

Modern PAD Access Strategies: Planning, Techniques, and Troubleshooting

With Katherine K. McMackin, MD, MS, and Constantino S. Peña, MD

CHOOSING AN ACCESS APPROACH

How important is access for peripheral artery disease (PAD) intervention?

Dr. McMackin: Planning access is a huge part of cases. To start, I'm thinking about: What has the patient had done before? Have they undergone any other surgeries? Is there any scarring? Where am I trying to get to? What's the easiest way to get there? The answers to these questions give you an idea of where you should start, and then you can determine your backup plan and plan C in some cases.

Dr. Peña: Each plan is tailored to your patient, having an idea of what you *think* you're going to do (you're never 100% sure) and which access you think is the safest, best access with which to start. However, you need to be ready to pivot to other types of access if needed.

What is your most common access site for PAD?

Dr. Peña: Our most common access would be common femoral artery (CFA) access, whether it's retrograde (going up toward the aorta) or antegrade (down toward the foot). Our choice of antegrade or retrograde access will depend on what we're going to treat. In certain situations, we go on the other extremities. For instance, we'll go retrograde on the right leg to treat a left leg PAD, depending on where we think we need to treat and what the clinical situation is.

Dr. McMackin: I would say the same: CFA access. I think safety is the biggest reason. Complications can occur, and the CFA is a large artery. One of the great things about the vascular space is that there are a lot of different thought leaders working in it, and that gives you different perspectives. Along with vascular surgery and interventional radiology, interventional cardiology also works in this space and they're using a lot of radial access, which I've recently started using in my practice. This gives you multiple different ways to treat disease and look at it from different avenues.

POTENTIAL ACCESS SITES FOR INTERVENTION

- Common femoral artery
- Radial artery
- Brachial artery
- Subclavian artery
- Popliteal artery
- Tibial artery
- Pedal artery
- Anywhere with a pulse

What approaches do you use other than CFA access?

Dr. McMackin: Depending on what you are doing and where you need to go, you can think upper extremity, radial, brachial, or subclavian. Usually, I go with either radial or subclavian. Brachial has some issues with postprocedural hematoma, which makes it a little bit more difficult. Then, you can work your way down. Everywhere you can feel a pulse theoretically is a good access site—femoral, popliteal (although most people don't use popliteal access), dorsalis pedis, or posterior tibial all give you ways to access this highway system to treat disease.

Dr. Peña: I agree with Dr. McMackin in terms of alternative access. I think radial is probably one of the most common as an alternative access. In my practice, if the groins are hostile, then I'll go ahead and do radial. If I'm doing something in the upper extremity or in the celiac or renal arteries, I may go radial just from the angles. There are a lot of alternative access approaches. Popliteal access is something we used to do a lot of—and we still do—and there are two ways you can do that. You can use frog legs, so you don't need to move the patient or have the patient prone. You can do tibial access or pedal access. I typically avoid brachial access; we do it when we have to.

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CHALLENGES TO ACCESSING SFA OR POPLITEAL LESIONS

- Caliber/size of access site
- Angles
- Distance to disease
- Lesion characteristics
- Flexibility versus pushability of the device

When treating superficial femoral artery (SFA) or popliteal artery PAD, what are some of the biggest challenges when it comes to access and reaching that lesion?

Dr. McMackin: Any time you're starting to work your way down the leg, you're talking about longer devices. If you're going contralateral, you'll need to go up and around the aortic bifurcation, so you need something that can make a turn but then also has that stiffness to provide pushability as you're getting through disease. Sometimes it's nice when you can do the antegrade access. It gives you that straight shot down the leg, and it's the same thing with the pedal access, the straight shot up the leg. It all depends on your angles, your pushability, and what the lesion looks like that help you decide which one of those you're going to use.

Dr. Peña: The aim is to be as direct as possible into the lesion you're treating. I think we've talked about which access site to choose, but you also have to think about the caliber or size of the access site. Is it going to require a 7-F sheath, a 6-F sheath, or can you do it with a 4-F sheath if you're looking for tibial work? The bigger the sheath, the greater risk of bleeding in terms of an access closure. All those things should be considered, but aiming to create a straight line to what we're trying to treat is ideal. Sometimes we have to go up and over and add some more angles, but we basically try to overcome those by using stronger devices and stiffer wires to help us achieve that and still have the pushability.

When you're obtaining access, how do you address tortuous or hostile vessels during PAD interventions?

Dr. Peña: We can't lose sight of the fact that when you're treating a patient with PAD, it's a systemic

process. All the arteries are going to be diseased to some extent. As you start planning, it is important that you pick the best vessel, the healthiest vessel and area you can control, somewhere that you can then deliver the planned therapy. Maybe even start off with a microaccess system to see what you see, and then you may make a decision to go somewhere else. Being able to pivot is important.

Dr. McMackin: I think that the pivoting point is very well taken, and you really need some flexibility because your preoperative noninvasive imaging can only tell you so much. It's not until you start the case and see what that tortuosity is, does it straighten out when you put a wire or a sheath across? Some of those things you're not going to be able to tell preoperatively. It's all about really listening to the patient, listening to what that patient's anatomy is telling you, and letting that guide your case.

How do you approach closure? Do you use a closure device, or do you hold manual pressure?

Dr. McMackin: Everyone who's accessing the vascular space needs to know how to hold good manual pressure. There will be times when an access or a closure device works really well and times when it doesn't. You should always pick an access site where you know you can hold manual pressure in case of a closure failure. I personally like closure devices; they can get the patient ambulatory much faster, and they have low complication rates. So, depending on the access, factors like how big the sheath is, how big the vessel is, and how clean the stick was will help determine which closure device I'll use at the end. For me, ideally closure device is plan A, and then manual pressure is usually plan B.

Dr. Peña: I would agree with that. You should have skill for manual closure as well as multiple closure devices. Each closure device functions differently, and you need to understand when to use one over another. The quality of your puncture and how well that patient is responding are also important as you start choosing what you're going to use. If you have a very small artery, a closure device may not be ideal. But, maybe you have someone who's anticoagulated, at high risk for bleeding, and you need to determine the risk/benefit, and then you might go ahead and close. That's exactly what you have to go through in deciding when you're going to close and when you're not. Generally, we use closure devices for most of our arterial punctures.

MANAGING PAD ACCESS COMPLICATIONS

What are some of the most common complications you encounter with an access site?

Dr. Peña: An access site complication could occur when you start accessing the artery. You may get spasm, or the needle may be in the wall instead of the lumen and cause a focal dissection. You may even get some bleeding around the wall during your puncture. These are things that we can often see with ultrasound, and a lot of these complications are very treatable. Many of these are self-limited and heal by themselves.

You may end up in a situation where when you're puncturing the artery, you go through the vein to get to the artery. This can create a fistula or communication between the artery and the vein. Use of ultrasound helps minimize a lot of these access-related complications, allowing us to see the artery or vein and evaluate its quality. Is it clean or is there plaque? Then, you can choose an ideal place to puncture and watch the needle go in.

When we are finishing these procedures, a fistula may be created or a pseudoaneurysm can occur, which means the artery where we placed the hole may not have healed completely. We treat these with compression or by injecting the area where that pseudoaneurysm is so that it will thrombose or clot off and heal.

Dr. McMackin: When you're planning your case, access site complications are something you consider. Large series tell us that 5% to 7% of cases are going to have access complications. It starts with the first stick. Knowing exactly what your needle is doing can help minimize the potential risk for those complications. Then, have everyone on the team know what to look out for when the patient is in the recovery area, so if there is a complication, they can catch it early.

How do you mitigate or reduce those risks?

Dr. McMackin: In any access, ultrasound is extremely helpful. There's no reason to guess where the artery is when you can see it on ultrasound; you can see your needle tip entering exactly into that vessel, and it helps identify if the vessel is healthy or if the vessel is spasming. Preoperative imaging can give you a good idea on plaque burden or if it's a short or long CFA. In the case of a long CFA, there is an increased risk of sticking too low, and if you have a short CFA, you could accidentally stick in the iliac.

Dr. Peña: To minimize the risk of a complication, we need to understand where we puncture, use our landmarks, and note where we think the CFA is going to be. Confirm that with

COMMON ACCESS SITE COMPLICATIONS

- Spasm
- Focal dissection
- Bleeding around the wall
- Fistula
- Pseudoaneurysm

ultrasound—find a good target when your wire goes in—and use fluoroscopy as you advance your wire. All these things add up to try to minimize the chance of a complication.

Do you think using a microaccess system aids in reducing some of those access-related complications?

Dr. Peña: I think that a microaccess system helps reduce complications. When you have a smaller needle, you may not get the same back bleeding that you would get with, for example, an 18-gauge needle. With ultrasound, you can see that you're in, and then you can slowly advance the wire and then with fluoroscopy see that you're in the vessel. I would say that 99.9% of our access is now started with a microaccess system and an introducer system using ultrasound and fluoroscopic guidance.

Dr. McMackin: Having the microaccess system with a small needle and 0.018-inch wire, you can still have that tactile feel to know where you are—although it won't be as strong as if you're using a 0.035-inch wire and a larger system. I like to do a hand injection just to make sure I know where I am, and I've seen some people do this with the needle. You just want to make sure your operator's hands are outside the image intensifier; you don't want your hands underneath the image. The microaccess system allows you to keep your hands out of the ionizing radiation and protect the operator in addition to the patient.

When advancing catheters or reinforced sheaths during the treatment of PAD, how often do you encounter resistance due to stenosis/plaque?

Dr. McMackin: Even though a wire or a catheter goes through easily, it doesn't necessarily mean the sheath is going to track easily. You want to have flexibility to

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MITIGATING RISK OF ACCESS SITE COMPLICATIONS

- Ultrasound can:
 - Visualize needle tip entering the vessel
 - Identify if the vessel is healthy
 - Identify spasm
- Preoperative imaging can:
 - Provide information on plaque burden
 - Determine location and length of the CFA

make turns but also stiffness. Once you are set up for success, everything is in place, and your sheath is just above your lesion, you need that stiffness so that it will not back out or push out as you're trying to push forward through the lesion.

Dr. Peña: Once you get the wire to where you want to go and you're following it with a sheath, you have to understand that tactile feel. It's common to feel some resistance. The first thing I always tell trainees is "don't push." Stop and figure out why you have resistance. Do you need a stiffer wire? Are you hitting something? Are you at an angle? Is it because of tortuosity? At that point, I stop and reassess what's going on. I might need a wire, or I might just need to back off and advance again. With experience, you learn what you can overcome with your sheath.

THE ROLE OF MULTIPLE ACCESS SITES

Is there ever a time when you plan to access multiple sites?

Dr. Peña: It is not routine to start with two or three accesses, but it is common to need two wires from both sides, and therefore you may be looking at two accesses. For instance, we may establish radial access and use that to inject and then use the pedal access for other types of manipulations. It's usually the complex cases where you have multiple access sites.

Dr. McMackin: The benefit of multiaccess is that it allows you look at it from one end and treat it from the other, and vice versa. If you are having issues tracking through a difficult lesion, sometimes having that through-and-through wire really gives you a rail that you lack when the wire is free on one side. So, you can track something across a lesion that maybe you couldn't get across before. Although you may not be intervening from both access sites, sometimes having multiple allows you to have that stiffer segment for wire if you wanted to use different treatment modalities across that lesion.

How often do you have to pivot access sites mid-case?

Dr. Peña: I think it's much more common now than it was in the past because now we have access sheaths

and access devices that help us access other arteries that we wouldn't have a decade ago. We often see this in the lower extremities—being able to do a quick pedal or tibial access to get a retrograde wire that you can snare and use as a rail to help us with our therapies.

I would say this is pretty common. Sometimes we use the secondary access for a function, such as when we need to recanalize from a retrograde approach or we want to have a rail so we can bring up our devices.

Dr. McMackin: I think the more you get comfortable with multiple access, the more you see the utility in it. That first time sticking the pedal, it might take 30 minutes, and then over time, it's streamlined and it takes 90 seconds to obtain access. The more the whole team gets used to multiaccess cases, the easier the flow is for the patient. ■



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