

Sheathless Retrograde Anterior Tibial Artery Approach for Superficial Femoral Artery Recanalization After Failed Antegrade Crossing

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Abstract

While antegrade crossing remains the standard first-line strategy for endovascular treatment of superficial femoral artery (SFA) chronic total occlusions (CTOs), technical success is often hindered in long-segment and complex lesions, particularly when guidewires fail to re-enter the distal true lumen. In such cases, distal retrograde access provides a valuable alternative. We report a successful retrograde intervention in a 56-year-old woman presenting with a long-segment SFA CTO. Initially, we attempted an antegrade approach via the contralateral femoral artery. Despite escalating guidewire support, we could not secure access to the distal true lumen. Consequently, we pivoted to a percutaneous, ultrasound-guided retrograde access through the distal anterior tibial artery (ATA). To minimize vessel trauma, a sheathless technique was utilized. The occlusion was crossed retrogradely using a Gladius MG guidewire supported by a FINECROSS microcatheter. The retrograde wire was then advanced into a 6F Judkins guiding catheter positioned in the right common femoral artery and successfully externalized. We completed the procedure with antegrade predilatation and drug-coated balloon (DCB) angioplasty. Post-procedural angiography demonstrated excellent distal flow with no major access-site complications. At three months, the patient's claudication had completely resolved, and a strong dorsalis pedis pulse was palpable. This case highlights that when conventional antegrade crossing fails in complex SFA CTOs, a sheathless retrograde approach via the distal ATA is a highly practical and safe bailout strategy to achieve successful revascularization.

Keywords: Peripheral arterial disease; Superficial femoral artery; Chronic total occlusion; Retrograde approach; Anterior tibial artery; Endovascular treatment

Introduction

Endovascular revascularization of chronic total occlusions (CTOs) in the femoropopliteal segment is technically challenging, especially when dealing with long and heavily diseased lesions. For years, the TASC II classification guided therapeutic strategies based on anatomy [1]. However, rapid advances in endovascular tools and crossing techniques have significantly broadened the indications for percutaneous treatment of these complex lesions. In everyday practice, the antegrade approach is the default initial strategy for femoropopliteal CTOs. Yet, in cases involving extensive occlusion lengths, operators frequently encounter subintimal tracking and fail to re-enter the distal true lumen. The morphological features of the proximal and distal caps can also

make conventional crossing impossible. Current infrainguinal CTO crossing algorithms clearly emphasize that when antegrade attempts are exhausted, operators should quickly consider a distal retrograde access as an alternative strategy [2]. The retrograde tibiopedal approach involves accessing the distal tibial or pedal arteries to cross the occlusion from a distal-to-proximal direction. This technique has proven highly effective for infrainguinal CTOs refractory to antegrade crossing. In a multicenter registry by Walker et al., procedural success for CTO crossing following tibiopedal access reached 85.3%, maintaining a solid 82.8% success rate even in the challenging subset of patients with prior failed antegrade attempts [3]. Approaching the lesion from its distal aspect often facilitates easier entry into the true lumen, as the distal cap morphology is typically softer and more favorable

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than the proximal cap. That said, the small caliber of distal arteries demands careful procedural planning to avoid access-site complications like vessel injury, profound spasm, or iatrogenic occlusion [2,4]. In this report, we detail the successful recanalization of a long-segment SFA CTO that failed antegrade crossing, utilizing a sheathless retrograde approach via the distal anterior tibial artery (ATA).

Case Presentation

A 56-year-old woman presented to our clinic with a six-month history of right lower extremity claudication that severely limited her lifestyle. She reported reproducible calf and thigh pain starting after roughly 50 meters of walking, consistent with Rutherford category 3 symptoms [2]. Her medical history included diabetes mellitus, hyperlipidemia, and a prior pulmonary embolism. Physical examination revealed a palpable right femoral pulse, but absent popliteal and distal pedal pulses. The right foot was mildly cool to the touch without any ischemic ulcers. Pre-procedural computed tomography (CT) angiography showed a CTO of the right SFA starting at the adductor canal, extending for approximately 15 cm. The popliteal artery immediately distal to the occlusion lacked distinct contrast opacification. Distally, the anterior tibial and dorsalis pedis arteries showed faint collateral reconstitution, while the posterior tibial and peroneal arteries lacked significant contrast enhancement (Figure 1). We decided to proceed with endovascular therapy (Figure 2). After obtaining contralateral access via the left femoral artery, a 6F Judkins guiding catheter was advanced over the aortic bifurcation and positioned in the right common femoral artery.

We first attempted antegrade crossing of the SFA occlusion using Gladius MG and V18 guidewires. When these failed to cross, we escalated to stiffer, more penetrative wires (Astato 30 and Astato 40). Despite these maneuvers, the wires repeatedly tracked into the subintimal space, and distal true lumen re-entry could not be achieved (Figure 3). Recognizing the failure of the antegrade strategy, we shifted to a retrograde approach. The distal ATA was selected as the target. Under direct ultrasound guidance, we percutaneously punctured the ATA using a standard Seldinger needle typically used for radial access. To minimize trauma to this small-caliber vessel, we deliberately performed the procedure without inserting a vascular sheath (Figure 4A, Figure 4B). Once access was secured, we advanced a guidewire through the distal ATA and reached the SFA occlusion retrogradely, supported by a FINECROSS microcatheter (Figure 5). Using a Gladius MG guidewire, we carefully crossed the occlusion from distal to proximal. We then navigated the retrograde wire directly into the 6F Judkins guiding catheter in the right common femoral artery and externalized it through the contralateral femoral access site (Figure 6). Notably, a snare was not required for this maneuver.

With a stable wire circuit established, we converted back to an antegrade approach. We performed sequential predilatation along the SFA using 2.0×80 mm, 3.0×120 mm, and 4.0×100 mm balloon catheters.



Figure 1: Pre-procedural computed tomography angiography demonstrating a long-segment chronic total occlusion of the right superficial femoral artery, with faint collateral reconstitution in the distal vascular bed.



Figure 2: Initial angiographic evaluation confirming the proximal cap of the occlusion and indicating the decision to proceed with endovascular treatment.



Figure 3: Failed antegrade crossing attempts showing the guidewire repeatedly tracking into the subintimal space without successful re-entry into the distal true lumen.



Figure 4A, 4B: Ultrasound-guided percutaneous puncture of the distal anterior tibial artery (ATA) using a sheathless technique to minimize procedural vessel trauma.



Figure 5: Retrograde crossing of the superficial femoral artery occlusion using a FINECROSS microcatheter and a guidewire advanced through the distal ATA.

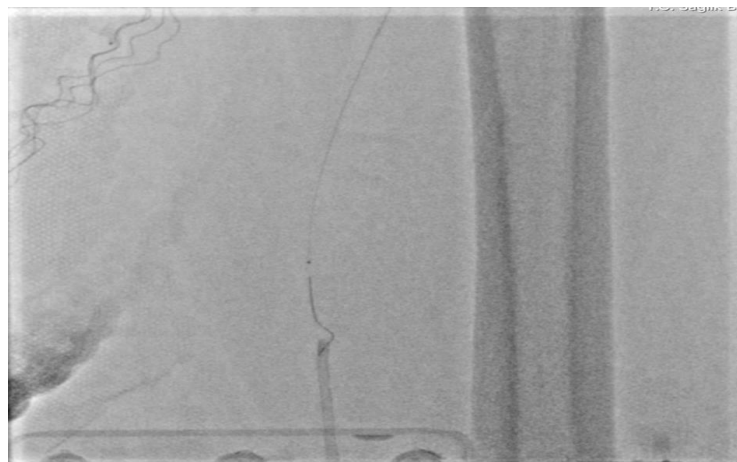


Figure 6: Externalization of the retrograde guidewire through the 6F Judkins guiding catheter positioned in the right common femoral artery.





Figure 7A, 7B: Antegrade therapeutic intervention showing sequential predilatation followed by the application of a drug-coated balloon across the occluded segment.

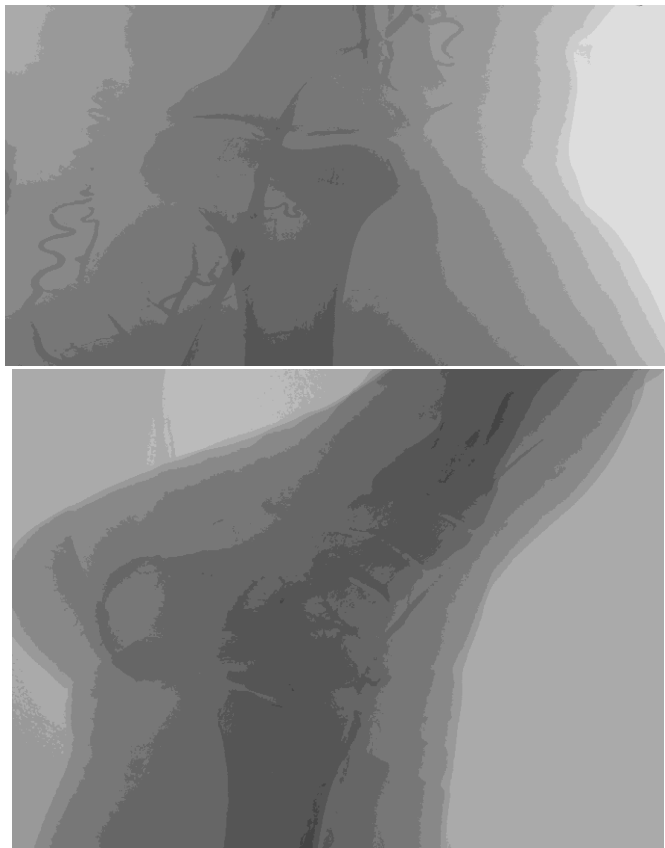


Figure 8A, 8B: Final control angiography revealing successful recanalization with robust antegrade flow into the distal vascular bed and no significant residual stenosis.

Definitive treatment was then delivered with a 5.0×150 mm drug-coated balloon (Figure 7). Final control angiography showed excellent antegrade flow into the distal vascular bed with no significant residual stenosis or flow-limiting dissection along the SFA (Figure 8). We achieved hemostasis at the distal ATA access site with simple manual compression. There were no access-site

complications such as hematoma, pseudoaneurysm, distal embolization, or acute vessel occlusion. The patient had an uneventful recovery. At her three-month clinical follow-up, she reported complete resolution of her right lower extremity claudication with significantly improved walking distance, and her dorsalis pedis pulse was fully palpable.

Discussion

The antegrade approach remains the undisputed first-line method for treating femoropopliteal CTOs endovascularly. However, technical failure is common in long-segment occlusions, largely driven by guidewire subintimal tracking and the inability to re-enter the true lumen. Modern infrainguinal CTO crossing algorithms stress that thoroughly evaluating the proximal and distal cap anatomy, the collateral network, and the distal reconstitution zone is critical for planning the best crossing strategy [2]. When the antegrade wire repeatedly tracks subintimally, retrograde tibiopedal access offers a distinct mechanical advantage by allowing the operator to approach the lesion from a different, often more favorable, angle. Montero-Baker et al. demonstrated the power of this strategy, achieving an 86.3% successful revascularization rate using retrograde approaches in complex popliteal and tibioperoneal occlusions that had failed antegrade crossing. While their focus was primarily below-the-knee, the technical principles apply strongly to complex SFA interventions [4]. The broader utility of tibiopedal access for infrainguinal CTOs was clearly established by Walker et al. in a multicenter registry of 197 patients. They reported a successful access rate of 93.4% and an overall crossing success rate of 85.3%. Crucially, crossing success remained high (82.8%) even among patients with prior failed antegrade attempts [3]. These data confirm that distal retrograde access is a rational and highly effective bailout strategy, not just a procedure of last resort.

Our case perfectly mirrors this clinical scenario. After escalating our antegrade wire choices without success, securing access via the distal ATA allowed us to retrogradely cross the occlusion and externalize the wire through the proximal guiding catheter. This maneuver—endorsed by recent expert consensus as a definitive technique following retrograde crossing—efficiently re-establishes a stable wire tract, paving the way for standard antegrade balloon therapy [2]. A key technical highlight of this case was our decision to puncture the distal ATA using a sheathless technique. The delicate nature and small caliber of distal tibial and pedal arteries make them highly susceptible to procedural trauma. A 2024 international position statement specifically advocated for sheathless approaches in tibial/pedal interventions to preserve the structural integrity of distal run-off vessels in suitable candidates [5]. Previous literature also supports the safety and feasibility of sheathless retrograde tibial access, a

strategy that directly contributed to our zero access-site complication rate [6,7]. Still, operators must respect the inherent risks of retrograde distal access. Working in small-diameter vessels carries the risk of profound spasm, dissection, perforation, or iatrogenic occlusion. This risk is amplified if the target vessel is the primary or sole outflow to the foot. Therefore, detailed pre-procedural anatomical assessment is mandatory. The retrograde approach should be reserved for carefully selected cases where antegrade crossing has failed, rather than used as a routine primary strategy [2,3,5]. This report shares the limitations of any single-center case study; the technical success we observed cannot automatically be generalized to all SFA CTOs. Additionally, our three-month follow-up limits conclusions about long-term patency or the need for target lesion revascularization. Nevertheless, this case clearly demonstrates that when antegrade crossing hits a dead end in complex SFA CTOs, a retrograde approach via the distal ATA can effectively salvage the procedure and deliver an excellent clinical outcome.

Conclusion

In complex chronic total occlusions of the superficial femoral artery where traditional antegrade crossing fails, a distal retrograde approach is an effective and safe bailout strategy. Advancing a retrograde wire through a sheathless distal ATA puncture and externalizing it via the proximal guiding catheter is a highly practical technique that facilitates successful endovascular revascularization. However, given the small caliber of distal vessels and the potential for ischemic complications, meticulous anatomical evaluation and judicious patient selection remain critical for success.

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