

## Original Research Article

# Distal radial access for routine consideration in coronary angiography-safety and feasibility study

Santanu Das, M. D. Azizul Haque, Rajeev Ranjan, Pritam Kumar Chatterjee\*

Department of Cardiology, Kolkata National Medical College, Kolkata, West Bengal, India

**Received:** 02 March 2022

**Revised:** 29 March 2022

**Accepted:** 07 April 2022

### \*Correspondence:

Dr. Pritam Kumar Chatterjee,

E-mail: pchatterjee2@gmail.com

**Copyright:** © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

## ABSTRACT

**Background:** Traditionally transfemoral and proximal radial access sites are chosen for percutaneous coronary intervention (PCI) but both these access sites have periprocedural complications with respect to bleeding and radial artery occlusion respectively. Distal radial arterial access has advantages over the two in terms of patient comfort and almost nil periprocedural complications including radial artery occlusion (as the access is distal to the palmar arch) and preservation of proximal radial artery for future procedures like chronic haemodialysis and bypass graft conduit. This study sought to determine the safety, feasibility and advantages of the distal radial artery as routine access site for percutaneous coronary interventions.

**Methods:** Between March and August 2019 a total of 70 patients were taken up for distal radial intervention (33 only CAG (coronary angiography), 37 adhoc PCI) after obtaining written informed consent before procedure.

**Results:** Of all the patients undergone CAG and PCI the success rate for puncture and access was 94% with 4 failures with crossover to proximal radial thereof. Periprocedural course remained uneventful and radial pulse palpable well in both distal and proximal course at the time of discharge. Follow-up for further 1 months also showed no access site related complications.

**Conclusions:** Among patients undergoing PCI distal radial access is definitely a low risk, feasible procedure without any periprocedural complications. It should, therefore be recommended the first-choice access site for all PCI procedures.

**Keywords:** Distal radial, PCI, CAG

## INTRODUCTION

PCI are important tools for the diagnosis and treatment of coronary artery disease (CAD).<sup>1</sup> The access routes for CAG and subsequent intervention include the femoral artery, radial artery, brachial artery access and ulnar artery. Although the femoral approach is still mostly adopted and conventional one, there is a paradigm shift from femoral to radial approach with the improvement in technology and equipment in coronary interventional treatment in the world.<sup>2,3</sup>

In 2017, Kiemeneij reported that radial artery cannulation in the anatomical snuffbox is safe and feasible.<sup>4</sup> The distal part of the radial artery passes through the anatomical snuffbox.<sup>5</sup> The anatomical snuffbox is a hollow space located on the dorsal side of the hand and can be clearly observed after the thumb is fully extended. The ulnar border of the anatomical snuffbox is the tendon of the extensor pollicis longus muscle. The radial border includes the tendons of abductor pollicis longus and extensor pollicis brevis muscles. The base of the anatomical snuffbox is the scaphoid and trapezium bones.

There is an increasing interest has been generated on recent time as this new approach can overcome some shortcomings of standard radial artery cannulation in several aspects.

The purpose of this study was to evaluate the safety and feasibility of the radial artery access in the routine clinical practice.

## METHODS

This was a retrospective, single-centre, observational study done in Kolkata National Medical College, Kolkata, West Bengal, India. Ethical approval was obtained from the hospital committee. Seventy (70) patients who were contemplated for CAG/PCI from March 2019 to August 2019 by distal radial route were enrolled for the study.

### Patients' selection

The most important inclusion criterion was the presence of a pulse in the snuffbox on examination by the interventional physician. All patients underwent Allen test. The preprocedural exclusion criteria were: absence of pulse, severe forearm artery malformation, shock and primary PTCA, history of previous coronary artery bypass grafting and radial artery use.

### Technique

After obtaining the proper informed consent patients were taken in cathlab and procedure was performed in fasting and non-sedated state. The patients were positioned comfortably supine on the angiography table with the right upper arm was positioned comfortable next to in a side-board (Figure 1).



**Figure 1: Arm and forearm position in right distal radial access.**

For left sided access, patient's left arm was naturally placed over the patient's abdomen and the hand was positioned over the right groin as described by Kiemeneij (Figure 2).<sup>4</sup>



**Figure 2: Arm and forearm position in left distal radial access.**

Patients were asked to hold his thumb under the other four fingers with the intention to bring the radial artery on the surface of the radial fossa. The operator stood on the right side of the patient. After subcutaneous injection of 2 ml lidocaine through a 5 ml needle, Seldinger's technique puncture was performed in the anatomical snuffbox. Through and through puncture was preferably avoided because the pain caused by the needle tip touching the periosteum of the underlying bones.

The radial artery puncture was performed with a 20 G puncture needle and a 0.025" wire. 6F radial sheath (Terumo) was used routinely for all cases which was upgraded in selective cases for PTCA later.

A spasmolytic cocktail consisting of 200 mcg of nitroglycerine, 50 mcg diltiazem and weight-based heparin was given intraarterially after successful insertion of the sheath.

### Vascular haemostasis

A small rolled up sterile gauze piece was placed over the puncture site and compressed tightly manually followed by with a semi-elastic bandage approximately for 2 hrs, without including the thumb.

### Data collection

Besides the baseline characteristics of the patients following parameters were also considered and analysed: success of taking access, number of puncture attempts, access time, total procedure time, postoperative complications: major and minor bleeding, hematomas, vasospasm, arteriovenous fistula, radial artery occlusion (RAO), hand movement disability.

## RESULT

March 2019 to August 2019, a total of 70 patients were included in our study. Demographic characteristics are shown in Table 1. The mean age of the patients (males

72%) was 54± years. Hypertension, diabetes, dyslipidaemia and smoking were present in 70%, 61%, 64% and 72%, respectively.

**Table 1: Demographic characteristics of study population.**

Demographics	%
Age mean (years)	54
Sex M/F%	72, male
Smoking	74
Hypertension	70
CKD	14
Diabetes	61
<b>Presentation</b>	
Chronic stable angina	5
Unstable angina	9
STEMI	59.3
NSTEMI	18.7

**Table 2: Procedural characteristics-CAG.**

CAG	%
<b>Disease extent</b>	
SVD	43.75
DVD	26
TVD	21
<b>Introducer sheath</b>	
6F	100
7F	
Diagnostic catheter	Tiger 6F
Crossover to proximal radial	3
Due to failure distal radial	

**Table 3: Procedural characteristics- PCI.**

Characteristics	
PCI	35%
Ad hoc	All
Elective	None
Bifurcation	2
CTO	None
Crossover	1

Out of 70 patients' access was taken successfully in 67 patients with failure in 3 patients requiring cross-over to conventional radial artery approach.

According to preference of the operator, mostly the right sided approach was adopted for distal radial artery access with left sided access in N number of cases.

In 7 cases, the traditional short hydrophilic wire (Terumo) could not negotiate through the puncture needle which was overcome by light tip weight PTCA wire (run through floppy) because of see saw course of the artery.

The cannula was inserted deep sliding over the PTCA wire helped to negotiate hydrophilic short wire to cross the tortuous course.

**Table 4: Study outcomes.**

<b>Primary endpoint</b>	
CAG success	98%
PCI success	98%
<b>Secondary endpoints</b>	
Puncture success	98%
Crossover	2%
Left radial	49%
Right radial	51%
<b>Procedural variables</b>	
Puncture time (mean)	1.6 min
<b>Procedure time (mean)</b>	
CAG	15 mins
PCI	40 mins
<b>Fluoroscopy time (mean)</b>	
CAG	4 mins
PCI	20 mins
<b>Contrast volume (mean)</b>	
CAG	30 ml
PCI	130 ml
Haemostasis time	90 mins-2 hours
<b>Access site complications</b>	
Bleeding	None
Artery occlusion	None
Perforation	None
Pseudoaneurysm	None
Dissection	None
AV fistula	None

The mean time for artery access time was 1.9±1.2 minutes. On average, the number of puncture attempts was 2±1, with maximum no of puncture of 3 in 4 patients. The VAS scores at 3hours after procedure was 2±1. The postoperative compression time was 3.4±0.8 hours. The mean hospitalization duration was 2 days. The mean X-ray exposure time was 3.23±1.66 minutes in the CAG group and 12.5±6.2 minutes for PTCA. No patient developed local hematoma after procedure, vasospasm. No major bleeding, arteriovenous fistula, RAO or other complications were noted.

No patient complained of dysfunction of the hand or arm. The patients were followed up for next 1 month for further complications. (Tables 1-4).

## DISCUSSION

The radial artery and femoral artery are two commonly used access as standard approaches for CAG and PCI. A large number of studies have confirmed that trans radial access can eliminate some of the deficiencies of femoral access and becomes more prevalent in recent times reducing local complication of the procedure.<sup>6</sup>

Despite the fact that radial access lowers the mortality and major adverse cardiac events in STEMI patients compared to femoral approach, the standard radial artery approach has its disadvantages.<sup>7-10</sup> The most common complication is RAO due to multiple punctures.<sup>11,12</sup>

After Kiemeneij firstly reported left distal trans radial access in the anatomical snuffbox for interventional therapy, several studies have found that coronary artery interventional therapy through this access is feasible.<sup>13-15</sup> The new access has become a new hot spot by allowing a more comfortable posture during the procedure and shorter postoperative haemostasis time. In addition to availability of radial artery as better conduit than saphenous graft for future CABG, there may be a reduced risk of RAO in case of distal radial artery access.

Our study found that coronary intervention through the distal radial artery in the snuffbox was safe and feasible, especially in the right distal radial artery. The VAS score was low and the haemostasis time was short, using minimal resources.

No major complications were reported and the patients tolerated it well. This was the first study from eastern part of this country to best of our knowledge addressing the novel technique.

Although the sample size of this study was small, it was consistent with other studies relative to patient comfort.

In this study, the success rate of distal radial artery access was as high as 94%, the number of punctures was 1-3 times, minimizing the risk of peripheral nerve injury, arteriovenous fistula and thrombosis.<sup>5</sup>

Radial artery, cephalic vein and superficial branch of radial nerve pass through the anatomical snuffbox.<sup>16</sup> Radial nerve injury was a common peripheral nerve injury, which can cause abnormal sensation in the back of the hand. Although there were no neurological problems in this study, we still need to further clarify the relationship between the radial artery and the distribution of nerves in the snuffbox.

From the anatomical point of view, the radial artery in the snuffbox was located at the distal end of the radial artery. The diameter of the puncture site being smaller access was more difficult and the learning curve is longer.

In this present study all the procedures have been performed using 6F sheath. 7F sheath as the preferred guiding catheter for the management of high complex lesions because of its stronger support and instrument trafficability could not be tried or advocated because of the size of the smaller calibre of distal radial artery.<sup>17-19</sup>

#### **Limitation of the study**

This study has been done on a limited number of patients.

## **CONCLUSION**

Cardiac catheterization through the distal radial artery is safe and feasible. The right distal radial artery access can be routinely carried out.

## **ACKNOWLEDGEMENTS**

We want to acknowledge all the Cath lab technicians and sister for their efforts during all procedures.

*Funding: No funding sources*

*Conflict of interest: None declared*

*Ethical approval: The study was approved by the Institutional Ethics Committee*

## **REFERENCES**

1. Thiele H, Desch S, de Waha S. Acute myocardial infarction in patients with ST-segment elevation myocardial infarction: ESC guidelines 2017. *Herz*. 2017;42:728-38.
2. Bertrand OF, Rao SV, Pancholy S. Trans radial approach for coronary angiography and interventions: results of the first international trans radial practice survey. *JACC Cardiovasc Interv*. 2010;3:1022-31.
3. Amoroso G, Kiemeneij F. Trans radial access for primary percutaneous coronary intervention: the next standard of care? *Heart*. 2010;96:1341-4.
4. Kiemeneij F. Left distal trans radial access in the anatomical snuffbox for coronary angiography (IdTRA) and interventions (IdTRI). *EuroIntervention*. 2017;13:851-7.
5. Cerda A, del Sol M. Anatomical snuffbox and its clinical significance. A Literature Review, *Int J Morphol*. 2015;33:1355-60.
6. Roule V, Lemaitre A, Sabatier R. Trans radial versus trans femoral approach for percutaneous coronary intervention in cardiogenic shock: a radial-first centre experience and meta-analysis of published studies. *Arch Cardiovasc Dis*. 2015;108:563-75.
7. Sinha SK, Mishra V, Afdaali N. Coronary angiography safety between trans radial and transfemoral access. *Cardiol Res Pract*. 2016;2016:4013843.
8. Karrowni W, Vyas A, Giacomino B. Radial versus femoral access for primary percutaneous interventions in ST-segment elevation myocardial infarction patients: a meta-analysis of randomized controlled trials. *JACC Cardiovasc Interv*. 2013;6:814-23.
9. Burzotta F, Trani C, Mazzari MA. Vascular complications and access crossover in 10,676 trans radial percutaneous coronary procedures. *Am Heart J*. 2012;163:230-8.
10. Mehta SR, Jolly SS, Cairns J. Effects of radial versus femoral artery access in patients with acute

- coronary syndromes with or without ST segment elevation. *J Am CollCardiol.* 2012;60:2490-9.
11. Mattea V, Salomon C, Menck N. Low rate of access site complications after trans radial coronary catheterization: a prospective ultrasound study. *Int J Cardiol Heart Vasc.* 2017;14:46-52.
  12. Avdikos G, Karatasakis A, Tsoumeleas A. Radial artery occlusion after trans radial coronary catheterization. *CardiovascDiagnTher.* 2017;7:305-16.
  13. Davies RE, Gilchrist IC. Back hand approach to radial access: the snuff box approach. *Cardiovasc Revasc Med.* 2018;19(3):324-6.
  14. Soydan E, Akin M. Coronary angiography using the left distal radial approach - An alternative site to conventional radial coronary angiography. *Anatol J Cardiol.* 2018.
  15. Valsecchi O, Vassileva A, Cereda AF. Early clinical experience with right and left distal trans radial access in the anatomical snuffbox in 52 consecutive patients. *J Invasive Cardiol.* 2018;30:218-23.
  16. Hallett S, Ashurst JV. Anatomy, Upper Limb, Hand, Anatomical Snuff Box. *StatPearls.* Treasure Island (FL). 2018.
  17. Robson AJ, See MS, Ellis H. Applied anatomy of the superficial branch of the radial nerve. *ClinAnat.* 2008;21:38-45.
  18. Li L, Zeng ZY, Zhong JM. Features and variations of a radial artery approach in southern Chinese populations and their clinical significance in percutaneous coronary intervention. *Chin Med J.* 2013;126:1046-52.
  19. Tanaka Y, Moriyama N, Ochiai T. Trans radial coronary interventions for complex chronic total occlusions. *JACC CardiovascInterv.* 2017;10:235-43.

**Cite this article as:** Das S, Haque MDA, Ranjan R, Chatterjee PK. Distal radial access for routine consideration in coronary angiography-safety and feasibility study. *Int J Res Med Sci* 2022;10:1095-9.