SAGE Open Medical Case Reports
3: 2050313X15621856

DOI: 10.1177/2050313X15621856
sco.sagepub.com
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Endovascular management of early-onset post-nephrectomy renal arteriovenous fistula: A report of two cases

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Abstract

Purpose: Here, we report two cases of early-onset post-nephrectomy renal arteriovenous fistula who were successfully managed by implantation of patent ductus arteriosus occluders.

Case report: Both patients were female, aged 38 and 36 years. They received left renal nephrectomy 9 and 6 months, respectively, with a complaint of chest congestion and dyspnea before admitting to our center. Computed tomographic angiography revealed a huge arteriovenous fistula of the left renal pedicle with a renal venous aneurysm in both patients. The fistulas were isolated by implanting patent ductus arteriosus occluders in the renal artery stumps. Clinical symptoms disappeared after intervention. Computed tomographic angiography confirmed the effectiveness of the occluders during follow-up time. The venous aneurysms shrank to normal size.

Conclusion: Our experience indicates that post-nephrectomy renal arteriovenous fistula can present as an early complication which can be efficiently managed by endovascular occlusion of the arterial stump by patent ductus arteriosus occluder.

Keywords

Endovascular, early onset, post-nephrectomy, renal arteriovenous fistula

Date received: 1 September 2015; accepted: 8 November 2015

Introduction

Post-nephrectomy arteriovenous fistula (AVF) of the renal pedicle is a rare complication which usually emerges several decades after initial surgery.[1,2] Early onset of such morbidity is extremely unusual. We successfully managed two patients with post-nephrectomy renal AVF which occurred only months after initial nephrectomy. Potential causes and interventional skills were discussed.

Case report

Case 1

A 38-year-old woman was admitted to our hospital with progressive chest congestion. She had received a left renal nephrectomy for renal dysfunction resulting from severe renal calculus 9 months previously at another center. There was no history of hypertension, congenital heart disease, trauma, or other renal disease. Clinical palpation and auscultation revealed a thrill and systolic–diastolic bruit over the left flank. Vascular color Doppler ultrasonography (VCDU) showed abnormal communication between arterial and venous stumps of the left renal pedicle and aneurysmal dilation of the left renal vein. Subsequent computed tomographic angiography (CTA) confirmed a giant left renal AVF (with a diameter of 8.0 mm). The venous stump of the AVF was dilated to 100 mm in diameter (Figure 1(a) and (b)).

The patient was managed by endovascular methods. The right common femoral artery was accessed by a retrograde puncture and a 6-Fr sheath (Terumo, Tokyo, Japan) was placed and secured with the Seldinger technique under local anesthesia. On aortic angiogram, an AVF of the left renal pedicle and a giant aneurysm of the venous stump were noted (Figure 1(c)). No connection was observed between the venous aneurysm and the inferior vena cava.

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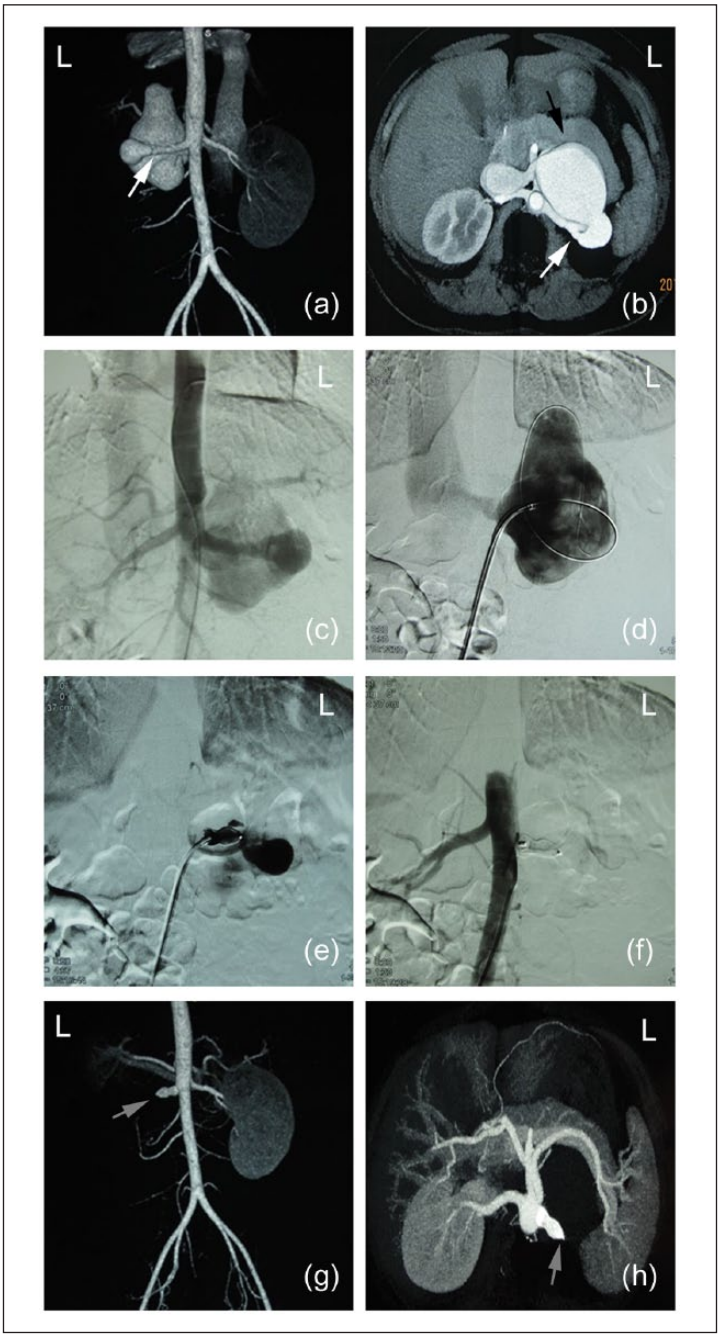

Figure 1. (a–c) Left post-nephrectomy renal arteriovenous fistula (AVF) with the shunt diameter of 8.0 mm, combined with a giant left residual renal venous aneurysm; (d–f) complete occlusion of AVF by a 12 mm × 10 mm patent ductus arteriosus (PDA) occluder; (g, h) post-operative computed tomographic angiography (CTA) revealed disappearance of left renal AVF and rebound of left residual renal vein. L: left orientation; white arrow: fistula; black arrow: aneurysmally dilated renal vein; gray arrow: implanted occluder.

The left renal artery was selected with a 0.035-in hydrophilic guidewire (Radiofocus, Terumo) and then catheterized by a 5-Fr Cobra catheter (Glidex, Boston Scientific, Natick, MA, USA). The guidewire and catheter were carefully advanced through the fistula and into the sac of the venous aneurysm. The Cobra catheter was then exchanged for an 8-Fr guiding catheter (Destination, Terumo), which marched gently to the distal part of residual left renal artery. After withdrawal of the guidewire, a 12 mm × 10 mm patent ductus arteriosus (PDA) occluder (HeartR™, Lifetech Scientific, Shenzhen, China) was pushed into the renal artery through the guiding catheter. The guiding catheter then retreated to the aorta. Following confirmatory angiography, the occluder was deployed within the renal artery which completely isolated the AVF (Figure 1(d) and (f)).

Clinical symptoms were alleviated after the intervention. The patient recovered uneventfully and was discharged 3 days later. The clinical manifestations of the AVF completely disappeared at 1-month follow-up. CTA at 3-, 6-, and 12-month follow-up confirmed complete isolation of the AVF and the stable location of the PDA occluder in the renal artery stump (Figure 1(g) and (h)). The patient was followed up for 1 year without evidence of pulmonary embolism or vessel rupture.

Case 2

A 36-year-old woman came to our hospital complaining of significant distention and pain of the left flank upon palpitation, chest congestion, and progressive dyspnea under daily activities. She had received a left renal nephrectomy for renal cell carcinoma at another center 6 months prior to her presentation to our facility. She had no history of hypertension, congenital heart disease, or trauma. Clinical auscultation revealed a systolic–diastolic bruit within the left flank. VCDU showed an abnormal artery to vein communication of the left renal pedicle and an aneurysmal dilation of the left renal vein. CTA displayed a left renal AVF (with a diameter of 6.0 mm) and a huge venous aneurysm (diameter of 70 mm) of the left renal pedicle (Figure 2(a) and (b)).

The endovascular manipulation was similar to procedures described above. A 12 mm × 8 mm PDA occluder (HeartR) was deployed within the arterial stump of the renal AVF. The shunt was sealed completely (Figure 2(c) and (f)).

The clinical manifestations of the AVF disappeared completely 7 days after intervention. Follow-up CTA at 3, 6, and 12 months verified complete isolation of the AVF and stable location of the PDA occluder within the left renal artery (Figure 2(g) and (h)). No complications were found during the 2-year follow-up.

Discussion

Post-nephrectomy AVF is a rare tardus complication[3] with less than 100 cases reported in the literatures. Renal AVFs are usually diagnosed several decades after nephrectomy. The mean interval between initial operation and diagnosis of renal pedicle AVF has been reported as 14.5 years.[4] The longest interval reported between initial operation and diagnosis was 50 years.[5] Late development of post-nephrectomy renal AVF may be attributed either to its chronic development or absence of symptoms when the blood flow via the fistula is slow. However, both patients in our present report were diagnosed less than 1 year after nephrectomy.

We have no convincing evidence to support a reason for the early onset of post-nephrectomy renal AVF in our cases. Based on the limited data obtained from existing case reports,[6–12] the genesis of post-nephrectomy AVF was presumed to be related to the following: (1) the lack of shear stress within the residual renal pedicle renders it susceptible to conducing aneurysm formation and erosion into the vein wall and finally results in AVF;[13] (2) local inflammation of the residual renal pedicle leads to attachment of adjacent artery and vein walls and finally induces AVF.[1] However, by thorough review of the history of our patients, no evidence of arterial aneurysm formation or infection was discovered. The only clue displayed by the operating documents was that the renal artery and vein were simultaneously ligated during nephrectomy in both patients. Matos et al.[1] had mentioned that post-nephrectomy renal AVF occurred in 75% of cases after en bloc ligation of the renal pedicle. We suspected that this irregular manipulation might be the cause of the early onset of post-nephrectomy renal AVF.

Most of the renal AVFs with high flow need surgical treatment for their tendency to cause heart failure and pulmonary hypertension.[14] In addition, the formation of venous aneurysm or pseudoaneurysm and delayed hemorrhage may be life-threatening. The AVFs in our patients were quite large, with diameters of 8 and 6 mm, respectively. Furthermore, the venous aneurysms had reached a diameter of 100 and 70 mm, respectively.

Endovascular intervention for renal AVF has become the preferred management for its minimal invasion and quick recovery.[4,6–8] Transcatheter coil embolization is the most popular method adopted,[7] although the potential risk of material migration remains when treating large, high-flow AVFs.[6] In order to prevent material migration, various skills including dual-balloons,[12] Wallstents,[6] and liquid embolic materials within a scaffold of coils[15] were introduced. The Amplatzer vascular plug (AVP) might be a safer tool due its larger size compared with other materials, which can reduce the risk of migration. In addition, the controllable deployment enables exact position of the plug.[9,10]

The PDA occluder (HeartR), a domestic product designed for isolating PDA, presents features similar to AVP but costs much less. We had previously managed several congenital and traumatic AVFs by PDA occluders successfully and were familiar with its manipulation profile. In addition, we believed that it has extra benefits to patients with poor financial support or uninsured condition.

In our patients, embolism of the venous aneurysm was abandoned to avoid material migration because the size of outflow tract exceeded the size of most of the available materials, even the PDA occluder and AVP. Besides, in our previous practice treating congenital or traumatic AVFs, blocking the high-pressure inflow by sealing the arterial segment alone was usually enough to induce shrinkage of the dilated venous segment. As the main aim of intervention was to seal the shunt and palliate heart burden, we decided to leave the left renal vein alone instead of embolizing it, as previously reported.[9]

As expected, the occluders sealed the shunt efficiently as the occluders were larger in size than the fistulas. In addition, they kept a stable position and minimized the risk of migration. Surprisingly, when set free from the high pressure, the

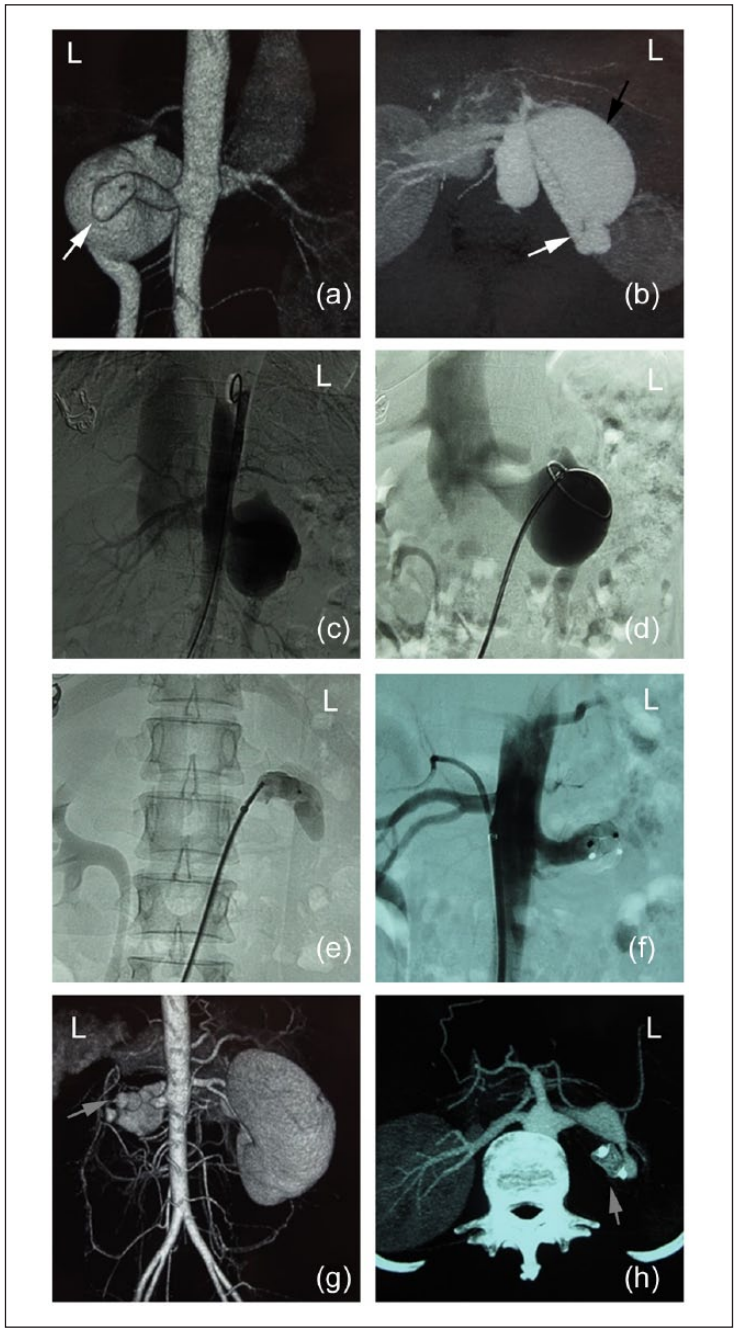

Figure 2. (a–c) Left post-nephrectomy renal arteriovenous fistula (AVF) with the shunt diameter of 6.0 mm, combined with a giant left residual renal venous aneurysm; (d–f) complete occlusion of AVF by a 12 mm × 8 mm patent ductus arteriosus (PDA) occluder; (g, h) post-operative computed tomographic angiography (CTA) revealed stability of PDA occluder, disappearance of left renal AVF, and rebound of left residual renal vein.
L: left orientation; white arrow: fistula; black arrow: aneurysmally dilated renal vein; gray arrow: implanted occluder.

aneurysmally dilated left renal vein shrank to normal size within a month.

Conclusion

Renal pedicle AVF can present as an early post-nephrectomy complication. Sealing the artery stump, alone, by PDA occluder is a safe and efficient treatment.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Ethics approval

Our institution does not require ethical approval for reporting individual cases or case series.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

Informed consent

Written informed consent was obtained from the patients for their anonymized information to be published in this article.

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