Case Report

Early renal arterial rupture and arterial pseudoaneurysm in graft kidneys from the same deceased donor

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ABSTRACT

Vascular complications are serious problems after kidney transplantation. An aneurysm or rupture in a graft artery is a rare but potentially devastating complication, which may lead to renal function impairment, graft loss, or even death. In this paper, we present two rare vascular complications in the early postoperative course after renal transplantation from the same deceased donor. In the first case, a 49-year-old woman who had spontaneous graft arterial rupture 13 days after kidney transplantation presented with sudden distension in the right lower abdomen. In the second case, a 56-year-old woman recipient with a graft renal arterial pseudoaneurysm presented with decreased urine output and deteriorating renal function 32 days after transplantation. Immediate surgical repair was performed, and fibrin sealant was applied to strengthen the fragile renal arterial wall. Although the function of both graft kidneys recovered well after surgery, the first graft kidney was removed 2 months later because of repeated fungal and bacterial infections. Aggressive surgical reconstruction may preserve graft kidneys in patients with vascular complications after kidney transplantation, but recovery of the graft condition remains a demanding challenge in renal transplantation.

KEYWORDS: Arterial repair, Arterial rupture, Graft nephrectomy, Pseudoaneurysm, Renal transplantation

INTRODUCTION

Transplantation is a renal replacement therapy in patients with end-stage renal disease (ESRD). Arterial pseudoaneurysm or arterial rupture of the transplanted renal artery is an extremely rare but potentially devastating complication which occurs in fewer than 1% of patients [1]. They may cause functional impairment or death. We describe two patients who underwent renal transplantation from the same deceased multi-organ donor and both developed early vascular complications.

CASE REPORTS

Case 1

A 49-year-old woman with ESRD underwent a cadaveric renal transplant in our department. The kidney was transplanted with an end-to-side anastomosis of the transplant renal artery to the right external iliac artery. Her postoperative condition was uneventful, and the drainage tube was removed on postoperative day 10. However, sudden onset of the right lower abdominal pain occurred 14 days after the operation. Physical examination revealed a distended right lower abdomen without tenderness. There was no significant decrease in the hematocrit. Emergency abdominal computed tomography revealed a large extraperitoneal perinephric renal hematoma. An emergency exploratory laparotomy showed a large number of fresh blood clots and a ruptured graft renal artery; a major 1 cm wide rupture was found at the middle part of the graft artery next to four more tiny leakage points. The arterial rupture was closed primarily with a 5-0 prolene suture, and fibrin sealant (TISSEEL®, Baxter AG, Vienna, Austria) was applied to strengthen the vascular wall after vessel repair.

Culture of the central venous catheter tip showed Candida albicans, and antifungal medication applied. A Doppler ultrasound revealed the graft renal vessels were patent with adequate perfusion of the graft kidney after surgical reconstruction. Renal function gradually recovered with adequate daily urine output 1 month after the operation. However, another episode of septic shock with right lower quadrant abdominal pain occurred 1 month later. An emergency exploratory

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laparotomy showed massive pus-like fluid around the graft kidney with fungal and bacterial infection confirmed by culture. Necrotic tissue around the graft artery and external iliac artery was observed. A graft nephrectomy was done and the external iliac artery was repaired with a graft patch.

Case 2

The second recipient was a 56-year-old woman with hypertension. The patient had a history of ESRD and had undergone hemodialysis for years. She also received renal transplantation on the same day as Case 1 with similar procedures. She had good graft function and was discharged early. However, decreased urine output and bilateral lower leg edema were noted 32 days after the operation. Compromised renal function was observed. Renal ultrasonography showed a 3 cm hypoechoic mass with a centrally anechoic lesion around the graft renal artery [Figure 1a]. Color-coded Doppler sonography revealed pulsatile flow within the central anechoic part of the lesion [Figure 1b]. The possible diagnosis was a pseudoaneurysm, which partially thrombosed the true lumen of the graft renal artery. Subsequent noncontrast magnetic resonance imaging confirmed a 3 cm × 3 cm false aneurysm near the anastomosis site near the external iliac artery [Figure 2]. Surgical exploration showed an aneurysmal mass along the anastomosis site near the external iliac artery. Scrupulous dissection isolated the false aneurysm from the transplanted kidney. Vascular control was obtained, and resection of the false aneurysm was then performed. Vascular repair was performed with a primary anastomosis at the external iliac artery and transplanted renal artery using a continuous 5-0 nonabsorbable suture (polypropylene). Fibrin sealant was also applied to the reanastomosis site to prevent vascular leakage.

Histopathology of the resected pseudoaneurysm wall showed consistent marked fibrosis and fragmentation of elastic fibers. C. albicans was cultured from the drainage fluid. The patient was continued on immunosuppressive therapy and antifungal medication and was discharged home under stationary condition.

**DISCUSSION**

Vascular complications are rare in renal transplantation patients but are significant causes of allograft loss. We conducted a comprehensive search to identify all relevant studies of extrarenal vascular pseudoaneurysm or arterial rupture in the MEDLINE (1950 – November 4, 2016) and EMBASE (1970 – November 4, 2016) databases. A total of 45 case reports or case series that met the inclusion criteria were reviewed [Table 1]. According to our literature review, the mortality rate was 13.8%. A major proportion (56.3%) of reported cases lost the graft kidney without mortality. Among the 87 patients, 73 (83.9%) experienced vascular complications at the anastomosis site. The majority of included patients (79.3%) were diagnosed with pseudoaneurysm, and 18 out of 87 patients (20.7%) had an arterial rupture. Only 33 patients (37.9%) had no infective pathogens. C. albicans (24 cases) was the leading pathogen in cases with infection. In our 2 cases, pseudoaneurysm occurred around the anastomosis site, while the ruptured site was at the middle portion of the graft artery in case 1, which is less common arterial than at other sites [Table 1].

Patients with pseudoaneurysms after renal transplant are often asymptomatic and diagnosed incidentally [20,23]. Detecting infective pseudoaneurysm in the early course and starting immediate surgical treatment with antifungal medications are essential. Candida arteritis-related pseudoaneurysm or ruptures may progress rapidly in the early stage after transplantation [11,35,37,40]. This finding is different from that of those with chronic rejection-related transplant arterial pseudoaneurysm, which may be associated with a delayed course and relatively slow progression [40]. One report suggested that 2-week preemptive prophylaxis with antifungal agents can effectively prevent delayed vascular complications in patients with donation-after-cardiac-death kidney transplantation complicated by fungal infection-related hemorrhage [46]. Elimination of C. albicans is required to prevent possible arterial complications.
## Table 1: Extrarenal vascular pseudoaneurysm and arterial rupture following renal transplantation in the literature

| Number | Author et al. | Year | Aneurysm site | Infection | Interval after transplant | Number/intervention | Outcome |
|--------|---------------|------|---------------|-----------|--------------------------|---------------------|---------|
| 1      | Kyriakides et al. | 1976 | 5/AS (ruptured) | 4/E. coli | 1.5-6 months | 8/Tx | 2/death |
| 2      | Renigers and Spigos | 1978 | 1/AS | 1/none | 28 days | 1/Tx | 1/graft loss |
| 3      | Benoit et al. | 1988 | 1/AS | 1/none | 6 months | 1/Tx | 1/graft loss |
| 4      | Koo et al. | 1999 | 3/AS | 1/S. aureus (MRSA) | 2-3 months | 1/endovascular coil embolization | 1/Tx | 1/graft loss |
| 5      | Battaglia et al. | 2000 | 1/AS (ruptured) | 2/C. albicans | 17 days-3 months | 2/Tx | 2/graft loss |
| 6      | Reus et al. | 2002 | 1/AS | 1/none | 2 months | 1/thrombin injection | 1/graft loss |
| 7      | Garrido et al. | 2003 | 1/EIA | 2/Aspergillus spp. | 1.5-4 months | 2/Tx | 1/Sudden death |
| 8      | Peel et al. | 2003 | 1/EIA | 1/C. albicans | 1 month | 1/SR + EVS | 1/graft preserved |
| 9      | Taghavi et al. | 2005 | 1/AS | 1/none | 72 months | 1/SR | 1/graft preserved |
| 10     | Laoud et al. | 2005 | 4/AS | 4/C. albicans | 9 days-3 months | 4/Tx | 3/graft loss |
| 11     | Zavos et al. | 2005 | 1/AS | 2/none | 5 months | 2/EVS | 1/Sudden death |
| 12     | Fujikata et al. | 2006 | 1/AS | 1/S. aureus (MRSA) | 1.3 months | 1/OBS | 1/graft preserved |
| 13     | Orlic et al. | 2006 | 1/AS (ruptured) | 1/none | 5 months | 1/EVS | 1/graft preserved |
| 14     | Nguyen and Luke | 2006 | 1/AS | 1/S. aureus | - | 1/Tx | 1/graft lost |
| 15     | Sia et al. | 2006 | 1/AS | 1/none | 3 months | 1/EVS + thrombin injection | 1/graft preserved |
| 16     | Fornero et al. | 2007 | 1/IA | 1/none | 15 months | 1/thrombin injection | 1/graft preserved |
| 17     | Poels and Riley | 2007 | 1/IA | 1/Pseudomonas spp. | 1.7 months | 1/EVS + thrombin injection | 1/graft preserved |
| 18     | Gravante et al. | 2008 | 1/AS | 1/none | 6 months | 1/SR | 1/graft preserved |
| 19     | Orlic et al. | 2008 | 1/AS | 1/none | 2.5 months | 1/Tx | 1/graft loss |
| 20     | Bracale et al. | 2009 | 5/AS | 2/C. albicans | 13 days-49 months | 8/Tx | 8/graft loss |
| 21     | Liu et al. | 2009 | 1/AS | 1/E. coli | 1/E. coli | 1/EVS + Tx | 3/graft loss |
| 22     | Orlando et al. | 2009 | 2/ES | 2/E. coli | 9/none | 1/SR + replantation | 1/graft preserved |
| 23     | Osmán et al. | 2009 | 1/AS | 1/AS (ruptured) | 1/S. aureus | 12 months | 1/Tx | 1/graft lost |
| 24     | Sharron et al. | 2009 | 1/AS | 1/none | 12 months | 1/EVS + Tx | 2/graft preserved |
| 25     | Wang et al. | 2009 | 2/AS | 1/Al, Pseudomonas spp. | 10 days-1.5 months | 1/EVS + Tx | 2/Tx | 2/death |
| 26     | Al-Wahaibi et al. | 2010 | 1/AS | 1/none | 4 months | 1/SR | 1/graft preserved |
| 27     | Akgul et al. | 2011 | 1/AS | 1/none | 14 years | 1/endovascular treatment with coil | 1/graft preserved |
| 28     | Lee et al. | 2011 | 1/AS | 1/C. albicans | 2 months | 1/Tx | 1/graft lost |
| 29     | Minz et al. | 2011 | 2/AS | 2/E. coli | 1-5 months | 2/Tx | 1/death |
| 30     | Buimer et al. | 2012 | 1/AS | 1/E. coli | 14 months | 1/SR | 1/graft lost |
| 31     | Favelier et al. | 2012 | 1/AS | 1/none | 36 months | 1/endovascular coil insertion and stenting | 1/graft preserved |
| 32     | Kouontidou et al. | 2012 | 1/AS | 1/C. albicans | 3 months | 1/SR | 1/graft preserved |
| 33     | Leonardou et al. | 2012 | 2/AS | 2/Pseudomonas spp. | 3-15 months | 4/EVS + Tx | 4/graft loss |
| 34     | Smeds et al. | 2013 | 1/AS | 1/none | 72 months | 1/EVS | 1/graft preserved |

Contd...
Surgical repair to preserve a transplanted kidney is not usually successful in vascular complications [37]. We applied fibrin sealant for anastomosis, which seemed sufficient for control after surgical suturing for realignment of the vascular wall. No evident leakage was observed through daily drainage monitoring in both case 1 and case 2. This study is also the first to report successful use of fibrin sealant in securing injured transplant vessels.

**CONCLUSION**

The development of an extrarenal pseudoaneurysm or arterial rupture in a transplant renal artery is extremely rare. It can cause a potentially devastating allograft loss and may require allograft nephrectomy. For those with suspected vascular complications, early clinical diagnosis and aggressive surgical intervention are necessary to achieve better allograft outcome and patient survival.

**Declaration of patient consent**

The authors certify that all patients have obtained appropriate patient consent forms. In the form, the patients have given their consent for their images and other clinical information to be reported in the journal. The patients understand that their names will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Nil.

**Conflicts of interest**

There are no conflicts of interest.

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**Table 1: Contd...**

| Number | Author | Year | Aneurysm site | Infection | Interval after transplant | Number/intervention | Outcome |
|--------|--------|------|---------------|-----------|--------------------------|--------------------|---------|
| 35     | Santangelo et al.[37] | 2013 | 6/AS | 2/C. albicans 4/none | 1.5-10 months | 1/SR + replantation | 1/graft preserved |
| 36     | Chandak et al.[38] | 2014 | 1/TRA (ruptured) | 1/Pseudomonas spp. | 10 days | 1/SR | 1/graft preserved |
| 37     | Che et al.[39] | 2014 | 1/EIA | 1/E. coli | 4 months | 1/EVS | 1/graft preserved |
| 38     | Dębska-Ślizień et al. [40] | 2015 | 2/AS (ruptured) | 2/C. albicans | 10 days-1 month | 2/Tx | 2/death after OP |
| 39     | Madhav et al.[41] | 2015 | 1/AS | 1/C. albicans | 25 days | 1/SR | 1/graft preserved |
| 40     | Patil et al.[42] | 2015 | 1/AS | 1/E. coli | 21 days | 1/EVS | 1/graft preserved |
| 41     | Patrano et al.[43] | 2015 | 2/AS (ruptured) | 2/C. albicans | 12 days-25 days | 2/Tx | 2/death after OP |
| 42     | Tshomba et al.[44] | 2015 | 1/AS | 1/Pseudomonas spp. | 9 months | 1/EVS | 1/graft preserved |
| 43     | Ardita et al.[45] | 2015 | 1/AS | 1/Pseudomonas spp. | 20 days | 1/SR | 1/graft preserved |
| 44     | Zhao et al.[46] | 2016 | 2/AS (ruptured) | 2/C. albicans | 14-21 days | 2/EVS + Tx | Graft loss: 26 Death: 12 |

**Summary**

| Number | Author | Year | Aneurysm site | Infection | Interval after transplant | Number/intervention | Outcome |
|--------|--------|------|---------------|-----------|--------------------------|--------------------|---------|
| 35     | Santangelo et al.[37] | 2013 | 6/AS | 2/C. albicans 4/none | 1.5-10 months | 1/SR + replantation | 1/graft preserved |
| 36     | Chandak et al.[38] | 2014 | 1/TRA (ruptured) | 1/Pseudomonas spp. | 10 days | 1/SR | 1/graft preserved |
| 37     | Che et al.[39] | 2014 | 1/EIA | 1/E. coli | 4 months | 1/EVS | 1/graft preserved |
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| 44     | Zhao et al.[46] | 2016 | 2/AS (ruptured) | 2/C. albicans | 14-21 days | 2/EVS + Tx | Graft loss: 26 Death: 12 |

AS: Anastomosis site, EIA: External iliac artery, TRA: Transplant renal artery, IA: Iliac artery, Tx: Transplantectomy, SR: Surgical repair, EVS: Endovascular stenting; OBS: Observation, E. coli: Escherichia coli, C. albicans: Candida albicans, S. aureus: Staphylococcus aureus, MRSA: Methicillin-resistant S. aureus, K. pneumonia: Klebsiella pneumonia

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