

Tailor-Made CLI Sheaths, Catheters, and Wires

The right equipment can make all the difference in successful procedural outcomes.

BY GARY M. ANSEL, MD

Sheaths, catheters, and wires may not be as interesting as stents or atherectomy, but these basics are the foundation for successful treatment in patients with critical limb ischemia (CLI). Without the proper equipment, CLI procedures are less successful and efficient—more contrast and radiation is necessary, and the procedures take longer. Selecting the best equipment is a crucial part of preparation that can positively impact the outcome of every case.

SHEATHS AND GUIDES

Endovascular specialists should be well versed in identifying the proper access sites that are available or may be needed for any particular case. Sheath selection is based on desired caliber and length for the best equipment insertion and contrast use. This decision process can become very complex in patients with multilevel disease or previous surgical bypass. Typically, antegrade access is used for nonobese patients without proximal femoral disease, especially if there is a long chronic total occlusion to be crossed. As the angiosome-directed approach has taken hold, antegrade access is especially important when considering the potential need for treatment of pedal arch disease. Due to the increasing prevalence of obesity, however, antegrade access is becoming less common, and retrograde contralateral femoral access is typically the initial access. Some physicians have also reported using radial artery access.^{1,2} However, until device

lengths are increased, radial access is limited to the vascular beds above the mid superficial femoral artery.

CLI typically includes tibial disease, and treatment is best completed with either a sheath or guiding catheter that reaches the popliteal segment (Figure 1). Long catheters often improve the ability to track devices and torque wires in the distal arterial segments. Long sheaths and catheters also improve the push of the device and facilitate the growing monorail market, which may allow for shorter procedures that use less radiation. Introducing contrast close to the segment of intervention can significantly decrease the total contrast usage because of the ability to dilute the contrast, reduce patient movement during subtraction films, and improve the quality of roadmap images.

Braided sheaths are optimal because there is less risk of kinking at areas of angulation, such as the aortic bifurcation. The lengths are typically 90 cm for contralateral femoral access and 45 to 60 cm for antegrade access sheaths. Sheath diameters as small as 4 F (Flexor Check-Flo Introducers with Ansel modification, Cook Medical, Bloomington, IN) will allow passage of most of the currently available tibial balloons and off-label coronary stents. However, with 4-F sheaths, contrast administration can be less than favorable once balloons are winged and withdrawn back into these low-profile sheaths. The use of the typical coronary aspiration catheter also necessitates the use of a 5-F sheath (Flexor Check-Flo Introducers with Ansel modification or Pinnacle by

Terumo Interventional Systems, Inc., Somerset, NJ), or a 6-F coronary guiding catheter. If multilevel disease is present and either iliac or femoral disease is also going to be treated, I favor using a braided 6- or 7-F, 45-cm sheath. I currently use a 7-F sheath that allows for the full array of femoral devices and up to a 5-F sheath to be passed through for the tibial procedure. If only tibial intervention is to be undertaken, the operator can choose between a long sheath versus a 6-F guiding catheter. We will typically insert a long 4-F, 125-cm diagnostic catheter through the guide for a better transition during guide advancement.

Since our group first reported on the technique for retrograde pedal wire access in 2003, there has been an expansion of pedal and tibial low-profile access for wire passage.³ Although we rarely find this technique necessary, it has expanded the treatment options for many patients. Some pedal access devices are now being marketed (Micropuncture pedal access set [Cook Medical, Figure 2], Micro-Stick [Medical Components, Inc., Harleysville, PA], and Pinnacle precision access system), and surely, more will follow. Currently, several of the available low-profile access kits can be used with one-way valves so that contrast can be injected and hemostasis maintained during wire manipulation. As previously described, the inner cannula makes for a very low-profile system; the outer cannulas, which are slightly larger, can allow for passage of a support catheter to assist with wire advancement. During catheter use in these more distal vascular beds, flow should be evaluated, and adequate anticoagulation should be maintained so that thrombus does not accumulate.

SUPPORT CATHETERS

Although balloon profiles have improved, there is still a significant role for support catheters both in terms of the lower cost and, more recently, the improved designs that allow angulation, torque,



Figure 1. Fluoroscopic image showing a 4-F, 90-cm Ansel sheath located at the distal popliteal artery with balloon angioplasty of the peroneal artery.

and push that a balloon cannot offer. Many vendors now offer simple nonbraided support catheters that accept 0.014-, 0.018-, or 0.035-inch wires (Quick-Cross [Spectranetics Corporation, Colorado Springs, CO], Trailblazer [Covidien, Mansfield, MA], and Minnie [Vascular Solutions, Inc., Minneapolis, MN]). We typically utilize the braided support catheter, which is also available with distal angulation (CXI [Cook Medical], Quick-Cross Extreme Select [Spectranetics Corporation], or NaviCross [Terumo Interventional Systems, Inc.]). This type of catheter is usually hydrophilically coated, offers improved wire support, and allows for frequent wire changes with excellent tip visibility. When a wire continues to exit into the subintimal tract, it is also occasionally possible to stay in the true lumen by advancing the support catheter for a short distance with no leading wire. Support catheter selection is very important for wire support during the plantar arch looped wire technique.⁴

WIRES

Tibial disease is pathologically different from both coronary and femoropopliteal occlusive disease. Much more prevalent in diabetes patients, tibial disease is primarily a disease of the artery's media.

Unless the patient has had a previous bypass or intervention, the presence of thrombus is uncommon. The medial fibrosis and calcification process compresses and may obliterate the vessel lumen. Until the very late stages, we have found that these impressively long occlusions can be easily traversed with a support catheter and wire. Although the wire looping technique is commonly used to cross long femoral artery chronic total occlusions, it is typically less necessary in tibial artery occlusions. It is also important to note that once a wire has exited the true lumen in a tibial vessel, it is much more difficult to reenter the true lumen due to the heavy diffuse calcification typically present.



Figure 2. Diagram showing the use of a one-way valve on a micropuncture introducer set for pedal wire access. Permission for use granted by Cook Medical.

Guidewire selection and technique is at the discretion of the physician. I often liken wire preference and technique to golf ... every physician will swear by his technique and wire of choice. For patients with primarily stenotic disease, I believe that any 0.014- or 0.018-inch floppy-tipped wire will suffice and be successful. However, tibial occlusions can be a challenge, and several different types of wire technology (hydrophilic, nonhydrophilic, and low-to-high-gram weight-tipped) should be available to the operator.

The type of wire that may successfully traverse a stubborn tibial occlusion cannot always be predicted. Personally, over the years, I have been drawn to a 0.018-inch gold-tipped hydrophilic catheter (Glidewire [Terumo Interventional Systems, Inc.]). It is a sturdy, very torqueable wire that will resist the permanent deformation that typically affects other wires. The 0.018-inch gold tip is used to cross stenotic and most total occlusions. Once the diseased area has been successfully crossed with a support cath-

I often liken wire preference and technique to golf ... every physician will swear by his technique and wire of choice.

eter, I will typically exchange the hydrophilic wire for a 0.014-inch, medium-weight, floppy-tipped wire so that inadvertent side branch perforation does not occur. As a cardiologist, it has been difficult to see how we can top the sundry of available coronary guidewires. However, many vendors now have wires designed for peripheral use (Winn family of devices [Abbott Vascular, Santa Clara, CA]; Thruway, Journey, and V-14 [Boston Scientific Corporation, Natick, MA]; and Approach [Cook Medical]).

CONCLUSION

The endovascular treatment of CLI has exploded and appears to offer patients a less invasive and successful treatment option. Although less “sexy” compared to the available stenting, atherectomy, and chronic total occlusion devices, the new pedal/tibial access devices, guides, wires, and sheaths lay the groundwork for a successful procedure. In my opinion, the ability to choose and utilize these devices separates the sometimes successful from the typically successful physician with the lowest risk of complications. ■

Gary M. Ansel, MD, is the Director of Peripheral Vascular Intervention at the Mid-Ohio Cardiology and Vascular Consultants, Riverside Methodist Hospital in Columbus, Ohio. He has disclosed that he receives product royalty from Cook Medical, serves on the advisory board for Abbott Vascular and Boston Scientific, and speaks on behalf of Bard Peripheral Vascular and Cook Medical. Additionally, Dr. Ansel receives research funding from Medrad, Medtronic, Inc., and Gore & Associates. Dr. Ansel may be reached at garyansel@aol.com.

1. Lorenzoni R, Mazzoni A, Lazzari M, et al. Radial artery access for above the knee angioplasty: a feasibility study. *EuroIntervention*. 2011;7:924-929.
2. Caputo RP, Tremmel JA, Rao S, et al. Transradial arterial access for coronary and peripheral procedures: executive summary by the Transradial Committee of the SCAI. *Catheter Cardiovasc Interv*. 2011;78:823-839.
3. Botti CF Jr, Ansel GM, Silver MJ, et al. Percutaneous retrograde tibial access in limb salvage. *J Endovasc Ther*. 2003;10:614-618.
4. Kawarada O, Yokoi Y, Sekii H, Higashiu S. Retrograde crossing through the pedal arch for totally occluded tibial artery. *J Interv Cardiol*. 2008;21:342-346.