Multilevel CTO Crossing and Treatment

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Critical limb ischemia (CLI) is associated with high morbidity and mortality. In untreated individuals, mortality has been estimated to be as high as 54% after only one year.[1] CLI is caused by inadequate arterial blood flow to the extremities and is often associated with multilevel atherosclerotic disease with long chronic total occlusions (CTOs). Treating chronic total occlusions is technically challenging due to a variety of proximal and distal cap configurations and mixed lesion morphology.[2,3] These lesions are often long and cross multiple vascular beds. CTOs are difficult to address, but we can successfully treat patients by employing strategies such as exotic access and crossing techniques, and the utilization of a variety of tools. It is also important to plan for the typically long duration of these cases, and to exercise patience with the process. The case herein utilizes a personalized approach for access, crossing, and treatment in order to achieve the best outcomes for the patient.

Case Presentation

A 66-year-old man with a history of tobacco abuse, bilateral carotid artery disease, coronary artery disease (CAD), diabetes mellitus, hyperlipidemia, hypertension, and peripheral arterial disease (PAD) presented with necrosis on the left great, second, and third toes. The patient was classified as Rutherford 5.

Angiography revealed that the superficial femoral artery (SFA) was occluded in the proximal segment with a short nub (Figure 1) and reconstituted in the mid segment by the profunda collaterals (Figure 2), before becoming reoccluded shortly thereafter and reconstituting in the distal SFA by the profunda collaterals (Figure 3). The P1 and P2 segments of the popliteal artery were patent, but the P3 segment had a short occlusion. The posterior tibial artery and peroneal artery also were patent.

Intervention

A 6 French (Fr), 45 cm sheath was placed at the level of the left common femoral artery (CFA) from a right contralateral, retrograde CFA access. An .018 inch × 90 cm NaviCross microcatheter (Terumo) and a .014-inch Victory wire (Boston Scientific) were used to cross the CTO of the SFA, but entered a subintimal plane. The patient was prepared for direct left SFA access. An 18-gauge needle, stiff Glidewire (Terumo), and NaviCross microcatheter were used to gain ipsilateral, retrograde access of the left SFA. The CTO was crossed successfully with the stiff Glidewire. The stiff glidewire was switched with a .014-inch, 40 g Astato wire (Asahi Intecc). A 5 Fr, angled DAV catheter (Cook Medical) was then inserted via the right CFA access, and the Astato wire was maneuvered into the angled DAV catheter (Figure 4). The Astato wire was externalized through the "flossing technique" out of the contralateral femoral access. Percutaneous transluminal angioplasty (PTA) of the SFA lesion with a 4 × 150 cm balloon (Cook Medical) was performed through the contralateral retrograde access and exchanged for a.035-inch Quick-Cross catheter (Philips). A Runthrough wire (Terumo) was placed alongside the Astato wire and was extended past the SFA access site.

Internal tamponade of the left SFA access site was performed using a 4 × 150 cm Advance PTA balloon (Cook Medical) for 180 seconds, while removing the direct SFA access and Astato wire (Figure 5). We then turned our attention to the mid-SFA occlusion. An 18 g Victory wire (Boston Scientific) was used to cross the lesion, followed by a 3 × 40 mm, .014-inch LP balloon (Cook Medical), followed by a 5 × 200 mm Armada balloon (Abbott) to dilate the lesion (Figure 6). A dissection occurred in the SFA and popliteal arteries (Figure 7), so we placed a 6 × 250 mm Viabahn covered stent (Gore Medical) from the ostium to the distal SFA, and a 6 × 100 mm Zilver PTX stent (Cook Medical) was placed distal to the Viabahn covered stent, resulting in <10% residual stenosis and successfully tacking up the dissection (Figure 8). We then addressed

Figure 1. Proximal segment occlusion (short nub) of the SFA.

Figure 2. A. Reconstitution in the mid segment occurring by the profunda collaterals. B. Reocclusion in the distal SFA.

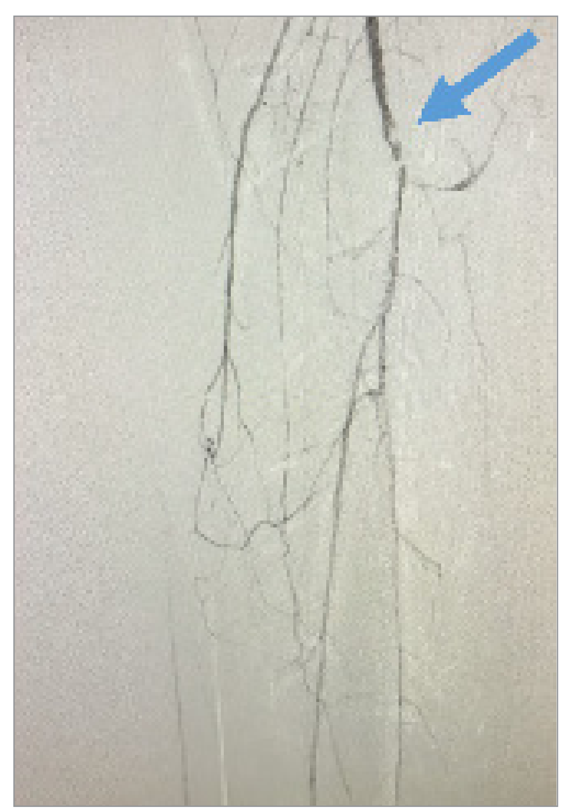

Figure 3. A short occlusion of the P3 segment of the popliteal artery.

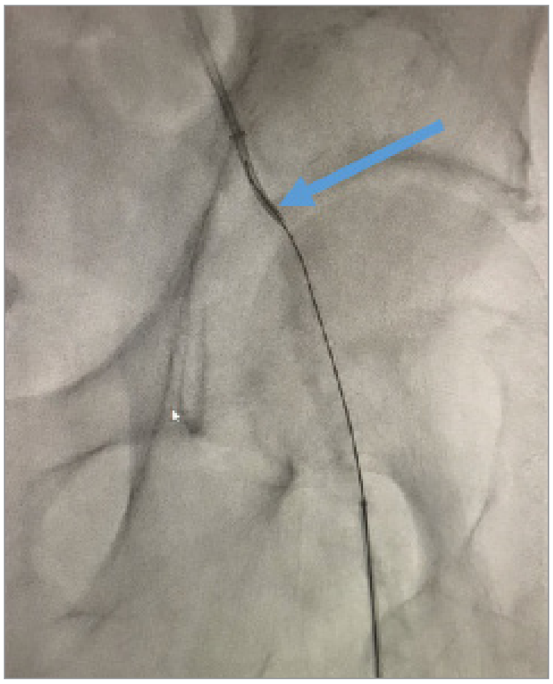

Figure 4. An Astato (Asahi Intecc) wire being maneuvered into the angled DAV catheter.

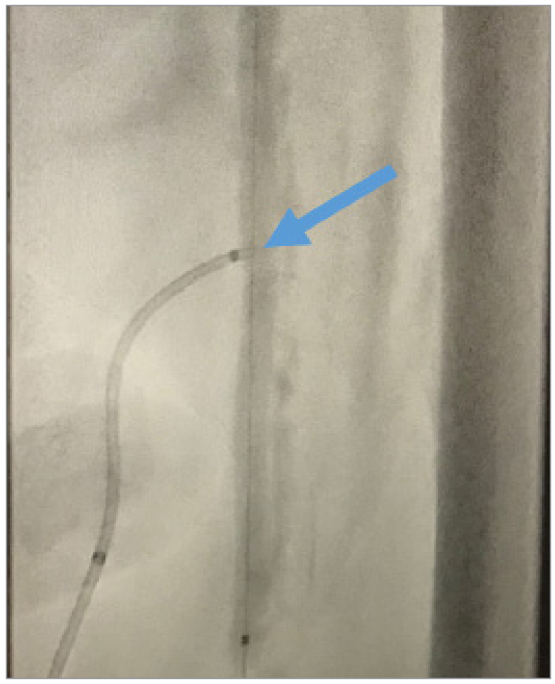

Figure 5. The balloon catheter was inflated and then externalized.

Figure 6. A 3 × 40 mm, .014-inch LP balloon (Cook Medical) was utilized to dilate the lesion.

Figure 7. Dissection of the SFA.

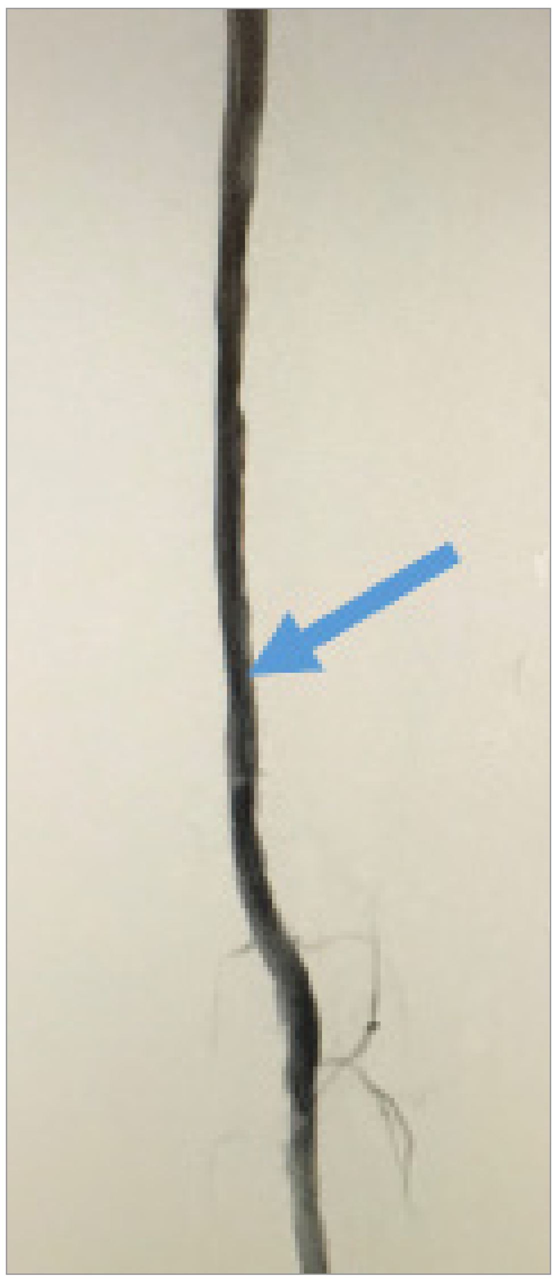

Figure 8. Stenting of the SFA.

An assortment of wires, balloons, and stents were utilized to cross and treat multiple lesion sites and ultimately restore blood flow to the left great, second, and third toes in order to heal the wounds.

Figure 9. A 99% distal popliteal/tibioperoneal trunk stenosis.

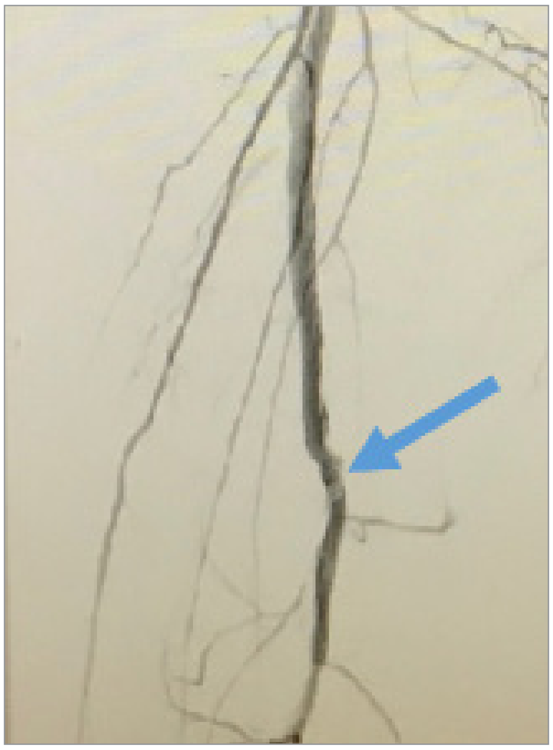

Figure 10. Tibioperoneal trunk.

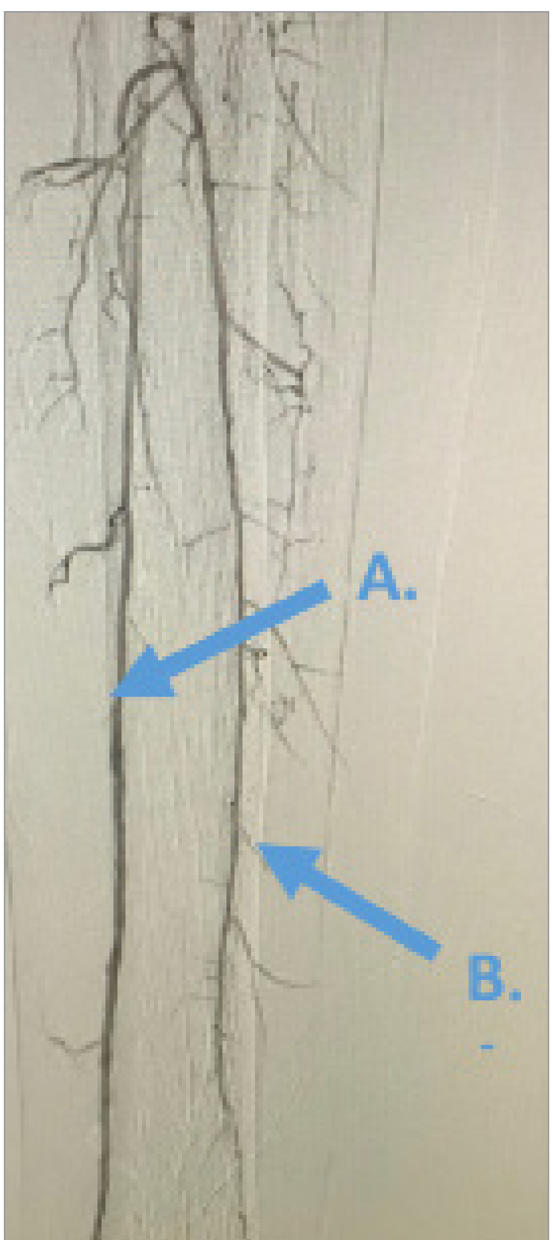

Figure 11. A. Posterior tibial artery. B. Peroneal artery.

the 99% distal popliteal/tibioperoneal (TP) trunk stenosis (Figure 9). We performed PTA of the TP trunk stenosis with a 4 × 28 mm Coronary Trek Balloon (Abbott), bringing the 99% stenosis to <20% residual stenosis (Figure 10) and improving the two-vessel flow to the foot (Figure 11).

Discussion

CLI is a complex disease that requires a multifaceted treatment approach, and high levels of technique and expertise.[4] Major strides have been made in the technology and tools associated with the treatment of CLI and have influenced patient outcomes. The case presented above illustrates the importance of understanding access techniques, crossing fundamentals, and treatment techniques. Each case of CLI is unique in the level and location of occlusion, and requires a personalized approach for effective treatment. This case demonstrates the importance of physician knowledge of tools, as well as patience, since CLI interventions are often long and complex. An assortment of wires, balloons, and stents were utilized to cross and treat multiple lesion sites and ultimately restore blood flow to the left great, second, and third toes in order to heal the wounds. The wounds healed over a period of 3 months. ■

References

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