Clinical Characteristics and Outcomes of Conventional *Versus* Distal Transradial (Snuffbox) Access for Coronary Vascular Intervention

Aiysha Nasir[1], Ghufran Adnan[1], Ihsan Ullah[1], Awais Farhad[1], Tahir Munir[2] and Muhammad Nasir Rahman[1]

[1]*Department of Adult Cardiology, The Aga Khan University Hospital, Karachi, Pakistan*
[2]*Department of Medicine, The Aga Khan University Hospital, Karachi, Pakistan*

ABSTRACT

Objective: To compare distal transradial access (dTRA) *via* the anatomical snuffbox as an alternative to conventional transradial access (TRA) for coronary angiography and angioplasty in terms of clinical outcomes and feasibility.

Study Design: An observational study.

Place and Duration of the Study: Department of Medicine, The Aga Khan University Hospital, Karachi, Pakistan, from August 2022 to January 2023.

Methodology: This study analysed medical records involving 100 participants, through a convenience sampling, who underwent angiography, with or without angioplasty, during the years 2022-2023. The participants were divided into two groups: Fifty patients were randomly selected for the conventional TRA group (Group T) and 50 for the dTRA group (Group D). Both groups were compared based on procedure type and the target vessel for angioplasty to minimise bias. Stratification analysis was performed using the independent t-test or Mann-Whitney U test (two-tailed) for quantitative data, and the Chi-square or Fisher's exact test for qualitative data to compare the groups based on their clinical and demographic profiles, procedural characteristics, and follow-up data, including post-procedural complications.

Results: The mean age of participants was comparable between Group D (58.6 ± 9.26 years) and Group T (57.8 ± 9.80 years). Procedural parameters, including median procedure time (Group D: 25 minutes; Group T: 25 minutes) and median fluoroscopy time (Group D: 6.40 minutes; Group T: 4.90 minutes), showed no significant differences ($p > 0.05$). Group D had a higher proportion of procedures for acute coronary syndrome (ACS) (56.0% *vs*. 34.0%; $p = 0.044$); however, no differences were observed for other indications. Haematoma incidence (Group D 2.0% *vs*. Group T 12%; $p = 0.004$) and haemostasis time (Group D *vs*. Group T) were significantly lower in Group D.

Conclusion: dTRA demonstrated comparable procedural efficiency to conventional TRA while offering significant advantages in safety and post-procedural outcomes. The faster haemostasis and reduced incidence of complications, particularly haematoma formation, suggest that dTRA may provide a safer vascular access alternative, minimising patient discomfort and enhancing recovery.

Key Words: *Transradial access, Distal radial artery access, Snuffbox, Coronary angiography, Coronary angioplasty*.

How to cite this article: Nasir A, Adnan G, Ullah I, Farhad A, Munir T, Rahman MN. Clinical Characteristics and Outcomes of Conventional *Versus* Distal Transradial (Snuffbox) Access for Coronary Vascular Intervention. *J Coll Physicians Surg Pak* 2025; **35(12)**:1521-1525.

INTRODUCTION

Since its inception, percutaneous cardiac catheterisation has evolved significantly, with the introduction of the Seldinger technique representing a major advancement in minimally invasive vascular access.[1,2] While the femoral artery was historically preferred for coronary angiography, its association with bleeding and vascular complications, particularly in anticoagulated patients, has shifted focus toward transradial access (TRA), which offers greater safety, faster recovery, and improved patient comfort.[3-6]

Correspondence to: Dr. Muhammad Nasir Rahman, Department of Adult Cardiology, The Aga Khan University Hospital, Karachi, Pakistan
E-mail: nasir.rahman@aku.edu

Received: May 05, 2025; Revised: September 10, 2025; Accepted: October 29, 2025
DOI: https://doi.org/10.29271/jcpsp.2025.12.1521

A newer technique, distal transradial access (dTRA), targets the radial artery within the anatomical snuffbox—a depression bordered by tendons and bones when the thumb is extended. This approach preserves collateral circulation, reduces hand ischaemia risk, and allows faster haemostasis due to the smaller arterial calibre.[7-9] Despite these advantages, evidence supporting the routine use of dTRA remains limited.

Most of the studies using the dTRA approach have been conducted on the European population. There is a paucity of data on dTRA access and its outcomes from the South Asian population. This study aimed to evaluate the feasibility, safety, and clinical outcomes of dTRA access compared with conventional TRA for coronary procedures in a South Asian population, addressing the current lack of regional data on this technique.

METHODOLOGY

This single-centre, prospective observational study was conducted after obtaining ethical approval from the Ethical Review

Committee of the Aga Khan University Hospital, Karachi, Pakistan, from August 2022 to January 2023. A total of 100 patients who underwent coronary angiography (50 *via* dTRA and 50 *via* conventional TRA), with or without angioplasty/ percutaneous coronary intervention (PCI), were included using a convenience sampling method. Both groups were compared for procedure type and target vessel for angioplasty to minimise bias, as these factors can independently influence procedure and fluoroscopy times.[1,3] Patients aged >18 years presenting with typical angina or acute coronary syndrome were included, while those who refused consent or had incomplete data were excluded. A convenience sample of 100 patients was selected over six months due to the limited availability of eligible cases and the absence of established local baseline data. This sample size was deemed sufficient to explore feasibility and generate preliminary outcome trends.

Patients were divided into two groups based on the access site: conventional TRA (Group T) and dTRA (Group D). Data were collected from medical records using a pre-designed form and included data such as age, gender, comorbidities, presentation mode, procedural specifics, and follow-up outcomes. Acute coronary syndrome (ACS) and its subclasses were defined based on ACC/AHA guidelines.[10] Similarly, the severity of angina was classified based on the Canadian Cardiac Society (CCS).[11] Informed consent was obtained, and follow-ups were conducted two days post-procedure. During the procedure, data on in-hospital haemostasis and complications were recorded. The collected data were reviewed and analysed using certified standard software. Demographic, clinical, and procedural data were extracted from medical records using standardised forms. ACS classification followed ACC/AHA guidelines; angina severity was graded as per CCS criteria. Follow-up assessments were conducted for 2 days and 1 week following the procedure.

Vascular access was obtained *via* either the conventional TRA approach or dTRA at the anatomical snuffbox, with right-sided access preferred when feasible. Arterial puncture was initially performed using the manual technique, with ultrasound guidance utilised in cases of difficulty. Following successful puncture, a 5F or 6F GlideSlender sheath was introduced after local anaesthaesia with 2% lidocaine infiltration. A standardised spasmolytic cocktail consisting of nitroglycerin and heparin was administered intra-arterially. Additional heparin was administered during PCI to maintain an adequate activated clotting time (ACT). Dual antiplatelet therapy was prescribed for all patients undergoing PCI, in accordance with institutional practice. Haemostasis was achieved using a modified compression dressing for dTRA cases (60 minutes following diagnostic angiography and 90 minutes following PCI), whereas a TR Band was applied for conventional TRA cases (180 minutes following diagnostic angiography and 240 minutes following PCI).

Outcome assessment focused on both primary and secondary endpoints. Primary endpoints included procedural success, which was defined as successful sheath insertion and completion of the intervention, haemostasis time, and access-site complications such as haematoma, radial artery occlusion, and patient-reported pain. Secondary endpoints involved evaluation of radial artery patency using the Allen's or Barbeau test, and assessment of post-procedural hand function to ensure preserved limb functionality.

Data analysis was conducted using R Studio (version 4.1.2, Boston, USA). Normality assumptions for numerical variables such as age, height, and weight were assessed using the Shapiro-Wilk test. Descriptive statistics were reported as mean ± SD or median (IQR), for normally distributed or skewed data, respectively. Categorical data such as gender, hypertension, diabetes mellitus, and smoking status were analysed in terms of frequencies (percentages). Stratification analysis based on Group D and T was performed, and statistical associations were determined using the independent t-test or Mann-Whitney U test (two-tailed) for quantitative data, and the Chi-square or Fisher's exact test for qualitative data. A p-value of <0.05 was considered statistically significant.

RESULTS

The study enrolled a total of 100 participants, with 50 individuals assigned to Group D and 50 to Group T. As shown in Table I, the demographic characteristics, including age, height, and gender distribution, were comparable between the groups, with no statistically significant differences observed ($p > 0.05$). However, patients in Group T had more weight compared to Group D ($p = 0.029$). The mean age of participants was 58.6 ± 9.26 years in Group D, and 57.8 ± 9.80 years in Group T, with an overall mean age of 58.2 ± 9.50 years.

Regarding comorbid conditions, Group T had more patients with hypertension ($p = 0.03$) and dyslipidaemia ($p < 0.001$) compared to Group D, while the rest of the conditions were comparable between both groups.

Analysis of procedure indications revealed statistically significant differences between the groups. Group D had a higher proportion of cases attributed to ACS, accounting for 28 procedures (56.0%), compared to 17 procedures (34.0%) in Group T ($p = 0.044$). However, there were no significant differences in other indications, such as Elective or ACS, between the two groups ($p > 0.05$).

In terms of procedural parameters (Table II), such as procedure time and fluoroscopy time, no significant disparities were observed between the groups ($p > 0.05$). The median procedure time for both groups was 25 minutes. Group D had a median time of 25 minutes (Q1, Q3: 15,43.8), and Group T had a median of 25 minutes (Q1, Q3: 15, 13.8; $p = 0.228$), indicating similar intervention duration across the groups. Similarly, the median fluoroscopy time, a crucial metric for assessing radiation exposure during procedures, showed no significant difference between Group D (median time of 6.40 minutes [Q1, Q3: 3.60, 13.1]) and Group T (median time of 4.90 minutes [Q1, Q3, 3.65, 6.50]; $p = 0.132$).

Table I: Comparative clinical characteristics of the patients.

Variables	Group D (n = 50)	Group T (n = 50)	Overall (n = 100)	p-values
Age				
Mean ± SD[b]	58.6 ± 9.26	57.8 ± 9.80	58.2 ± 9.50	0.691
Height (cm)				
Median[c] [Q1, Q3]	165 [160, 173]	167 [152, 171]	166 [156, 172]	0.656
Weight (kg)				
Mean ± SD[b]	74.4 ± 13.0	79.4 ± 9.28	76.9 ± 11.5	0.029*
Gender				0.494
Male	39 (78.0%)	35 (70.0%)	74 (74.0%)	
Female	11 (22.0%)	15 (30.0%)	26 (26.0%)	
Hypertension				0.030*
Yes	34 (68.0%)	44 (88.0%)	78 (78.0%)	
Diabetes mellitus				0.416
Yes	18 (36.0%)	23 (46.0%)	41 (41.0%)	
Dyslipidaemia				<0.001*
Yes	9 (18.0%)	35 (70.0%)	44 (44.0%)	
Peripheral arterial disease	50 (100%)	50 (100%)	100 (100%)	>0.900
Smoker				0.217
Yes	11 (22.0%)	19 (38.0%)	30 (30.0%)	
CKD				0.712
Yes	5 (10.0%)	3 (6.0%)	8 (8.0%)	
COPD				>0.900
Yes	3 (6.0%)	2 (4.0%)	5 (5.0%)	
Prior CABG				>0.900
Yes	0 (0%)	1 (2.0%)	1 (1.0%)	
Prior stroke				>0.900
Yes	1 (2.0%)	1 (2.0%)	2 (2.0%)	
Prior PCI				>0.900
Yes	6 (%)	8 (%)	76 (76.0%)	
History of atrial fibrillation				>0.900
Yes	0 (0%)	1 (2.0%)	1 (1.0%)	
Indication for procedure				0.044*
ACS	28 (56.0%)	17 (34.0%)	45 (45.0%)	
Elective	22 (44.0%)	33 (66.0%)	55 (55.0%)	
ACS				0.115
USAP	21 (42.0%)	8 (16.0%)	29 (29.0%)	
NSTE-ACS	7 (14.0%)	9 (18.0%)	16 (16.0%)	
Elective (CCS class of angina)				0.694
CCS2	10 (20.0%)	12 (24.0%)	22 (22.0%)	
CCS3	12 (24.0%)	21 (42.0%)	33 (33.0%)	

**Statistically significant results, [a]Chi-square or Fisher's exact, [b]Independent t-test [c]Mann-Whitney U test (two-tailed). CKD: Chronic kidney disease; COPD: Chronic obstructive pulmonary disease; CABG: Coronary artery bypass grafting; PCI: Percutaneous coronary intervention; ACS: Acute coronary syndrome; USAP: Unstable anginal pain; NSTE-ACS: Non-ST elevation-acute coronary syndrome; CCS: Canadian Society of Cardiology*.

Table II: Procedural and follow-up characteristics of the patients.

Variables	Group D (n = 50)	Group T (n = 50)	Overall (n = 100)	p-values[a]
Multivessel disease				>0.900
Yes	28 (56.0%)	28 (56.0%)	56 (56.0%)	
No	22 (44.0%)	22 (44.0%)	44 (44.0%)	
Procedure performed				>0.900
Angiography only	38 (76.0%)	38 (76.0%)	76 (76.0%)	
Angioplasty only	2 (4.0%)	2 (4.0%)	4 (4.0%)	
Angiography + Angioplasty	8 (16.0%)	8 (16.0%)	16 (16.0%)	
FFR	2 (4.0%)	2 (4.0%)	4 (4.0%)	
Procedure time (minutes)				
Median[c] [Q1, Q3]	25.0 [15.0, 43.8]	25.0 [15.0, 31.8]	25.0 [15.0, 35.0]	0.228
Mean ± SD[b]	39.7 ± 38.1	26.3 ± 13.3	33.0 ± 29.2	0.044*
Haemostasis achieved				
Yes	50 (100%)	50 (100%)	100 (100%)	>0.900
Haemostasis time (minutes)				
Mean ± SD[b]	135 ± 19.40	196.8 ± 19.31	165.9 ± 36.54	<0.001*
Fluoroscopy time (minutes)				
Median[c] [Q1, Q3]	6.40 [3.60, 13.1]	4.90 [3.65, 6.50]	5.50 [3.60, 8.40]	0.1328
Target artery				>0.900
LAD	4 (8.0%)	4 (8.0%)	8 (8.0%)	
RCA	1 (2.0%)	1 (2.0%)	2 (2.0%)	
Multivessel PCI	5 (10.0%)	5 (10.0%)	10 (10.0%)	
Procedure failure				
No	50 (100%)	50 (100%)	100 (100%)	>0.900
Haematoma	1 (2.0%)	6 (12.0%)	7 (7.0%)	0.004*
Access site pain	0	0	0	
Hand clumsiness	0	0	0	
Clinical radial artery patency	50 (100%)	50 (100%)	100 (100%)	>0.900

**Statistically significant results, [a]Chi-square or Fisher's exact, [b]Independent t-test. [c]Mann-Whitney U test (two-tailed). LAD: Left anterior descending; RCA: Right coronary; PCI: Percutaneous coronary intervention; FFR: Fractional flow reserve*.

Post-procedural complications (Table II) were also assessed during hospitalisation, with particular attention to haematoma formation. There was no difference in the incidence of haemostasis between both groups; however, the time to achieve haemostasis differed significantly, with Group D achieving haemostasis faster than Group T (Group D: 135 ± 19.40 mins *vs*. Group T: 196.8 ± 19.31 mins, p-value <0.001). Similarly, a statistically significant difference was observed in the incidence of haematoma between Group D and Group T. Specifically, 1 case (2.0%) in Group D experienced post-procedural haematoma, compared to 6 cases (12.0%) in Group T (p = 0.004), indicating a higher risk of haematoma formation in Group T. All patients were discharged on the same day, with a follow-up period of 2 days. Moreover, after one week of the procedure, all patients were assessed. Based on clinical examination, there were no complaints of access site pain and/or hand clumsiness, and no radial artery occlusion was assessed by clinical tests in both groups.

DISCUSSION

This study demonstrates that dTRA is a safer and more effective technique than conventional TRA in a South Asian population, offering notable advantages in haemostasis and post-procedural outcomes. While demographic characteristics were largely comparable between groups, Group T had a higher prevalence of overweight patients and cardiovascular risk factors, including hypertension and dyslipidaemia, which may have contributed to the observed differences in complication rates. Previous studies have associated elevated body mass index with a reduced bleeding risk in TRA compared to femoral access; however, findings from this study suggest that dTRA may further mitigate vascular complications, particularly in higher-risk patients.[12-15] The dTRA approach, performed *via* the anatomical snuffbox, combines procedural efficiency with ergonomic benefits for both the operator and the patient. Contrary to concerns regarding technical difficulty,[16-18] this study found no significant differences in procedural or fluoroscopy time between dTRA and TRA (p >0.05), even in ACS cases, which were more prevalent in the dTRA group. This challenges prior assumptions about radial spasm and tortuosity, limiting the utility of dTRA in urgent settings.[14-16] Notably, dTRA was associated with significantly faster haemostasis and a lower incidence of haematoma (p = 0.004), likely due to the smaller vessel size and superficial puncture site. At one-week follow-up, neither group exhibited radial artery occlusion, hand dysfunction, or chronic pain, reinforcing the safety profile of dTRA.

The clinical implications of this research are remarkable, as dTRA enables same-day discharge, preserves proximal access options, and reduces hand congestion risks, consistent with findings from other studies.[12,13,16,19,20] However, limitations of this study include single-centre design, moderate sample size, and short follow-up period. Larger multicentre studies with extended observation are recommended to validate these findings and assess long-term vascular outcomes. Future research should also explore the applicability of dTRA in diverse populations and complex interventions. Despite these limitations, these results support dTRA as a promising refinement of transradial techniques, particularly in regions with high cardiovascular risk burdens.

CONCLUSION

This study demonstrated that dTRA access is a safe, feasible, and advantageous alternative to conventional transradial techniques for coronary procedures. These findings indicated that the dTRA offers clinically significant benefits, including faster haemostasis and reduced haematoma formation, while maintaining comparable procedural efficiency.

ETHICAL APPROVAL:

Ethical approval was obtained from the Institutional Review Board of the Aga Khan University, Karachi, Pakistan (Approval No. 2020-3360-11382).

PATIENTS' CONSENT:

Informed consent was obtained from all the patients included in the study.

COMPETING INTEREST:

The authors declared no conflict of interest.

AUTHORS' CONTRIBUTION:

AN: Interpretation of results and manuscript writing.
GA: Data collection, analysis, preparation of tables, and interpretation of results.
IU: Study design and data collection.
AF, TM: Data analysis, critical review, and editing corrections.
MNR: Conception and design of the study, contribution to data acquisition, interpretation, and proofreading.
All authors approved the final version of the manuscript to be published.

REFERENCES

1. Mueller RL, Sanborn TA. The history of interventional cardiology: cardiac catheterization, angioplasty and related interventions. *Am Heart J* 1995; **129(1)**:146-72. doi: 10.1016/0002-8703(95)90055-1.
2. Bourassa MG. The history of cardiac catheterization. *Can J Cardiol* 2005; **21(12)**:1011-4.
3. Sinha SK, Mishra V, Afdaali N, Jha MJ, Kumar A, Asif M, *et al*. Coronary angiography safety between transradial and transfemoral access. *Cardiol Res Pract* 2016; **2016**:4013843. doi: 10.1155/2016/4013843.
4. Roussanov O, Wilson SJ, Henley K, Estacio G, Hill J, Dogan B, *et al*. Cost-effectiveness of the radial *versus* femoral artery approach to diagnostic cardiac catheterization. *J Invasive Cardiol* 2007; **19(8)**:349-53.
5. Brueck M, Bandorski D, Kramer W, Wieczorek M, Holtgen R, Tillmanns H. A randomized comparison of transradial versus transfemoral approach for coronary angiography and angioplasty. *JACC Cardiovasc Interv* 2009; **2(11)**: 1047-54. doi: 10.1016/j.jcin.2009.07.016.

6. Kedev S, Kalpak O, Dharma S, Antov S, Kostov J, Pejkov H, *et al*. Complete transitioning to the radial approach for primary percutaneous coronary intervention: a real-world single-centre registry of 1808 consecutive patients with acute ST-elevation myocardial infarction. *J Invasive Cardiol* 2014; **26(9)**:475-82.
7. Cerda A, del Sol M. Anatomical snuffbox and its clinical significance. A literature review. *Int J Morphol* 2015; **33(4)**: 1355-60. doi: 10.4067/S0717-95022015000400027.
8. Kiemeneij F. Left distal transradial access in the anatomical snuffbox for coronary angiography (ldTRA) and interventions (ldTRI). *EuroIntervention* 2017; **13(7)**:851-7. doi: 10.4244/EIJ-D-17-00079.
9. Doscher W, Viswanathan B, Stein T, Margolis IB. Hemodynamic assessment of the circulation in 200 normal hands. *Ann Surg* 1983; **198(6)**:776-9. doi: 10.1097/00000658-198312000-00018.
10. Kumbhani DJ, Cibotti-Sun M, Moore MM. 2025 acute coronary syndromes guideline-at-a-glance. *J Am Coll Cardiol* 2025; **85(22)**:2128-34. doi: 10.1016/j.jacc.2025.01.018.
11. Campeau L. The Canadian Cardiovascular Society grading of angina pectoris revisited 30 years later. *Can J Cardiol* 2002; **18(4)**:371-9.
12. Hamandi M, Saad M, Hasan R, Megaly M, Abbott JD, Dib C, *et al*. Distal *versus* conventional transradial artery access for coronary angiography and intervention: A meta-analysis. *Cardiovasc Revasc Med* 2020; **21(10)**:1209-13. doi: 10.1016/j.carrev.2020.03.020.
13. Saleemi MS, Mohy-ud-din MT, Ahmad N, Qadir F, Sherwani MAK, Butt ZR. Incidence and risk factors of forearm haematoma after transradial percutaneous coronary intervention. *Pak Heart J* 2020; **53(3)**. doi: 10.47144/phj.v53i3.1935.
14. Xenogiannis I, Brilakis ES. Distal radial access at the anatomical snuffbox: The new standard for left radial access? *Catheter Cardiovasc Interv* 2019; **94(5)**:658-9. doi: 10.1002/ccd.28551.
15. Corcos T. Distal radial access for coronary angiography and percutaneous coronary intervention: A state-of-the-art review. *Catheter Cardiovasc Interv* 2019; **93(4)**:639-44. doi: 10.1002/ccd.28016.
16. 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 haemostasis. *Catheter Cardiovasc Interv* 2019; **94(5)**:651-7. doi: 10.1002/ccd.28155.
17. Valsecchi O, Vassileva A, Cereda AF, Canova P, Satogami K, Fiocca L, *et al*. Early clinical experience with right and left distal transradial access in the anatomical snuffbox in 52 consecutive patients. *J Invasive Cardiol* 2018; **30(6)**: 218-23.
18. Ziakas A, Koutouzis M, Didagelos M, Tsiafoutis I, Kouparanis A, Gossios T, *et al*. Right arm distal transradial (snuffbox) access for coronary catheterization: Initial experience. *Hellenic J Cardiol* 2020; **61(2)**:106-9. doi: 10.1016/j.hjc.2018.10.008.
19. Lee JW, Park SW, Son JW, Ahn SG, Lee SH. Real world experience of the left distal transradial approach for coronary angiography and percutaneous coronary intervention: A prospective observational study (LeDRA). *EuroIntervention* 2018; **14(9)**:e995-1003. doi: 10.4244/EIJ-D-18-00635.
20. Shah RM, Patel D, Abbate A, Cowley MJ, Jovin IS. Comparison of transradial coronary procedures *via* right radial *versus* left radial artery approach: A meta-analysis. *Catheter Cardiovasc Interv* 2016; **88(7)**:1027-33. doi: 10.1002/ccd.26519.