

Research Article

A Case of Chronic limb-Threatening ischemia Associating a True, and Huge, Superficial Femoral Artery Aneurysm, Treated by Primary Endovascular Approach

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Abstract

Introduction: True superficial femoral artery aneurysms are rare clinical entities. They remain asymptomatic most of the time, until complications such as local compression, sudden thrombosis, remote embolisation aneurysmal rupture or critical limb ischemia occur. Although open surgical solutions for revascularisation are available, literature is scarce, due to the paucity of these presentations. Thus, limited available methods for treatment were described.

Materials and methods: A 77-year old man having a high preoperative risk score (ASA4) was hospitalised via the emergency department for Chronic Limb-Threatening Ischemia (CLTI) of the left leg (Rutherford category 4), associated to a painful, and pulsatile mass on the left thigh. The clinical exam and the CT-scan assessment revealed the presence of a true aneurysm of the left superficial femoral artery. For this high risk patient (severe O2-dependent COPD, and cardiac insufficiency), only a low invasiveness, endovascular solution was proposed. It was associating an endovascular exclusion of the aneurysm to endoluminal repermeabilisation of the superficial femoral artery's proximal segment, using two covered stents ("Covera plus" stent-grafts (BD-Bard inc. USA) that were implanted via an antegrade, homo-lateral trans-femoral approach.

Results: Technical success was evinced by complete angiographic exclusion of the aneurysmal sac and correct SFA reperfusion. No pre or postoperative complications were noted.

Discussion: SFAA remain a rare entity. A systematic review of the literature covering the last 20 years show that only 40 papers were published as to this matter. Most of them tackle the open surgical solution, and just a few of them relate to the endovascular technique, that is so far a marginal solution.

Conclusion: Endovascular exclusion of SFAA appears to be a safe and lowly aggressive solution, affording a correct hemodynamic result, particularly in high-risk ASA IV patients.

Keywords: Superficial femoral artery aneurysm; Endovascular; Chronic limb ischemia; ASA score; Chronic limb-threatening ischemia; Angioplasty; Chronic total occlusion; Covered stents

Introduction

True SFA Aneurysms (SFAA) are rare clinical entities [1]. Most of them associate atherosclerotic or degenerative etiologies. Generally, SFAA remain asymptomatic until local complications are noted. These aneurysms preferentially affect elderly men [2] and are often (84%) associated with other aortic or peripheral locations. In 38% of the cases both inferior limbs are affected [2]. During their natural evolution, local compression symptoms and rupture are the most frequent complications encountered. Spontaneous thrombosis

or distal embolisms represent less frequent, yet recognised parallel complications.

True or native SFAA (more likely than secondary aneurysms) may associate common symptoms like calf claudication, local pain and swelling, neighboring nerve compression, or rest pain. Rupture of these aneurysmal structures can lead to local limb or systemic severe threats. SFAA aneurysm's treatment gathers open surgical techniques (prosthetic or venous bypass), bare endovascular procedures, or hybrid exclusion and revascularisation [2,3].

This case report describes a totally endovascular approach used to treat a large SFA true aneurysm combined with recent CLTI presentation, in a high-risk surgical patient (ASA IV).

Materials and Methods

A 77-years old patient presented to the emergency department with a painful, and pulsatile, mass located on the internal aspect of the left thigh. The patient described an increasing pain during the last two weeks, with tandem location: at the level of the left thigh and in the left foot (rest-pain). The patient provided clear consent for eventual publication of the used medical approach and of related images, and data from his medical records.

The patient's medical history included: severe dyspnea, (Gold grade IV), active tobacco use, oxygen-dependent COPD, long-lasting

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hypertension, popliteal bilateral aneurysms previously treated by popliteo-popliteal, venous bypasses (inverted saphenous veins), and nine years ago. A slightly distressing and growing tumefaction was noted in the upper thigh during the last six months, with growth increasing more rapidly over the last weeks. The patient noticed concomitant and increasing claudication adding rest-pain on the left inferior limb (Rutherford grade II, category 4). Beyond the previously treated popliteal aneurysms, no other aneurysmal location was mentioned in his previous surgical files and no history of collagen or elastin mutation was known in the patient's family.

The clinical exam disclosed the lack of pulsatility on the distal AFS, on the popliteal, and the pedal arteries. CLTI features were present on the left foot (AP=30 mmHg, and ABI=0.5).

A CT-angiography showed a bulky, 9cm-diameter SFA aneurysm with parietal contrast enhancement inside the thrombus, witnessing possible wall-instability (Figures 1 and 2). The initial segment of the left SFA also presented three other lower volume (2.5 cm diameter) serial native aneurysmal dilatations. The next mid and distal third SFA segments appeared thrombosed. Among the tibial trunks, only the posterior tibial artery was permeable at the time of this exam. No available profunda-femoris or peri-genicular collaterals were evinced. Because of the poor general condition of the patient (ASA IV perioperative risk), an endovascular approach was favored instead of open surgery.

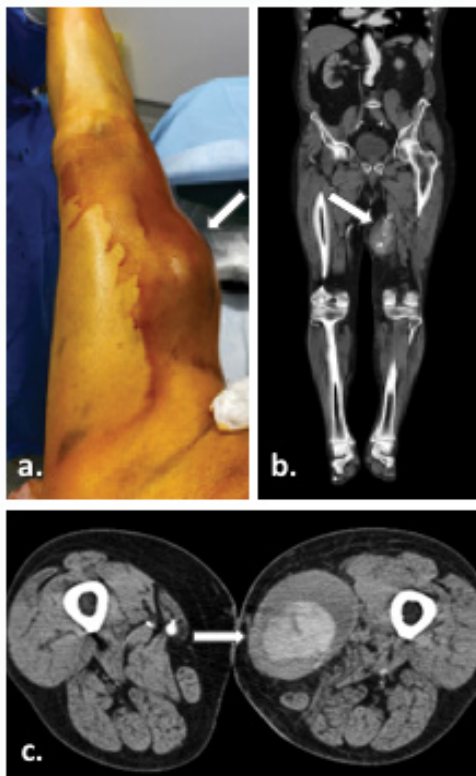


Figure 1: Clinical and CT-scan preoperative aspects of this bulky, native SFA-Aneurysm: A) the initial clinical presentation noted at the "Emergency Room". It appears evident (arrow) a huge and painful pulsatile mass on the medial aspect of the left thigh. B) Same aspect depicted by the Angio-CT performed in the same setting. The presence of a bulky aneurysmal mass (white arrow) along the left SFA course is described. C) More detailed CT view allowed by an axial incidence, showing the intimate topography of this giant SFA aneurysm, however exempt from leakage, or peri-adventitial hematoma at that stage.

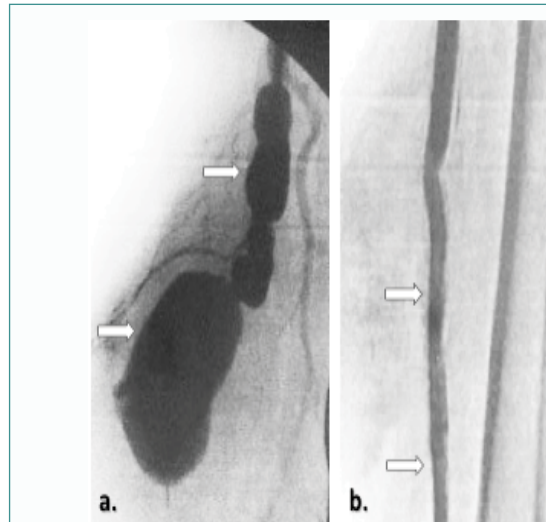


Figure 2: Perioperative angiographic aspects of the SFA-Aneurysm.

a) The initial angiographic aspect showing a complex aneurysmal degenerative disease of the left SFA, containing 3 small-diameter (2-2.5 cm/ maximal transversal diameter), associated to a 4th, much more extended (9 cm-diameter) aneurysmal sac (arrows). The left SFA appears occluded a few millimeters away from the aneurysmal neck. The main flow of the SFA is derived into this giant aneurysmal sac; this explains at once the rapid growth of this true aneurysmal entity (associated to crescendo pain and enlarging prominence), also the concomitant severe ischemic symptoms of the left leg, deprived from femoro-popliteal direct arterial flow.

b) The post-procedural angiographic aspect which shows a correct exclusion of the SFA aneurysm, no endo-leak, and correct reperfusion of the appended SFA (arrows).

Using an antegrade SFA access, the whole SFA was catheterised with a 0.035 in. hydrophilic guidewire (Terumo, Japan). After intra-arterial heparin administration (5.000 UI), the adjacent SFA was traversed by endoluminal way, with the same 0.035 in guidewire. Using a 5 mm/20 cm non-coated balloon, a few gentle (maximum 10 atm.), and long (3 minutes) inflations were performed in the newly recanalised channel, from the distal-to-the-proximal SFA segments, as to pre-dilate the vessel and to elude eventual thrombus migration. An optimal back flow was obtained via the popliteal segment. Following the new regained angiographic marks, two "Covera plus" covered stent-grafts (BD-Bard inc. USA) were placed under fluoroscopic control (10 mm/10 cm, and 10 mm/10 cm). These two covered stents afforded the next therapeutic goals:

- Complete exclusion of the main, true, huge SFA aneurysm.
- Complete exclusion of the other three native, yet smaller aneurysms at the origin of this same left SFA.
- Complete recanalisation of this totally thrombosed SFA, by same endovascular treatment.

Results

The endovascular operations afforded the complete exclusion of the aneurysm and correct reopening of the adjacent SFA reopening. The final angiographic control showed a correct exclusion of the aneurysm's sac, with no peri-prosthetic leak and a correct reperfusion of the femoro-popliteal segments. An early Duplex control confirmed the patency of the posterior tibial artery, with normalised ankle pressure and ABI at 9. During the follow up, we noticed a correct regression of the thigh aneurysmal diameter and the complete disappearance of pain. Unfortunately, the patient died 6 weeks after

the surgery, by pulmonary sepsis in the context of his severe stage of COPD.

Discussion

True SFA aneurysms are rare entities (only about 40 papers published during the last 20 years). Degenerative ("primary", or "true") femoral artery aneurysm occurs in approximately 5/100,000 patients [1], and they represent approximately, 6% of peripheral arterial aneurysm [2].

Due to their relatively deep-tissue localisation, SFAAs remain undetected until complications arise. Cutler and Darling established since 1973 an initiatory classification of the true femoral artery aneurysms as showed in Table 1. Type I occur in the common femoral artery, type II in the femoral bifurcation, type III is a sole SFA aneurysm (like our case report), and type IV is an aneurysm of PFA [2]. Later on, Perini et al. [2] more precisely described the classic localisation of these aneurysms: the middle and distal third of the SFA represent the commonest location of aneurysm presentation: 15% on the proximal third, 22% in the middle and 59% on the distal part. They also note that only 4% of them exclusively involve the whole SFA length. The same authors add that 18% of the patients having a femoral artery aneurysm may hold bilateral lesions, while 27% to 69% of these patients associate other coexisting aneurysmal disease. Lawrence et al. [3] also documented that SFAAs are (in up to 60%) coexisting with AAA.

Table 1: A simplified view of the Cutler and Darling femoral artery true aneurysm classification.

Type of aneurysm	Description
Type I	Localised in the common femoral artery only
Type II	Localised in the femoral bifurcation
Type III	Sole SFA aneurysm
Type IV	Aneurysm involving profunda femoral artery at its origin from the common femoral artery

It has been also showed that 52% of these patients will present with aneurysmal rupture as a first symptom, while the other most common presentation is represented by different forms of limb ischemia, having a 13% to 22% incidence. These symptoms currently are caused by intra-aneurysm thrombus embolisation [3-5]. Other described symptoms may follow a neighboring compression phenomenon on the femoral nerves, and the deep veins causing (for these latest) deep vein thrombosis associated with lower limb oedema [2,4]. In some cases, a pulsatile and painful mass becomes evident in the thigh, as in our case study. However, most of them remain asymptomatic until local complications appear [4-8]. Our case is probably extremely rare, by evincing a true aneurysmal disease (not only one pathological entity on this left SFA), but a series of four true linked aneurysms, from which only the more distal added a bulky volume (9 cm transverse diameter).

In the present case, the rapidly growing aneurysm was associated to severe atherosclerotic SFA disease and a long occluded segment without distal collateral support (previous popliteal surgical bypasses). These specific circumstances may have triggered the dual painful syndrome at the aneurysmal sac level, and the distal limb, by associating the CLTI condition [4]. Currently, there is no standardised consensus about the threshold for operative repair. It was emphasised that symptomatic aneurysms should benefit from emergency repair, with first surgical options in young and fit patients [7-9].

However, no pertinent recommendations are available for the

asymptomatic subjects. Some previous publications show that this kind of lesions only seldom develop complications as long as the aneurysmal sac measures less than 35 mm-diameter, and have no intra luminal thrombus [6-8]. The presence of intra luminal thrombus, (confirmed by ultrasound and CT-scan), may represent an important risk factor for eventual distal embolisation (spontaneously, and during eventual endovascular manipulation for aneurysmal exclusion [5,6]. However, because of these concerns, the asymptomatic patients are recommended to be treated if the aneurysmal diameter is larger than 35 mm and if the lesion is located near the PFA origin [6].

True AFS aneurysms can be subject to both methods of treatment: open-surgical and endovascular exclusion.

Until now, only few articles have promoted primary endovascular techniques for SFAAs exclusion. For medium-to-low surgical risk patients, open surgery remains the gold standard for treatment is most of the cases. However, the availability of optimal autologous vein conduit and the existence of a good lasting tibial and pedal distal run-off (spared from repetitive micro-embolic episodes) are variable, and each plays a major decisional factor in selecting and applying most appropriate technique for revascularisation.

Endovascular Techniques (EVT) are reputed for their low invasiveness, high reproducibility, low perioperative risk, and comparative patency and limb salvage rates as surgery at 1-2 years [5-8]. Nevertheless, by affording shorter hospital stay and quicker rehabilitation of patients, EVT gains applicability in current vascular practice including also the redo-surgery cases, although holding more complex occlusive disease patterns, in high-risk surgical, and anesthesiologic patients [2,5,7,8].

Conclusion

Endovascular SFA true aneurysm exclusion, associating SFA recanalisation represents a safe, low aggressive, and effective therapeutic option, with particular benefit in high-risk perioperative (ASA IV) patients. In parallel with indisputable surgical approaches, the Endovascular techniques appear as encouraging, low aggressiveness, and safe therapeutic solutions, especially for high risk (ASA IV-V), patients.

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