When the Crossing Gets Tough, the Pedal Access Empowers Crossing: A Limb Saving Approach

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The global burden of peripheral artery disease (PAD) is continuously increasing within the last decades, currently affecting over 230 million individuals worldwide.¹ With an aging population and increasing comorbidity rates, these numbers are expected to further rise in the next decades. Chronic limb-threatening ischemia (CLTI) represents the most severe manifestation of PAD, being associated with ischemic resting pain and wound healing disorders.² CLTI affects up to 11% of patients with PAD and represents a major medical and socioeconomic problem with growing impact on health and social care services.³ In addition, CLTI is associated with high risk of leg amputation and low survival rates, mainly due to cardiovascular complications.⁴

Both endovascular and surgical revascularization techniques need to be considered in patients with CLTI. In this regard, 2 randomized controlled trials (RCTs), the BEST-CLI (Best Endovascular vs Best Surgical Therapy in Patients with CLTI)⁵ and the BASIL-2 (Bypass vs Angioplasty for Severe Ischemia of the Leg)6 were recently published. Both RCTs investigated limb-related outcomes of patients with CLTI who underwent endovascular treatment vs bypass grafting. The results of these 2 studies were conflicting, with the BEST-CLI study favoring vein bypass grafting in terms of technical success and major reintervention rates and the BASIL-2 favoring endovascular treatment in terms of amputation-free survival rates. Therefore, it currently appears reasonable to leave the focus on procedures and address specific demands and challenges of CLTI patients on an individual basis. In this regard, it should be noted that real-world CLTI patients are frequently older than 75 years, frail, and exhibit high rates of cardiovascular comorbidities such as coronary artery disease and symptomatic heart failure,7-10 thus are not optimal candidates for open repair. Therefore, an endovascular-first approach may be the preferred option in the majority of CLTI patients.

In the current *Journal of CLI* issue, Simon Papoyan et al report on their single-center experience with retrograde pedal access in patients who underwent endovascular recanalization of femoropopliteal vessels due to CLTI. From January 2020 to May 2022, the transpedal recanalization approach was applied in 60 patients, either after failed antegrade crossing of the chronic total occlusion (CTO) or as a primary strategy when an antegrade

approach was not deemed appropriate or possible. Patients had a mean age of 65 years and 71.6% were men. Importantly, patients had high rates of comorbidities, including 53.3% of ischemic heart disease. Regarding the lesion characteristics, the mean occlusion length was relatively high with 17.0 cm, and 25.0% of the occlusions extended to the popliteal artery. Reasons for selecting a retrograde strategy besides a failed antegrade passage were obesity, tortuosity of the iliac arteries, and a "flush" occlusion of the superficial femoral artery (SFA) at the ostium of the vessel. Interestingly, all punctures were performed under ultrasound and not under fluoroscopic guidance, which obviates the need for additional contrast injections and radiation exposure of both patients and operators compared with contrast-assisted, fluoroscopy-guided punctures. In most cases (58%) the posterior tibial artery was selected as a distal access site, followed by the anterior tibial artery in 42% of cases. In addition, 4/5 or 6F sheaths were placed after distal puncture in all cases. Subsequent endovascular treatment included balloon angioplasty and, if required, bailout stenting in case of significant recoil or dissections.

The study of Papoyan et al confirms the high technical success rate and safety of the retrograde recanalization approach in patients with CLTI. Thus, a very high technical and procedural success rate of 98.3% was reported. In addition, the procedure was safe, and only minor local complications of non-pulsatile and non-tense hematomas were reported in 5 (8.3%) cases. Furthermore, the clinical success rates during 1 year of follow-up were high, with patency rates of 85% and limb salvage in 98.3% of patients, which can be considered very high considering the length and complexity of the treated CTO lesions.

Overall, the presented data appear encouraging, confirming the results of previous multicenter studies and meta-analyses, which highlighted the importance of the retrograde access for the successful crossing of long and complex CTO lesions in patients with CLTI.¹¹⁻¹³ Thus, both the high success rates and low rate of major complications is similar to previous observations. Patients with a failed antegrade and retrograde recanalization approach, on the other hand, exhibit a significantly higher rate of major above-the-ankle amputations, which confirms the value of this approach for limb salvage.¹¹ It also needs to be noted that a sheath-less approach has been associated with lower distal access complication rates in previous studies, so a primary sheath-less approach may be advisable as a primary strategy in most cases,¹¹ whereas the insertion of a sheath can still be considered if more support is required from retrograde for crossing of the CTO.

Due to the importance of retrograde access for successful endovascular treatment, a crossing algorithm was recently developed by endovascular specialists from different disciplines, including cardiology, angiology, vascular surgery, and interventional radiology, to educate and appropriately guide clinical practice and aiming at the harmonization and standardization of peripheral endovascular revascularization procedures.14,15 With this algorithm, retrograde access, together with re-entry devices and bi-directional recanalization techniques, need to be considered by endovascular specialists to achieve high technical success rates, which is a prerequisite for a "best endovascular" revascularization approach. Despite the rather small sample size, the study of Papoyan et al represents another important milestone toward establishing the optimal algorithm for crossing femoropopliteal CTOs in real-world CLTI patients. Future studies are now warranted in the field of vascular medicine to compare treatment tools such as drug-coated balloons, bare-metal and drug-eluting stents, and minimal invasive atherectomy techniques for the optimal treatment of femoropopliteal lesions. Along with optimal revascularization techniques, lifestyle modification and medical management need to systemically address the underlying atherosclerotic processes in patients with PAD, and especially in those with CLTI who still exhibit very high cardiovascular morbidity and mortality rates.^{5,6,16}

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