Case Report: Managing Multilevel Occlusions

Successful crossing and revascularization of the femoral, popliteal, and tibial arteries in a patient with critical limb ischemia.

BY KANWAR SINGH, MD, FACC, FSCAI, RPVI

An 80-year-old man presented to his primary care physician with complaints of nonhealing ulceration of the dorsal surface of the left great toe for 1 year and the development of a new blackened third toe on both the dorsal and plantar surfaces. The recent lesions were associated with severe rest pain, and there was a long-standing history of bilateral calf claudication.

The patient's past medical history was notable for type II diabetes mellitus, coronary artery disease with previous acute myocardial infarction and coronary stenting, hypertension, and chronic renal replacement therapy with hemodialysis. A reformed tobacco user, he had a 70-pack/year history of smoking. His medications included aspirin, clopidogrel, Lopressor®, lisinopril, and calcium acetate. He had no drug allergies and no history of illicit substance use.

A physical exam showed a heart rate of 106 bpm, blood pressure of 154/90 mm Hg (right side), 5/10 on the pain scale, respiratory rate of 18, and temperature of 99º F. The left arm blood pressure was not interrogated due to dialysis access in the left brachial position. His weight was 155 pounds, and his height was 5' 8".

The patient's neck was supple but featured a soft right carotid bruit. His lungs were clear, and a cardiac exam revealed a 2/6 systolic ejection murmur. The left arm access had an excellent thrill. Abdominal pulsation was not apparently increased. Femoral pulses were readily appreciable and were without bruits. The right leg had a reduced pulse amplitude in the popliteal position, and pedal pulses were not palpable. The left side (the affected side) had pulse in neither the popliteal nor pedal positions, and the left foot was cool. The skin was shiny and hairless on both sides, and a dark skin tone complicated the assessment of elevation pallor, dependent rubor, and mottling. Neurologically, the patient was cognitively intact, alert, oriented, and in obvious discomfort. He had stocking-glove sensory neuropathy and no gross motor deficits. The lesion on the third toe extended to the midmetatarsal and was dry, whereas the more chronic wound on the first toe had some purulent discharge and surrounding edema without fluctuance.

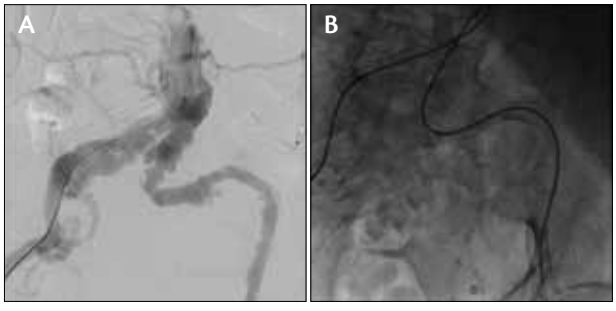

Figure 1. Cobblestone aorta with severe tortuosity (A). Difficulty delivering the catheter to the contralateral limb (B).

Bedside ankle-brachial index testing showed the right side to be 0.52 and the left side to be 0.1 by Doppler evaluation.

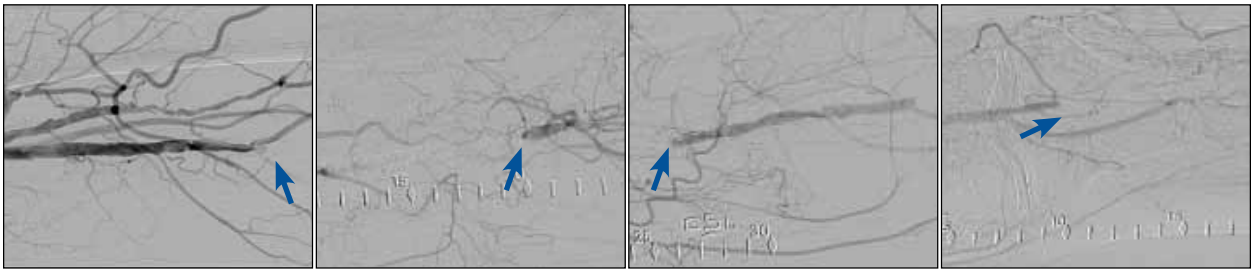

Figure 2. Left leg runoff. Arrows indicate multisegment occlusions and no runoff at the foot.

Figure 3. Popliteal occlusion.

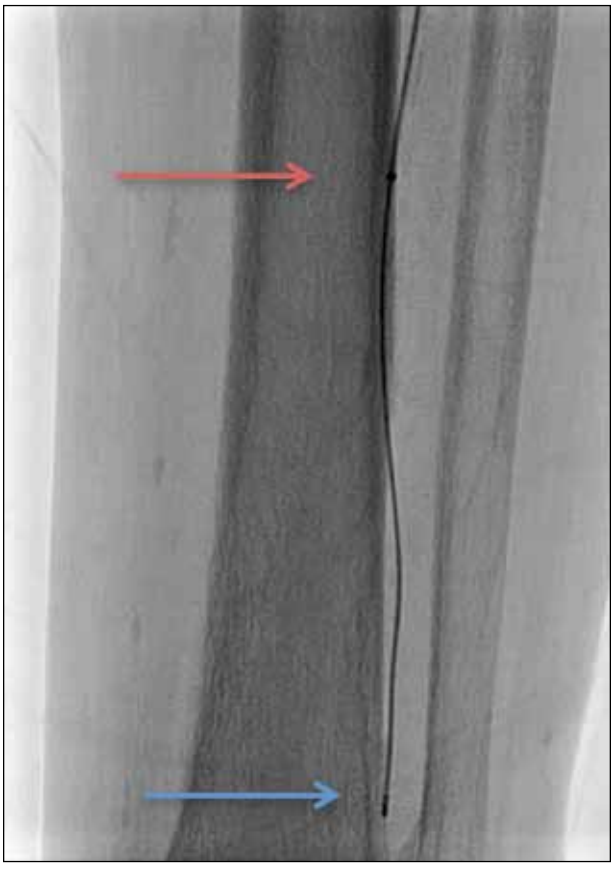

Figure 4. Micro-Guide Catheter position (red arrow) and FRONTRUNNER® XP CTO Catheter position (blue arrow).

The patient was diagnosed with critical limb ischemia with probable cellulitis. He was admitted and started on intravenous heparin and broad-spectrum antibiotics.

Abdominal aortography was notable for cobblestone aorta with severe tortuosity (Figure 1A). An Aquatrack® Hydrophilic Guidewire (Cordis Corporation, Bridgewater, NJ) and diagnostic catheter were introduced via the right common femoral artery. Crossover was difficult (Figure 1B) but did permit runoff diagnostic angiography.

Runoff digital subtraction angiography revealed severe calcification and multilevel chronic total occlusion within the superficial femoral artery (SFA), as well as total occlusion of the popliteal artery with a lack of evident nameable distal runoff (Figure 2).

With this clinical scenario and angiographic picture in mind (Figure 3), it was evident that without revascularization, amputation would be required to the above-knee level, which, with his comorbidities, would be severely debilitating. It was clear that an aggressive effort to reconstruct flow to the foot would be required to attempt to salvage the foot and heal an amputation of the third toe.

REVASCULARIZATION STRATEGY

Ipsilateral access was achieved with antegrade access using a combination of fluoroscopic localization and ultrasound guidance. A 6-F short sheath was introduced, and the patient was systemically anticoagulated with unfractionated heparin to a target activated clotting time of 250 seconds. A FRONTRUNNER® XP

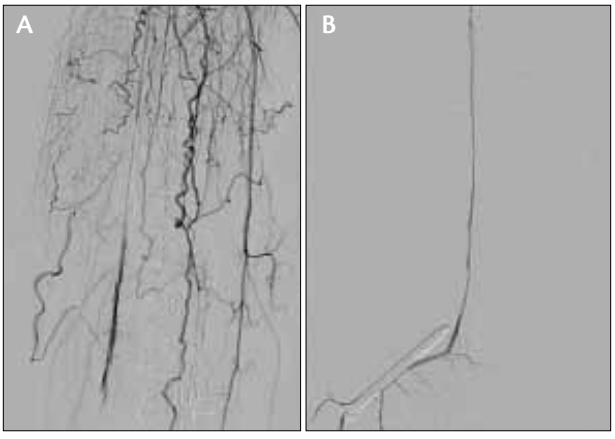

Figure 5. Injection via Micro-Guide Catheter at the popliteal artery showed hints of tibial branches (A). Final crossing with 0.014-inch wire and support catheter; flow was restored to foot (B).

CTO Catheter (140-cm length) (Cordis Corporation) with support from a Micro-Guide Catheter (Cordis Corporation) was chosen to optimize crossing in the SFA. The FRONTRUNNER® XP CTO Catheter was able to cross luminally throughout the totally occluded segment beyond the popliteal artery. The presumed course of the FRONTRUNNER® XP CTO Catheter was into the peroneal artery due to the straight, inline direction of progress (Figure 4).

However, the Micro-Guide Catheter would not advance beyond the midtibial artery due to profound calcification, hence the FRONTRUNNER® XP Catheter was removed, and careful injection was performed (Figure 5), which showed hints of hibernating tibial vasculature. At this point, we exchanged to a

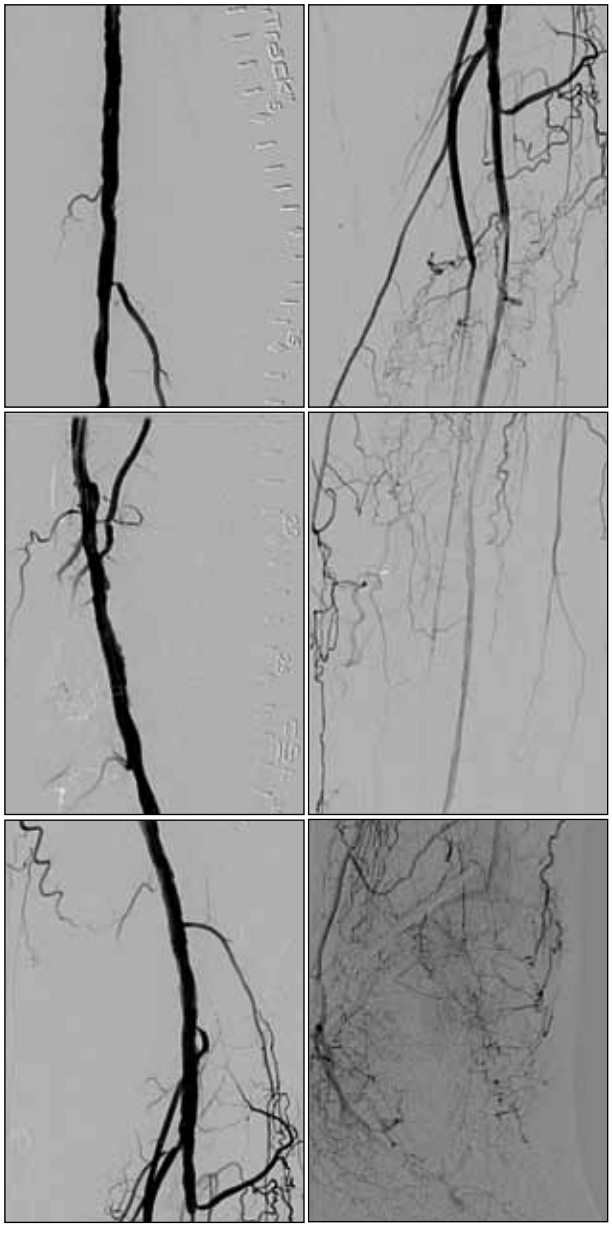

Figure 6. Flow reestablished to the foot with blush.

The FRONTRUNNER® XP CTO Catheter was able to cross luminally throughout the totally occluded segment beyond the popliteal artery.

0.014-inch wire system (Hi-Torque Pilot 200 [Abbott Vascular, Santa Clara, CA], 300-cm length), and an 0.014-inch support catheter (0.014-inch Quick-Cross® [Spectranetics Corporation, Colorado Springs, CO]). The wire was readily passed into calcaneal branches off the peroneal artery.

Angioplasty was performed across the occluded peroneal artery using a 2.5- X 220-mm SLEEK® OTW PTA Dilatation Catheter (Cordis Corporation), and the popliteal and SFA were treated with a 5- X 150-mm POWERFLEX® Pro PTA Dilatation Catheter (Cordis Corporation), restoring inline flow from the aorta to the foot. Stenting was performed in the SFA and proximal popliteal arteries using two overlapping 6- X 150-mm S.M.A.R.T.® Vascular Stent Systems. Spot-stenting was also performed in an off-label fashion in the proximal cap of the occluded segment of the peroneal artery using a 3.5- X 33-mm sirolimus-eluting coronary stent (Figure 6).

FOLLOW-UP

The patient remained hospitalized for 48 hours for pain control medication and renal replacement therapy. He was discharged on oral antibiotics and underwent distal amputation for the necrotic third digit. He has remained ambulatory and independent at 24-month follow-up to date.

SUMMARY AND CONCLUSION

This patient presented with critical limb ischemia and had multilevel occlusions, as is common for such patients. A combination of careful crossing with aggressive revascularization of the femoral, popliteal, and tibial arteries resulted in the re-establishment of inline flow from aorta to ankle. Robust collateralization of the dorsal and plantar surfaces of the foot were seen to arise from communicating arteries from peroneal to dorsalis pedis and posterior tibial arteries. Clinically, the patient was definitively treated with a functional, limited amputation of nonviable tissue and remained independent at long-term follow-up. ■

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