



Crossing the Long Occlusion: Combined Antegrade-Retrograde Rendezvous via Mid-SFA Puncture with an Overview of Hybrid Recanalization Techniques

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Abstract

Long-segment infrainguinal occlusions challenge endovascular interventions. When standard antegrade and retrograde techniques fail, hybrid approaches become vital. We report a case of critical limb ischemia secondary to long-segment superficial femoral artery (SFA) and P1 popliteal occlusion. After failed antegrade recanalization and unsafe retrograde access, a mid-SFA puncture enabled retrograde guidewire entry and successful reentry. Antegrade snaring and balloon angioplasty followed. Mastery of hybrid methods—SAFARI (subintimal arterial flossing with antegrade-retrograde intervention), CART, reverse CART (controlled antegrade and retrograde tracking), PIERCE (percutaneous direct needle puncture of calcified plaque), and wire rendezvous—is crucial for success in complex peripheral interventions.

Keywords

- ▶ wire rendezvous
- ▶ retrograde access
- ▶ hybrid techniques

Introduction

Long-segment infrainguinal arterial occlusions often pose considerable challenges to endovascular revascularization. In cases where standard antegrade approaches fail, retrograde and combined antegrade-retrograde (“rendezvous”) techniques are increasingly utilized to achieve successful crossing and recanalization. This report describes a successful hybrid recanalization using mid-superficial femoral artery (SFA) puncture and rendezvous technique, along with a concise review of evolving hybrid strategies in the management of complex peripheral arterial occlusions.

Case Report

An 85-year-old male patient presented with nonhealing ulcer in the hind foot since 1 month (Rutherford category 5

ischemia). The patient had significant cardiovascular risk factors, including a 20-year history of smoking, chronic alcoholism, poorly controlled hypertension, and diabetes mellitus. The preprocedure ankle-brachial index (ABI) was 0.35. Computed tomography angiogram confirmed a long-segment occlusion of the right superficial femoral artery (SFA) from the origin and P1 segment of popliteal artery. The P2 popliteal was reformed by collaterals (▶ **Fig. 1**).

A retrograde puncture of the contralateral common femoral artery was performed and a crossover sheath placed. Sheath angiogram revealed complete occlusion of the right SFA at the origin with hypertrophied collaterals. The SFA stump was not visible. Multiple attempts at antegrade crossing using standard guidewires failed, with the wire entering a subintimal plane at the SFA ostium without any advancement or successful reentry distally.

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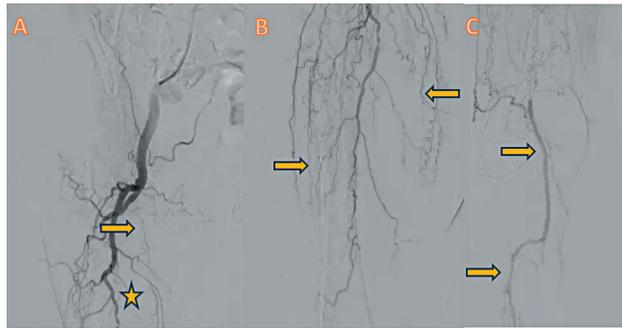


Fig. 1 (A) Initial external iliac artery angiogram demonstrating complete occlusion of superficial femoral artery (SFA) from the ostium (arrow) with hypertrophied profunda and collaterals (asterisk). (B) Extensive collaterals in the thigh region (arrows). (C) Reformation of the P2 popliteal artery by collaterals and single anterior tibial artery (ATA) runoff (arrows).

The P2, P3 popliteal was assessed for retrograde access, but the vessel was heavily calcified and markedly attenuated. Hence, the plan was abandoned and a combined antegrade-retrograde approach was then pursued.

A mid-SFA puncture was performed under ultrasound guidance and an 18G needle was punctured and 035J tip Terumo guidewire was passed retrogradely, which could cross the SFA ostium with successful luminal reentry in the right external iliac artery.

The retrograde wire was successfully snared from the antegrade sheath in the right external iliac artery. After snaring, the retrograde needle was removed carefully, maintaining guidewire position. Antegrade insertion of 4f TERUMO Glide catheter was done and externalized guidewire was carefully withdrawn and reversed to cross the needle puncture site into the P2 popliteal artery. After confirming the intraluminal position of the catheter in the P2 popliteal artery, antegrade balloon angioplasty was performed (→ Fig. 2).

Completion angiography demonstrated excellent luminal patency without residual stenosis or distal embolization. No flow-limiting lesions were noted. There was no extravasation from the needle puncture site (→ Fig. 3). Postprocedure, the

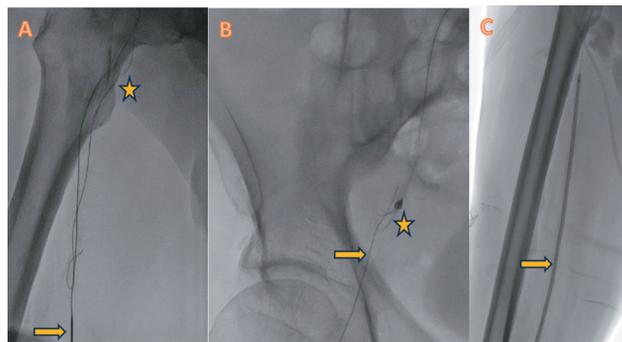


Fig. 2 (A) An 18G needle puncture of the mid-superficial femoral artery (SFA) (arrow) with retrograde 035 wire reaching the antegrade wire subintimally (asterisk). (B) Reentry in the right distal external iliac artery (arrow) with snaring from the contralateral crossover sheath (asterisk). (C) Antegrade balloon angioplasty of SFA (arrow).

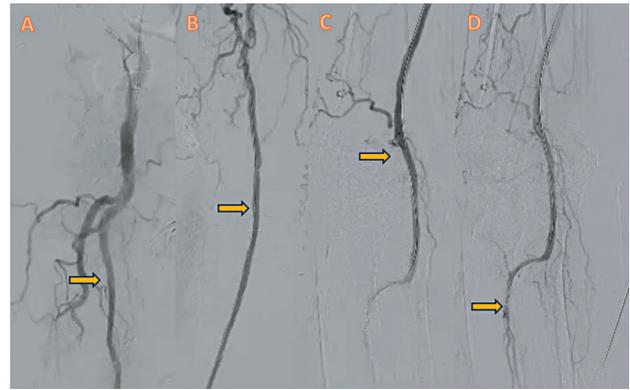


Fig. 3 Final angiogram demonstrating complete recanalization of the proximal superficial femoral artery (SFA) (A), mid and distal SFA (B), and P1 popliteal artery (C), with patent single anterior tibial artery (ATA) runoff (D, arrows).

patient had a palpable distal pulse and ABI improved to 0.82. He was discharged on dual-antiplatelet therapy.

At 3-month follow up, there was progressive healing of hind foot ulcer, with complete healing of the ulcer at 6 months.

Discussion

Combined antegrade and retrograde recanalization strategies have become increasingly important for treating long-segment chronic total occlusions (CTOs) in infrainguinal and infrapopliteal vessels, especially when standard antegrade approaches fail. Retrograde techniques can significantly increase the success rates in difficult cases by providing an alternative pathway for wire passage and lumen reentry.¹

Retrograde puncture options include distal SFA, popliteal artery, tibial arteries, and pedal arteries. The choice depends on the lesion location, vessel quality, and available access sites.² Retrograde access is typically performed under fluoroscopic, duplex ultrasound, or roadmap guidance, and techniques may include direct puncture or open surgical cutdown. When combined with antegrade techniques, retrograde access can facilitate successful reentry into the true lumen, significantly improve procedural success, reduce procedural time, allow completion of the procedure in a controlled manner, and decrease the need for surgical bypass in complex infrainguinal occlusions.

The following are the specialized techniques for combined antegrade-retrograde recanalization:

SAFARI technique (subintimal arterial flossing with antegrade-retrograde intervention): Introduced for infrapopliteal CTOs, SAFARI involves gaining both antegrade and retrograde access into the subintimal space.³ A retrograde wire is advanced to meet the antegrade wire, often utilizing snaring techniques for wire externalization.

CART technique (controlled antegrade and retrograde tracking): Primarily developed for coronary CTOs, CART involves antegrade balloon inflation within the occluded segment to enlarge the subintimal space, facilitating retrograde wire passage into the true lumen.⁴

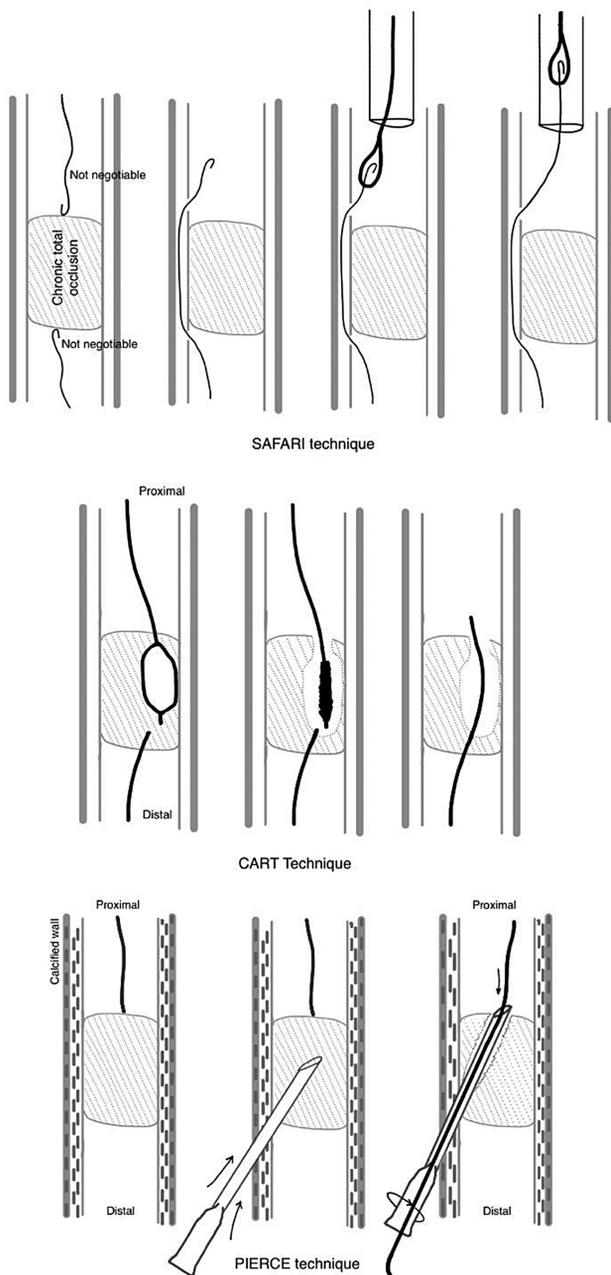


Fig. 4 Schematic illustrations of SAFARI (subintimal arterial flossing with antegrade-retrograde intervention), CART (controlled antegrade and retrograde tracking), and PIERCE (percutaneous direct needle puncture of calcified plaque) techniques.

Reverse CART: A modification of the CART technique where the retrograde wire creates the initial subintimal space, followed by antegrade balloon dilatation to enable wire passage.

PIERCE technique (percutaneous direct needle puncture of calcified plaque): Useful when heavily calcified occlusions resist wire or device passage. A needle is used to directly puncture the calcified plaque or subintimal channel to allow device advancement or facilitate rendezvous.

WIRE Rendezvous technique: A straightforward method where a retrograde wire is inserted into the subintimal space and is then captured antegrade, often using a snare.⁵ Particularly effective when retrograde access into the true lumen is difficult. **► Fig. 4** demonstrates schematic diagrams of SAFARI, CART, and PIERCE techniques.

In our case, the mid-SFA puncture combined with the wire rendezvous technique provided a simple, effective solution for long-segment SFA occlusion recanalization without the need for tibial access or complex reentry devices.

Conclusion

The combined antegrade-retrograde wire rendezvous technique is a valuable tool in the endovascular treatment of complex, long-segment SFA occlusions. Familiarity with combined access strategies and hybrid techniques such as SAFARI, CART, reverse CART, PIERCE, and wire rendezvous can significantly enhance technical success rates and optimize patient outcomes in peripheral endovascular interventions.

Conflict of Interest

None declared.

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