

ASK THE EXPERTS

Radial Access: How I Teach It

Tips and tricks for teaching and learning radial access techniques.

With Darren Klass, MBChB, MD, MRCS, FRCR, FRCPC; Vivian Bishay, MD; and Eric C. Peterson, MD



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I have always found teaching radial access to be immensely rewarding. From the moment I began using the technique, I felt it could really have an impact in interventional radiology (IR). Over the years, I have been fortunate to be involved in a formalized, multinational platform for teaching the technique. Many have not tried radial access, but there are some who either have attended a short webinar or a talk at a conference and began practicing with no formal training. I have always been a huge proponent of formal teaching for radial access because it creates a standard operating procedure that spans not only access but also navigation of vessels, catheter selection, management of pitfalls and complications, and, most importantly, patient selection.

My teaching philosophy has been simple: knowledge, technique, and problem-solving. I always incorporate the literature and history of radial intervention into every training session because it is important to know why we are doing something rather than doing it just because it is different. The data for radial began in cardiology, where large randomized studies clearly demonstrated the benefit of the technique for handling bleeding complications

and avoiding major adverse cardiac events postprocedure. Although not necessarily directly translatable to many IR procedures, we do have complications, and it is important to use techniques to decrease that incidence. Understanding the data on stroke incidence is hugely important in what we do and should not be ignored when teaching. There is a risk, but it is vanishingly small.

Adhering to proven technique is essential to successful procedures, and this is where many novice operators make mistakes. I often have attendees with experience in radial access who skip steps or do not follow best practice because it adds time to the procedure. I concentrate a lot on a step-by-step approach to my teaching, beginning with patient selection, room setup, preparation, and access, and all the way to closure and follow-up.

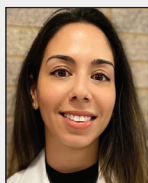
However, it is an evolution—with time, my techniques have been refined, and I cannot remember ever using the exact same slide deck for two consecutive talks or courses. Something always changes. I have made sure that the message was the same each time, so that whether the course was delivered in Spain, the Netherlands, China, Australia, or the United States, the attendees were taught to do things the same way. Whether attendees were experienced or novice, I didn't change the message or teaching because there are always things to improve on and learn. In addition, teaching the technique the same way made me feel like I contributed specifically to program development in each center. Thus, if there are issues or challenges, I take them personally and try to address them with the physician.

Instruction regarding pitfalls and complications is a challenging but essential part of any radial course. It is when many novice attendees become hesitant about doing the procedure. But, when instructed correctly and in context, attendees are provided the skills needed to prevent or manage complications with no surprises. Avoiding discussion of the potential complications does

no one any service, and I would rather have my attendees leave with all the tools available to deal with any potential issue.

I think radial access is an excellent tool essential to any practicing interventional radiologist. Although it does

not entirely replace femoral access, radial is the safer approach, and it is important not to cherry-pick cases. The worst mistake you can make is to label it as “just another access site” and not get trained in it, because you will falter where you could fly.



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Radial access is a fantastic tool that should be in every interventionalist's tool kit. Beyond improved patient satisfaction versus femoral access, there are instances when a radial approach simply offers a better angle, a more stable setup, or an alternative option when a femoral approach is unpalatable or not feasible. Although starting a radial practice may seem daunting, getting a handful of well-selected cases under your belt can make a big difference toward building an operator's confidence and skill set. Here I provide some tips and trips for the budding radialist.

Just like with all access arteries, there is variation in the overall “quality” of each radial artery as an access choice. Particularly when starting out with radial access, patient selection is paramount. Elderly patients and diabetics may have smaller or more heavily calcified arteries, and the elderly aortic arch can be ectatic and tortuous. Available imaging of the chest should be reviewed to assess the overall degree of atherosclerotic calcification, aortic tortuosity, and left subclavian artery patency. A radial diameter for access ≥ 2 mm is a good cutoff. Young women have smaller radial arteries that are more prone to spasm. Selecting patients with larger arteries can ensure that the first few radial cases go smoothly. Performing a Barbeau test with the pulse oximeter on the thumb or index finger will help ensure selection of patients with patent palmar arches. In our practice, we do not routinely ultrasound the forearm to assess for radial loops given their overall rarity, but you can consider including this as part of the preprocedure ultrasound.

A good access technique will minimize the occurrence of complications. Use ultrasound guidance, and try to perform a single-wall puncture technique. The smallest sheath size possible to achieve your end goal

should be selected, along with a low-profile, hydrophilic one intended for the radial artery. This will minimize the risk of radial artery spasm or thrombosis. Pretreatment of the wrist with nitroglycerin and lidocaine paste can make the access more comfortable and promote vasodilatation prior to needle entry. A “radial cocktail” of nitroglycerin, verapamil, and heparin should be administered when the sheath has been placed to minimize the risk of radial artery thrombosis. Although the majority of radial artery occlusions recanalize at 1-month follow-up, confirming that the patient has a patent palmar arch at the intervention outset and maintaining and monitoring the pulse oximeter on the thumb or forefinger throughout the procedure will help ensure that any sustained occlusion is asymptomatic. Access site closure with a patent hemostasis cuff will also minimize the chance of radial artery thrombosis or occlusion. Entering the artery over the radial styloid rather than “cheating up” the arm whenever possible will minimize the low chance of an access site hematoma. Finally, choosing the left radial artery for below diaphragm interventions will minimize unnecessary crossing of aortic arch vessels.

Make yourself comfortable and optimize your access setup. At our institution, we fix the left arm and hand to an armboard and gently extend the wrist with a small gauze roll placed underneath it, then tuck the arm alongside the patient to use standard femoral drapes for access. Set the table at an appropriate height so that you are relaxed and well supported. I usually recommend a 45° angle for needle approach, with the ultrasound maintained in transverse axis to the artery. Giving several milliliters of lidocaine can help create an anechoic window through which to visualize your needle. Avoiding “jiggling” of the needle as a means of localizing it will help reduce the chance of artery spasm. When spasm is encountered, dropping the access angle and driving down the barrel of the artery can be helpful, as can using a long-axis view. Consider an alternative wire such as a Nitrex wire (Medtronic) and/or accessing a little higher on the wrist.

Additional troubleshooting techniques involve efficiently navigating the left arm and aortic arch. Lead with an atraumatic tip wire like a Bentson wire (Cook Medical). Forming a simple curve on your wire can help

you direct your catheter down the descending aorta when excessive angulation is encountered. Opening up the arch with a left anterior obliquity can help the early radialist orient down the aorta quickly. If the angulation between the subclavian artery and descending aorta is very severe, an exchange length wire and reverse curve catheter can be used to hook the descending aorta. Initial case time and radiation exposure may be a little

higher than with a conventional femoral approach but are not significantly different for experienced operators. Maintaining a low threshold for switching to the next tactic can improve overall speed and efficiency. Soon, you will reap the benefits of an access option that carries low risk, improved patient satisfaction, and offers an alternative approach, depending on patient and case characteristics.



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One of the quirks of teaching radial access is that the most powerful teaching point by far has nothing to do with technique. It's simply the mindset that radial is a better way to access the arterial system and then committing to 30 consecutive radial cases. If you don't believe that and try to dabble in radial, the actual technique is immaterial; you will never be facile with it because you won't do it enough to learn it. There is simply no other path forward. No one gets good at radial doing the occasional diagnostic and posterior circulation interventions. However, once you get there mentally and commit, the rest is pretty easy.

Although the safety data are compelling, the most powerful physician driver of a full transition to a radial-first practice is the patient response, which is only encountered once you start doing all your cases radially. This is what happened to me. I found the safety data compelling and felt it was something I had to figure out how to do for the majority of the patients, but what really made me a full believer was the overwhelming patient and nursing staff response. I simply could no longer justify femoral access if radial was doable in a patient because femoral was a significantly more unpleasant way to undergo a neurointerventional procedure—both awake or under anesthesia.

Once I reached that conclusion, it really became an internal conversation of my convenience versus my patients' comfort and pain level. At that point, it was tough for me to continue with a femoral-first practice. In fact, I don't know anyone who has converted their practice to radial, seen the dramatic benefits after a few months of 100% conversion, and then gone back to femoral first. Once you commit to 30 to 50 consecutive cases, almost everyone picks up the technique fairly easily. However, there are a few things out of the gate that will make your life much easier.

The first is to use ultrasound in every case—no exceptions. It's a total game changer. It's tempting to try to stick the radial artery blindly because you can feel the pulse, but trust me, if you use ultrasound in every case, it will improve your radial experience 10-fold.

The second is to reform the Simmons curve by directing the wire down the descending aorta toward the feet rather than bouncing off the aortic valve. We still need to do the latter occasionally, but in the vast majority of cases, the former is the method we use. It's significantly cleaner and more elegant than forming the Simmons off the valve.

Finally, use the right tools. There are special thin-walled radial hydrophilic sheaths that make life so much easier, and we now have radial catheters specifically designed for neurointervention. The learning curve is now so much flatter than it was when I was learning.

In the end, remember that radial is not a religion. It's just another tool in your toolkit. However, like all tools, you can't use it effectively if you haven't put in the work to get over the tool's initial learning curve. We all owe it to our patients to become facile with the radial approach, not just dabble in it, and then decide which approach is best for each individual patient and case. ■