Distal Radial Artery Cannulation for Challenging Radial Anatomy

Deepthi Sudhakar^a John M. Suffredini^a Charles E. Howard^a Hani Jneid^{a, b}

^aSection of Cardiology, Department of Medicine, Baylor College of Medicine, Houston, TX, USA;

^bSection of Cardiology, Medical Care Line, Michael E. DeBakey, VA Medical Center, Houston, TX, USA

Trans-radial arterial access for coronary angiography and percutaneous coronary intervention (PCI) has become increasingly adopted as a mainstay approach. A trans-radial arterial approach offers several advantages when compared to a femoral angiography approach, including lower rates of access site-related bleeding and overall vascular complications [1]. The reduced incidence of vascular complications is particularly evident among patients presenting with ST-segment elevation myocardial infarction (STEMI). Trans-radial access was associated with lower major bleeding and access site events among STEMI patients enrolled in the Radial Versus Femoral Randomized Investigation in ST-Elevation Acute Coronary Syndrome (RIFLE-STEACS) trial, the ST Elevation Myocardial Infarction Treated by Radial or Femoral Approach (STEMI-RADIAL) trial, and the STEMI subgroup analysis of the Radial Versus Femoral Access for Coronary Intervention (RIVAL) trial [2–4]. Furthermore, a reduction in mortality was observed among ACS patients in the Minimizing Adverse Hemorrhagic Events by Trans-radial Access Site and Systemic Implementation of AngioX (MATRIX) trial and among STEMI patients in the RIVAL and RIFLE-STEACS trials [2, 4, 5].

While a “radial first” approach has led to decreased access site complications, its association with radial-specific complications such as radial artery occlusion (RAO), pseudoaneurysm, and arterial spasm led to further refine-

ment of this access strategy [6, 7]. A distal trans-radial approach is increasingly recognized as a feasible alternative arterial access [6–9]. The use of retrograde recanalization of an occluded radial artery through the distal radial artery (dRA) for perioperative monitoring was first described in 2011; however, its use in cardiac catheterization was only introduced in 2017 [8, 9]. It carries the advantage of bypassing the superficial palmar arch, allows preservation of antegrade flow, and reduces the incidence of RAO seen with a traditional trans-radial approach [6, 10]. The lower time to achieve patent hemostasis also makes this an attractive option [11]. The limitations of this new approach, however, relate to technical challenges in accessing the artery within the anatomic snuffbox [10].

It is in this context that the current case series by Ferreira-Martins and Lim should be viewed [12]. They describe the challenges encountered during cannulation of the dRA and outline specific strategies to overcome potential limitations among elderly patients [12]. We applaud the authors for their diligent efforts to identify these challenges and come up with practical solutions. The diversity in patients’ clinical presentation and the variations in the utilized techniques implemented provide the invasive cardiologist with multiple useful options for troubleshooting.

There are several noteworthy aspects of the current study that merit attention. First, all cases in the series describe the use of coronary guidewires to navigate difficult tortuosity. In a majority of the cases, a Pilot 50 polymer-covered soft-tipped guidewire allowed successful advancement into the radial artery. Sheaths were easily exchanged over these 0.014-inch angioplasty guidewires, and these were used prior to anticoagulation, compelling the authors to emphasize the need for expeditious insertion to prevent wire-associated thrombosis. The operators showed that a variety of sheaths can be employed via the dRA, ranging from 4 Fr to 6 Fr sheaths, and showed the feasibility of performing PCI with a 5Fr sheath through the dRA. It is interesting also to note that in one patient presenting with STEMI, a timely door-to-balloon time of <90 minutes was achieved despite the challenges encountered in navigating his tortuous arterial vessels.

The study therefore demonstrates the feasibility of dRA access among elderly patients. We praise the authors for providing concise steps for performing dRA access and a variety of solutions for troubleshooting difficult access. Their report also highlights potential topics for future research, including long-term outcomes and potential complications associated with PCI via the dRA access. Previous studies have described a low incidence of hematoma, RAO, and arteriovenous fistula formation following dRA access [6, 7, 13]. The results of several current ongoing trials comparing dRA with traditional trans-radial arterial access will be informative [7].

Overall, the advent of trans-radial access was an important milestone in the field of invasive cardiology and resulted in marked improvement in clinical outcomes in specific subsets of patients undergoing PCI [1–4]. The adoption of the trans-radial access was slow in the USA given the steep learning curve associated with it. Arterial access via the dRA is an attractive option that is gaining increasing interest but remains technically challenging. The findings of low rates of RAO, decreased time to achieve hemostasis, and the feasibility of PCI via the dRA approach are very promising. The current study provides important contributions to our knowledge of the dRA access and emphasizes the need for continued investigation of this novel approach.

Conflict of Interest Statement

There are no conflicts of interest.

Funding Sources

The authors did not receive any funding.

Author Contributions

All of the listed authors contributed to the writing and review of the manuscript.

References

- Mason PJ, Shah B, Tamis-Holland JE, Bittl JA, Cohen MG, Safirstein J, et al. An update on radial artery access and best practices for transradial coronary angiography and intervention in acute coronary syndrome: a scientific statement from the American Heart Association. *Circ Cardiovasc Interv.* 2018 Sept; 11(9):e000035.
- Romagnoli E, Biondi-Zoccai G, Sciahbasi A, Politi L, Rigattieri S, Pendenza G, et al. Radial versus femoral randomized investigation in ST-segment elevation acute coronary syndrome: the RIFLESTEACS (Radial Versus Femoral Randomized Investigation in ST-Elevation Acute Coronary Syndrome) study. *J Am Coll Cardiol.* 2012 Dec;60:2481–9.
- Bernat I, Horak D, Stasek J, Mates M, Pesek J, Ostadal P, 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 Mar;63(10):964–72.
- Jolly SS, Yusuf S, Cairns J, Niemelä K, Xavier D, Widimsky P, et al. Radial versus femoral access for coronary angiography and intervention in patients with acute coronary syndromes (RIVAL): a randomised, parallel group, multicentre trial. *Lancet.* 2011 April; 377(9775):1409–20.
- Valgimigli M, Gagnor A, Calabr P, Frigoli E, Leonardi S, Zaro T, et al. MATRIX Investigators. Radial versus femoral access in patients with acute coronary syndromes undergoing invasive management: a randomised multicentre trial. *Lancet.* 2015 Jun;385:2465–76.
- Aoi S, Htun WW, Freeo S, Lee S, Kyaw H, Alfaro V, et al. Distal transradial artery access in the anatomical snuffbox for coronary angiography as an alternative access site for faster hemostasis. *Catheter Cardiovasc Interv.* 2019 Nov;94(5):651–7.
- Cai G, Huang H, Li F, Shi G, Yu X, Yu L. Distal transradial access: a review of the feasibility and safety in cardiovascular angiography and intervention. *BMC Cardiovasc Disord.* 2020 Aug;20(1):356.
- Babunashvili A, Dundua D. Recanalization and reuse of early occluded radial artery with access for coronary angiography and intervention in patients with acute coronary syndromes (RIVAL): a randomised, parallel group, multicentre trial. *Lancet.* 2011 April; 377(9775):1409–20.
- Kiemeneij F. Left distal transradial access in the anatomical snuffbox for coronary angiography (IdTRA) and interventions (IdTRI). *EuroIntervention.* 2017 Sep;13(7):851–7.
- Corcos T. Distal radial access for coronary angiography and percutaneous coronary intervention: a state-of-the-art review. *Catheter Cardiovasc Interv.* 2019 Mar;93(4):639–44.
- Coughlan JJ, Zebrauskaite A, Arnous S, Kieran TJ. Left distal trans-radial access facilitates earlier discharge post-coronary angiography. *J Interv Cardiol.* 2018 Dec;31(6):964–8.
- Ferreira-Martins J, Lim PO. Two-step distal radial artery cannulation for challenging radial anatomies. CRD-2020-5-44/R1 resubmission. *Cardiology.* 2021;146(2):144–50.
- Al-Azizi KM, Grewal V, Gobeil K, Maqsood K, Haider A, Mohani A, et al. The left distal transradial artery access for coronary angiography and intervention: a US experience. *Cardiovasc Revasc Med.* 2019 Sept;20(9):786–9.