

## Coil embolization as an alternative endovascular approach for ruptured superficial femoral artery aneurysms

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### ABSTRACT

**Purpose:** True aneurysms of the superficial femoral artery (SFAA) are rare and, the endovascular approach using covered stents has gained more popularity. We report an endovascular alternative using embolization coils for treatment of a ruptured SFAA.

**Case description:** An 88-old male admitted for a ruptured true SFAA (67×52mm in diameter and 70mm in length) presenting with painful mass pulsating in the proximal third of the left thigh. His surgical history consisted of an infrarenal abdominal aneurysm treated by open surgery and an ipsilateral popliteal aneurysm treated with prosthetic bypass by a medial approach; this was revealed to be occluded at the CT scan evaluation. The patient was asymptomatic for limb ischaemia, therefore we decided to perform embolization of the SFA with coils (MReye® Embolization Coil, Cook Medical, Bloomington, USA). Under local anaesthesia, via a 5-Fr sheath and an antegrade approach, coils were deployed first at the distal neck of the SFAA and then to its proximal neck. On the angiogram, complete aneurysm sac thrombosis with no leaks was achieved. At 6-month follow-up, the SFAA remained occluded, and the patient had not developed any sign of limb ischaemia.

**Conclusion:** Coil embolization of SFAA in selected cases represents a feasible and safe endovascular alternative.

### Introduction

True aneurysms of the superficial femoral artery (SFAAs) are rare and often diagnosed when they reach great dimensions or become symptomatic. Symptoms, unlike popliteal artery aneurysms, are related to mass compression and rupture, rather than ischaemic effects.<sup>1</sup> Traditional surgery has been the mainstay of treatment for SFAAs; however, in recent years, the endovascular approach using covered stents has gained more popularity.

In this paper, we report a giant true SFAA presenting with painful pulsating mass and rupture treated with coil embolization, which could be an endovascular alternative approach for selected cases. Written consent from the patient was obtained for the publication of this case report and the images, and it is available if required.

### Case description

An 88-year-old male presented to the emergency department with a painful pulsatile mass in the proximal third of the left thigh and bilateral leg swelling. His medical history included hypertension, dyslipidaemia, and atrial fibrillation in a setting of relapsing heart failure. His surgi-

cal history included infrarenal aortic aneurysm treated by the open approach with a bifurcated graft, popliteal artery aneurysm treated by the open medial approach with an ePTFE graft, and aortic valvular replacement due to severe valvular stenosis. No history of connective tissue or congenital disorders were recorded. The patient had not undergone any invasive procedures or interventions involving the left lower limb. The count white cell was within range levels, protein C reactive was slightly increased (8 mg/l) and no fever was present. The first instrumental evaluation consisted of duplex ultrasound and demonstrated a large SFAA suspicious for rupture. Subsequently, CT angiogram was performed, revealing an SFAA 67×52 mm in diameter and 70 mm in length, with thrombotic wall apposition and posterior rupture infiltrating the adjacent muscles (Figs. 1 and 2). The ipsilateral popliteal graft was occluded, but the distal popliteal artery and anterior tibial and peroneal arteries were patent. As an additional incidental finding, CT revealed massive bilateral pleural effusion and ascites.

In this case, considering the multiple comorbidities and the current critical clinical conditions, we opted for an endovascular approach. The suitable segment of the common femoral artery for puncture was assessed preoperatively by means of ultrasonography, and local anaesthesia was performed with 1% lidocaine. Under ultrasound guidance,

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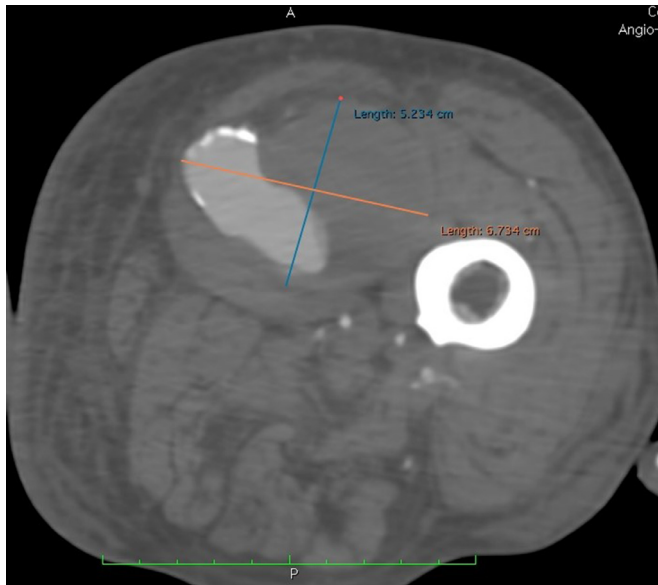


Fig. 1. . Aneurysm of the superficial femoral artery located at the proximal third of the thigh presenting with posterior rupture.

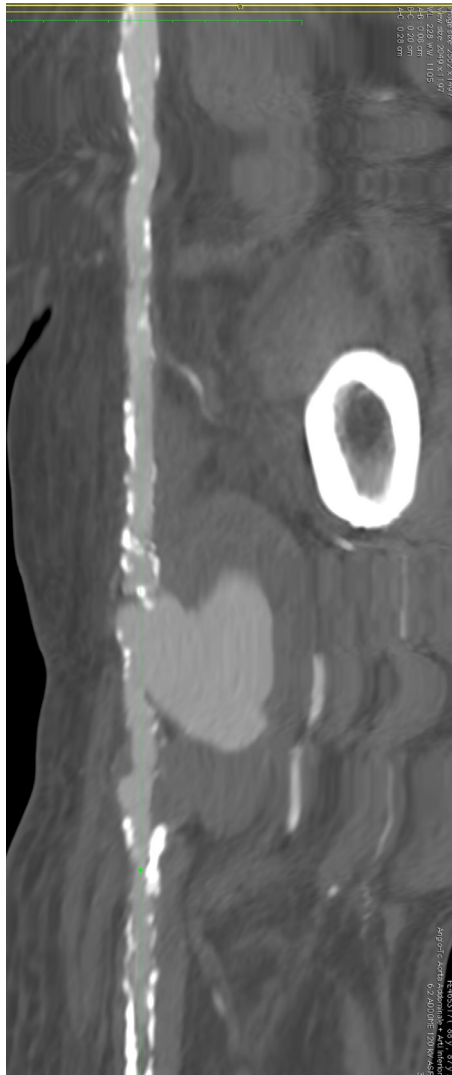


Fig. 2. . Aneurysm of the superficial femoral artery located at the proximal third of the thigh presenting with posterior rupture.

arterial puncture was performed using a 19 G needle, and a standard guidewire was introduced over a 5 Fr sheath (12 cm long; ULTIMUM™ EV INTRODUCER, Abbott, Plymouth, MN, USA). The angiogram demonstrated SFAA of the mid-proximal segment with rupture, occlusion of the popliteal graft, and reperfusion of the distal popliteal artery and anterior and peroneal arteries. With the aid of a 4-Fr diagnostic catheter (C2, 65 cm, Tempo-Aqua, Cordis, Miami Lake, FL, USA), we performed embolization of the distal and proximal neck of the SFAA using ten 8 mm and six 8 mm embolization coils (MReye® Embolization Coil, Cook Medical, Bloomington, USA). On the control angiogram, complete SFAA thrombosis and the absence of mass pulsation at palpation were demonstrated. During the deployment of the coils at the proximal end, one migrated towards the aneurysm sac and ended up likely outside it (Fig. 3). After the removal of the sheath, haemostasis was obtained with manual compression.

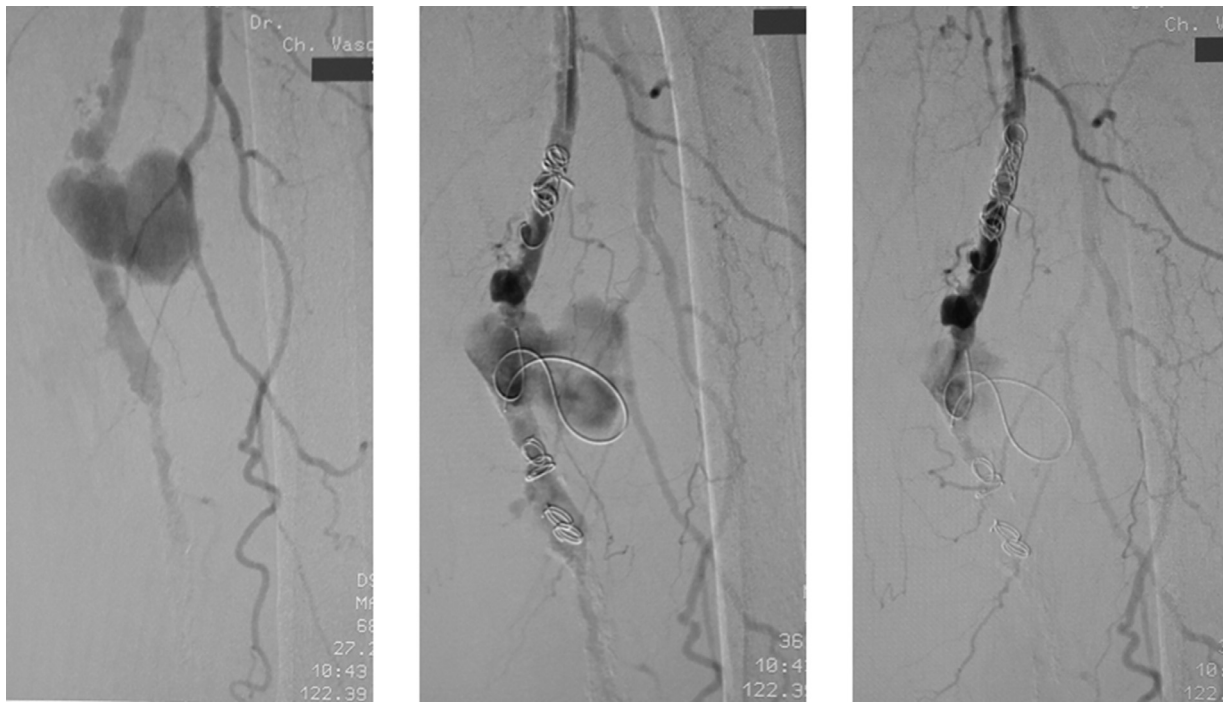
The day after the procedure, the patient was transferred to the internal medicine department for medical therapy for heart failure exacerbation and discharged after 17 days of in-hospital stay. At the 1-, 3- and 6-month follow-ups with duplex ultrasound, the SFAA remained occluded with no signs of leakage, and the patient did not develop any symptoms or signs of limb ischaemia.

## Discussion

Most of the aneurysms of the lower extremities are located in the popliteal artery, and the femoral artery is rarely involved. Among femoral aneurysms, those involving the superficial femoral artery represent only 15% to 25%.<sup>2</sup> The unique considerations of SFAAs are that patients may be asymptomatic for a long period and diagnosed late, as SFAAs are located deep in the thigh, which makes them difficult to recognize on physical examination.<sup>2</sup> As reported in a recent review, most of them present with symptoms due to mass compression and rupture rather than ischaemic signs.<sup>1</sup> Our patient's presentation is consistent with this review, as he presented with a pulsating painful mass and rupture, and no signs of claudication or critical threatening ischaemia were present.

The available literature reports that SFAAs have been treated mainly by open surgery, which consists of mass decompression and bypass reconstruction.<sup>3</sup> In selected cases, considering the patient's comorbidities, SFAA ligation can be performed with no revascularization, but the viability of the limb must be monitored. On the other hand, in the last 5 years, the endovascular approach with aneurysm exclusion using covered grafts has become an attractive alternative.<sup>1,4,5</sup> However, no endovascular SFAA embolization with coils has been described yet. In this case report, the patient presented with a particular lower limb blood perfusion characterized by popliteal graft occlusion with no symptoms of limb ischaemia. Therefore, for this patient, occlusion of the SFA would have been unlikely to develop ischaemia of the limb, which led us to proceed with SFA embolization. This case demonstrates that the induction of thrombosis of ruptured SFAA, deploying coils first to the SFA below and then above the aneurysm sac, is feasible and safe. During the procedure, it is possible for dislocation any coils towards the aneurysm sac to occur and, in case of rupture, to end up outside the aneurysm, as occurred in our case. This undesirable situation can be avoided using longer coils and deploying them at least 1 cm above the proximal SFAA neck. Currently in the market are available particular embolization system using detachable coils which can be retrieved in case of their dislocation.

Finally, considering the occlusion of the SFA, the clinical state of the limb must be monitored during the follow up. The 6-month follow up we report is a limitation in this case and a longer follow up is necessary to determine the long term clinical outcome of this approach.



**Fig. 3.** Angiogram of the superficial femoral artery showing a ruptured aneurysm (left), deployment of coils (middle), and gradual thrombosis of the distal superficial femoral artery and of the aneurysm sac.

### Conclusion

Coil embolization of SFAs may represent an alternative endovascular approach for intact and ruptured SFAAs, and was revealed to be feasible and safe. This procedure should be addressed in selected cases to avoid lower limb ischaemia.

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### Declaration of Conflicting Interests

The authors declare no potential conflicts of interest with respect to the research, authorship, and publication of this article.

### References

1. Traina L, Zenunaj G, Bisogno F, Scian S, Acciarri P, Medini C, et al. Incidence, diagnosis, treatment and outcomes of true superficial artery aneurysms. *Ann Vasc Surg.* 2021;24 S0890-5096(21)00440-4Epub ahead of print. PMID: 34175418. doi:10.1016/j.avsg.2021.04.044.
2. Jr Leon LR, Z Taylor, Psalms SB, Sr Mills JL. Degenerative aneurysms of the superficial femoral artery. *Eur J Vasc Endovasc Surg.* 2008;35(3):332–340 Epub 2007 Nov 7. PMID: 17988902. doi:10.1016/j.ejvs.2007.09.018.
3. Perini P, Jean-Baptiste E, Vezzosi M, Raynier JL, Mottini F, Batt M, et al. Surgical management of isolated superficial femoral artery degenerative aneurysms. *J Vasc Surg.* 2014;59(1):152–158 Epub 2013 Nov 5. PMID: 24199768. doi:10.1016/j.jvs.2013.07.011.
4. Mufty H, Daenens K, Houthoofd S, Fourneau I. Endovascular treatment of isolated degenerative superficial femoral artery aneurysm. *Ann Vasc Surg.* 2018;49 311.e11-311.e14Epub 2018 Feb 16. PMID: 29458083. doi:10.1016/j.avsg.2017.11.038.
5. Sallustro M, Faggioli G, Ancetti S, Gallitto E, Vento V, Pini R, et al. Endovascular treatment of a ruptured superficial femoral artery aneurysm in Behcet's disease: case report and literature review. *Ann Vasc Surg.* 2020;65 287.e1-287.e6Epub 2019 Nov 23. PMID: 31770572. doi:10.1016/j.avsg.2019.11.023.