Totally percutaneous endovascular renal allograft salvage for common iliac artery pseudoaneurysm

Wessam Hassanein, MD, Eugene Schweitzer, MD, Shahab Toursavadkohi, MD, *and* Khanjan Nagarsheth, MD, *Baltimore, MD*

ABSTRACT

Delayed presentation of recipient artery pseudoaneurysms following kidney transplantation is a rare, yet critical, complication. Although the precise etiology remains unclear, factors such as chronic steroid use, iatrogenic injuries (including vascular clamp damage during index surgery), or infections could contribute. Timely surgical intervention is imperative to prevent arterial rupture and life-threatening bleeding. Open repair, although commonly used, is associated with notable mortality rates and graft loss. Endovascular repair for delayed presentations of native iliac artery pseudoaneurysms has seen limited documentation in the literature. We present a case involving salvage of a kidney graft through innovative application of an endovascular technique using a modified stent graft with fenestration for the transplanted renal artery. The pseudoaneurysm, discovered 4 years after transplantation, was situated in proximity to the anastomosis site of the kidney graft's renal artery to recipient common iliac artery. Traditional open repair posed significant risks of graft loss due to its location near the kidney allograft. Our approach successfully resolved the issue, preserving graft function and resulting in a short length of hospital stay. This case contributes to the limited body of knowledge on delayed presentation of pseudoaneurysms after kidney transplantation. Successful application of an endovascular approach underscores its potential as a safe and effective alternative to open repair, offering favorable outcomes in terms of patient morbidity, mortality, and graft salvage. (J Vasc Surg Cases Innov Tech 2024;10:101485.)

Keywords: Endovascular surgery; Physician modified endovascular stent; Kidney transplant; Pseudoaneurysm

A delayed arterial pseudoaneurysm from vascular clamp injury is a rare complication following kidney transplantation.[1] Although infrequent, these pseudoaneurysms demand urgent attention due to the risk of rupture and exsanguination. The potential etiologic factors, such as chronic steroid use, difficulty with vascular clamp placement, and infection, underscore the need for careful monitoring and prompt intervention.[2]

Open surgical repair, although traditionally used, poses substantial risks, including high mortality rates and graft loss.[3] Although there have been documented cases of endovascular repair of iliac artery aneurysms in the perioperative period, limited reports regarding management of delayed presentations.[4] The present case demonstrates an innovative approach using a physician-modified endovascular graft to address the challenge posed by a perianastomotic common iliac artery pseudoaneurysm discovered 4 years after transplant.[5]

The rarity of such cases is emphasized, because the incidental detection of an iliac artery pseudoaneurysm 4 years after kidney transplantation, to the best of our knowledge, has not been previously reported in the literature. The uncertainty surrounding the etiology of such complications underscores the need for continuous monitoring and research to improve our understanding and management strategies.

CASE REPORT

This is a 75-year-old man with a history of heart failure and renal failure due to ischemic cardiomyopathy, who underwent a combined heart and kidney transplant. At 1 month postoperatively, a suspicious mass in the native left kidney on routine computed tomography (CT) of the abdomen and pelvis was found incidentally. Notably, the transplanted kidney exhibited adequate perfusion and no vascular anomalies at that time. The patient was taking his immunosuppressive medication, including corticosteroids. Four years later, the patient presented with right lower back pain, which led to the discovery of a 4.8-cm right common iliac artery pseudoaneurysm located in close proximity to the kidney allograft renal artery and internal iliac artery (Fig 1). The patient underwent extensive workup to rule out an infectious source, including CT-positron emission tomography. All the tests were negative for an infectious process. The patient provided written informed consent for the report of his case details and imaging studies.

The decision to pursue endovascular repair was driven by the potential morbidity and graft loss associated with open surgery, given the precarious location of the pseudoaneurysm in close proximity to kidney allograft renal artery. The use of a

From the Division of Vascular Surgery, Department of Surgery, University of Maryland Medical Center.

Correspondence: Wessam Hassanein, MD, Division of Vascular Surgery, Department of Surgery, University of Maryland Medical Center, 22 S Greene St, Baltimore, MD 21201 (e-mail: whassanein@som.umaryland.edu).

The editors and reviewers of this article have no relevant financial relationships to disclose per the Journal policy that requires reviewers to decline review of any manuscript for which they may have a conflict of interest.

2468-4287

https://doi.org/10.1016/j.jvscit.2024.101485

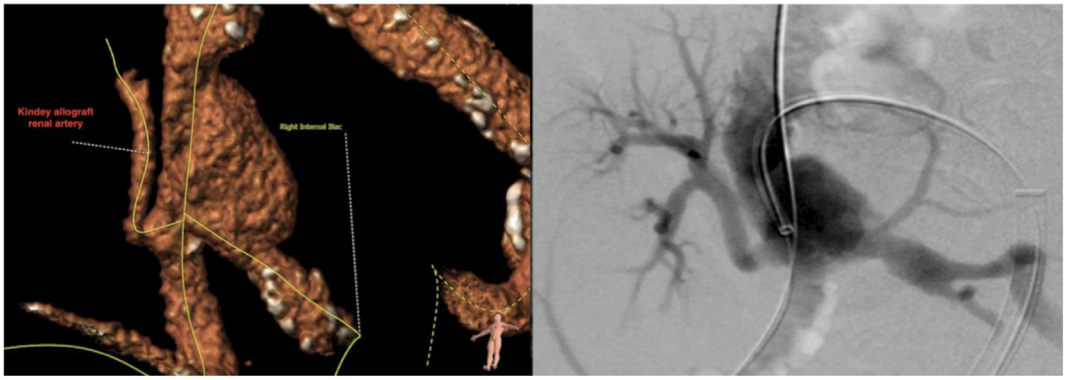

Fig 1. Incidental finding of a 4.8-cm right common iliac artery pseudoaneurysm located in close proximity to the kidney allograft and internal iliac artery on computed tomography (CT) and confirmed by angiography.

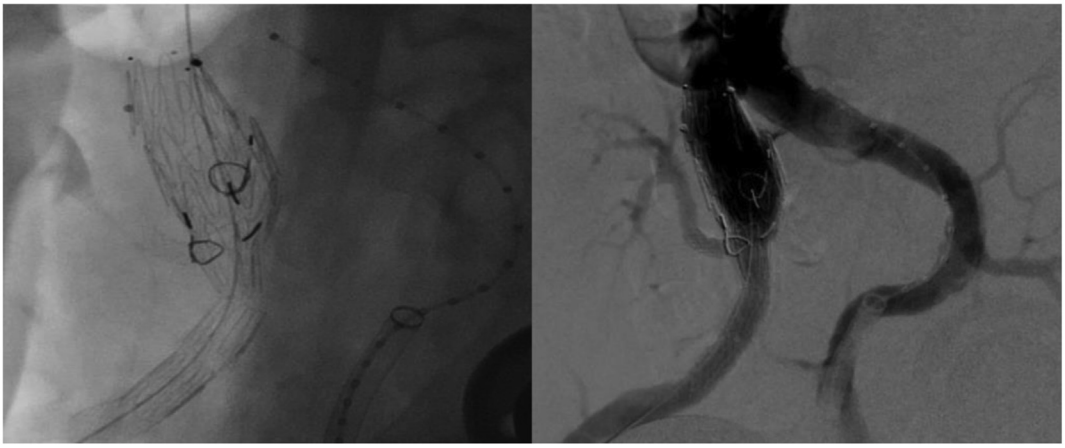

Fig 2. Successful deployment of a physician-modified endovascular graft with adequate coverage of the pseudoaneurysm and alignment of a fenestrated endovascular graft allowing for proper kidney allograft renal artery blood flow through the stent.

fenestrated physician-modified endovascular graft allowed for effective coverage of the pseudoaneurysm in the common iliac artery. A 22-mm aorto-uni-iliac stent graft (Cook Medical) was selected based on preoperative sizing, and a fenestration was created for the transplanted renal artery and right internal iliac artery before repackaging the device in its delivery system. The graft used in this procedure was modified beyond the manufacturer's instructions for use. TeraRecon software facilitated three-dimensional reconstruction of perioperative CT scans, aiding in the precise location and measurement of the fenestrations. The fenestrations were created using manual electric cautery during initial deployment of the graft on the back table. To reinforce the fenestrations, a snare wire was used and secured in place with 5-0 Ethibond sutures (Ethicon, J&J MedTech), and gold markers from a pigtail catheter were used for intraoperative localization during deployment.

A 2-0 chromic gut suture was used as a size-constricting suture to facilitate repackaging of the device in the delivery sheath. Intravascular ultrasound was used to confirm the presence of a pseudoaneurysm, as evidenced by the absence of three vessel wall layers characteristic of a true aneurysm. Following this confirmation, the kidney allograft renal artery was cannulated, with a safety wire left in place as a precaution against accidental coverage during graft deployment.

In the event of accidental coverage, a snorkel technique of the allograft artery would be performed. Subsequent to graft deployment, successful cannulation of the transplant renal artery through the fenestration was achieved. A balloon-expandable covered stent (Gore Medical) was then deployed, ensuring adequate renal blood flow. Efforts were made to cannulate the internal iliac artery fenestration; however, the pseudoaneurysm septum ruptured, which resulted in obliteration of the internal iliac artery ostium. Nonetheless, the graft opened up and effectively covered the arterial ostium. This sealed the pseudoaneurysm completely, with no evidence of an endoleak (Fig 2). Despite stent coverage of the internal iliac artery, satisfactory pelvic perfusion was maintained via the contralateral internal iliac artery.

The postoperative course was marked by its smooth progression, and the patient was discharged on the first postoperative day with a daily regimen of 81 mg of aspirin and 75 mg of clopidogrel (Plavix; Bristol-Myers Squibb — Sanofi Pharmaceuticals). At 3 months of follow-up, the patient is doing well, with preserved renal allograft function, no complaints of claudication, and no evidence of persistent arterial flow into the pseudoaneurysm sac.

DISCUSSION

This case demonstrates the feasibility and safety of treating complex iliac artery aneurysms and pseudoaneurysms following kidney transplantation through an endovascular approach. The advantages, including shorter hospital stays, decreased morbidity and mortality, and improved allograft salvage, highlight the potential superiority of endovascular techniques over conventional open repair.

The pathophysiologic mechanism underlying the delayed presentation of pseudoaneurysms following kidney transplantation remains enigmatic, particularly compared with the better understood progression of true aneurysms.[6] Although iatrogenic injury typically accounts for early postoperative pseudoaneurysms, the extended interval of 4 years between the index surgery and the presentation in this case complicates straightforward attribution. Although vascular clamp injury during the index procedure might be considered as etiology, the prolonged time lapse makes it difficult to be certain.[7]

The likelihood of an arterial anastomosis pseudoaneurysm due to a defective suture line or delayed healing is also tempered by the fact that the pseudoaneurysm's location was more proximal than the actual anastomosis site.[8,9] However, the lack of such abnormalities in this case suggests that the etiology of the pseudoaneurysm likely resulted from other factors. Although the pathophysiology remains complex and multifaceted, the absence of graft-related flow concerns and no evidence of infection shifts the focus toward potential contributions from other sources, such as chronic steroid use or previous surgical trauma.

The potential influence of chronic steroid and immunosuppressive medications emerge as a feasible contributor.[10,11] Although chronic steroid use can weaken the vascular wall connective tissue and result in aneurysm development, pseudoaneurysms emerging as a result of such use remains unreported. We speculate that this case might represent a culmination of multiple factors, with the initial vascular wall trauma during the index operation compounded by chronic steroid exposure. Despite the absence of a clear-cut etiologic pathway, this case report exemplifies the feasibility of endovascular treatment for such complications. The limitations and risks associated with open repair—such as the need for proximal and distal control of blood flow and potential graft loss due to warm ischemia time—underscore the significance of exploring less invasive alternatives.

In particular, endovascular repair emerges as an attractive option due to its potential to obviate the need for reexploration of a prior surgical field, iatrogenic vascular injuries caused by clamps, and the potential warm ischemia time from such approach. Although conceding the technical complexities of the endovascular approach, the benefits outweigh the challenges when executed by experienced surgeons. Thus, in circumstances in which the complications associated with open repair are heightened, the endovascular approach could provide a favorable alternative for these complex situations.

Additionally, the present case contributes to the limited literature on delayed recipient artery pseudoaneurysms after kidney transplant. The successful application of an endovascular approach using a physician-modified endovascular graft underscores the significance of continuous research and innovation in managing such vascular complications. Sharing experiences and documenting cases such as this one will further refine and expand the application of endovascular strategies, ultimately improving patient outcomes.

DISCLOSURES

None.

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Submitted Jan 20, 2024; accepted Mar 5, 2024.