

# Left Radial Approach in Cardiac Catheterization. Does it Really Matter?

Ferdinand Kiemeneij

Departamento de Cardiología Intervencionista, Hospital Onze Lieve Vrouwe Gasthuis, Amsterdam. The Netherlands.

Inspired by the pioneering study of Dr Lucien Campeau, who performed transradial coronary angiography in 100 patients with 5F catheters,<sup>1</sup> we undertook a feasibility study on transradial coronary balloon angioplasty in 1992,<sup>2</sup> soon followed by another study on transradial coronary stenting.<sup>3</sup> The main reason for choosing this alternative access site instead of the femoral artery was to avoid the major arterial bleeding so frequently seen in patients treated with an aggressive regimen of anticoagulant and antiplatelet agents. The first and most important and most consistent finding until this very day was a dramatic reduction in major bleeding complications.

Over the past 17 years, a great number of publications on the efficacy and safety of transradial procedures have been reported in all types of patient subsets: very elderly patients, Asian patients, female patients, patients at risk for bleeding, patients with acute coronary syndromes, patients with peripheral arterial disease, etc. All types of coronary disease addressed via the radial artery have been described: chronic total occlusions, bifurcation lesions, unprotected left main disease, diseased venous bypass grafts, etc.

Of course, there are limitations and downsides. The most common problem is the need to overcome a learning curve. Transradial coronary access is not easy. One has to deal with smaller and spasm-prone arteries. Anomalies of the arteries of the arm are not uncommon, and one has to learn how to overcome these variations. As a consequence, especially in the early phase of learning, procedure times and fluoroscopy times are longer compared to those of the routine femoral approach. Re-entry of the radial

artery can become more difficult over time because of narrowing of the vessel or even loss of radial artery patency. The patient might experience unpleasant to painful sensations in the arm, especially if there is a mismatch between the radial artery lumen and the size of equipment used to approach the coronary arteries. However, with experience, success rates are approaching femoral success rates and the limitations mentioned can be overcome at least in great part.

The paper of Santas et al<sup>4</sup> describes a randomized comparison between femoral (TFA), right (RRA) and left (LRA) radial approaches (TRA). It is quite a unique study, in which all the patients scheduled for coronary angiography are randomized without exclusion criteria. The findings are therefore not easily comparable with other studies in which exclusion criteria are applied before inclusion of the patient in any study and, thus, the feasibility of the arterial access site is analyzed. The rate of procedures ended using the assigned approach was only 71% for LRA and 68% for RRA, versus 92% for TFA. These numbers for TRA are disappointingly low and will not coincide with the perception of those centers where the transradial approach has been introduced as the routine technique.

It is my personal opinion that there should be no freedom of choice between radial or femoral access in any center. Patients do not understand why one is catheterized via the groin and the other via the radial artery. This leads to understandable and critical questions if a patient, restricted to bed rest, with or without an (expensive) closure device and an additional risk for bleeding, sees another patient with only a hemostatic dressing on the wrist walking around freely and safely. What explanation can be given?

At our center (OLVG hospital in Amsterdam, the Netherlands), the entire logistic process for patients undergoing transradial catheterization and percutaneous coronary intervention (PCI) has been dramatically changed. Now, basically all the elective patients remain in a lounge without beds before and a few hours after the procedure, before being discharged. Only femoral patients require a bed.

SEE ARTICLE ON PAGES 482-90

Correspondence: F. Kiemeneij, MD, PhD,  
Onze Lieve Vrouwe Gasthuis, Interventional Cardiology,  
Oosterpark 9, Postbus 95500,  
Amsterdam, The Netherlands  
E-mail: ferdi@euronet.nl

Crossover from radial to femoral is extremely rare. Of all the coronary catheterizations carried out at our center, 87% are performed via the radial artery. As we train residents in TFA as well, the percentage of patients who are scheduled for TRA and who are actually catheterized via the radial artery by far exceeds 90% (unpublished data).

Indeed, the only contraindications that we apply are absence or very small size of bilateral radial arteries and bilateral mastectomy (lymphedema). Even if the radial arteries are not suitable for coronary access, the ulnar arteries can still be used. Once the assignment had been made to either the left or right radial approach, success rates were still low in this study (80% and 82%, respectively) versus a high femoral success rate (96%). This finding is surprising as well since all the operators can be considered experienced (>1000 transradial procedures).

In a recent meta-analysis, the success rates were higher, especially in the later studies (crossover in TRA, 5.9%, vs 1.4% in TFA, for all the studies).<sup>5</sup>

The rate of failure to catheterize the radial artery was 12.3% for LRA, 5.7% for RRA, and 3.1% for TFA. The discrepancy between LRA and RRA may be explained by the difficulty for the operator to puncture the LRA from the right side of the patient. This is a common finding, especially if the patient is obese. Proper preparation of the catheterization table becomes very important. The left arm should be abducted to the greatest possible extent towards the operator and placed on a comfortable support. There were no other major differences between LRA and RRA.

The most important advantage of LRA must be sought in patient comfort. Especially right-handed patients are disabled for about a day after RRA, depending on the advice and instructions they receive.

In this study, radiation exposure for both RRA and LRA exceeded exposure during TFA. This disadvantage of TRA has been reported previously. Increased exposure of the operator to radiation might deter colleagues from applying the radial approach in their patients.<sup>6</sup> However, in our laboratory, all the personnel involved in TRA remain far below radiation safety limits. This is accomplished by proper placement of protective shields, under and over the table. Proper table preparation, where the arm of the patient is positioned parallel and not perpendicular to his or her body, allows the physician to maintain an adequate distance from the radiation source.

In this study, the key finding (again) was the major reduction of severe bleeding complications in patients undergoing TRA.

Major bleeding is an independent predictive factor of adverse acute and long-term outcomes. In the light of increased adverse cardiac events and mortality<sup>7-9</sup> associated with serious bleeding complications and need for blood transfusions after PCI, the debate over the preferred access site should now end in favor of radial access. Higher crossover rates, a learning curve, increased procedure time, radial artery spasm, increased radiation exposure, loss of radial artery pulse, and so on, are all weak excuses for not approaching the coronary arteries via the radial artery, when weighed against the loss of patients' lives.

How many comparisons have to be made, 17 years after the first transradial PCI? How many meta-analyses have to be published? What answers are we waiting for? The most important finding, as documented in a myriad of other studies in all different patient categories, is a significant reduction in major bleeding complications following TRA.<sup>5</sup> Patient comfort, cost reduction and safe outpatient strategies are all, although relevant, secondary advantages.

In case of unforeseen radial access failure, crossover to the contralateral radial artery, or even either of the ulnar arteries can precede crossover to the femoral approach. Here, patient safety should prevail over the preference of the doctor. Given the finding that success rates are higher via right radial approach, I would prefer the right arm to the left. In the latter case, the convenience of the doctor may prevail over the comfort of the patient.

## REFERENCES

1. Campeau L. Percutaneous radial artery approach for coronary angiography. *Cathet Cardiovasc Diagn.* 1989;16:3-7.
2. Kiemeneij F, Laarman GJ. Transradial coronary angioplasty. *Am Heart J.* 1995;129:1-7.
3. Kiemeneij F, Laarman GJ. Percutaneous transradial artery approach for coronary stent implantation. *Cathet Cardiovasc Diagn.* 1993;28:173-8.
4. Santas E, Bodí V, Sanchis J, Núñez J, Mainar L, Miñana G, et al. Acceso radial izquierdo en la práctica diaria. Estudio aleatorizado para comparar los accesos femoral, radial derecho y radial izquierdo. *Rev Esp Cardiol.* 2009;62:482-90.
5. Jolly SS, Amlani S, Hamon M, Yusuf S, Mehta SR. Radial versus femoral access for coronary angiography or intervention and the impact on major bleeding and ischemic events: A systematic review and metaanalysis of randomized trials. *Am Heart J.* 2009;157:132-40.
6. Brasselet C, Blanpain T, Tassan-Mangina S. Comparison of operator radiation exposure with optimized radiation protection devices during coronary angiograms and ad hoc percutaneous coronary interventions by radial and femoral routes. *Eur Heart J.* 2008;29:63-70.
7. Manoukian SV, Feit F, Mehran R, Voeltz MD, Ebrahimi R, Hamon M, et al. Impact on major bleeding on 30 day mortality and clinical outcomes in patients with acute coronary syndromes: An analysis from the ACUTY Trial. *J Am Coll Cardiol.* 2007;49:1362-8.

8. Bertrand OF, Larose E, Rodes-Cabau J, Gleeton O, Taillon I, Roy L, et al. Incidence, predictors, and clinical impact of bleeding after transradial coronary stenting and maximal antiplatelet therapy. *Am Heart J*. 2009;157:164-9.
9. Chase AJ, Fretz EB, Warburton WP, Klinke WP, Carere RG, Pi D, et al. Association of arterial access site at angioplasty with transfusion and mortality; the M.O.R.T.A.L study (Mortality benefit of reduced transfusion after PCI via the arm or leg). *Heart*. 2008;94:1019-25.