Superficial Femoral Artery Rupture "Bailed Out" Using Novel Design of Supera Stent

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Abstract

Peripheral artery disease is a condition that occurs due to narrowing or occlusion of arterial lumen usually secondary to atherosclerosis. Endovascular treatments are minimally invasive procedures that have become popular for recanalization of such calcified/sclerosed arteries. However, heavily calcified arteries make these procedures challenging and are more prone to complications like balloon rupture and bleeding. Herein, we report a novel case of rupture of superficial femoral artery and its management using self-expanding Supera stent.

Keywords

- Supera stent
- SFA
- calcified plaques
- peripheral artery disease
- rupture

Introduction

Treatment of heavily calcified peripheral arterial disease is challenging due to chances of rupture and bleeding. We present a case of iatrogenic rupture of superficial femoral artery which has been treated with Supera stent.

Case Description

A 61-year-old female, a known case of rheumatoid arthritis and diabetes mellitus, came with complaints of bilateral intermittent claudication for the last 8 months. Computed tomographic (CT) angiography was performed that revealed extensive calcified plaques predominantly in the superficial femoral artery (SFA), popliteal artery (PA) and dorsalis pedis arteries. We planned for angioplasty repair.

Aortogram with bilateral lower limb angiogram showed extensive long segment dense calcification of entire SFA and PA on both sides. Approximately 5 cm of mid-right SFA showed heavily calcified dense nodular mural plaques causing critical stenosis of ~95% (►**Fig. 1**). Bilateral anterior tibial artery occlusions were noted with patent bilateral posterior tibial and peroneal arteries.

A 7 French crossover sheath was placed using left femoral retrograde access with its tip in the right external iliac artery. A 5 French Headhunter Catheter (MERIT OEM, South Jordan, Utah, USA) and a coaxially introduced Progreat microcatheter (TERUMO, Tokyo, Japan) were used to cross the stenotic segments. The segments were predilated with a 2.5 × 20mm coronary balloon and then with a 4 × 16mm balloon (Armada, Abbott, Illinois, USA). A 60% arterial caliber restoration was seen postdilatation. Extensive calcification prompted use of Supera stent in the patient.

During predilatation with a 5 × 60 mm stent (Armada, Abbott USA Balloon), patient complained of pain and an angiogram was performed, which confirmed a local perivascular bleed (►**Fig. 2**). Immediately, a balloon was placed across the ruptured site and inflated at 4 mm atmospheric pressure for tamponade effect combined with external local

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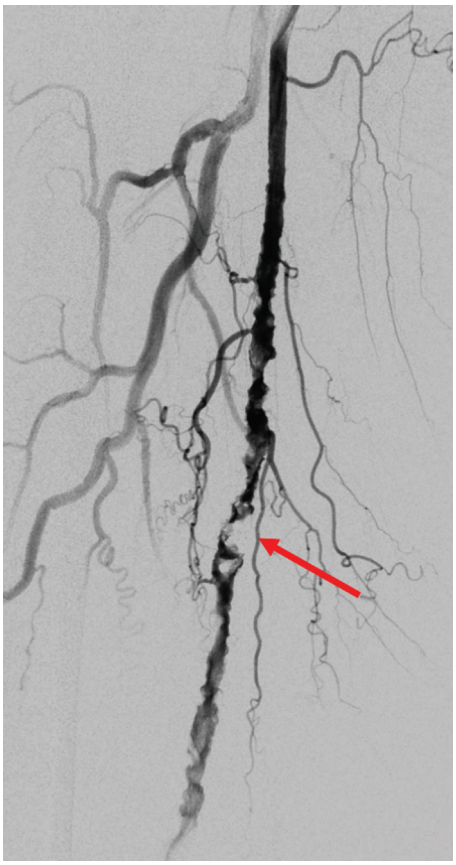

Fig. 1 Superficial femoral artery (SFA) angiogram: Diffuse and long-segment atherosclerotic wall calcification of SFA causing multifocal moderate-to-severe narrowing, with a focus of severely calcified plaque causing critical stenosis (*arrow*).

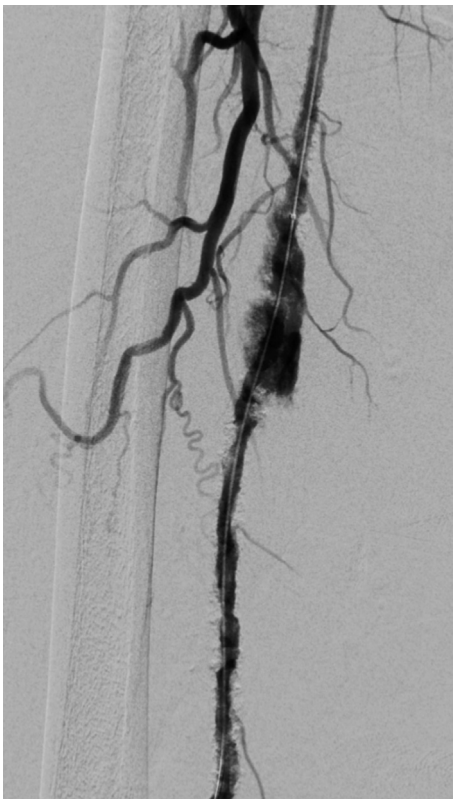

Fig. 2 Post-balloon-plasty angiogram showed extravasation of contrast from mural nodular calcification site.

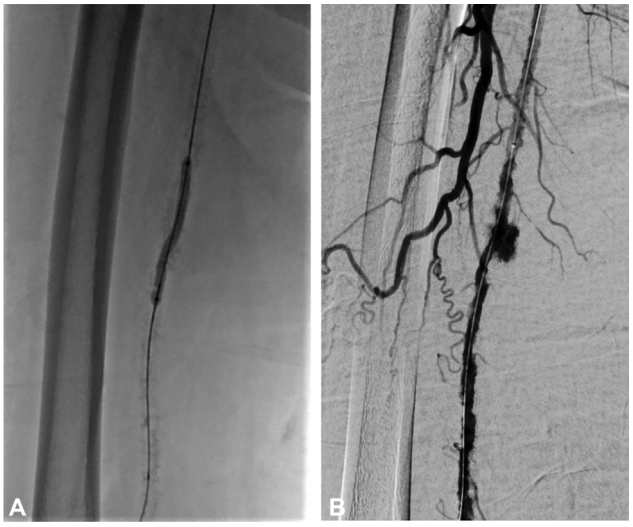

Fig. 3 (**A**) Fluoroscopic image showing tamponade of the vessel rupture site with an angioplasty balloon. (**B**) Post-angioplasty persistent extravasation was noted.

pressure with blood pressure cuff for 15 to 20 minutes (►**Fig. 3A**). However, the bleeding did not stop (►**Fig. 3B**).

As long-term patency of stent grafts is known to be poor in this location with calcified plaques, a decision to not place a stent graft was taken. Instead, a 4.5 × 80 mm Supera stent was placed, across the ruptured site, in a manner to compactly assort the cells in the stent across the bleeding site following which good distal run off up to the foot was seen with no bleeding from the vessel (►**Figs. 4**–**5**).

Follow-up after 20 months showed good flow across the stent and distal circulation.

Discussion

Peripheral artery disease (PAD) secondary to atherosclerosis commonly involves femoral and PAs, resulting in diminished blood supply to lower limbs.[1] While most patients are asymptomatic, a few develop intermittent claudication and these patients are more prone to developing complications like ulcers and gangrene that may require amputation.[2] As compared with age and sex-matched controls, rheumatoid arthritis patients show early onset diffuse calcification involving numerous vascular beds.[3] An extensive study by Giles et al[4] on coronary vessel calcification and rheumatoid arthritis suggests positive (directly proportional) association between raised cytokines and development of arterial sclerosis.

Though initial screening of PAD is done by using the ankle–brachial pressure index, medial calcification leading to inaccurate ankle–brachial index has significantly reduced the sensitivity of the test.[5] Duplex ultrasound, CT angiography, and magnetic resonance angiography are other noninvasive imaging techniques, but catheter angiography is considered the gold standard method for evaluation in

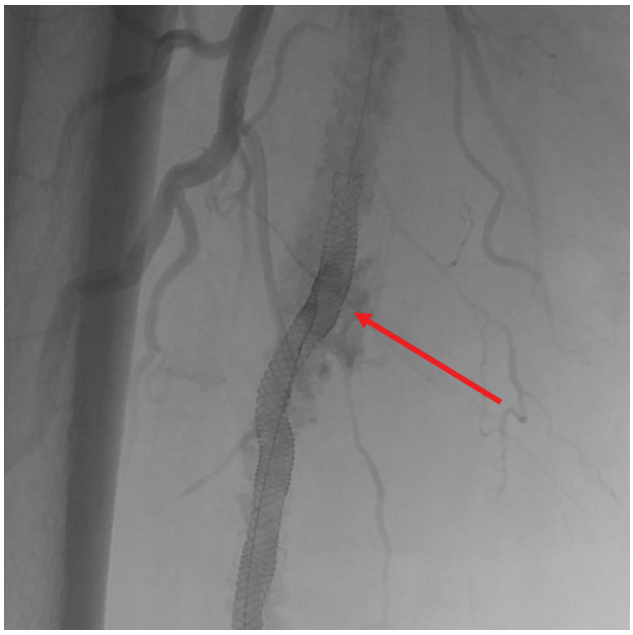

Fig. 4 Post-Supera stent placement showing compact arrangement of struts at rupture site (*arrow*).

Fig. 5 Final angiogram: No extravasation from ruptured site with good flow across the stent.

adjunction with digital subtraction techniques that improve image quality.

The various endovascular methods for revascularization in peripheral vascular disease include percutaneous transluminal angioplasty (PTA) and stenting, intra-arterial thrombolysis, thrombectomy, and atherectomy. Septic symptoms, microembolization to foot, occlusion of artery, hematomas, balloon rupture, and intimal damage are common PTA-associated complications. The patient described in this case report had ruptured vessel post-PTA.

Guidelines suggest the use of PTA for short segment SFA calcification; however, stent placement is required if longer segments are involved.[6] Vienna randomized controlled studies also suggested lesser complications such as restenosis, with the use of self-expanding stents for the treatment of SFA atherosclerosis.[7] Data from studies have found Supera stents very efficient and superior to other traditional nitinol stents.[8,9] The use of an interwoven stent provides better freedom from in-stent restenosis and major adverse events; Supera stent is one such stent designed to reduce the risk of stent fracture and for better patency across the joints.

Although Supera stents are conventionally made for the treatment of atherosclerotic peripheral arteries, its use is not restricted to it. The stent has previously been utilized for the successful treatment of PA aneurysms as described by Tessarek[10] and iatrogenic perforation as mentioned by Eisele et al.[11] The control of iatrogenic rupture involved the use of overlapping insertion of two stents; however, the unique design and longitudinal flexibility offered by a single Supera stent can be used to control a focal arterial rupture. We used this property of Supera's dynamic architecture by closely arranging the struts of the stent at the focal ruptured site for controlling bleeding from SFA, thus successfully averting the use of overlapping stent and possibly reducing the chances of restenosis.

Stent grafts have a regular nitinol stent as a metallic scaffold and are expected to have poor long-term patency in such diseased vessels, hence making Supera stent a potential onsite alternative for stent grafts.

Conclusion

We report a case of placement of self-expanding Supera stent for the treatment of SFA calcification as well as iatrogenic rupture caused by balloon expansion. The use of the design of the stent and the arrangement of its struts can be a novel alternative to stent grafts and surgical management for the treatment of onsite arterial perforations.

Conflict of Interest
None.

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