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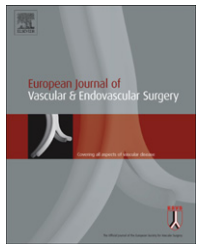

SHORT REPORT

Endovascular Repair of a Ruptured Popliteal Artery Aneurysm Associated with Popliteal Arteriovenous Fistula

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KEYWORDS
Popliteal artery;
Ruptured aneurysm;
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Stent-graft

Abstract Popliteal artery aneurysms (PAAs) represent the most common peripheral arterial aneurysm and are a significant cause of patient morbidity and limb loss. Complications of PAA include distal embolisation, thrombosis and, rarely, rupture. Whereas open surgical repair remains the gold standard, endovascular exclusion has been demonstrated to be a valid alternative in selected patients.

We present an unusual case of ruptured PAA associated with popliteal vein arteriovenous fistula that was successfully treated with an endovascular approach.

In our opinion, higher-risk patients as well as patients presenting with rupture may constitute a subgroup warranting an endovascular approach whenever possible.

Introduction

Popliteal artery aneurysms (PAAs) represent the most common peripheral arterial aneurysm and are a significant cause of patient morbidity and limb loss. Aneurysm rupture is rare, being reported in 1–5% of cases; however, it can have devastating consequences including limb loss or death.[1] We present an unusual case of ruptured popliteal aneurysm associated with popliteal vein arteriovenous fistula that was successfully treated with an endovascular approach.

Case Report

A 66-year-old male presented to our institution for evaluation of a 2-day history of severe pain in the left popliteal fossa associated with increased swelling of the left leg. He denied prior lower extremity procedures or trauma. The patient was known to have asymptomatic large bilateral PAAs for several years, but was felt to be a prohibitive cardiac risk for elective treatment at an outside institution.

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His past medical history included dilated cardiomyopathy undergoing cardiac transplantation evaluation, hypertension, pacemaker placement and prior smoking history. Medications included warfarin, beta-blocker, angiotensin-converting enzyme (ACE) inhibitor, digoxin and furosemide.

On physical examination, there were bilateral PAAs palpated with moderate left lower extremity swelling and tenderness localised in the left popliteal fossa. Pedal pulses were normal with ankle brachial indices of 1.1 bilaterally. Duplex examination revealed a 6-cm left PAA, 3-cm right PAA and a mildly enlarged right common iliac artery of 2 cm with a normal abdominal aorta. There were noted to be elevated velocities in the left popliteal vein initially felt to be due to venous compression. Computerised tomographic (CT) angiography demonstrated a 6-cm left popliteal aneurysm with contained rupture and a left popliteal vein arteriovenous fistula (Fig. 1). The proximal superficial femoral artery (SFA) diameter was 11 mm and the distal popliteal artery 7 mm, with approximately 90° angulation distal to the aneurysm. The anterior tibial artery on the left side was occluded at the origin.

Despite the popliteal swelling and tenderness, the patient was haemodynamically stable with normal pedal perfusion and no evidence of compartment syndrome. Based on his high cardiac risk, the patients was defined unfit for open repair and was considered for an endovascular treatment.

The operation was carried out in the operating room under local anaesthesia and mild sedation with an antegrade percutaneous access to the left common femoral artery. After intravenous administration of 2500 IU of heparin, a Supracore guidewire (Abbott Vascular, Abbott Park, IL, USA) was positioned into the peroneal artery. Endovascular exclusion of the lesion was performed with an 8 mm × 15 cm Viabahn endoprosthesis (W.L. Gore & Associates, Flagstaff, AZ, USA), deployed just proximal to the anterior tibial artery takeoff, extended proximally with an additional 8 mm × 15 cm Viabahn device (W.L. Gore & Associates, Flagstaff, AZ, USA). A small proximal endoleak was then sealed by placement of an Advanta 10 mm × 39 mm (Atrium Medical Corp., Hudson, NH, USA) covered stent in the mid-SFA which was dilated to 12 mm. Completion angiography showed excellent flow through the endograft with no evidence of endoleak, and complete popliteal arteriovenous fistula exclusion (Fig. 2). The arterial puncture was closed with a Proglide (Abbott Vascular, Abbott Park, IL, USA) closure device. The patient tolerated the procedure well and had a palpable posterior tibial pulse at completion.

The postoperative course was clinically uneventful with pain resolution despite the persistency of a mild leg swelling which, however, underwent complete resolution at 1-month follow-up. The patient was discharged home on postoperative day 4 under dual anti-platelet therapy with aspirin 75—162 mg/day^{-1} and clopidogrel 75 mg/day^{-1}, with normal duplex scan evaluation. First-month CT angiography demonstrated complete aneurysm and arteriovenous fistula exclusion with no evidence of endoleak or deep venous thrombosis, and a widely patent endoluminal graft (Fig. 3). A 3-month duplex scanning confirmed the patency of endograft without signs of aneurysm sac refilling.

Discussion

Rupture of a PAA is a rare event, yielding an overall incidence of 2.1%,[2] often reported as an isolated case report.[3,4] Complications of PAAs include distal embolisation, thrombosis and, rarely, rupture. Patients with a ruptured PAA typically present with severe pain, tenderness, subcutaneous ecchymotic lesions and painful pulsatility behind the knee. The diagnosis can be delayed as the symptoms are frequently misinterpreted as deep

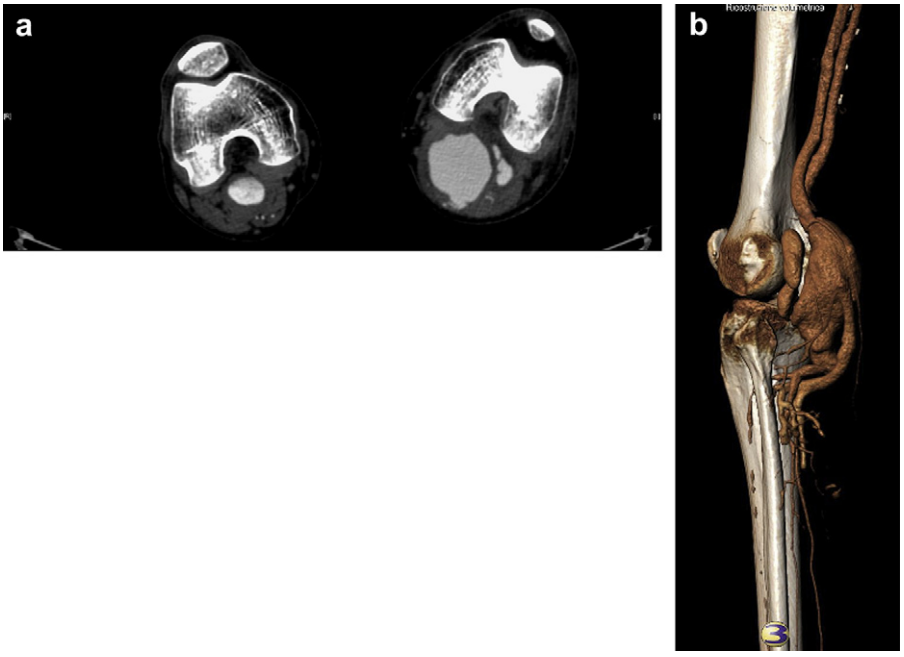

Figure 1 a, b: Preoperative CT angiography.

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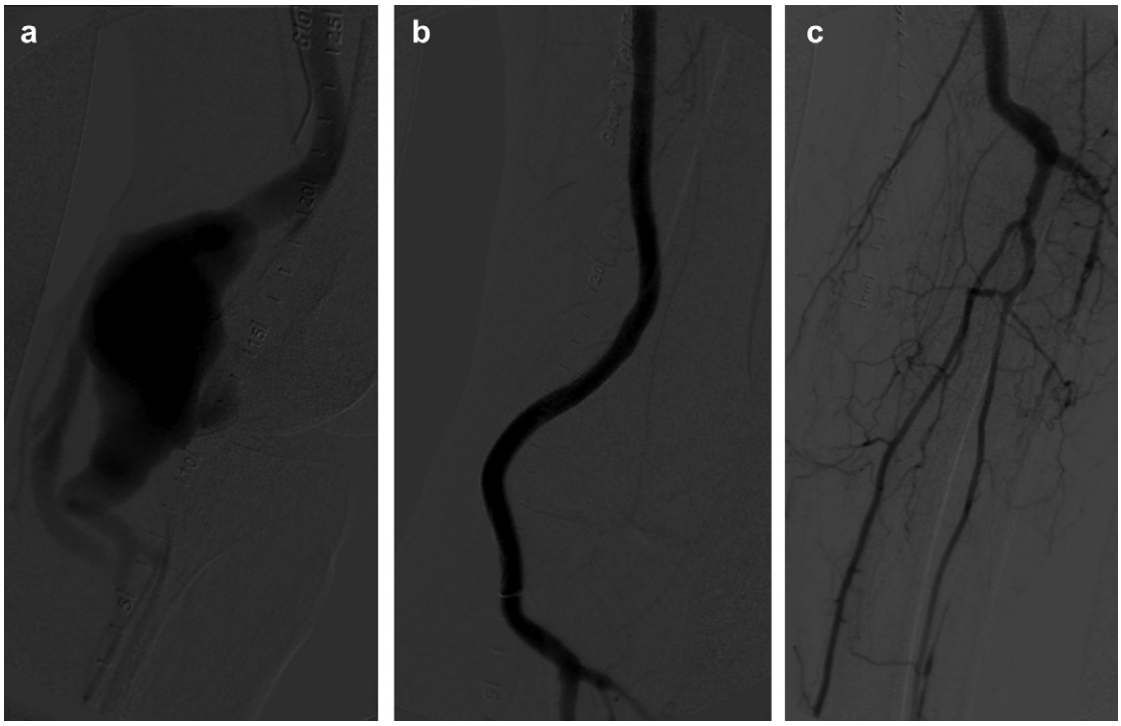

Figure 2 a, b, c: Intraoperative diagnostic and completion angiography.

venous thrombosis, abscess, ruptured Baker's cyst or bleeding from other causes.[4] Duplex exam or CT angiography typically will confirm the diagnosis.

We present an unusual case of ruptured PAA that was associated with an arteriovenous fistula to the popliteal vein. To the best of our knowledge, this complication has not been previously described in the literature. This high-risk patient underwent successful management with an endovascular procedure. Similar in theory to the occurrence of aortocaval fistula with large abdominal aortic aneurysms, the anatomy of the popliteal vein compressed against a large popliteal aneurysm seems to lend itself to the development of an erosion and fistula. In fact, approximately 10% of patients with PAA have presenting symptoms attributed to nerve or vein compression. The development of an arteriovenous fistula with the popliteal

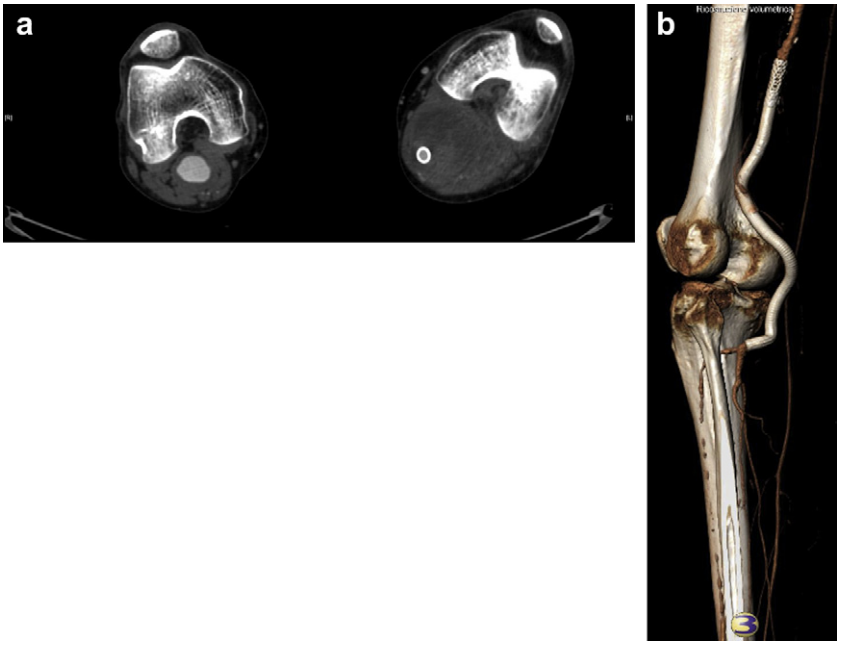

Figure 3 a, b: Postoperative CT angiography.

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vein, however, may be less common than aortocaval fistula because of the large amount of thrombus in the popliteal artery, leading to thrombosis rather than rupture with fistula formation.

Although open repair and bypass remain the gold standard for PAA treatment, endovascular techniques have been increasingly used especially in higher-risk patients. Endovascular treatment for ruptured PAA has been described by other authors.[5] Ruptured PAA does not typically lead to massive haemorrhage due to the relatively tight bony and musculofascial compartments in the popliteal fossa. Patients are often stable and the limb not acutely ischaemic and, therefore, as in our case, there may be in selected cases some delay in intervention to medically optimise patients and to plan an endovascular procedure. Our patient underwent an uneventful procedure and postoperative course. As described by other authors, the primary difficulty with the procedure was crossing the aneurysm sac and tortuous distal popliteal artery to gain access to the tibioperoneal trunk. Despite the arteriovenous fistula, there was no evidence of endoleak on early follow-up studies.

Similar to other endovascular procedures, there continues to exist concerns about the durability of endovascular repair of PAA. Most large series report utilisation rates of endovascular repair of less than 5% in patients presenting with PAA and little long-term data are available concerning endovascular repair of PAA.[6] We feel, however, that in selected patients at higher surgical risk with suitable anatomy, an endovascular approach may represent a valid alternative to open surgery.

Conflict of Interest

None.

Funding

None.

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