Peripheral arterial disease (PAD) affects more than 12 million patients in the United States and more than 200 million patients worldwide. Current PAD management, including antiplatelet agents, statins, smoking cessation, and supervised exercise programs, aims to improve the patient’s quality of life and prevent the cardiovascular comorbidities associated with vascular disease. These therapies are reported to improve the maximum walking distance and to reduce limb loss, consequently resulting in better quality of life. Percutaneous vascular interventions (PVIs), on the other hand, are often needed in patients whose symptoms are refractory to conservative management or in those who develop critical limb ischemia and have the goal of limb salvage, potentially obviating the need for complete foot amputation. However, in the face of severe peripheral vascular disease and chronic total occlusions, crossing infragenicular lesions may prove exceptionally difficult using the standard antegrade approach. Herein, we describe a case of a 62-year-old female with multiple comorbidities, including severe PAD, who was admitted for the management of right fifth digit gangrene with PVI to the anterior tibial artery using both a combined antegrade and retrograde approach, resulting in successful crossing, atherectomy and balloon angioplasty, thereby obviating the need for complete foot amputation. This is an important technique to consider in the face of chronic total occlusions in patients with severe PAD in whom limb salvage is desired and who would otherwise be considered too high a surgical risk.

In our case, we highlight the importance of combining the antegrade and retrograde approaches in order to achieve optimal revascularization in this form of severe infragenicular arterial disease.

**ABSTRACT:** In patients with peripheral arterial disease (PAD) refractory to conservative therapy or in those who develop critical limb ischemia, percutaneous vascular interventions (PVIs) can potentially be limb saving. However, in the face of severe peripheral vascular disease and chronic total occlusions, crossing infragenicular lesions may prove exorbitantly difficult using the standard antegrade approach. Herein, we describe a case of a 62-year-old female with multiple comorbidities, including severe PAD, who was admitted for the management of right fifth digit gangrene with PVI to the anterior tibial artery using both a combined antegrade and retrograde approach, resulting in successful crossing, atherectomy and balloon angioplasty, thereby obviating the need for complete foot amputation. This is an important technique to consider in the face of chronic total occlusions in patients with severe PAD in whom limb salvage is desired and who would otherwise be considered too high a surgical risk.

**Key words:** peripheral arterial disease; critical limb ischemia; retrograde approach; pedal access; chronic total occlusion; infragenual vessels; lower limb; vascular intervention

**Figure 1.** Chronic total occlusion of the right anterior tibial artery (as represented by the red arrow).
thy with an ejection fraction status of 15% to 20% after automatic implantable cardioverter-defibrillator (AICD) placement was admitted to our center for management of right fifth digit gangrene. The patient also had severe peripheral arterial disease. The patient was evaluated by our interventional cardiology team, in conjunction with the podiatry and vascular surgery teams, who agreed that she might benefit from percutaneous vascular intervention to allow better tissue healing and possibly avoid the need for foot amputation. The patient had recently undergone percutaneous transluminal angioplasty (PTA) of the right posterior tibial artery, which was completely occluded proximally in the setting of a poorly healing heel ulcer.

Four weeks later, the patient returned for planned percutaneous transluminal angioplasty of the right anterior tibial artery (ATA).

**PROCEDURE DETAILS**

Left antegrade femoral arterial access was obtained. After performing angiography (Figure 1), a 0.018 gold-tip wire was advanced via antegrade approach to the proximal end of the occluded ATA (Figure 2). Multiple attempts were made at antegrade crossing, which led to subintimal crossing and inability to re-enter the true lumen. Subsequently, retrograde pedal access (via the dorsalis pedis artery) was obtained under fluoroscopic guidance (using roadmap technique) with placement of 4/5 FR Slender sheath (Figure 3). In a retrograde fashion, a 0.014 Runthrough wire was advanced...
in combination with a micro 14 support catheter, which was advanced to the proximal cap of the ATA occlusion and used as a reference (Figure 4). Under guidance of the retrograde wire, the antegrade wire was advanced in the appropriate direction, leading to intraluminal crossing (Figure 5), as confirmed by intravascular ultrasound (IVUS). Balloon angioplasty was then performed using a 2.0 × 150 mm NanoCross balloon with single inflation at 10 atm, followed by laser atherectomy and subsequent low-pressure inflation of the proximal ATA using the same balloon. Final angiograms revealed excellent antegrade flow through the tibioperoneal trunk, ATA, and PTA with 2.5 run-off to the foot (Figures 6 and 7). The patient was discharged home the next morning on guideline-directed medical therapy for PAD in stable condition. The patient subsequently had the toe amputated; however, given her revascularization, the foot was salvaged and is currently doing well.

**DISCUSSION**

Critical limb ischemia (CLI) and chronic total occlusions (CTO) are associated with extensive morbidity and pose a significant challenge for interventionists, often leading to an excessive number of patients undergoing amputation. Consequently, techniques aimed at facilitating crossing of complex lesions that are not amenable to the standard antegrade approach, and thereby potentially impeding or altogether preventing the need for amputation, have piqued the interest of the medical community.

In a retrospective review of prospectively collected institutional data of 430 patients with CLI undergoing peripheral vascular intervention (PVI), patients treated with retrograde access were more likely to have a history of recent (< 5 years) coronary artery bypass graft, tended more towards advanced age, and were more likely to have had prior PVI. Interestingly, retrograde access was successful in 90.5% of cases, without any instances of perforation, distal embolization, or loss of distal target. In the group that received PVI via retrograde access, follow-up data revealed freedom from re-intervention (either by PVI or surgical bypass) was 68.6% at 6 months and 1 year. Moreover, freedom from amputation at 6 months and 1 year was 86.2% and 78.3%, respectively. This case, as supported by the literature, shows the importance of using the retrograde approach when possible, along with the antegrade approach, for patients with multiple comorbidities who are otherwise deemed as too high-risk to undergo surgical revascularization.

**CONCLUSION**

In this case, retrograde arterial access of the arteries of the lower extremities (popliteal, tibial, and pedal) enabled limb salvage in a complex lesion, thereby salvaging the foot and limiting the extent of amputation.

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