

Thirty Years of Transradial Coronary Interventions: Perspectives and Challenges

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Thirty years ago, Canadian cardiologist Lucien Campeau first published his series of 100 coronary angiographies via transradial coronary catheterisation in *Catheterisation Cardiovascular Interventions Journal*.¹ Transradial access (TRA) was achieved initially via radial artery cutdown in those with a positive Allen's test, with the angiographic procedures themselves being performed predominantly via 5 French catheters.¹ This was followed by the adaptation of the radial access technique for percutaneous coronary intervention (PCI), pioneered by Ferdinand Kiemeniej of the Netherlands, who published his experiences, also in *Catheterisation Cardiovascular Interventions* in 1993.²

TRA for PCI seemed an attractive alternative, particularly as coronary stenting required higher doses of anticoagulation, consequently predisposing patients to bleeding, which was a substantial risk of the femoral approach and use of larger guide catheters. This was especially true in the case of acute coronary syndromes and primary PCI.³⁻⁷ A number of randomised controlled trials has been published since then, demonstrating the superiority of transradial approach versus transfemoral in reducing access site complications, bleeding and mortality.³⁻⁶

The superiority of TRA is not limited to its reduced bleeding & mortality. The procedure is accompanied by greater patient comfort, the ability to same-day discharge as well as enhanced cost-effectiveness. As a result, TRA was gradually adopted across the

globe, with many centres, including our centre, learning the process from proponents of TRA, friends and proctors: the proverbial "See one, do one, teach one" in practice. Given its advantages, TRA gradually gained popularity not just among patients who would seek out the convenience of having their procedures via the wrist, but also catheterisation laboratory staff, for whom the task of sheath removal and haemostasis was quicker, could be done in the catheterisation laboratory immediately post-procedure, did not involve documenting activated clotting times, enhancing convenience. As a pioneer in the adoption of transradial intervention in the country, our centre has implemented the transradial route as the default access site for a wide range of coronary catheterisation procedures, including primary PCI⁸ as well as complex PCI procedures such as graft vessel interventions,⁹ chronic total occlusion (CTO) PCI with bi-radial access for dual injection,¹⁰⁻¹¹ bifurcation PCI & calcified lesions.^{12,13} Furthermore, unlike transfemoral access, TRA also allows for the use of universal diagnostic catheters as well as guide catheters, which reduce radial artery spasm and affords better patient comfort and operator ease by precluding the need for multiple catheter exchanges.¹⁴ At our radial centre, multivessel left and right system PCI is not infrequently undertaken with a single JL guide by dedicated radial operators.¹⁵

As TRA gradually gained momentum worldwide, colleagues in Japan began propagating the slender TRA approach,¹⁶ which is essentially a further

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downsizing of transradial equipment, with the use of smaller sheaths and guides, sheathless guides, and active support techniques (Figure-1). Slender techniques are particularly useful among patient subsets with narrower radial arteries, such as diabetics and South Asians, whom we frequently encounter in local practice in Bangladesh. A case series of slender CTO PCI as well as a novel use of transradial ping-pong technique has been undertaken at our centre with satisfactory results.¹¹

With the development of ancillary equipment for PCI, and greater deliverability of stents and balloons, back-up support via TRA required for complex PCI is no longer an issue. Furthermore, contemporary transradial guides, can easily accommodate intravascular imaging catheters (even 5 French guides), rotational atherectomy burrs and up to two balloons for kissing balloon inflation in bifurcation PCI via 6 French guides. The adoption of TRA is not without challenges, however, as is often the case when pursuing a shift from the norm. For the operator, a learning curve exists that cannot be underestimated, particularly with navigating radial loops, subclavian loops (in the form of rollercoaster loops and cobra loops etc.) and learning to acquire active and passive support appropriately, including for those operators previously accustomed to the femoral approach. For the centre, there arises a need to train staff in preparation and ergonomics, as well as make provisions for dedicated radial equipment. Paradoxically, for fellows trained in the contemporary generation, radial access remains the easier choice, with a need for dedicated training in femoral access, an important skill that must be retained when emergency and alternative access is required.

Despite its popularity and ease of use, a notable caveat of TRA remains radial artery occlusion (RAO), which is the Achilles' heel of TRA.¹⁷ An occluded radial artery restricts the use of the same RA for future procedures, as a conduit for coronary artery bypass grafting or for arteriovenous fistula creation.^{17,18} The adoption of various techniques, including patent haemostasis, first proven in an RCT to reduce RAO in 2008,¹⁹ as well as ipsilateral ulnar artery compression during patent haemostasis,²⁰

along with the use of adequate anticoagulation and contemporary best practices have resulted in reducing the incidence of RAO to <1% in randomised evidence globally.¹⁸ Real-world RAO rates globally however, remain between 0.3 to as high as 33%,¹⁸ possibly owing to lack of adoption of best practices in busy labs.²¹ The distal radial approach, via the anatomic snuffbox or on the dorsum of the hand has recently gained global popularity as an alternative access route for vascular procedures, with a strong rationale supporting its potential for significantly reduced risk for RAO.²²

Thirty years since the first transradial angiogram, transradial intervention is more than "just a fad", with further innovations in access and transradial equipment resulting in greater convenience and improved outcomes for our patients, with the branching out of TRA not just for coronary intervention, but also as an access site for peripheral interventions, carotid artery & neuro-interventions. However, despite the overwhelming evidence in favour of TRA and its inclusion in society guidelines, its uptake and incorporation into routine clinical practice globally, is still limited. As has been demonstrated however, the challenges to its adoption are not insurmountable, even in busy high-volume centres in Bangladesh, and thus every effort should be made to incorporate innovation into routine practice to improve patient outcomes.

Figure legends

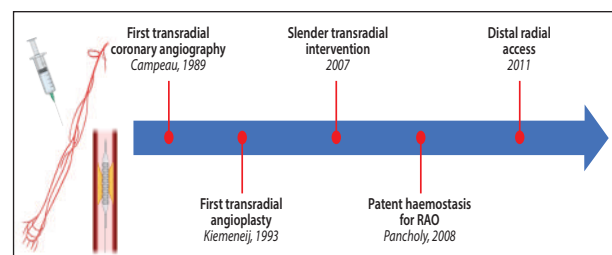


Figure 1: Evolution of access sites for coronary interventions since the first transradial procedure (Cader FA, Haq MM, Khan SR.)

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