

CASE REPORT

Below-the-Knee Chronic Total Occlusion: The Power of a Multi-Technique Usage

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ABSTRACT

Chronic limb-threatening ischemia represents the end stage of peripheral arterial disease. In patients presenting with chronic total occlusions (CTOs) of below-the-knee (BTK) arteries, revascularization can be technically challenging. We report a case of a diabetic patient admitted to our diabetic foot care clinic with a non-healing ulcer and focal gangrene on the dorsal surface of the right foot. Revascularization was successfully achieved using a combination of antegrade hydrodynamic contrast recanalization (HDR) and a retrograde “just marker” technique. This case highlights that reliance on a single approach may be insufficient in complex BTK CTOs. The transition between techniques can be crucial for procedural success. In our case, we believe that the HDR technique at the proximal cap facilitated partial channel formation, allowing the retrograde wire to subsequently cross the lesion. Therefore, an initial technique’s apparent failure may, in fact, contribute to overall success when used in combination. We propose that HDR is a valuable option in heavily calcified, long-segment CTOs. A collaborative, hybrid approach that incorporates multiple CTO techniques should be considered essential, as the limitations of one method may directly contribute to the success of another.

Keywords: Below the knee chronic total occlusion, diabetic foot, hydrodynamic contrast recanalization, peripheral artery disease, retrograde approach

INTRODUCTION

Chronic limb-threatening ischemia is the end stage of peripheral artery disease.¹ In diabetic patients with chronic total occlusions (CTOs) of below-the-knee (BTK) vessels, revascularization is often technically challenging and, in many cases, cannot be achieved using an antegrade approach alone. Several studies have demonstrated the efficacy and safety of retrograde recanalization, particularly in the femoropopliteal and infrageniculate arterial segments, in patients with advanced atherosclerotic disease.²

CASE REPORT

A 70-year-old male with diabetes mellitus (managed with insulin and oral agents for 8 years), hypertension, and stage 3 chronic kidney disease presented to our diabetic foot care clinic with a non-healing ulcer and focal gangrene on the dorsum of his right foot.

Doppler ultrasonography revealed absent flow beginning at the proximal segment of the anterior tibial artery (ATA). Diagnostic peripheral angiography confirmed a CTO of the ATA and multiple high-grade stenoses in the peroneal artery, with no significant distal ATA or pedal arch flow. (Supplementary Video 1).

Because no suitable distal landing zone was available in the ATA, we initially attempted an antegrade approach using the HydroDynamic contrast Recanalization (HDR) technique. (Supplementary Video 2). After engaging the proximal ATA segment with a 0.035” microcatheter, the system was exchanged for a 0.018” microcatheter. The proximal cap was engaged with a 0.014” Hornet™ peripheral wire, followed by the gentle injection of 0.5 cc of contrast to visualize the antegrade course.

Lesion crossing was first attempted with a 0.018” Blackeel™ hydrophilic peripheral guidewire and, after failure, with a 0.018” V-18™ Boston Scientific guidewire. Both attempts were unsuccessful.

Given the failure of the antegrade strategy, we proceeded with a retrograde approach. A 0.018” V-18™ Boston Scientific guidewire was introduced via the lateral plantar artery to access the distal ATA. (Supplementary Video 3). The guidewire passed smoothly through the occlusion into the proximal cap and was successfully advanced into the popliteal artery.

Using the retrograde wire as a fluoroscopic marker, we aligned and advanced the antegrade wire along the same path, entering the true lumen. (Supplementary Video 4). Alignment was confirmed with a tip injection. (Supplementary Video 5).

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Following successful wire passage, multiple balloon inflations were performed, achieving complete revascularization of the ATA. (Supplementary Video 6).

CONCLUSION

Retrograde revascularization is a safe and effective option for treating BTK vessel occlusions in diabetic patients, particularly when the antegrade approach fails. This case underscores the importance of flexibility and the synergistic application of multiple CTO techniques in complex interventions. The failure of one technique does not necessarily indicate ineffectiveness; rather, it may facilitate the success of another. In this instance, we believe the HDR technique may have created microchannels or weakened the proximal cap, enabling easier passage of the retrograde wire.

Collaboration between different CTO strategies is therefore essential. In the setting of heavily calcified, long-segment CTOs, HDR can serve as a valuable adjunct to retrograde approaches.

Retrograde revascularization has emerged as a safe and effective method for treating BTK vessel occlusions in diabetic patients, particularly when conventional antegrade approaches are unsuccessful. This case underscores the value of procedural flexibility and the strategic combination of CTO crossing techniques in managing complex infrainguinal disease.

In this patient, initial recanalization attempts using the HDR technique did not achieve full lumen passage. However, this was not a procedural failure. We believe HDR played a crucial preparatory role by altering the lesion morphology, potentially creating microchannels, weakening the proximal cap, or disrupting heavily calcified plaque. These modifications likely reduced resistance during the subsequent retrograde approach and indirectly contributed to procedural success.

This outcome highlights an important principle in complex CTO interventions: techniques that do not yield immediate technical success may still enhance the effectiveness of subsequent strategies. In this case, synergy between HDR and retrograde wire crossing was critical. Adapting the procedural plan and integrating multiple techniques underscores the importance of operator experience and familiarity with the full spectrum of CTO strategies.

HDR may be particularly valuable as an adjunct in long-segment, heavily calcified BTK occlusions, where direct lumen crossing is often challenging. Its use before retrograde intervention may facilitate wire entry or improve re-entry outcomes by modifying lesion architecture. Rather than viewing individual techniques in isolation, interventionalists should consider their complementary roles in achieving revascularization—especially in high-risk, multi-comorbid patients such as those with diabetes and critical limb ischemia.

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2. Nezzo M, Meloni M, Carini A, et al. Efficacy of retrograde revascularization in diabetic patients with chronic limb-threatening ischemia after a failed antegrade approach. *Vascular*. 2025;33:717-724.



Supplementary Video 1.

<https://youtube.com/shorts/sZQvjhqpZik>



Supplementary Video 2.

<https://youtube.com/shorts/GPnvs4Q40E8>



Supplementary Video 3.

<https://youtube.com/shorts/jXb0YfciT1Y>



Supplementary Video 4.

<https://youtube.com/shorts/o2082JyzCkk>



Supplementary Video 5.

<https://youtube.com/shorts/AgX-XTNOgcM>



Supplementary Video 6.

<https://youtube.com/shorts/vAHFkGtAvhs>