to open repair due to multiple previous abdominal surgeries.

Case report 1: Patch angioplasty repair with arterial jump graft to transplant kidney

A 20-year-old male with renal failure from chronic glomerulonephritis underwent deceased donor KTx. Fourteen months post-operatively his serum creatinine increased to 165 mmol/L from baseline of 87 mmol/L. Imaging revealed a 4 cm AP arising from the medial-distal aspect of the end-to-side EIA anastomosis (Fig. 1).

Details of repair

The allograft was approached using the previous incision. Dissection was started in the virgin cephalad area exposing the inferior vena cava and was carried distally, working lateral to medial. CIA and EIA were isolated, leaving the allograft vein undissected. Iliac arterial vessels (CIA, EIA, and IIA) from a 17-year-old ABO-compatible donor was used as a jump graft for reconstruction. This new vascular graft was placed in a reverse fashion with EIA anastomosed to the recipient EIA and the graft IIA anastomosed to the main renal allograft artery, using running 6-0 prolene. The CIA portion of the jump graft was left intact and occluded for possible jump to the distal iliac or femoral artery if needed. Following KTx reperfusion, the original Carrel patch and AP were excised. An onlay cadaveric patch graft was carried out with running 6-0 prolene.

With successful repair, the CIA of the jump graft was ligated (Fig. 2). At 3 years of follow up, the patient is asymptomatic with a GFR of 80 mL/min and no recurrence of AP on imaging.

Case report 2: Endovascular management

A 46-year-old morbidly obese female with renal failure secondary to lupus nephritis underwent a left orthotopic KTx. She had a hostile abdomen after multiple laparotomies resulting in a permanent colostomy, with a frozen abdomen and an anterior abdominal wall replaced with a split-thickness skin graft. She also had a large hiatus hernia with viscera in the left chest. Based on this anatomy, we felt a transplant was best approached retroperitoneally with a left orthotopic renal transplant. Imaging revealed atherosclerotic left renal artery with good caliber splenic artery without atherosclerosis. Pretransplant cystoscopy and retrograde pyelogram revealed an adequate bladder and left native ureter for transplantation. She underwent a living unrelated KTx into the left renal fossa following native nephrectomy and splenorenal end-to-end arterial and an end-to-end reno-renal venous reconstruction. She represented with declining kidney function after 2 years. Imaging demonstrated a large splenic artery AP, displacing the KTx inferiorly and exerting mass effect on its upper pole (Fig. 3). The AP measured approximately 12.0 × 10.5 × 12.8 cm with well-defined partial

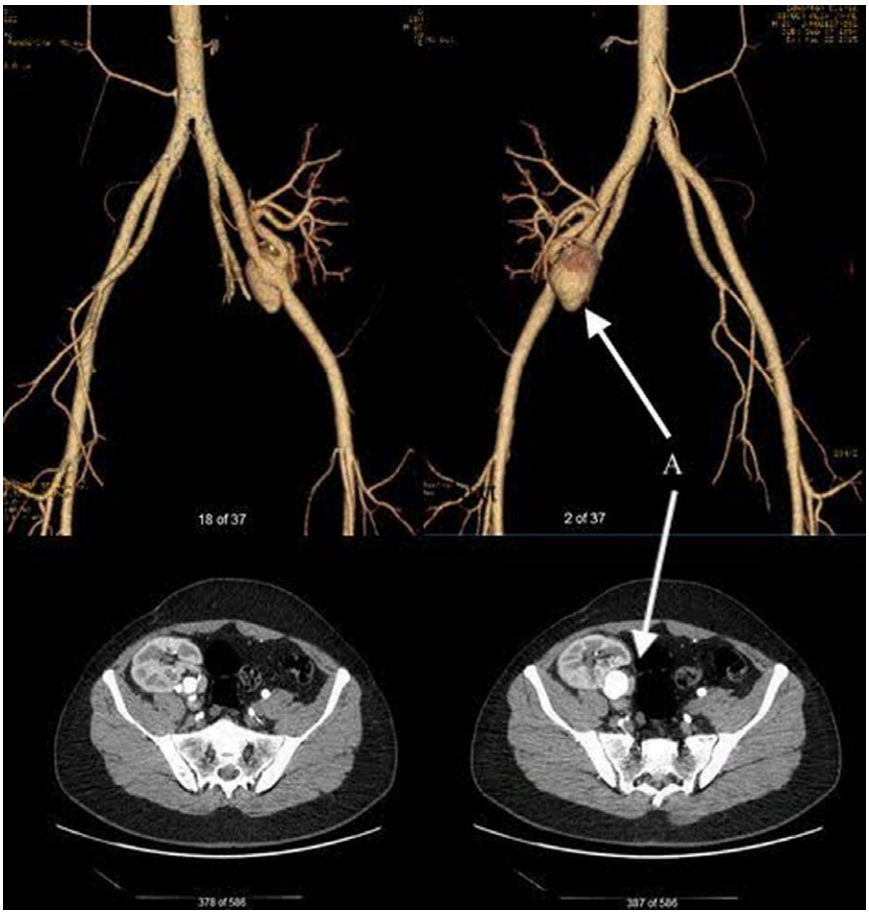

Fig. 1 Anastomotic pseudoaneurysm arising on the medial aspect of the end-to-side anastomosis. CT angiography with 3-D reconstruction demonstrates a 4 × 3 cm sized anastomotic pseudoaneurysm with complete enhancement on arterial phase (labeled A).

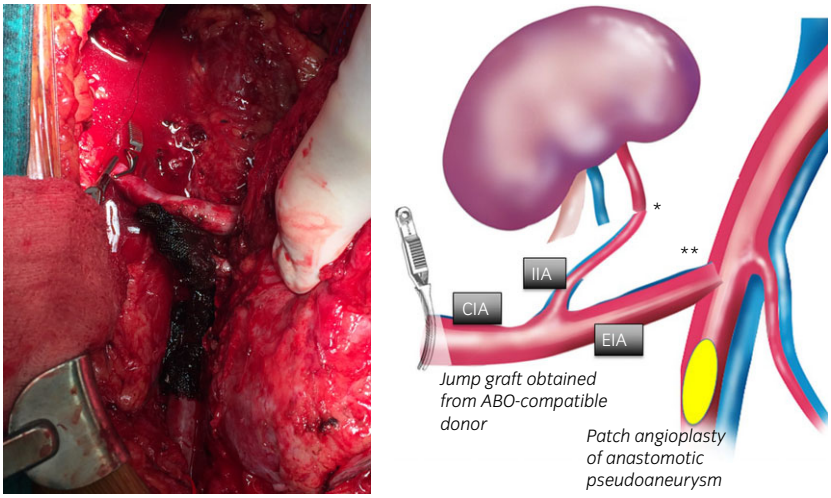

Fig. 2 Photograph (left) and schematic (right) demonstrating intraoperative reconstruction of anastomotic pseudoaneurysm. A jump graft from an ABO-compatible donor was obtained to facilitate reconstruction. The jump graft EIA was anastomosed proximally to the recipient iliac artery (**), and the IIA to the donor renal enabling renal reperfusion (*). The venous anastomosis was undisturbed (not shown). The previous anastomotic site and pseudoaneurysm were taken down and repaired with an onlay pericardium patch graft (yellow oval). The jump graft CIA limb was preserved in case it was required for distal anastomosis to the recipient EIA in case of difficulties with the AP repair, however this was not required and was simply ligated.

enhancement in the arterial and venous phases. There was poor contrast opacification of the transplant kidney with minimal enhancement on arterial phase and very minimal cortical enhancement on the venous phase.

Following consultation with interventional radiology and 3-dimensional visualization, a decision was made to attempt endovascular stenting. Using transbrachial artery approach, a 6 mm × 5 cm covered stent graft was successfully deployed extending from the splenic artery across the pseudoaneurysm neck into the transplant renal artery (Fig. 4). This resulted in excellent transplant kidney perfusion and exclusion of the pseudoaneurysm. After 3-year follow-up, eGFR is stable at 64 mL/min.

Discussion

Due to the relatively low incidence of KTx APs in the literature, management of this condition is debatable. Treatment options in these complex rare cases are surgery or endovascular repair. Conventional surgeries are still considered the gold standard, particularly with large or infected APs. Open surgery offers several alternatives for arterial reconstruction thus improving the possibilities for graft preservation. However, in practice, allograft preservation rates are low. After excision of an AP, options for arterial reconstruction include patch grafting, an interposition bypass or in cases of infection with an extra-anatomical femoro-femoral crossover bypass.

There are recent isolated published cases of endovascular treatment with covered stents with Chimney[6] and Periscope[7] techniques with successful preservation of renal graft; however, they are only possible with a very favorable iliac anatomy without infection. Endovascular treatment can be useful in emergent AP rupture to control active bleeding in unstable patients as a bridge to surgery. There is also a report of hybrid treatment in which allograft renal artery is reimplanted to the CIA and AP excluded with a covered stent.[8]

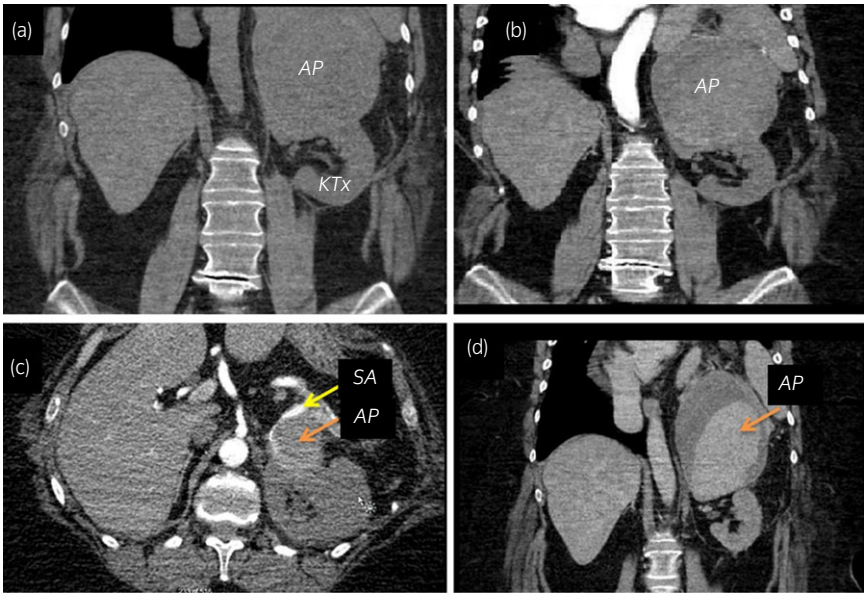

Fig. 3 Computed tomography angiogram (CTA) images demonstrating pseudoaneurysm formation of the splenic artery just proximal to the end-to-end splenic artery to donor renal artery anastomosis. (a) Pre-contrast image showing a 12.0 × 10.5 × 12.8 cm pseudoaneurysm. (b and c) Arterial phase imaging highlighting the poor enhancement of the transplant kidney. Yellow arrow identifies the splenic artery leading to the pseudoaneurysm (orange arrow). (d) Delayed phase imaging showing delayed filling of the pseudoaneurysm.

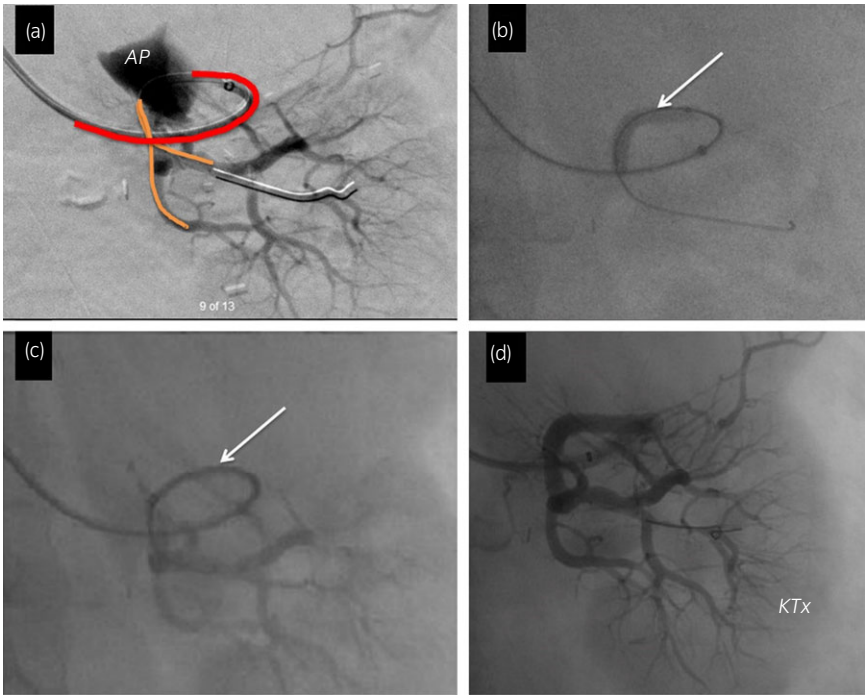

Fig. 4 Angiographic images demonstrating successful stenting of a large AP. (a) Tortuous splenic artery (red line) with filling of the AP, followed by the transplant renal artery (orange line). (b and c) Successful placement of a 6 mm × 5 cm covered stent graft across the spleno-renal arterial anastomosis (white arrow). (d) Successful occlusion of the AP with full perfusion of the allograft kidney.

Ultrasound-guided injection of thrombin in smaller APs has been described.[9]

Herein, we have described two ways of managing APs. The first case used a cadaveric donor iliac vasculature as a jump graft, thus preserving arterial circulation to the allograft and subsequent AP repair. This approach markedly decreased the risk of graft loss, with option of using the common iliac limb of the jump graft vessels to preserve the distal limb circulation, when EIA reconstruction is not possible. The second case was a situation where a surgical approach was considered extremely high risk and we demonstrated that an endovascular approach can successfully manage large APs.

Conclusion

Treatment of renal transplant APs is difficult and associated with high rates of graft loss even in experienced hands. Open surgery should be considered as the "*gold-standard*" for AP treatment in most of the cases as it allows multiple possibilities for arterial reconstruction, graft preservation, and preserving limb circulation. Endovascular treatment can be considered in high-risk surgical patients with non-infected AP.

Acknowledgments

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Conflict of interest

The authors declare no conflict of interest.

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