What Is Your Top Tip on How to Safely and Efficiently Cross a Lower Extremity CTO?

Experts discuss their access approaches to and techniques for crossing chronic total occlusions.

WITH JOHN A. PHILLIPS, MD; SAHER SABRI, MD, FSIR; RAMON L. VARCOE, MBBS, MS, FRACS, PhD; SABINE STEINER, MD; AND OSAMU IIDA, MD

In my opinion, crossing long tibial chronic total occlusions (CTOs) in patients with critical limb ischemia (CLI) can be one of if not the most challenging procedure performed by endovascular interventionalists. CTOs in this patient population require a different skill set and a level of patience that is unparalleled to other peripheral interventions. Reconstructing tibial CTOs that are often > 30 cm long with no defined ostium can take several hours. Therefore, my one tip centers around this quandary and is not that of a specific wire, catheter, or device, but more of an ethos or procedural philosophy. We all are familiar with Einstein’s quote regarding insanity, which is particularly germane when treating difficult CTOs. The longer the case goes without any progress, the quicker the fog of doubt seeps into your mind, and the sooner you abort the procedure, ultimately resulting in failure. My one tip is simple: If what you are doing isn’t working, try something else—another wire, catheter, or access point. Set a timer in your head, give yourself 2 minutes with your current plan of attack, and if that is getting you nowhere, switch tactics. The more time you waste, the less successful you will be. Oftentimes, I will even have my staff set a timer for me, and when the 2 minutes are up, we move on. The more often I practice this approach, the more frequently I am successful when tackling any complex CTO.

I believe that most, if not all, CTOs can be crossed, regardless of location. Serious, immediately life-threatening complications are rare during these cases; thus, we have little to lose when attempting these interventions for CLI. Our patients are the sickest of the sick, with extremely high mortality rates even with a successful intervention. So, have a plan, be nimble, and quickly change your approach when you stall.
Crossing CTOs is all about support. Support provides pushability and the ability to effectively and responsively torque the guidewire. The approach begins with choice of access. Where the vascular lesion, anatomy, and patient body habitus allow, I prefer to access the ipsilateral common femoral artery in an antegrade direction and use a long sheath to get close to the lesion. This maximizes both push and torque. A supportive guidewire such as a V-18 ControlWire (Boston Scientific Corporation) or a Hi-Torque Command 18 (Abbott Vascular) is used coaxially within an angled support catheter to find and engage the CTO microchannels wherever possible. This will help to facilitate a transluminal CTO crossing path, which simplifies reentry into the reconstituted lumen. Finally, I have a low threshold for converting to a retrograde crossing technique (bidirectional), as I find this more efficient than persisting with time-consuming attempts from an antegrade approach.
I prefer an ipsilateral antegrade approach for CTO crossing, unless I am treating very obese patients or proximal/ostial superficial femoral artery disease. An ipsilateral antegrade approach helps shorten the distance from the access site to the CTO with enhanced pushability and much better torqueability with the wire and catheter. However, antegrade recanalization of peripheral CTOs is typically associated with a high failure rate, which was subsequently linked to an increased risk of major amputations in clinical studies. Therefore, I believe knowledge of the retrograde approach with the puncture of tibioperoneal arteries is the most important tool for safe and efficient treatment of lower extremity CTOs.

I try to gain access close to the CTO cap for the same reasons as previously mentioned. For femoropopliteal occlusions, I prefer to puncture the proximal anterior tibial artery, because due to its larger caliber, it can usually accommodate a 4-F sheath if needed. Another reason to perform retrograde access is heavy vessel calcification where it is sometimes impossible to cross the lesion with a balloon from an antegrade approach. In these cases, balloon passage can often be accomplished using a pull-through wire. We know from our own large series of more than 550 endovascular interventions with retrograde tibioperoneal access for CTO crossing, that acute and long-term complications at the distal puncture site are extremely rare.

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Vessel diameter, lesion length, and calcification severity are factors that largely impact the difficulty of recanalization for treating CTO lesions. Improving the technical success of recanalization begins with a careful assessment of the CTO lesion using preoperative angiography to confirm: (1) the CTO stump shape, (2) the degree of the collateral circulation, and (3) the puncture site in cases using a two-way bidirectional approach.

If the CTO distal stump shape is reverse tapered, do not hesitate to use a retrograde approach as the first-line option, because this decision may shorten procedural time as well as potentially reduce the complication rate. The two-way bidirectional approach with a distal puncture is the safest, most effective, and routine method for achieving a successful CTO recanalization.

In long CTO lesions, recanalization can be attempted using a knuckle wire from both sides, followed by either controlled antegrade and retrograde subintimal tracking (CART) or reverse CART at the closest portion to each wire. For short or intermediate CTOs, careful penetration of the center portion of the lesion using a 0.014-inch wire is strongly recommended. Although the 0.018-inch, 12-gauge tip load Treasure 12 guidewire (Asahi Intecc USA, Inc.) has been initially used for CTO recanalization, I have found the 0.014-inch, 3-gauge tip load Gladius guidewire (Asahi Intecc USA, Inc.) to be the most effective for penetrating the microchannel in the CTO. The Gladius guidewire is especially useful for a single-directional approach for CTO lesions and is my primary choice.

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