ASK THE EXPERTS

How Has Retrograde Access Changed Your CLTI Practice and Algorithms?

Retrograde access is an integral and routine component of CLTI revascularization strategies, offering improved success rates for complex occlusion patterns and crossing CTOs and an alternative when a traditional antegrade approach fails.

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Chronic limb-threatening ischemia (CLTI) is often characterized by complex patterns of tibiopedal and femoral occlusions. Because the disease state is "chronic," these occlusions frequently consist of extensively fibrotic and calcified atherosclerotic plaque morphologies, resistant proximal caps, and regions of obliterative endarteritis with complete absence of any reconstructible lumen. Endovascular recanalization of such lesions represents one of the most challenging catheter-based therapies in the human body.

As a result of these complexities, transarterial reestablishment of flow through chronic total tibial artery occlusion has historically been associated with high failure rates—as high as 40% with a single contralateral or antegrade femoral access. The ability to perform retrograde access from pedal or tibial arteries completely changes the success profile of these therapies, such that failure to create a through-and-through lumen is now < 10% among experienced operators. While there is clearly a learning curve, regarding both the methods of obtaining ultrasound or fluoroscopic retrograde access and the techniques necessary for combined retrograde and antegrade lesion crossing, this skill set is an absolute imperative for vascular providers treating patients with CLTI. Even when considering the overall conclusions of the BEST-CLI trial, which suggested that surgical bypass is preferred over endovascular therapy for CLTI,[1] a large percentage of patients do not have suitable venous conduit or have hostile distal anastomotic targets. This highlights the necessity of advanced endovascular skills to prevent limb loss and mortality.

"Retrograde access" is the underpinning of different terms and methods of bidirectional "rendezvous" transcatheter lower extremity revascularization, including SAFARI (subintimal antegrade flossing with antegrade and retrograde interventions), CART (controlled antegrade and retrograde subintimal tracking), reverse CART, and, perhaps most important, BAD-FORM (balloon angioplasty deployment with forced manipulation). Despite how its name sounds, the BAD-FORM technique allows for crossing of even the most complex mor-

phologies once through-wire positioning is achieved. It involves clamping at the hub of catheters and simultaneously advancing from above and pulling down on the accessible pedal wire from below. In our practice, we revert to retrograde access very quickly after reaching an angiographic dead end from a solely antegrade approach. In chronic total occlusions (CTOs), distal punctures are used at least one-third of the time, without hesitation.

However, it all begins with tibiopedal access.

1. Farber A, Menard MT, Conte MS, et al. Surgery or endovascular therapy for chronic limb-threatening ischemia. N Engl J Med. 2022;387:2305-2316. doi: 10.1056/NEJMoa2207899

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Endovascular treatment of peripheral artery disease is not only becoming more frequent—the complexity of the patients we treat continues to increase as well.[1] Retrograde access to assist with revascularization was first described in 1988, initially via open surgical cutdowns of the popliteal and tibial vessels.[2,3] It took another 10 to 15 years to gain in popularity as endovascular tools and interventionalist techniques evolved. Since then, interest in retrograde access has grown dramatically, as reflected by the exponential rise in related publications (Figure 1).

In my practice, retrograde access has been an integral and routine component of my CLTI revascularization strategy for many years. The primary value of the technique lies in improving the success rate of crossing CTOs. Retrograde access has several advantages, including a potentially more favorable approach to a CTO cap, less engagement of collateral vessels, and the simple fact that it provides an alternative when a traditional antegrade approach fails.

Currently, all of my CLTI patients have their entire leg prepped from the outset to minimize the inertia of switching to an alternative retrograde access when needed. Initially, I reserved retrograde attempts to the pedal vessels only, and only after exhausting extensive antegrade efforts with various tools and techniques. Over time, my approach has evolved significantly. I now have no hesitation to switching to retrograde access—and I often do so promptly. In addition, I access essentially any vessel in the leg: from infrapopliteal arteries to the popliteal, superficial femoral, and even digital arteries. I routinely access both patent and occluded vessels, including previously stented segments.

Retrograde access has fundamentally reshaped my CLTI practice. It has expanded the way I think about revascularization, broadened my technical repertoire, and improved my ability to treat some of our most challenging patients. I look forward to the continued development of innovative tools and techniques that will further enhance our ability to manage this complex patient population.

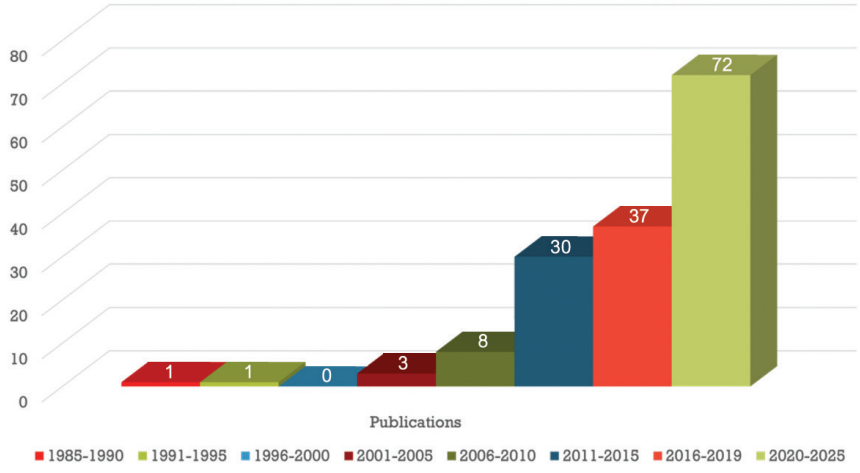

Figure 1. Publications on retrograde access from 1985 to 2025.

1. Egorova NN, Guillerme S, Gelijns A, et al. An analysis of the outcomes of a decade of experience with lower extremity revascularization including limb salvage, lengths of stay, and safety. J Vasc Surg. 2010;51:878-885, 885.e1. doi: 10.1016/j.jvs.2009.10.102.
2. Tønnesen KH, Sager P, Karle A, et al. Percutaneous transluminal angioplasty of the superficial femoral artery by retrograde catheterization via the popliteal artery. Cardiovasc Intervent Radiol. 1988;11:127-131. doi: 10.1007/BF02577101
3. Iyer SS, Dorros G, Zaitoun R, Lewin RF. Retrograde recanalization of an occluded posterior tibial artery by using a posterior tibial cutdown: two case reports. Cathet Cardiovasc Diagn. 1990;20:251-253. doi: 10.1002/ccd.1810200408

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In the 15 years I have been working in the CLTI space, my advanced limb salvage algorithm has evolved from contrafemoral to antegrade, retrograde, retrograde primary, and even extreme distal retrograde approaches. This evolution parallels the advent of technologies that have facilitated atraumatic access and improved crossing strategies, as well the drive to maximize distal perfusion to achieve wound healing (the "woundosome" concept).

In the past, we would struggle with antegrade crossing. The CTOP (CTO crossing approach based on plaque cap morphology) classification brought to light that not all chronic occlusion antegrade cap morphologies are ideal for primary wire crossing strategies; sometimes, specialty tools are necessary to facilitate intraluminal crossing. However, it also showed that retrograde caps are sometimes ideal for primary or secondary crossing. As such, in my CLTI practice, we prep for retrograde access at the beginning of the case, with a switch to or combination with retrograde after 2 to 5 minutes of antegrade wiring attempts. The importance of this approach is to avoid disruption of the vessel, extension of dissection planes into healthy vessel, and unnecessarily complicating the case.

Primary retrograde procedures like TAMI (tibiopedal arterial minimal invasive retrograde revascularization) are also increasingly used in patients whose body habitus, vasculature, or other factors may preclude safe antegrade access. In addition, the "switchback" technique allows for treatment of additional tibial vessels from the retrograde approach, given the flexibility of modern catheters and balloons coupled with wires that have excellent torque response and tip load. I tend to still use a radial-to-peripheral catheter above for ease of visualization, while working primarily from below.

I challenge the concept that patients with single-vessel runoff are too prohibitive for retrograde access. Extravascular ultrasound (EVUS) allows for atraumatic anterior wall crossing into tibial vessels. We have extremely small sheaths and inner dilators available that facilitate microcatheter or wire crossing without damage to the distal tibial vessels. However, I do feel it is important to make sure that patency of the accessed vessel is demonstrated (sometimes facilitated with gentle balloon-assisted closure), especially in CLTI patients.

Extreme distal retrograde (and antegrade) access techniques have been popularized by Drs. Marco Manzi, Luis Mariano Palena, August Ysa, and other contemporaries. Below-the-ankle intervention represents some of the most challenging but also important approaches to limb salvage, as perfusion does not end at the malleolus. Utilization of careful fluoroscopy, EVUS, and adequate patient sedation can facilitate successful access and crossing.

Ultimately, we have many retrograde options and tools available that help us achieve limb salvage in challenging CLTI patients. ■

Disclosures
Dr. Rundback: Consultant to Abbott, AngioDynamics, BD/Bard, Boston Scientific Corporation, Cordis, Inari Medical, Medtronic, Philips, Teleflex, Terumo, and Veryan; board member, CLI Global Society; speaking bureau (paid) for Abbott, AngioDynamics, BD/Bard, Boston Scientific Corporation, Medtronic, and Philips; research institutional support (Site National PI–no individual compensation) from Abbott (LIFE-BTK), Aveera (Boomerang DVA trial), Boston Scientific (SAVAL), Inari (DEFIANCE), LimFlow (PROMISE III), MedAlliance (Selution), Reflow Medical (DEEPER REVEAL), Reva Medical (MOTIV BTK), Surmodics (TRANSCEND), Terumo Medical (OSPREY), Vesper Medical (VIVID), and Amplitude Vascular Systems (AVS POWER PAD II IDE study); stocks/options in Aveera, Protexa, Summa, Evident, Inquis, Solvein, and Jana Care.
Dr. Chandra: Consultant to Cook, Gore, Medtronic, Shockwave, and Boston Scientific Corporation.
Dr. Mathews: Consultant to Reflow Medical, Boston Scientific Corporation, Cordis, Philips, and Shockwave; receives research support from Reflow Medical, Cordis, Abbott, Boston Scientific Corporation, and Philips.