JRSM Cardiovascular Disease
Volume 10: 1–5

DOI: 10.1177/20480040211027792
journals.sagepub.com/home/cvd
SAGE

Ruptured infected popliteal artery aneurysm treated with endovascular therapy: A case report

Shunsuke Kojima, Tatsuya Nakama, Kotaro Obunai and Hiroyuki Watanabe

Abstract

An 86-year-old woman was admitted for a ruptured popliteal artery aneurysm (rPAA, 26 × 28 mm). Due to the patient's age and comorbidities, emergency endovascular repair was performed. After the failed antegrade guidewire crossing, a retrograde approach from the anterior tibial artery and snaring was performed for lesion crossing, and stentgraft (5 × 50 mm) was deployed from antegrade fashion. At the 14-month follow-up, computed tomography angiogram demonstrated stentgraft patency and reduced aneurysmal size. Although open surgery remains the first-line treatment for infected rPAA, our approach adds to the evidence and can be applied to emergency cases or high-risk surgical patients.

Keywords

popliteal artery aneurysm, aneurysmal rupture, stentgraft, coil embolization, acute compartment syndrome, infective endocarditis

Date received: 1 December 2020; Revised 14 March 2021; accepted: 7 June 2021

Introduction

Popliteal artery aneurysms (PAAs) are the most common, accounting for 70% of peripheral aneurysms.[1] In contrast to other aneurysm, however, rupture of PAAs (rPAA) is rare.[1–3] Once it occurs, a prompt diagnosis and treatment are mandatory. Moreover, if rPAA is associated with infection, management can be complicated.[2] Although surgical repair remains the first-line treatment,[2,3] endovascular therapy (EVT) is a favorable alternative, particularly in patients with multiple comorbidities.[4] Still, there is little evidence regarding its clinical presentation, optimal treatment, and long-term outcomes. Herein, we report a case of infected rPAA in an elderly patient, successfully treated with EVT.

Case report

An 86-year-old woman with a history of stroke, hypertension, and dementia was referred to our hospital with complaints of severe right-leg pain. She was found to be in vital shock (84/40 mmHg, 120 beats/min) and her right leg was massively swollen and tense (Figure 1(a)). The distal-artery pulse was not palpable. Emergent contrast-enhanced computed tomography (CT) revealed an rPAA (26 × 28 mm) (Figure 1(b) and (c)). The proximal site of the anterior tibial artery (ATA) was compressed by the hematoma (Figure 2(c)). Due to the patient's severe situation, we performed alternative emergent EVT instead of open surgery. Written informed consent was obtained for the procedure. The Ethics Review Board of Tokyo Bay Medical Center approved publication of this case report.

A 7-Fr 55-cm Ansel Flexor sheath (COOK Medical, Bloomington, IN) was inserted from the right common femoral artery. Angiography showed an rPAA with hematoma (Figure 1(d) and (e)). Since a guidewire

Department of Cardiology, Tokyo Bay Medical Center, Urayasu, Japan

Corresponding author:
Tatsuya Nakama, Department of Cardiology, Tokyo Bay Medical Center, 3-4-32, Todaijima, Urayasu, Chiba 279-0001, Japan.
Email: tatsuya_nakama@med.miyazaki

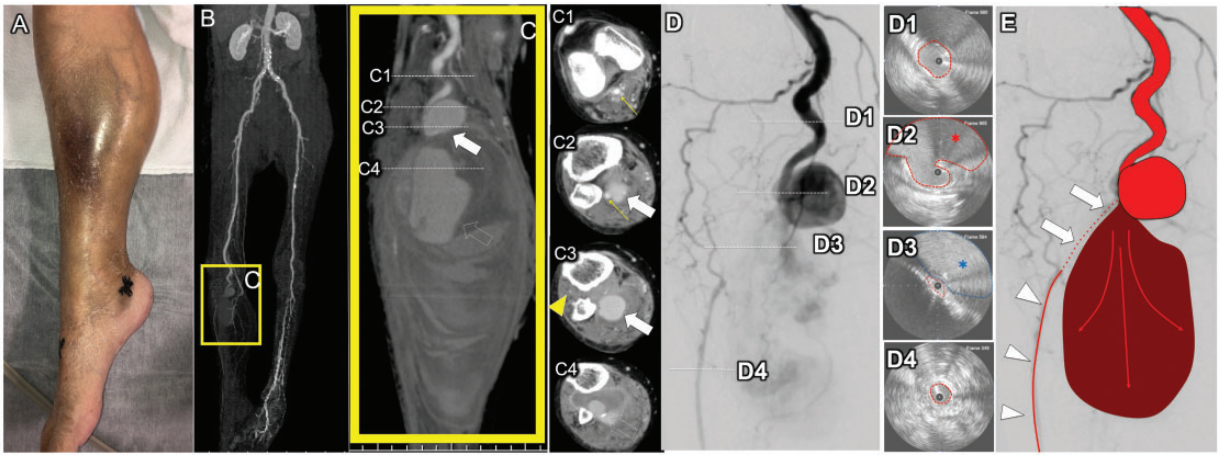

Figure 1. The patient's right leg on arrival appears to be massively swollen and tense with diminished sensation (a). Computed tomography angiography (b) showing a large hematoma (empty white arrow in (c)) around the 26 × 28 mm ruptured popliteal aneurysm (white arrow in (c)). Although the popliteal artery is patent (yellow arrow in C), the anterior tibial artery proximal site is compressed (yellow arrowhead in C3) by the hematoma. Digital subtraction angiography (d) and intravascular ultrasonography findings, showing an intact popliteal artery (D1–4), popliteal artery with entry to the aneurysm (D2), and compressed proximal anterior tibial artery (ATA) by the hematoma (D3). The red dot circle is the artery wall. The red asterisk in D2 is the ruptured aneurysm. The blue asterisk and dot circle in D3 is a hematoma. The proximal ATA is compressed by a hematoma. White arrow: compressed ATA, White arrowhead: patent ATA (e).

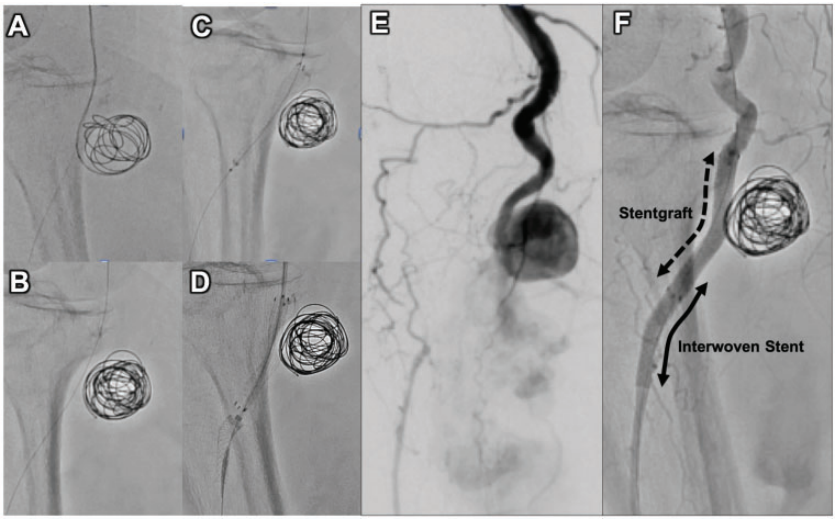

Figure 2. Four detachable coils inside the popliteal artery aneurysm (a, b) 5 × 50-mm stentgraft placement to exclude the aneurysm (c). Interwoven nitinol stent from the proximal anterior tibial artery to the distal part of the stentgraft (d). Final angiogram showing aneurysm exclusion without endoleak (e: digital angiography, f: digital subtraction angiography).

could not be crossed antegrade, an angiographic guided distal puncture was performed as an alternative approach. The distal ATA was punctured with 20 G needle, and a 0.014-inch guidewire (Jupiter FC, Boston Scientific, Marlborough, MA) supported by a microcatheter (Carnelian Support DP, Tokai Medical, Aichi) was advanced retrograde from the ATA into the aneurysm. Afterward, the guidewire was snared, pulled up into the sheath, and externalized. Intravascular ultrasound (IVUS) was used to calibrate the vessel diameter and detect the aneurysm's entry site (Figure 1(d): D1–2). IVUS also confirmed that the proximal ATA was compressed by the hematoma (Figure 1(d): D3–4). Four coils (Interlock, Boston Scientific) were deployed inside the aneurysm (Figure 2(a) and (b)) to prevent possible endoleak after stentgraft implantation. Then, a 5 × 50-mm stentgraft (Gore® VIABAHN® Endoprosthesis, W.L

Gore&Associates, Inc., Flagstaff, AZ) was deployed to just ostial of the ATA to P3 segment to exclude the aneurysm (Figure 2(c)). Because a 5-mm stentgraft is relatively oversized for the ATA ostium, and the ATA proximal side was compressed by the hematoma, a 5×60-mm interwoven stent (IWS, Supera, Abbott Vascular, Chicago, IL) was placed from the proximal ATA to the distal part of the stentgraft (Figure 2(d)). Due to its unique structure, IWS can create a tapered shape. As shown in Figure 2(d) and (f), distal IWS precisely fit the ATA, and the compressed ATA was restored. A final angiogram showed no residual flow into the aneurysm and excellent downstream flow. Based on clinical findings, acute compartment syndrome was suspected; therefore, a fasciotomy was performed.

Postoperatively, echocardiography showed large mobile vegetation on the posterior leaflet of the mitral valve (MV) with severe MV regurgitation. We collected additional blood cultures and started intravenous vancomycin and ceftriaxone. Careful reexamination of the patient's medical history showed that she had presented with intermittent fever at a previous hospital, for which antibiotics had been prescribed. The patient was ultimately diagnosed with infectious rPAA and infectious endocarditis [Duke criteria (5)]. Blood cultures from the previous hospital were positive for Group B *Streptococcus*; based on the pathogen's sensitivity, we narrowed treatment to ceftriaxone.

Although MV replacement was deferred due to her limited activity and comorbidities, the patient had an uneventful postoperative course during recovery. The wound showed significant improvement after 6 weeks. The patient was transferred to a long-term nursing facility for further rehabilitation. Dual antiplatelet treatment (aspirin and clopidogrel) was continued postoperatively for 6 months, followed by lifelong aspirin administration. Based on an infection-control doctor's recommendation, after the 6 weeks of antibiotic injection, a lifelong oral antibiotic (amoxicillin 1500 mg/day) was started. Fourteen months after EVT, the patient was clinically well, and follow-up CT demonstrated stent patency without an endoleak.

Discussion

Although rPAA is uncommon, it requires rapid treatment for limb conservation.[1–3] According to a large Swedish study evaluating the clinical characteristics and outcomes of patients with rPAA, the proportion of rPAA among patients with treated PAA ranged from 2.2 to 3.3%.[3] Although open surgery remains the first-line treatment for infected rPAA,[2,3] endovascular repair has strong benefit in emergency cases or high-risk surgical patients.[4,5,6,7] In this case, technically challenging endovascular exclusion performed via retrograde approach, followed by wire snaring and antegrade endograft deployment. The antegrade wiring through the ruptured aneurysm and compressed distal segment is sometimes challenging. Retrograde guidewire passage and snaring are reasonable option in these challenging situations. After the guidewire passage, a 5×50-mm stentgraft was deployed to exclude the aneurysm. To keep the ATA open,[8] we used an IWS to resist hematoma-related external compression. Eventually, adequate antegrade without residual flow was achieved. The possibility of bloodstream infection was a concern in our case. Based on the large vegetation on the MV and blood-culture findings, infective endocarditis was diagnosed.[9] The preferred treatment in such cases is surgical repair, avoiding the placement of foreign devices. Conversely, EVT is also advocated for patients unfit for surgery. Bani-Hani et al.[10] reported a case of infected PAP treated with EVT using a stentgraft and drainage of the infected hematoma. They highlighted that stenting with long-term antibiotic use can be a valuable alternative to surgery in selected cases such as in high surgical-risk patients. Of course, this strategy includes a potential risk of graft infection; therefore, careful clinical follow-up and long-term antibiotic therapy are mandatory. Imaging follow-up, such as positron emission tomography CT, can be useful in these situations.

Conclusion

Although open surgery is the recommended first-line treatment for rPAA, EVT can be a valuable alternative even in cases of infection. Further well-designed prospective trials are necessary to confirm the feasibility and safety of EVT for rPAA.

Acknowledgements

None.

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.

Funding

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

Ethical approval

None.

Guarantor

■■■

Contributorship

Shunsuke Kojima and Tatsuya Nakama wrote this manuscript. Kotaro Obunai gave valuable comments for the concept of this case report. Hiroyuki Watanabe gave final approval of this manuscript.

ORCID iDs

Shunsuke Kojima https://orcid.org/0000-0001-7764-2165
Tatsuya Nakama https://orcid.org/0000-0001-9107-6438

References

1. Hirsch AT, Haskal ZJ, Hertzer NR, Vascular Disease Foundation, et al. ACC/AHA 2005 Practice guidelines for the management of patients with peripheral arterial disease (lower extremity, renal, mesenteric, and abdominal aortic): a collaborative report from the American Association for Vascular Surgery/Society for Vascular Surgery, Society for Cardiovascular Angiography and Interventions, Society for Vascular Medicine and Biology, Society of Interventional Radiology, and the ACC/AHA Task Force on Practice Guidelines (Writing Committee to Develop Guidelines for the Management of Patients with Peripheral Arterial Disease): endorsed by the American Association of Cardiovascular and Pulmonary Rehabilitation; National Heart, Lung, and Blood Institute; Society for Vascular Nursing; TransAtlantic Inter-Society Consensus; and Vascular Disease Foundation. *Circulation* 2006; 113: e463–e654.
2. Akman J, Katsogridakis E and Antoniou GA. Ruptured popliteal artery aneurysms. *Vascular* 2019; 27: 430–447.
3. Cervin A, Ravn H and Björck M. Ruptured popliteal artery aneurysm. *Br J Surg* 2018; 105: 1753–1758.
4. Safar HA and Cinà CS. Ruptured mycotic aneurysm of the popliteal artery. A case report and review of the literature. *J Cardiovasc Surg (Torino)* 2001; 42: 237–240.
5. Ghassani A, Delva JC, Berard X, et al. Stent graft exclusion of a ruptured mycotic popliteal pseudoaneurysm complicating sternoclavicular joint infection. *Ann Vasc Surg* 2012; 26: e13–e15.
6. Muir D and Kulkarni SR. Successful endovascular repair of a ruptured popliteal artery aneurysm: a case report and literature review. *Case Rep Vasc Med* 2020; 2020: 8745780.
7. Kawai Y, Morimae H and Matsushita M. A ruptured popliteal artery aneurysm treated with coil embolization. *Ann Vasc Dis* 2019; 12: 80–82.
8. Maleckis K, Deegan P, Poulson W, et al. Comparison of femoropopliteal artery stents under axial and radial compression, axial tension, bending, and torsion deformations. *J Mech Behav Biomed Mater* 2017; 75: 160–168.
9. Li JS, Sexton DJ, Mick N, et al. Proposed modifications to the Duke criteria for the diagnosis of infective endocarditis. *Clin Infect Dis* 2000; 30: 633–638.
10. Bani-Hani MG, Elnahas L, Plant GR, et al. Endovascular management of ruptured infected popliteal artery aneurysm. *J Vasc Surg* 2012; 55: 532–534.