Symptomatic superficial femoral artery pseudoaneurysm due to late stent fracture

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ABSTRACT

Late formation of pseudoaneurysm related to stent fracture is rarely described in the literature. We describe a case of spontaneous 8-cm femoral superficial artery pseudoaneurysm rupture that had developed from fracture of a stent implanted 3 years previously. Surgical repair was performed with fractured stent removal and reverse saphenous vein bypass. (J Vasc Surg Cases and Innovative Techniques 2020;6:106-9.)

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Although endovascular stenting in the superficial femoral artery (SFA) is well established for peripheral vascular disease, stent fracture is one of the complications that decrease the long-term patency of this treatment.[1-3] Late stent fracture can also lead to artery rupture and pseudoaneurysm formation; however, it occurs rarely. We describe a rare case of an 8-cm SFA pseudoaneurysm due to stent fracture 3 years from the index procedure performed for occlusive disease successfully managed with reverse saphenous vein bypass.

CASE REPORT

An 80-year-old man presented to the emergency department with a complaint of worsening symptoms of swelling, pain, and redness in the left thigh. The patient reported that the symptoms started a month earlier, without history of trauma, and he was evaluated at another center with the finding of deep venous thrombosis in the left popliteal vein on duplex ultrasound scan. Since then, he was prescribed rivaroxaban anticoagulation therapy, but the patient interrupted it after a few days. His past medical history included coronary artery bypass graft with left saphenous vein (2000), infrarenal open repair (2004), and peripheral artery disease treated by means of bilateral SFA stenting (2016) for short (<15 cm) TransAtlantic Inter-Society Consensus C lesions of the distal SFA. A past medical report described intimal implantation of one self-expanding stent (Absolute Pro; Abbot Vascular, Abbott Park, Ill) in the left distal SFA with postimplantation ballooning (Fig 1). All the procedures were performed in another hospital. Three follow-up duplex ultrasound scans within 3 years were available for review, and none showed an aneurysm at the level of stent implantation.

Physical examination on admission to our hospital revealed a tense pulsatile mass on the left thigh, painful with left lower limb edema. He was hemodynamically stable and apyretic; routine laboratory investigations showed normal white blood cell count, and C-reactive protein level was 43 mg/dL with normal coagulation parameters. Duplex ultrasound revealed an 8-cm pseudoaneurysm with a bidirectional, turbulent, swirling blood flow pattern with peripheral thrombosis. A communication was visible between the pseudoaneurysm and the distal stented SFA. Computed tomography angiography of the left lower extremity confirmed the voluminous pseudoaneurysmal saccular dilation of the SFA at the level of Hunter canal as a result of the stent fracture (Fig 2). The runoff vessels were all patent to the foot, and the superficial vein was compressed by the aneurysm with thrombosis of the distal popliteal vein. The patient was taken immediately to the operating room for open repair of the pseudoaneurysm. The patient signed the institutional informed consent for the procedure and the publication of his clinical information and images.

Above- and below-knee popliteal incisions were performed to identify and to clamp the below-knee popliteal artery and proximal SFA. The pseudoaneurysm was located at Hunter canal at the level of the fractured stent. A 2-cm tear of the SFA was found perfusing the pseudoaneurysm, and backbleeding from the collateral was controlled with two Pruitt catheter endoclamps. The stented artery was resected, and the distal SFA and the above-knee popliteal artery were ligated. The left limb was revascularized by means of a left SFA (end-to-end) to below-knee popliteal artery (end-to-side) bypass using a reversed great saphenous vein (from the right limb; Fig 3). The postoperative course was uneventful with the exception of limb swelling due to venous thrombosis, which was treated with anticoagulation

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Fig 1. A, Intraoperative angiography during the index procedure. Implantation of 6-mm by 10-cm-long superficial femoral artery (SFA) stent (Absolute Pro; Abbot Vascular, Abbott Park, Ill). **B,** Completion angiography shows revascularization of distal femoral artery extending to proximal popliteal artery in the absence of filling defects. Proximal and distal stent markers are indicated by the *arrows*.

therapy. The swelling progressively improved, and 6-month ultrasound evaluation revealed patent bypass and resolution of the deep venous thrombosis.

DISCUSSION

Stenting of the SFA has increased exponentially in recent years to treat peripheral artery disease and now represents >50% of the revascularizations performed in this segment in many vascular surgery services.[4] However, the high rates of stent fracture related to these procedures and their clinical impact remain a concern.[2] According to the literature, the incidence of stent fracture may reach 65%, and high rates are related to endovascular treatment of long and distal femoropopliteal lesions.[2,3] The clinical impact of these stent fractures is still a matter of debate.[2] According to retrospective and prospective cohort studies, stent fractures in the femoropopliteal segment could lead to recurrence of symptoms, in-stent restenosis, and stent thrombosis.[2,4,5]

The formation of pseudoaneurysm due to stent fracture is limited to a few case reports.[1,6] Different mechanisms of pseudoaneurysm formation after stent implantation are reported, such as ballooning with rupture of the plaque (usually with early onset) or stent fracture due to the continuous stress (compression, extension, bending, and twisting) between the nitinol stent fragments and the arterial wall structure.[6] Another risk factor is subintimal stent implantation leading to a more fragile arterial wall that is more likely to rupture if stent fracture occurs.[6]

Rahimi et al[1] presented a case report of symptomatic pseudoaneurysm formation caused by SFA stent fracture treated successfully with a covered stent. The authors advocated endovascular treatment as a reasonable strategy in patients with multiple comorbidities. Tsuji et al[7] described another case of pseudoaneurysm formation after popliteal artery stent fracture. The patient was successfully treated using autologous

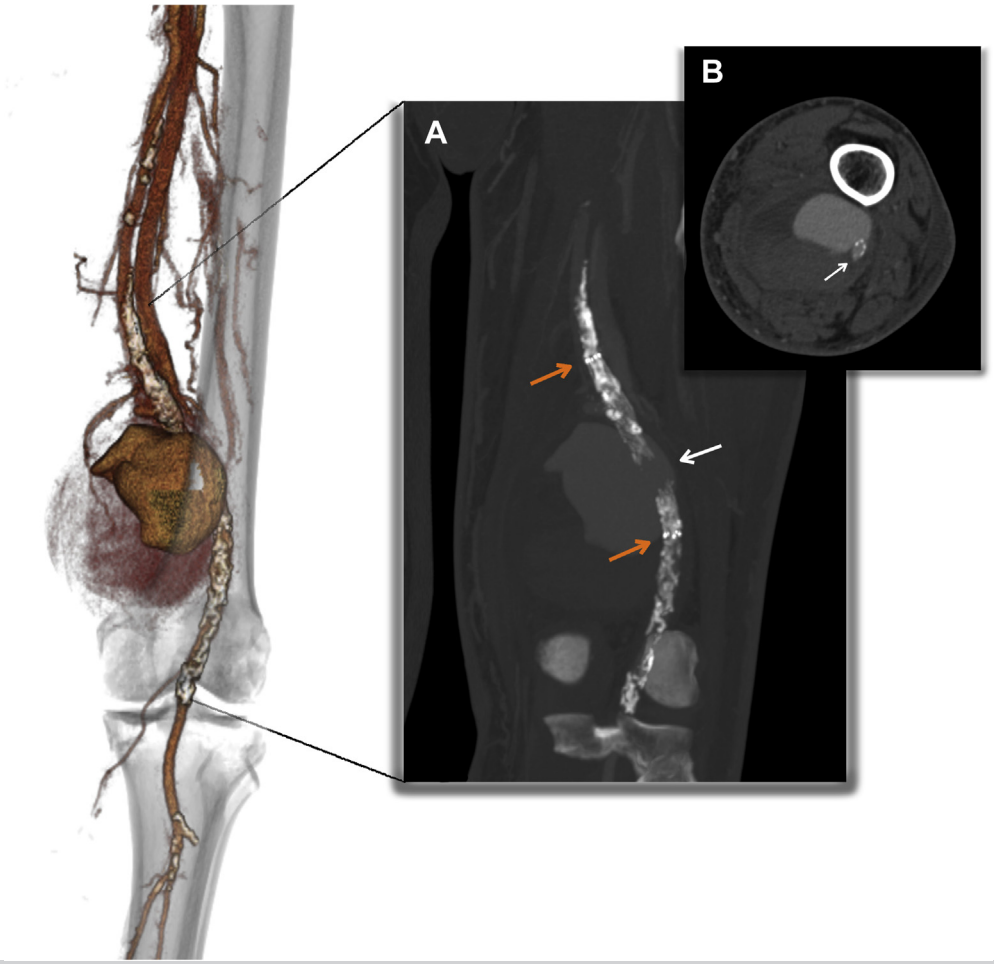

Fig 2. Volume rendering and multiplanar reconstruction **(A)** of preoperative computed tomography image of the left lower limb showing a stent fracture of the distal superficial femoral artery (SFA; *white arrow*) with a voluminous pseudoaneurysm at the level of Hunter canal **(B)**. Note that the vein below the dilation is completely thrombosed. Proximal and distal stent markers are indicated by *orange arrows*.

saphenous vein graft. In our case, the dimensions of the pseudoaneurysm with vein compression lacked anatomic suitability; absence of healthy SFA or popliteal arteries for a landing zone due to heavy calcification and the likelihood of a possible mycotic cause warranted an open traditional repair.

An important point to be debated is the interval between the index procedure, stent fracture occurrence, and pseudoaneurysm formation. Horimatsu et al[8] reported a case of spontaneous pseudoaneurysm rupture of the SFA that had developed because of subintimal stent placement 4 years previously. Rahimi et al[1] reported that in their case, the stent was implanted 5 years earlier. The patient described in our case had undergone SFA stenting 3 years before. Most of the prospective and retrospective studies were limited to a 1- or 2-year follow-up after stent implantation in the SFA and no further follow-up had been done yet.[2,9,10] These case reports demonstrate the need for continual follow-up of those patients who have undergone endovascular revascularization of the SFA with stent implantation. The relationship between time of formation of pseudoaneurysms and stent fracture is unknown. Further studies should be carried out to investigate these aspects.

CONCLUSIONS

Spontaneous pseudoaneurysm formation due to stent fracture of the SFA is rarely reported and can occur lately. Surgical treatment with pseudoaneurysm decompression and limb revascularization with autologous reversed saphenous vein is suggested

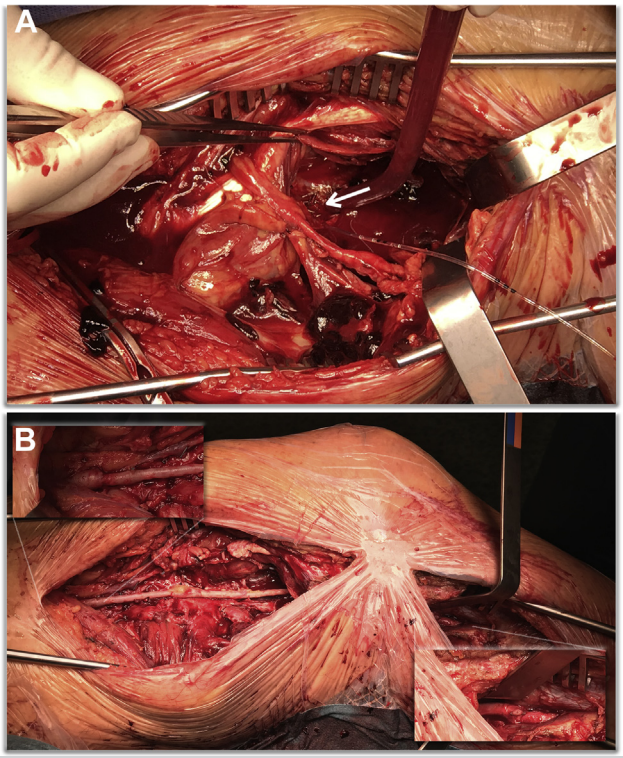

Fig 3. Revascularization of the left lower limb. **A,** Opening of the aneurysmal sac and collateral bleeding control with a Pruitt catheter (*arrow*). Note the stent fracture. **B,** End-to-end anastomosis of the left superficial femoral artery (SFA) to below-knee popliteal artery (end-to-side) bypass using a reversed great saphenous vein (from the right limb).

when large aneurysms are detected with associated deep venous thrombosis. Lifelong surveillance of patients with endovascular lower limb revascularization is recommended.

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