



# Successful Treatment of a Superficial Femoral Artery Pseudoaneurysm with Balloon Tamponade

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The development of post-catheterization arterial pseudoaneurysms is one of the most common vascular access complications following angiographies and endovascular interventions. Different therapeutic options to treat these lesions have been used. We herein report the case of a 79-year-old woman who was referred to our service for evaluation with a post-catheterization superficial femoral artery pseudoaneurysm measuring 4 cm. Owing to the anatomical location of the arterial pseudoaneurysm and the patient's refusal to undergo open surgery, we treated the lesion using an endovascular approach with a balloon tamponade. The procedure was successful, and the patient recovered well and was discharged from the hospital without complications. At 6-month follow-up she remained symptom-free and without recurrence.

**Key Words:** Superficial femoral artery, Pseudoaneurysm, Balloon angioplasty

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## INTRODUCTION

The femoral artery remains to be the most common vascular access for both coronary and peripheral artery interventions [1,2]. As in any procedure, complications may occur, and these are typically associated with inadequate puncture techniques [3]. Examples of these complications are hematomas, arteriovenous fistulas, and pseudoaneurysms, of which pseudoaneurysm is the most frequent complication, with a reported incidence of 0.05% to 2% [4-6]. Therapeutic options and maneuvers to treat pseudoaneurysms are routinely performed, and their success rates depend on the complexity of the case. Examples of these techniques are as follows: ultrasonography-guided compression (USG-GC), direct thrombin injection, and open surgical repair [6]. We herein present the case of a patient who developed a superficial femoral artery (SFA) pseudoaneurysm after endovascular treatment for occlusive disease,

which was successfully treated with balloon angioplasty and tamponade.

## CASE

A 79-year-old woman with history of type 2 diabetes mellitus, ischemic heart disease, and end-stage renal disease presented to our institution with right foot paresthesia and right first toe necrosis 2 months prior to presentation. The patient was diagnosed with critical limb ischemia, and the ankle-brachial index on her right lower extremity was 0.3. She underwent a right SFA angioplasty with a 5×100 mm drug-coated balloon (Ranger; Boston Scientifics, Würselen, Germany) in a month prior to presentation at our institution, secondary to a 10 cm occlusive lesion extending from the proximal to the middle SFA. Three weeks later, she returned again due to worsening pain on her right first toe at rest and a second percutaneous angioplasty was

performed by the interventional cardiology team. Arterial puncture was performed with an 18-gauge needle in the proximal SFA, and a 6-Fr sheath was placed. Subsequently, diagnostic angiography revealed a SFA restenosis of >50%. The cardiologists decided to use a Supera self-expanding peripheral stent (Abbott, Santa Clara, CA, USA). The procedure was completed without perioperative complications. However, 24 hours later, the patient developed a pulsatile mass in her right thigh which was confirmed to be a right SFA pseudoaneurysm with a short neck measuring approximately 4 cm in diameter, with duplex ultrasonography.

Therapeutic options were discussed with the patient. The patient refused to undergo the proposed open surgical arterial repair. After taking into consideration the risk and benefits, we offered a minimally invasive approach using endovascular means. An antegrade puncture was performed with an 18-gauge needle in the proximal right common femoral artery. A 4-Fr sheath was placed, and the angiography revealed an SFA pseudoaneurysm (Fig. 1). The SFA lesion was crossed with a 0.018 in  $\times$ 250 mm guidewire and a 4-Fr hydrophilic, 100 cm long, diagnostic Berenstein catheter (Tempo Aqua, Cordis, Miami, FL, USA). A percutaneous transluminal angioplasty (PTA) with a 5 $\times$ 150 mm balloon catheter (Invatec Pacific Xtreme; Medtronic, Jacksonville, FL, USA) was inflated at 4 atm for 20 minutes (Fig. 2) over the arterial lesion, with a previous retraction of the 4-Fr sheath. During inflation, 1,000 units of heparin and 2 mL of normal saline were injected through the 4-Fr sheath and the balloon, to avoid proximal and distal thromboses. After balloon deflation, a final angiography revealed complete resolution of the pseudoaneurysm (Fig. 3), and 30 minutes of manual compression at the common femoral

artery was performed without complications. At 6-month follow-up, the patient was symptom-free and without recurrence of the pseudoaneurysm.

## DISCUSSION

Femoral artery pseudoaneurysms are the result of a failure in the sealing of arterial punctures, allowing blood to collect into the surrounding tissues resulting in the formation of a pseudocapsule; the hematoma acquires pulsatile characteristics that lead to the development of these lesions



**Fig. 2.** Right superficial femoral artery percutaneous transluminal angioplasty with a 5 $\times$ 150 mm balloon (Invatec Pacific Xtreme).



**Fig. 1.** Right limb arteriogram with a pseudoaneurysm of the right superficial femoral artery (arrow).



**Fig. 3.** Arteriogram obtained after superficial femoral artery percutaneous transluminal angioplasty.

[7]. A detailed physical examination of the patient should be completed to achieve the correct diagnosis. The presence of a palpable mass in the groin has been associated with a positive predictive value of 100% [6,8]. Some other clinical manifestations include bruits, thrill, and/or inguinal pain secondary to the compressive effect of this mass. Color Doppler ultrasonography is recommended for all cases, as this study can confirm the diagnosis, defining precisely the anatomical details, including the characteristics and size of the neck, and the sac length and its relationship with surrounding structures [9,10]. The presence of the “to-and-fro” waveform [11], which reflects the entry and exit of blood inside and outside the sac, is considered a pathognomonic finding in this pathology. The current treatment consists of closing the defect in the femoral artery wall [1]. In a case series reported in the literature, most small pseudoaneurysms closed spontaneously, although a cutoff point for which observation is advisable has been difficult to define [12].

Regarding the therapeutic interventions, two modalities have been used over the last two decades, namely USG-GC and direct injection of thrombin, each with their own advantages and disadvantages. USG-GC consists of direct compression of the pseudoaneurysm to the neck to induce thrombosis; although this simple maneuver represents the least invasive method, it usually requires >30 minutes of compression and is a painful procedure for most patients [13]. In addition, the recurrence rate with this procedure is considerably high (25%-35%), especially in patients receiving systemic anticoagulation or dual antiplatelet therapy concomitantly. The patient described herein was receiving dual antiplatelet therapy, because of which we did not consider and attempt this maneuver as an option [14]. Moreover, studies have shown that large pseudoaneurysms may recur after USG-GC [15]. Ultrasonography-guided thrombin injection consists of the application of this procoagulant agent inside the sac to induce thrombosis of the pseudoaneurysm [16]. The use of this technique is effective and safe in experienced hands, but complications, although rare, such as thrombosis and anaphylaxis may be life-threatening [17]. A previous study reported that patients with short pseudoaneurysm necks have the propensity to develop thrombosis of the native artery, which is a potentially catastrophic complication [18]. Our patient had multiple risk factors associated with this complication. Since she had a pseudoaneurysm with a short neck measuring 4-cm in diameter, taking the previous factors into consideration, we decided not to use the aforementioned method.

Endovascular techniques involving the use of covered stents, bare stents, and embolization with coils have been described, although these techniques should be avoided in

the femoral artery because it is an anatomical site of flexion [19]. Open surgical repair is recommended for specific clinical situations such as expanding hematomas, infected pseudoaneurysms, and compression of the femoral nerve. In these procedures, the rate of complications especially at the surgical site, such as bleeding, infection, and wound dehiscence are reported to be remarkably high [20]. Our patient refused to undergo an open surgery. After discussions, we offered a PTA balloon to tamponade the entrance of the pseudoaneurysm, with concomitant proximal and distal injections of heparin to avoid thrombosis. Our technique presents with a risk of thrombosis while the balloon is inflated to tamponade the hole in the artery. In addition, it confers a risk of secondary bleeding in response to the additional infusion of heparin during the balloon inflation. Nevertheless, a low-dose heparin should be administered to prevent bleeding.

In conclusion, our case illustrates a simple endovascular technique that might represent a successful option for patients with large pseudoaneurysms with short necks and a contraindication for open repair, or in patients who refuse open surgery.

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## CONFLICTS OF INTEREST

The authors have nothing to disclose.

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