

ASK THE EXPERTS

What Are Your Patient Selection Strategies for Radial Neurointervention?

Key considerations in patient and procedural selection and determining the right fit.

With Amanda Baker, MD, and Brian Snelling, MD



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Radial artery access for neurointervention followed the field of interventional cardiology. In 2012, two randomized controlled trials, RIFLE-STEACS and STEMI-RADIAL, were published and demonstrated that transradial access (TRA) resulted in better cardiac outcomes and lower complication rates.^{1,2} The same year, publications on TRA for intracranial procedures in the field of neurointervention were first published. Despite the robust evidence produced by the interventional cardiology community, TRA has been less uniformly adopted by interventional neuroradiologists, neurosurgeons, and neurologists. Reasons for this include anatomic considerations, device sizing, and training. The approach to TRA versus transfemoral access (TFA) for neurointervention ranges from “radial first”—in which TRA is used first and foremost despite the patient or procedure indication—to those who never use TRA.

In an effort to put the patient’s safety first, consideration for TRA versus TFA should be approached in a systematic way. First, the neurointerventionalist should have appropriate training in using ultrasound-guided arterial access to prevent complications and vasospasm as well

as upper extremity anatomic variation. Second, there are specific instances in which TRA should be considered, including the following:

- **Inability to safely access the femoral arteries:** Some patients have femoral arteries that cannot be accessed due to occlusion, severe atherosclerotic disease, or prior stenting. Additionally, tortuosity of the femoral arteries may increase procedural difficulty, which can increase the risk of complication. Beyond this, the presence of an underlying collagen vascular disease or other systemic disorder can predispose patients to arterial dissection.
- **Bovine aortic arch anatomy:** Arterial access of the left common carotid artery (CCA) can be difficult from the TFA approach, particularly in older patients with unwound aortic arches or tortuous brachiocephalic arteries. In those patients with a common origin of the brachiocephalic artery and left CCA, the angle of the left CCA can be easier to catheterize from the right radial approach. The right vertebral artery can also be more easily catheterized from a right radial approach, especially if the brachiocephalic artery is markedly redundant.
- **Posterior circulation stroke intervention:** In keeping with above, radial to vertebral artery access can increase ease of catheterization of the basilar and posterior cerebral arteries. Often, these arteries do not require the large-size bore that the anterior circulation branches require.
- **Prone intraoperative cerebral angiography:** Coordinating arterial access to obtain pre- and intra-operative angiograms can sometimes be challenging. In prior years, femoral artery access was achieved with a long sheath, which could then be secured around the

patient's hip depending on the intraoperative positioning. However, if a patient is prone, their palms can face up in a "superman" position such that the right or left radial artery can be accessed for the purpose of intraoperative angiography. Then, closure can be obtained immediately with a compressive wrist band.

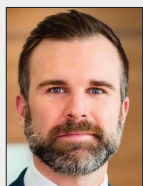
- **Inability to use a closure device:** Closure devices are only indicated in adult patients, and the radial artery size is typically too small to be amenable to catheterization in some pediatric patients. Yet, in adult patients, closure devices cannot be used if the femoral artery is too small. The risk for lower extremity embolus increases if there is atherosclerotic plaque present. Some patients with a metal allergy, specifically to nickel, can have a reaction to nitinol closure devices.

As the training and technical ability of neurointerventionalists increases with TRA, the feasibility for expanded use can be realized. For example, spinal angiography can be time-consuming and difficult given the varied angles of the radicular arteries from the aorta, which increases contrast and radiation dose. However, in appropriate patients, TRA with appropriate catheter tip shapes can be used to obtain a spinal angiogram. In more recent years, outpatient ambulatory surgical centers have included angiography.

Generally, same-day discharge after angiography favors TRA, as patients are aware of a postprocedural complication due to the obvious upper extremity symptoms as opposed to the inconspicuous symptoms of a retroperitoneal hematoma, which can be life-threatening.

Although TRA has provided another route to access the arteries of the neuroaxis, TFA remains an important and necessary route to neurointerventional surgery. Larger-bore catheters are safer to use in the femoral artery. The anatomy of each patient should be assessed so that the easier, more feasible, and safer approach should be attempted first. For example, in many patients, the external carotid artery and its branches, the left vertebral artery, and the branches of the subclavian arteries can be more easily accessed from a TFA approach. Pediatric patients often undergo TFA because the caliber of the radial artery is too small. Historically, the TFA approach to neurointervention has been the tried and true method and should not be forgotten in the approach to diagnose and treat vascular disorders in the brain and spine.

1. Romagnoli E, Biondi-Zoccai G, Sciahbasi A, et al. Radial versus femoral randomized investigation in ST-segment elevation acute coronary syndrome: the RIFLE-STEACS (Radial Versus Femoral Randomized Investigation in ST-Elevation Acute Coronary Syndrome) study. *J Am Coll Cardiol.* 2012;60:2481-2489. doi: 10.1016/j.jacc.2012.06.017
2. Bemat I, Horak D, Stasek J, et al. ST-segment elevation myocardial infarction treated by radial or femoral approach in a multicenter randomized clinical trial: the STEMI-RADIAL trial. *J Am Coll Cardiol.* 2014;63:964-972. doi: 10.1016/j.jacc.2013.08.1651



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- **Don't make your first TRA case an emergency:** The most common mistake untrained neurointerventionalists make is trying to "learn radial quickly" when they have a challenging case in a few days, or worse, when they need to try an alternative access site during an emergent mechanical thrombectomy. This leads to poor results for all involved. Although its exact role might be debated, there is no doubt that every neurointerventionalist should be proficient in TRA. Getting trained can take as little as half a day—and once you become facile with the technique, you'll find where it makes sense for the patient.
- **Do use an ultrasound—every time:** This means making sure your team has the ultrasound ready and on the field by the time you scrub into the case.

- **Don't wire blindly from the arm to the arch:** Digital subtraction angiography (DSA) from the guide sheath is a must. Although many early in their TRA journey are most concerned with radial loops at this stage (note that they are quite rare and most can be reduced easily), I particularly value DSA in helping me avoid perforation while navigating to the subclavian artery and showing high radial artery origins. Perforations are best managed through avoidance. High radial origins are much more common than radial loops and can have an impact on whether the case can be completed via TRA. I've never had an issue completing a cerebral angiogram via a high radial takeoff, and I even completed interventions using a 0.071-inch guide catheter. However, I will typically cross over to TFA if a larger guide is needed.
- **Do use a long sheath:** Routine use of 23-cm radial sheaths has eliminated radial artery spasm in my practice.
- **Don't do an Allen test:** The Allen and Barbeau tests are not reliable predictors of hand ischemia after TRA and are not routinely performed. Their limited utility may create false reassurance or unnecessary contraindications. Instead, I prioritize clinical screening for conditions like Raynaud syndrome or small-vessel disease that may increase risk, especially in elective settings. ■