



PHYSICIAN
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ACCESS SITES

- Contralateral femoral access is most familiar to cardiologists and helps to keep the access-site management issues separate from the treatment sites. For very tall patients, however, interventional devices may not reach the ankle and foot from a contralateral approach.
- Ipsilateral, antegrade access is an important skill to master and is very useful in patients who are free of disease in the common and superficial femoral arteries. It allows for easy access to the ankle and foot even in the tallest patients and facilitates pushability of devices. It is highly recommended that this only be done in patients who have had diagnostic angiography previously to identify the access-site anatomy. Insertion of an antegrade sheath should only be done over a stiff wire to avoid prolapse of the sheath into subcutaneous tissues. In obese patients, this is a challenging approach. “Off-label” use of closure devices can be very effective in antegrade access cases.
- When guidewires cannot cross tibial or popliteal occlusions from “above,” and when the ankle level tibials are patent, roadmapping-guided needle puncture of the posterior or anterior tibial arteries can be safely performed at the level of the ankle using a micropuncture needle. Once guidewire crossing from “below” is achieved, the wire can be snared in the common femoral artery, exteriorized, and the procedure is completed from “above.”

DIAGNOSTIC DEVICES USED

Diagnostic angiography of the infrapopliteal region is best obtained by selective catheter placement in the common femoral artery or below. Injections at the level of the aorta will not show the tibial vessels in as much detail and will require much larger doses of contrast. This can be done easily with the contralateral insertion of a 5-F catheter over the bifurcation. If the superficial femoral or popliteal arteries are occluded, be sure that angiographic injection is performed above the origin of the profunda femoral artery in order to visualize collateral filling arising from the profunda femoral artery. If the SFA and popliteal arteries are patent, the 5-F catheter can be advanced to the popliteal artery selectively, which allows for outstanding visualization of the tibial vessels.

SHEATH SIZES

Sheaths for diagnostic purposes can be 5 F or 6 F. Typically, a short sheath is used, and a longer, low-pro-

file catheter is advanced into the aorta and/or contralateral iliac artery for angiography. If an angiogram is being done on the ipsilateral leg, direct angiography through the short sheath is all that is needed.

DIAGNOSTIC CATHETERS (NONSELECTIVE)

Nonselective angiography of the infrapopliteal artery can be done from the aorta using either pigtail catheters or reverse-curve catheters, as long as sufficient contrast is used and subtracted images are obtained. As noted previously, the quality of this angiogram will not be as clear as a selective angiogram.

DIAGNOSTIC CATHETERS (SELECTIVE)

In most patients, the direct advancement of a catheter over the aortic bifurcation to the level of the common femoral artery can easily be accomplished and can allow for selective infrapopliteal imaging. If the iliac arteries are highly angulated or calcified, a 5-F hydrophilic

INFRAPOPLITEAL INTERVENTIONS

catheter is often very effective in advancing over the aortic bifurcation.

DIAGNOSTIC GUIDEWIRES

Any wire can be used to access the aorta. If hydrophilic guidewires are used, use caution to only advance with fluoroscopic guidance to avoid vascular perforations or subintimal dissection. For advancing wires over the aortic bifurcation, an angled hydrophilic wire through a reverse-curve catheter is highly recommended. Avoid overly stiff wires for this maneuver to prevent prolapse of the wire up into the aorta.

INTERVENTIONAL GUIDEWIRES

The wire(s) used for an intervention are dependent on the presence or absence of occlusions, the diameter(s) of the vessel being treated, and the type of devices that are planned. Often, the wire that is used to cross an occlusion may not be the wire ultimately used for the intervention, requiring wire exchanges through an exchange catheter. Crossing occluded vessels with guidewires takes skill, patience, and experience. I always use a .018-inch hydrophilic wire through a .018-inch exchange catheter as the first-line approach to occlusion crossing in femoral, popliteal, and tibial vessels. Using this wire is usually most successful when prolapsing the wire at the occlusion and pushing with the "loop" and keeping the support catheter as distal as possible to provide support. In general, crossing occlusions is most easily accomplished with hydrophilic wires of .014-inch, .018-inch, or .035-inch diameters. Straight-tipped wires are more effective than curved tips. Prolapsed wires are generally very effective for traversing occlusions.

Inability to advance a wire across an occlusion can be handled by the use of a CTO catheter, a step-by-step laser catheter (be very cautious below the knee to avoid tibial perforations), or distal, retrograde vascular access.

Once across an occlusion, injection of contrast through an exchange catheter into the distal vessel is highly recommended to verify intraluminal position.

INTERVENTIONAL SHEATHS

Infrapopliteal interventions should never be performed with guide catheters. These only serve to reduce the working diameters and increase access diameters with no advantage. Sheaths are much better and maximize working internal diameters. For contralateral-access

infrapopliteal interventions, a 6-F, 45-cm sheath is ideal. If the SFA/popliteal arteries are large and patent, a 90-cm sheath could be useful. For ipsilateral access cases, a short 6-F sheath is quite adequate but should be sutured into place during the case to avoid accidental withdrawal of the sheath.

PTA BALLOONS

Tibial vessels are generally in the 2-mm to 4-mm diameter range, most commonly around 3-mm to 3.5-mm. These vessels can be treated with coronary balloons or peripheral balloons. Coronary balloons have the advantage of a very low crossing profile, which facilitates crossing, but suffer from being very short (15-20 mm), which is suboptimal for long lesions. Peripheral balloons have higher crossing profiles but come in lengths of 4 cm and 10 cm, which are ideal for long lesions of the tibial arteries. Use of .035-inch balloon systems in this location should be avoided because these are exceedingly bulky balloons. There are several .018-inch balloons that are available in 3-mm to 4-mm diameters and in 2-cm, 4-cm, and 10-cm lengths.

STENTS

Stenting the tibial arteries is never an ideal solution and should be avoided. Balloon-expandable stents are crushable, the calf compartments are surrounded by muscles, and the distal tibial arteries are easily compressible by external forces. Nitinol stents are preferred when necessary. I have found only one vendor (Abbott) that manufactures nitinol stents in a diameter range (3-4 mm) that is suitable for tibial arteries.

OTHER DEVICES

I believe that infrapopliteal vessels are best treated with debulking techniques, which minimize the risk of barotrauma and dissection and reduce the need for stents. Excimer laser catheter systems are ideally suited to work in small tibial vessels and are available in .9-mm to 2.5-mm diameters. For tibial vessels, laser fibers in the .9-mm to 1.7-mm diameters are suggested. Lasers are especially helpful in heavily calcified tibials that will not permit balloon advancement. Laser-treated vessels almost always need adjuvant balloon angioplasty. Plaque excision or atherectomy using the SilverHawk System is extremely effective in the tibial vessels, can be used as a primary treatment, and helps to avoid the need for balloons and stents. In tibial

arteries, the SS SilverHawk is most commonly used. For lesions at the ankle and below, or for extremely small/diseased tibials, the ES SilverHawk is better.

INTERVENTIONAL TIPS

A constant awareness of the “platform” being used is essential to successful procedures. The “platform” concept means the wire diameter being used (keep the wire/device diameters as compatible as possible), and also the device lengths (be sure that wires and catheters are of compatible lengths given the access and treatment locations). I always use 300-cm wires in the .014-inch diameter for tibial interventions.

IMAGING TIPS

Digital subtraction imaging is absolutely necessary for tibial intervention. The small vessels, bony background, and the need to identify slow-filling distal vessels make nonsubtracted imaging inadequate for the task. Familiarity with road-mapping techniques facilitates wire-crossing and interventions and greatly reduces contrast requirements in patients who are cooperative and can lie still. Many existing cardiac cath labs require that subtracted images be specifically saved at the end of the case before archiving. Otherwise, the archived images are unsubtracted and of little future value.

OTHER EQUIPMENT

Availability of an excimer laser is helpful in approximately 15% of cases. A steerable catheter can also facilitate wire manipulation. Re-entry systems, such as the Outback and Pioneer catheters, may be of value to re-enter the lumen after subintimal wire positioning. Cryoplasty balloons, cutting balloons, and the rotablator are all occasionally useful devices in selected cases.

CONTRAST

When using digital subtraction imaging, contrast can be diluted by 30% to 50% with saline, which reduces contrast load and is less painful to the patient.

PHARMACEUTICALS

I use unfractionated heparin for infrapopliteal interventions. Postprocedural treatment with clopidogrel, aspirin, and statins are indicated. I do not use warfarin for these cases except under specific circumstances.

LABWORK

ACTs during the intervention should be maintained over 250. ■