The Next Game Changers for Radial Access in…

Opportunities to improve or optimize radial access for peripheral artery disease and embolization include additions and expansions to the current toolbox, safety and efficacy data, increased physician adoption, and more.

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PERIPHERAL ARTERY DISEASE

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Transradial access for coronary artery intervention has been adopted steadily over the last 15 years. In the current era of coronary intervention, it has become a class I indication due to the extensive research showing a significantly lower rate of access site complication and better safety profile with this approach. In 2019, we received the first dedicated radial-to-peripheral sheath that allowed us to intervene on iliac and intrainguinal arterial disease (R2P Destination Slender, Terumo Interventional Systems). Radial-to-peripheral technology has improved quickly since then and now provides operators a diverse tool kit to tackle more challenging cases.

To begin, one of the most pivotal additions has been the 200-cm-shaft In.Pact drug-coated balloon (Medtronic). This device has allowed us to treat patients with all types of disease, from simple superficial femoral artery (SFA) disease to more complex cases like in-stent restenosis (ISR) or popliteal disease, without placing a stent. Another device that has changed the field is the Auryon atherectomy laser system (AngioDynamics, Inc.). This XL version comes in sizes of both 0.9 and 1.5 mm, with a 220-cm shaft that allows us to perform laser atherectomy in many types of lesions, including below-the-knee (BTK) disease and ISR. Retrospective data have been presented, and more data are to come.

Treating heavily calcified lesions is the Achilles' heel of peripheral artery disease intervention. For this reason, lesion modification technique is essential. In recent years, calcium modification has been made possible with the Diamondback orbital atherectomy system (Abbott) and its long shaft. More recent is the Shockwave E8 intravascular lithotripsy (IVL) catheter (Shockwave Medical, Inc.), which features a 150-cm shaft. This tool became available in September 2024 and has quickly assumed the position as an essential tool for treating the iliac artery, common femoral artery, and proximal SFA.

Of note, these devices would not have been usable over complex lesions if not for 200-cm microcatheters, such as the Sublime 0.018- and 0.035-inch catheters (Surmodics, Inc.), which allow us to cross the lesion with our wire of choice and then advance distally to the lesion with ease. Once at the lesion, we can replace the wire with the 0.014-inch, 475-cm ViperWire (Abbott), known as the "workhorse" wire of radial-to-peripheral intervention.

There are several advancements on the horizon that I think will greatly shape radial-to-peripheral intervention. Based on the safety profile seen in the DISRUPT PAD III trial, many operators have added Shockwave IVL to their toolkit for daily use. The longest shaft available

today for Shockwave IVL is 150 cm. However, a dedicated radial-to-peripheral Shockwave IVL catheter is in the works and should be coming in the next few years. This will level the playing field between the two approaches for tackling complex and heavily calcified lesions.

Next in line will be a longer-shaft, smaller-profile covered stent. The new lower-profile version of the Viabahn balloon-expandable covered stent (Gore & Associates) recently received FDA approval and comes in 6- and 7-mm diameters. However, more options with longer shafts and lower profiles will be of great need, particularly larger balloon sizes and self-expanding covered stents.

Even with experienced radial-to-peripheral operators and the availability of the 0.014-inch, 250-cm percutaneous transluminal angioplasty balloon from Surmodics, many operators are hesitant to perform BTK intervention from radial access due to the complex nature of the disease. Next-generation bioresorbable stents are also available, with excellent data from the LIFE-BTK trial. Operators are looking forward to having a longer delivery system to use in BTK disease.

Even with all of these advancements in radial-to-peripheral intervention, the only true long wires we have are the 0.014-inch, 475-cm ViperWire and 0.035-inch stiff Glidewire (Terumo Interventional Systems). However, neither is ideal in all instances for various reasons. Several companies are working toward producing long 400- to 500-cm wires on all three profiles (0.014, 0.018, and 0.035 inch) that will be dedicated to radial-to-peripheral intervention.

The last two technologies we currently use from the femoral approach but not in the radial approach due to the short shaft length are reentry devices (Pioneer, Philips; Outback, Cordis) and distal embolic protection devices. I am not aware of any company that is developing those products in a profile that is compatible with radial to peripheral, but I hope to see it in the near future.

Finally, what may be the greatest contribution to radial to peripheral is the rapid adoption rate and growing awareness of its safety and efficacy profile even in very complex patients. Many medical device companies and medical societies have adopted educational events, lectures, and training courses to educate and spread the knowledge of the growing technology in radial to peripheral. We are still at the first step of a long journey, and more research, publications, and educational events are needed to advance this field to the next level.

EMBOLIZATION

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The use of radial access for embolization therapy has evolved rapidly in the last 5 years. Current estimates indicate that radial access is used in about 35% of embolization therapy cases in the United States and about 11% globally. The substantial increase in radial access adoption in recent years is, in part, related to the availability of devices that are longer and specifically designed for radial access, including microcatheters (up to 175 cm long, varying from 1.9-2.8 F) and diagnostic catheters (up to 150 cm long, in 4 and 5-F profiles). In 2024, most embolization procedures can be performed via radial access safely and effectively. Examples include delivering superselective radioembolization beads, any type or size of microspheres, coils, liquid embolic agents, and up to 10-mm plugs through microcatheters, virtually in any artery above the inguinal ligament.

Radial access has become the default arterial access in our practice since 2013, and this has been a fantastic journey. The most common embolization therapies performed via radial access in our practice have been liver radioembolization; chemo/bland embolization; splenic, uterine, and prostatic artery embolization; and trauma and gastrointestinal bleeds in multiple sites.

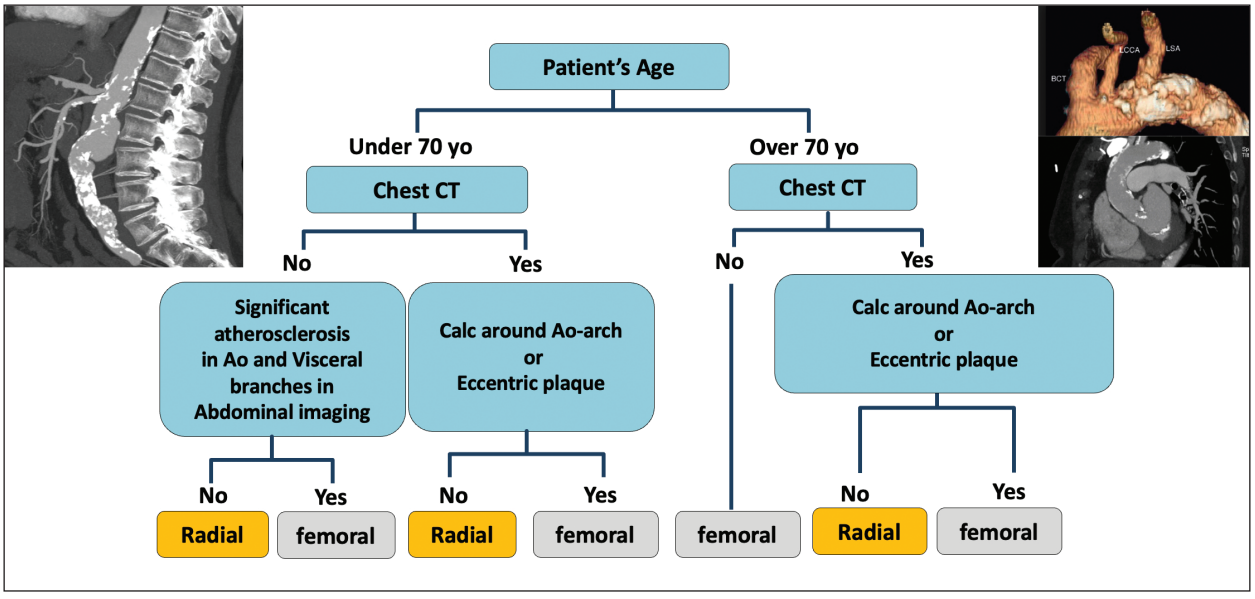

Figure 1. Stroke prevention screening protocol for embolization therapy via radial access.

The game changer for us has been the use of right radial access for certain procedures in the last 2 years. For several years, we advocated for use of left radial access because it prevents crossing the aortic arch and was thought to be safer. However, several cardiology studies compared right versus left radial access in percutaneous coronary interventions and demonstrated no difference in the incidence of stroke between right or left radial access, with some studies showing a 0% of stroke in both groups[1,2] and another showing stroke as an extremely rare event for both groups in very high-risk patients with severe coronary and peripheral artery disease.[3]

We created a patient-screening protocol to prevent stroke during radial access (Figure 1). Frankly speaking, it was based on common sense rather than evidence, but it has worked well for us for stroke prevention. After several thousands of embolization therapy cases performed via radial access in the last 11 years, our incidence of clinically evident stroke has been 0%. Right radial access is easier for operators who are used to performing embolization procedures via the right common femoral artery, working on the right side of the table. Because we have been using cone-beam CT more frequently on these cases, right radial access does not require any adjustment of equipment or patient position, which has increased the satisfaction of our procedure room staff.

We recently completed a retrospective evaluation of the safety and efficacy of right radial artery access for visceral embolization in 139 patients. The procedural technical success was 99% (137/139). There was one radial-to-femoral conversion due to an occluded midradial artery discovered after access, and one case was aborted due to uncontrollable vomiting. None of the patients had symptomatic stroke or hand ischemia at 30 days. There was one access site complication (< 1%) related to a self-limited hematoma.

RECOMMENDED RESOURCES

Seven pillars for successful and safe performance of radial access from Gayed A, Yamada R, Bhatia S, et al. Society of Interventional Radiology quality improvement standards on radial artery access. J Vasc Interv Radiol. 2021;32:761.e1-761.e21. doi: 10.1016/j.jvir.2020.12.013

Technical tips from BackTable. Radial access evolution: clinical perspectives & insights from the RAVI registry. BackTable VI. March 22, 2024. Accessed October 15, 2024. https://www.backtable.com/shows/vi/podcasts/428/radial-access-evolution-clinical-perspectives-insights-from-the-ravi-registry

Data from the RAVI registry of radial access in visceral interventions in Guimaraes M, Fischman A, Yu H, Tasse J, et al; RAVI Registry Investigators. The RAVI registry: prospective, multicenter study of radial access in embolization procedures–30 days follow up. CVIR Endovasc. 2024;7:15. doi: 10.1186/s42155-023-00415-5

This preliminary analysis indicates that right radial access is effective and safe for visceral embolization procedures. With the right arm tucked against the torso, it allows the operator to stand on the right side of the patient (similar to a right common femoral artery approach), facilitating room setup and procedures that require cone-beam CT. It is a win for patients, interventionalists, and ancillary staff.

OPPORTUNITIES

Although not necessarily a game changer, other opportunities to improve or optimize radial access in embolization therapy include but are not limited to:

- A shorter (20 mm in length) and smaller-profile (22-23 gauge needle with hyperechogenic tip) radial access kit, with a smaller guidewire (0.018–0.016-inch nitinol wire)
- An introducer sheath with specialized antithrombotic coating that may inhibit thrombogenicity; a similar theoretical opportunity is the local release of vasodilator (introducer sheath coated) to prevent spasm
- A 5-F (smaller profile) self-expanding stent platform for visceral and iliac stenting, and a 5-F self-expanding stent platform for the SFA
- A radial access closure device that would allow immediate hemostasis
- 3-F diagnostic catheters compatible with a 0.025–0.035-inch wire
- Longer diagnostic catheters and microcatheters to support genicular artery embolization and other lower extremity embolization ■

1. Norgaz T, Gorgulu S, Dagdelen S. A randomized study comparing the effectiveness of right and left radial approach for coronary angiography. Catheter Cardiovasc Interv. 2012;80:260–264. doi: 10.1002/ccd.23463
2. Elmahdy MF, ElMaghawry M, Hassan M, et al. Comparison of safety and effectiveness between right versus left radial arterial access in primary percutaneous coronary intervention for acute ST segment elevation myocardial infarction. Heart Lung Circ. 2017;26:35–40. doi: 10.1016/j.hlc.2016.04.021
3. Rashid M, Lawson C, Potts J, et al. Incidence, determinants, and outcomes of left and right radial access use in patients undergoing percutaneous coronary intervention in the United Kingdom: a national perspective using the BCIS dataset. JACC Cardiovasc Interv. 2018;11:1021–1033. doi: 10.1016/j.jcin.2018.01.252