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# Twelve-month clinical outcomes of transradial coronary artery intervention: comparison of the right and left radial artery approach

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## ABSTRACT

**Introduction.** Trans-radial intervention has several advantages such as reduction of bleeding risk, improvement of patients' convenience, and immediate ambulation as compared with the trans-femoral intervention. In the trans-radial intervention, there are some anatomical and technical differences between right and left radial approach. The aim of this study is to evaluate the impact of the choice of the right or left radial approach on 12-month clinical outcomes in patients undergoing the trans-radial intervention.

**Methods.** A total of 506 consecutive patients who underwent trans-radial intervention were enrolled from Nov 2013 to Oct 2014 in the Lithuanian University of Health Sciences Trans-radial Intervention Registry. The patients were divided into two groups; a right radial approach group and a left radial approach group. To adjust potential confounders, propensity score-matched analysis was performed using the logistic regression model.

**Results.** After propensity score matching, the baseline clinical and angiographic characteristics were balanced between the two groups. However, contrast volumes during the procedure were larger and fluoroscopic times were longer in the right radial approach group, whereas procedure times were longer in the left approach group. Procedural and in-hospital complications were similar between the two groups. The cumulative clinical outcomes up to 12 months, including mortality, recurrent myocardial infarction, repeat revascularisation, stent thrombosis, and MACE, were similar between the two groups.

**Conclusions.** In this study, despite the procedural efficacy including procedural time and contrast volume were increased in the right artery approach, however, 12-month cumulative clinical outcomes were similar between the two groups.

**Key words:** percutaneous coronary intervention, trans-radial, right approach, left approach

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## Introduction

The popularity of the transradial approach to coronary angiography and percutaneous coronary intervention (PCI) continues to grow with mounting evidence of its clinical benefits, particularly the lower incidence of bleeding and vascular complications [1], among others. Transradial cardiac catheterisation can be effectively and safely performed using either right or left radial arteries for vascular access. However, unlike the transfemoral route, the patient preparation, equipment setup, and overall techniques vary depending on which radial artery is used. Ideally, the transradial operator should be proficient with both right and left radial access

and, therefore, should be well versed on the subtle variations between the two approaches. The modern cardiac catheterisation laboratory and its support staff should also be equipped to handle these differences efficiently in order to maximise the advantages gained from transradial procedures.

Historically, transradial catheterisation was developed using the left radial artery as the primary access site. In the original description of the technique by Lucien Campeau in 1989, the patient's left wrist was hyperextended to facilitate puncture of the left radial artery with an 18-gauge needle and subsequent cannulation using a 5-F sheath. Coronary angiography was successfully completed using 5-F catheters [2]. The

**Table 1.** Comparison between right and left radial access

	Right radial access	Left radial access
Acceptability	Widely adopted	Less popular
Preparation and setup	More standardised	May be cumbersome
Comfort for the operator	++++	+
Learning curve	Longer	Shorter
Catheter manipulation	More technically challenging	Better control
Radiation	Similar to left radial access among expert operators	Shorter with trainees
Efficacy and safety	Similar	Similar

left radial approach was not widely adopted, however, perhaps because it relocated the operator to the left side of the patient and disrupted the traditional laboratory setup. The right radial approach was utilised in the first description of transradial PCI in 1993, as described by Ferdinand Kiemeneij [3]. During this time, dedicated radial catheterisation kits with 22-gauge access needles were already commercially available, as were the 6-F guiding catheters used for PCI.

The right radial approach has since become the vascular access site of choice for the majority of transradial operators. The familiarity and ease of catheter and equipment manipulation from the right side by both the operator and the ancillary staff, like that of the standard transfemoral route, has probably driven this trend. However, the left radial artery route offers a few advantages over the right radial approach, such that mastery of this technique has become almost compulsory for the modern transradial operator. Furthermore, modifications in patient preparation and equipment setup make it possible to perform left radial catheterisation from the right side of the patient, providing convenience that is comparable to that of right radial or transfemoral access. Table 1 summarises the differences and similarities between right and left transradial access.

## Methods

A total of 506 consecutive patients who underwent transradial intervention (TRI) were enrolled from Nov 2013 to Oct 2014 in the Lithuanian University of Health Sciences TRI Registry. The patients were divided into two groups: a right radial approach group ( $n = 240$  pts) and a left radial approach group ( $n = 266$  pts). To adjust potential confounders, propensity score-matched (PSM) analysis was performed using the logistic regression model (C-statistics: 0.726). After PSM, a total of 450 patients (225 pairs) were enrolled for this analysis.

## Results

After PSM, the baseline clinical and angiographic characteristics were balanced between the two groups. However, contrast volumes during the procedure were larger and fluoroscopic times ( $20.5 \pm 26.0$  minutes vs.  $15.1 \pm 10.6$  minutes) were longer in the right radial approach group ( $256.3 \pm 116.6$  cc vs.  $225.0 \pm 88.7$  cc,  $p$ -value  $< 0.001$ ), whereas procedure times ( $45.2 \pm 27.4$  minutes vs.  $53.4 \pm 25.7$  minutes,  $p$ -value = 0.003) were longer in the left approach group. After PSM, procedural and in-hospital complications were similar between the two groups. The cumulative clinical outcomes up to 12 months, including mortality, recurrent myocardial infarction (MI), repeat revascularisation, stent thrombosis, and MACE, were similar between the two groups (Tab. 2).

The safety and efficacy of the right and left radial approaches were compared in a recent randomised trial involving 1000 patients who underwent transradial coronary angiography. The study found significantly shorter fluoroscopy times with the left radial approach. This may be partly explained by a three-fold higher incidence in subclavian tortuosity, as well as a higher incidence of radial loops with right radial access. Nevertheless, the overall procedural success rate, total procedure duration, number of catheters used to complete the procedure, and amount of contrast material used were the same between the two routes [4]. A similar observation was seen in patients undergoing transradial PCI for acute myocardial infarction. In a retrospective series of 135 patients, no significant difference between right and left radial approaches was found in terms of procedure success rate, procedure duration, room-to-balloon time, and safety profile [5].

In the hands of expert transradial operators, outcomes are comparable with either right or left radial access. During the learning phase, however, transradial catheterisation is technically demanding and time-con-

**Table 2.** Clinical outcomes

	Right radial (n = 225)	Left radial (n = 225)	P value
Mortality	9 (4%)	11 (4.8%)	> 0.05
Cardiac death	7 (3.1%)	8 (3.5%)	> 0.05
Recurrent myocardial infarction	8 (3.5%)	10 (4.4%)	
Repeat percutaneous coronary intervention	18 (8%)	21 (9.3%)	> 0.05
Stent thrombosis	3 (1.3%)	1 (0.4%)	> 0.05
MACE (mortality, repeat PCI, MI)	35 (15%)	42 (18%)	> 0.05

MACE — major adverse cardiac events; PCI — percutaneous coronary intervention; MI — myocardial infarction

suming. Data suggest that it may be advantageous to emphasise the left radial approach during the training period because it appears to allow novice operators to acquire the skills and confidence required for transradial procedures more quickly than the right radial route. This was demonstrated by the TALENT (Left Versus Right Transradial Approach for Percutaneous Coronary Procedures) trial, which randomised nearly 1500 patients undergoing transradial coronary angiography with either right or left radial routes. The study found that among trainees, the left radial approach was associated with a significantly shorter learning curve, with progressive reductions in cannulation and fluoroscopy times as the operator volume increased, compared to right radial access [6].

This difference may be explained by the anatomical variations between the right and left vasculature. In addition to the higher incidence of loops in the right radial artery, the right subclavian artery is often more tortuous than the left, especially in patients with short stature and those who are elderly [7]. Additionally, in the right radial route, the catheter has to pass not only through the right subclavian artery, but also through the brachiocephalic trunk, before reaching the aortic root. Traversing these two areas of bifurcation increases the technical difficulty, especially if atherosclerosis is involved. Because the left subclavian artery arises directly from the aorta, the path followed by the catheter in the left radial route is very similar to that of the transfemoral approach, resulting in less complex catheter manipulation and greater control. Furthermore, the left radial approach provides direct access to the left internal mammary artery (LIMA), which is of special significance in patients who have undergone coronary artery bypass grafting. Certainly, the LIMA can also be cannulated

from the right radial route, but it is significantly more challenging from a technical standpoint, and there is a potential risk of embolic stroke due to catheter manipulation in the aortic arch.

## Conclusions

In this study, despite the procedural efficacy including procedural time and contrast volume were increased in right artery approach, however, 12-month cumulative clinical outcomes were similar between the two groups; the right and left routes to transradial catheterisation are equally safe and effective.

**Conflict of interest:** none declared

## References

1. Rao SV, Cohen MG, Kandzari DE et al. The transradial approach to percutaneous coronary intervention: historical perspective, current concepts, and future directions. *J Am Coll Cardiol* 2010; 55: 2187–2195.
2. Campeau L. Percutaneous radial artery approach for coronary angiography. *Cathet Cardiovasc Diagn* 1989; 16: 3–7.
3. Kiemeneij F, Laarman GJ. Percutaneous transradial artery approach for coronary stent implantation. *Cathet Cardiovasc Diagn* 1993; 30: 173–178.
4. Norgaz T, Gorgulu S, Dagdelen S. Arterial anatomic variations and its influence on transradial coronary procedural outcome. *J Interv Cardiol* 2012; 25: 418–424.
5. Larsen P, Shah S, Waxman S et al. Comparison of procedural times, success rates, and safety between left versus right radial arterial access in primary percutaneous coronary intervention for acute ST-segment elevation myocardial infarction. *Catheter Cardiovasc Interv* 2011; 78: 38–44.
6. Sciahbasi A, Romagnoli E, Burzotta F et al. Transradial approach (left vs right) and procedural times during percutaneous coronary procedures: TALENT study. *Am Heart J* 2011; 161: 172–179.
7. Dehghani P, Mohammad A, Bajaj R, et al. Mechanism and predictors of failed transradial approach for percutaneous coronary interventions. *JACC Cardiovasc Interv* 2009; 2: 1057–1064.