

Vascular Access, Closure, and Devices: Best Practices and the Future

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Welcome to Vascular Voices, the podcast of Vascular Disease Management, the peer-reviewed online journal that educates readers on the latest advancements in endovascular treatment strategies. In this episode, we talk about vascular access, closure, and devices with Dr. Pradeep Nair, an interventional cardiologist with extensive experience in vascular access and closure. Dr. Nair is currently board-certified in internal medicine, cardiovascular disease, interventional cardiology, nuclear cardiology, and adult echocardiography. He is a member of the American College of Cardiology, the Society of Cardiac Angiography and Interventions, and the American College of Physicians. He has authored multiple peer-reviewed research publications and presented many abstracts at national cardiovascular meetings. Dr. Nair is currently a reviewer for the Journal of Invasive Cardiology.

Welcome to the podcast, Dr. Nair.

Thank you, Cynthia. Glad to be here.

Tell us a little about your practice and what kinds of cases you typically see. What is your mix of procedures in the hospital vs OBL vs ASC?

I'm an interventional cardiologist and work out of the Cardiovascular Institute of the South in Houma and Gray, Louisiana. The early stages of my career as an interventional cardiologist were primarily based in a hospital setting. But then over the last several years, it's shifted more toward the outpatient center, especially since we built our ambulatory surgery center/OBL, which functions as both on certain days. So my case volume these days has been heavily geared toward vascular disease and intervention.

I still have a robust interventional cardiology practice, but in Louisiana, we're able to do PCI in the ambulatory surgery center. We are also doing complex peripheral vascular work in the outpatient setting, but we still have a very strong relationship with our hospital, Terrebonne General, where we do more complex cases where we feel the patient may need an overnight hospital stay, where there are patient-specific risk factors that may yield a higher risk of complications or procedures such as aortic aneurysm repairs and where large-bore IV access is required. So that's typically where I practice, in the hospital setting, these days.

Most commonly, femoral access has been retrograde from the femoral artery with an up-and-over to the contralateral side for interventions. Do you see a change in that access, more antegrade access, or even below-the-knee access, from popliteal to pedal access? And when do you prefer to use femoral access for peripheral vascular interventions?

That's a great question. Anybody who knows me or has been following me and what I do in the cath lab knows that I am a proponent of radial intervention, and we're trying to foster that approach for access to treat patients with PAD.

Yet anybody who's in that space also knows that we are still growing as far as the type of equipment that we can utilize to treat critical limb-threatening ischemia, there are still a lot of tools that we need to get complete therapy.

There's going to be need for femoral arterial access, and it still may be a dominant access site for a decade or more. It's hard to know, but I will say that my choice of access when I choose to go femoral is primarily based upon what am I treating. I look at the patient, the lesion subset, and understand what types of therapies I may need. Do I need a specific type of stent, possibly? In that scenario, we may not be able to go radial. We can only go from a femoral access. Are there limitations with atherectomy choices if I choose to use an atherectomy tool? All of these aspects will be important.

IVUS catheters are 150 cm long, so at times I use IVUS quite frequently. I want to fully evaluate vessels, so femoral access will be important. The standard approach is typically, for me specifically, femoral popliteal disease. I'll go in a contralateral approach from the retrograde femoral access, but if I'm dealing with infrapopliteal disease or below-the-ankle disease, especially in calcific vessels where I need a lot of pushability and translation of my force, antegrade access is very valuable in those scenarios to aid in crossing lesions and delivering equipment.

I think the bottom line is that for a vascular specialist, whoever is the interventionalist, should be comfortable accessing whatever site is necessary to get from point A to point B and get the job done right.

What's the most common femoral complication you see in your practice? What do you do to minimize complications for your patients?

Overall, our complication rates have dropped dramatically and there have been specific reasons for that, which I'll get into. I still believe today the most common groin access complications are hematomas; usually they're minor. Major hematomas are present but still relatively rare, those that require blood transfusions and so forth.

But when you talk about more serious issues such as perforations or pseudoaneurysms, our rates have gone down. These are issues that have gone down primarily because of our access techniques. We utilize ultrasound guidance for virtually 100% of our access. Now, the way ultrasound can benefit the interventionalist will be multifaceted.

First of all, you can get a clean anterior wall puncture. If your goal is to close the vessel with a closure device, you want to avoid an anterior straight through to the posterior wall puncture because if you go through, and through the vessel, the best closure device will never close a posterior wall puncture. You're going to have unabated bleeding through that wall, and that's where hematomas can form, and sometimes they can become quite serious. So ultrasound allows a clean anterior wall puncture and also, you're able to find areas of disease-free vessels. I get that vessels, especially in our vascular disease patients, have calcification and disease throughout, but virtually all patients—most patients, I should say, not all—but most patients have a zone of access that can be utilized safely, and that may be most optimal for a future closure device at the end of the case.

One last point I would make is that as far as gaining access and using ultrasound guidance, I mentioned that we use it 100% of the time, and I think I should take that back. I think I use it 99% of the time. There are times when I'm doing an emergent coronary case in the cath lab for a patient coming in with a STEMI or an acute heart attack where they're crashing and burning, and we use the old-fashioned palpate, maybe quickly look on fluoroscopy and use anatomical landmarks to get in. So you need to know that access point well, but for endovascular interventions, I have yet to find a patient's leg that fibrillates. So time should never be an issue, door-to-balloon times and so forth should never be an issue. We should be able to take our time with access when we do peripheral vascular intervention.

What have you learned about femoral access that you wish you would have been taught sooner? Even back to your fellowship days when you were first learning and obtaining access, what do you wish you knew then about access and closure?

Well, during my training, my interventional training and general cardiology training, I primarily was taught to gain access by palpation. I mean, we were doing it without ultrasound the vast majority of the time unless we couldn't get in. That yielded complications. I was the manual compression fellow after cases to hold groins that if we pulled

sheets out, if that was our chosen strategy, but hematomas would happen. Sometimes late issues would happen.

So at the interventional conferences, I still remember physicians such as Zoltan Turi who would always talk about anatomical landmarks. I would learn from experts who really focus on safe access. So I would learn about those aspects. But then really what shifted me into ultrasound was when Arnold Seto published a trial called the FAUST trial that was looking at femoral artery-guided access with ultrasound vs without angiography-guided. So that trial showed that there were less complications in those with ultrasound guidance. And so it raised essentially some interest, it piqued some interest in me. But it wasn't until I really got into the vascular intervention, the world of limb salvage, where I really, really honed my skills with ultrasound guidance.

So the take-home message from my standpoint for any fellow who's in training, no matter what your discipline, always, if it's not an emergent case where time is of the essence and you actually have time for a procedure, get good access with an ultrasound, get good with utilizing your ultrasound because it will save an otherwise great interventional case from turning into a disaster from a very poor issue or complication from closure or lack of hemostasis. That's the take-home message I would give to fellows in training.

What is the most important lesson you've learned in proper vessel access technique? How does your access affect your ability to close cleanly?

I think the key points would be, number one, familiarizing yourself with ultrasound, understanding if you're sticking the femoral artery where the common femoral artery, superficial femoral artery, and profunda artery bifurcation occurs, identify how you want to be able to see vessel tenting with your needle. I didn't mention that micropuncture technique is very important. Smaller gauge needles can be highly valuable because if you do inadvertently puncture the wrong spot, it's less of an issue as opposed to a larger needle where you can actually have more bleeding issues, but anterior wall puncture and as well as identifying locations on the vessel that are relatively disease-free. These are very important points. You can't always find a disease-free spot, but you can always find the least disease spot to access, so I think that will help you in gaining access to optimize your success.

Now, from a closure perspective, if you start off with good access, your odds of having good closure increase exponentially, in my opinion. So, the first goal is to be familiar with multiple closure devices. I think in multiple labs, they have multiple closure devices. Be familiar with all of them, but when you're doing peripheral vascular intervention, I think it's important to know extravascular closure devices very well or become very familiar with one because these patients may need to be re-accessed sometime in the future. And so, understanding the deployment techniques, the proper deployment techniques, is going to be important for adequately having hemostasis at the end of the case.

We've talked a bit about arterial access—what about femoral venous access? How do you approach access differently when it's a venous procedure? And which venous procedures are you performing today, for example, venous stenting peripheral vascular mechanical thrombectomy, etc.?

With venous access, the general principles still hold true. You have less in the way of calcification of the vessel and disease in the vein itself, but the general principles hold true. One of the most important aspects of venous access would be to still use ultrasound for your access.

And early on in my training, we were talking about training and how it's influenced me. We used anatomical landmarks to get venous access, but I can tell you there are going to be times where an artery is running either on top of the vein or on the side of the vein, and you can create arterial venous fistulas if you do not utilize ultrasound. But what I would say is if you use ultrasound, it's very hard to get poor access in a vein. The most common procedures that we utilize for the vein these days, aside from the cardiology world, right heart catheterizations in the endovascular world, we do pulmonary embolus thrombectomy cases. We utilize them for access in the veins for venous thrombosis, i.e., thrombectomy cases.

My colleagues in structural heart utilize large-bore venous access for transcaval TAVRs. My electrophysiology colleagues are utilizing it for ablations and also for implantation of Watchman devices or left atrial appendage closure devices. Venous access, venous cases are very important. I think the access is important but start with ultrasound. That's going to be the key for, again, success with not only the access, but also with hemostasis closure.

When we talk about femoral access, we obviously need to discuss closure of that access. What is the primary method of closure in your practice? How do you decide what you are going to use, and is it before or after you obtain access?

Typically, I guess I've had a change in viewpoint over the years. Early on, if I saw a diseased common femoral artery in the past, before I was an expert in endovascular intervention, I would say that we may have been holding manual compression for those vessels. But now, having treated multiple common femoral arteries with severe occlusive disease and dealing with the worst of the worst types of limb salvage cases, I often will try a closure device as a strategy before attempting manual compression in the vast majority of these patients. Now, even in the most calcific disease, there are ways to get closure that is acceptable with the current closure devices that we have available. But in those scenarios, extravascular closure devices are going to be vitally important to have in your lab, because the last thing you want to do with an intravascular device is obstruct the lumen even more. So those are things that you want to avoid.

But when you talk about arterial cases, our ACTs are elevated and we utilize IIb/IIIa inhibitors, I do believe that

achieving hemostasis with a closure device is helpful. There are other aspects of this that are just intuitively apparent, you know—the patients, especially in an outpatient setting, we want them to go home. We're in an OBL, they're not staying overnight, our patients are going home. So, we want to make sure of early time to ambulation, we want to assure early hemostasis. These patients can sit up relatively soon after the procedure, typically within 2 hours is our standard after a closure device, and then they can go home. That's an important point in the outpatient setting. It's also important in the hospital setting where we do a closure and then they're sent to a floor. Maybe the nurses are sitting with them 24 hours in the room with them, and not all patients know if their hematoma is developing and growing. So having a closure device backup is very important from that perspective. These are similar issues that we can talk about with the veins, early time to ambulation and with closure devices available that that can be helpful.

If you talk to my elderly male population who may have issues with their prostate, having to urinate on their back is not an easy proposition for some of them, and putting a Foley catheter in some of these patients is not something that makes them want to come back for ongoing procedures if that's necessary down the road. But I think it's a comfort level. I think these patients are more comfortable if they can get up earlier.

Which patients are best suited for a vascular closure device?

I think the vast majority of patients are going to be candidates, especially in the femoral artery where vascular closure devices are approved. The vast majority will be able to be treated with a closure device in the current era, especially with extravascular devices available to us.

What are some of the more challenging cases for extravascular closure?

Actually, now that you mention it, last week would be a good case of a closure device. This was a patient with severe vascular path. And I say vascular path—he had an above-the-knee amputation on the right. He had a left subclavian artery occlusion in the past with a carotid subclavian bypass. He had a type III aortic arch, so accessing him from the right arm, brachial artery, or radial artery was always very challenging. And then to make matters worse, he had a wound to his left leg. And the problem was he had a femoral-femoral bypass. So now we are dealing with an area where access was exceedingly difficult. So, his disease extended proximally in the SFA on the left side, so we couldn't access him antegrade to fix. We had to come through the bypass conduit to do this, and we couldn't come from the arm. So, we had a small window of access. This gentleman's right groin was heavily scarred. And as anybody who does a lot of procedures knows very well, scar tissue is a very high risk for developing access site complications, large hematomas, major adverse events, so you have to be exceedingly cautious. Even with ultrasound, it was difficult and

challenging to see the artery, but we had a small window to access, and then we were able to complete the intervention and revascularize his SFA, popliteal, and tibial vessels and restore flow to the foot.

So that's the great part of the procedure, right? You get that part down, now you have to deal with probably, which is equally important, which is now the closure, because if you get poor closure in this gentleman, what are you going to do? He could die if he bleeds, right? Or he may need a surgical cutdown to stop the bleeding. We knew this, we were well aware of this. We discussed this with our surgeon who was on standby in case this closure device failed. We ended up using a VASCADE closure device. It was a 7F VASCADE because we needed the appropriate tools to treat him on the left side.

We can utilize the tools such as fluoroscopy to see the disk as it expands. And we noted that the disk from the VASCADE device was getting caught on some calcium in the external iliac artery where the device was placed. And as we pulled back, if you didn't look on fluoroscopy, you wouldn't know. So what you do is you basically retract the disk on the VASCADE device, pull it a little bit more, deploy it, and then you're able to join the disk to the arteriotomy and we were able to get a successful closure and everybody was happy.

This is a case that just popped up from last week, actually, that I think highlights the importance of closure. But you have to be using good technique. And I think that's going to be the key for any success.

Since the pandemic, there's been a desire to not keep patients in the hospital longer than necessary or even in an OBL. What are your goals for early ambulation and improving the workflow for your staff as well as yourself?

Workflow for us is important. We're a high-volume center or ambulatory surgery center dealing with patients with critical limb-threatening ischemia all over Louisiana and even outside the state. So with that in mind, we need to be able to treat our patients and make sure that some of these patients are able to go home, so early ambulation and adequate access is going to be key. Now, in our lab, especially on the outpatient side, we're unique in the sense that we have a sonographer with us in the lab at all times who uses a lot of extravascular ultrasound-guided crossing, and we utilize that modality. But we also utilize them to ensure that we have adequate closure. Before the patients leave, we actually image the femoral artery, the common femoral artery, to ensure that there's adequate seal. We utilize that in the outpatient setting, but it's a lot easier to do that when you have minimized bedrest and the patients are able to get up and you feel more comfortable and confident that these patients are going to go home without a late complication or hematoma.

In the hospital setting, obviously in the era of the pandemic, it was vitally important that we kept our beds and rooms available, right? We wanted to minimize who

was going to be admitted into the hospital to only those who were the most critically ill. So closure devices were a great benefit to all of us, not just me as a vascular interventionist, but also to my structural heart colleagues, my EP colleagues, you name it, we all benefited greatly from getting these patients home the same day. I think it's been a tremendous benefit for us when you look at the grand scheme of closure.

What do you think the future holds for femoral access and closure procedures?

I think the future for vascular closure devices will be bright. I think they play a vital role in every cath lab. And I think patients will benefit from this because they don't have to lay in bed for 6 hours, which is not a very comfortable thing to do.

Great! Thank you so much for taking the time to speak with us today and sharing your expertise. We really appreciate it.

Thank you very much.

And that does it for this episode of Vascular Voices! Thank you to Dr. Nair for being our guest. To find more podcast episodes, visit our website at vasculardiseasemanagement.com or you can find us on Apple Podcasts and Spotify.

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