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Incidence of Radial Artery Occlusion in Patients Undergoing Percutaneous Coronary Intervention via Trans Radial Assess

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ABSTRACT

***Objective*:** To determine the incidence of radial artery occlusion (RAO) in patients undergoing percutaneous coronary intervention (PCI) via trans-radial assess (TRA).

***Method*:** A descriptive study was carried out at the Department of interventional cardiology, Chaudhary Pervaiz Elahi Institute of Cardiology, Multan from 30-April 2019 to 30-October 2020. One hundred and twenty-five patients, who underwent PCI by TRA were selected for this study. The presence of Radial artery occlusion was noted 24 hours after the procedure by Doppler ultrasonography. SPSS version 23 was used for data analysis. A Chi-square test was applied. P-value $\leq$ 0.05 was taken as statistically significant.

***Results*:** Gender distribution revealed 109 (87.2%) males and 16 (12.8%) females. The mean age of the patients was 65.22 ± 11.54 years. The mean BMI of the patients was 29.93±4.87 kg/m^2. 84 (67.2%) patients were hypertensive, 40 (32%) patients were diabetics, 22 (17.6%) patients were smoker and 24 (19.2%) patients were having dyslipidemia. RAO after 24 hours was found in 5(4.0%) patients.

***Conclusion*:** Radial artery occlusion is a common complication of trans-radial assess so radial artery patency must be checked before using it for transcatheter procedures.

KEYWORDS: Radial Artery, Occlusion, Percutaneous coronary artery occlusion.

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INTRODUCTION

In recent times, the radial artery is becoming popular for its use in transcatheter coronary procedures as a default access site not only in the developed western world but also in the developing countries of Asia.[1-3] Trans Radial Access (TRA) has shown fewer complications like retroperitoneal bleeding and access site vascular complications like hematoma as compared to trans femoral access and is more comfortable for the patient as it allows early mobilization.[4,5] But it doesn't mean that TRA is without any complications. TRA is not only technically difficult but it takes a longer time to learn and leads to radial artery complications in especially in women and older patients.[6,7]

Radial artery occlusion is a serious post-procedure complication of trans-radial access that may cause critical ischemia of the used limb. Once the radial artery is occluded permanently, it cannot be used in future for percutaneous coronary intervention (PCI), fistula formation in hemodialysis patients or as a conduit for coronary bypass grafting.[8] The incidence of RAO in literature is reported to be as low as 0.8% to as high as 38%.[9] Aykan et al. found a 5.5% frequency of RAO after PCI in their study patients.[10] A systematic review has reported a 0.8% to 30% frequency of RAO in coronary artery disease patients after PCI.[11]

There is high variability in the reported literature regarding the frequency of RAO after PCI. In addition, research has revealed demographic features such as gender, age, diabetes and body mass index (BMI) may affect the frequency of RAO.[12] The aim of the proposed study was to find out the incidence of RAO after PCI. The results of this study will help us to determine the true prevalence of RAO in our population.

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Table-I: RAO after 24 hours among the patients.

RAO after 24 hours	*n (%)*
Yes	n=5 (4%)
No	n=120 (96%)
Total	n=125 (100%)

METHOD

It is a descriptive Case Series study carried out from 30-April 2019 to 30-October 2020 at the department of interventional cardiology Chaudhary Pervaiz Elahi Institute of Cardiology Multan. A total of 125 patients were selected for the study. The study was approved by the ethics committee ref# 12-48 dated 13-03-2019 and consent was taken from all the included patients. The sample size for this study was calculated by taking the expected frequency of RAO in 5.5% of patients after PCI, at the desired precision level of 4.0% and 95% confidence. A consecutive non-probability sampling technique was used. Patients of both genders in the age group 30 to 70 years who had undergone PCI via TRA were part of this study. Patients who have a history of PCI in past using TRA were not included as subjects. Percutaneous coronary intervention via TRA in all patients was performed by a senior cardiologist with three years of post-fellowship experience. Diagnosis of RAO was made by using the ultrasonic Doppler signal flow detector seven MHz (FD1, Huntleigh, Sonicaid) probe. A probe was placed above to assess the site of the radial artery in the resting and extended position of the forearm. RAO was defined as the absence of any Doppler signal flow.

Doppler ultrasonography was performed 24 hours after the procedure for assessment of RAO. Confounder variables e.g. patient's age, gender, diabetes, hypertension, smoking, dyslipidemia and BMI were also noted. The collected information was analyzed with SPSS version 16. Mean and standard deviation was calculated for continuous variables like age, height, weight and BMI. Frequency and percentage were calculated for categorical variables i.e. gender, diabetes, hypertension, smoking, dyslipidemia and RAO at 24 hours. Stratification of confounder variables e.g. patient's age, gender, BMI, hypertension, smoking, dyslipidemia and diabetes was done. A Chi-square test was applied for stratification. P-value of ≤ 0.05 was taken as a significant difference.

Table-II: Association of RAO after 24 hours with age distribution.

Age distribution	*RAO after 24 hours*		*P-value*
	Yes	*No*	
30-50 years	2	53	
51-70 years	3	67	0.854
Total	5	120	

Table-III: Association of RAO after 24 hours with a gender distribution.

Gender distribution	*RAO after 24 hours*		*P-value*
	Yes	*No*	
Male	3	106	
Female	2	14	0.063
Total	5	120	

RESULTS

A total of 125 patients were a part of the study including 109 (87.2%) men and 16 (12.8%) women. The mean age of the patients was 65.22±11.54 years, mean weight was 68.81±15.55 kg, mean height was 163.54 ± 9.07 cm and mean BMI was 29.93 ± 4.87 kg/m^2. 84 (67.2%) patients were hypertensive, 40 (32%) patients were diabetics, 22 (17.6%) patients were smoker and 24 (19.2%) patients were having dyslipidemia.

RAO after 24 hours was found in five (4%) patients (Table-I). To check the effect modification, the chi-square test was applied. The relation of RAO with age, gender and BMI is shown in Tables-II, III and IV.

DISCUSSION

This study was conducted to assess the incidence of RAO after PCI in Pakistan. An occluded artery after PCI can result in misdiagnosis of RAO like in Brancheau et al, RAO was assessed by the absence of a radial pulse. 3.7% of patients did not have a radial pulse and 14.8% of patients showed an absence of radial artery flow when assessed via Duplex ultrasound.[13] Therefore it's better to assess RAO more objectively using radial flow by performing ultrasound.[14] RAO may improve with time therefore the incidence of RAO depends on the duration when the radial artery was assessed post-operatively.

Radial artery occlusion is usually higher immediately after the procedure and it reduces with the passage of time. In the PROPHET study, the presence of RAO was 12% after 24 hours which was reduced to half almost when assessed after 28 days (7%).[15] Radial artery can spontaneously recanalize causing the decline in RAO after some time.

In a prospective study, 2004 patients were checked for RAO after transradial angioplasty after one day at the time of discharge and a 1-month follow-up. At

Table-IV: Association of RAO after 24 hours with BMI distribution.

BMI distribution	*RAO after 24 hours*		*P-value*
	Yes	*No*	
27-29 kg/m^2	2	63	
<29 kg/m^2	3	57	0.773
Total	5	120	

discharge, 93 patients (4.6%) had RAO. But after one-month persistent radial reperfusion was 13% with no oral anticoagulation.[14] Aykan et al. found a 5.5% frequency of RAO after PCI in their study patients.[10] Our study showed nearly similar results of 4% RAO 24 hours after the procedure. But there are studies which showed significantly fewer cases of RAO like Voon et al reported no patients with RAO in their study group and there are studies which reported 0.8% RAO.[16,17]

However, there are studies which have reported up to 32.9% of cases of RAO after Doppler examination for PCI.[18] The observations of our studies revealed that RAO has no significant relation to the age gender and BMI of the patient. Munir et al.[19] found a 11.3% frequency of RAO after PCI in their study patients after trans-radial access. Most of the patients with RAO had a cardiac instability during PCI.

Limitations: It includes a simple observational study with single-time Doppler ultrasonography. For a better assessment of RAO after transradial assess an analysis with a larger sample size and proper follow-up of RAO via Doppler scan up to 28 days.

CONCLUSION

The Trans radial approach is associated with fewer complications. RAO is one of the common post-procedural complications. A 24-hour postprocedural assessment is necessary to evaluate the patient for RAO. Objective assessment by colour doppler is of great help in making the right diagnosis.

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REFERENCES

1. Mohsen A, Alqasrawi M, Shantha GP, DeZorzi C, Panaich S. Comparison of radial artery occlusion following Transradial access for percutaneous coronary intervention using Sheath-based versus Sheathless technique. Sci Rep. 2018;8(1):1-7. doi: 10.1038/s41598-018-30462-1
2. Sharma AK, Razi MM, Prakash N, Sharma A, Sarraf S, Sinha S, et al. A comparative assessment of Dorsal radial artery access versus classical radial artery access for percutaneous coronary angiography-a randomized control trial (DORA trial). Indian Heart J. 2020;72(5):435-441. doi: 10.1016/j.ihj.2020.06.002
3. Farooqi MA, Malik BR, Anwar R. Radial Artery Occlusion after Percutaneous Coronary Intervention through Transradial Approach. Pak J Med Health Sci. 2021;15(8):2246-2249. doi: 10.53350/pjmhs211582246
4. Coomes EA, Haghbayan H, Cheema AN. Distal transradial access for cardiac catheterization: a systematic scoping review. Catheter Cardiovasc Interv. 2020;96(7):1381-1389. doi: 10.1002/ccd.28623
5. 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
6. Xie L, Wei X, Xie Z, Jia S, Xu S, Wang K. Feasibility of Distal Radial Access for Coronary Angiography and Percutaneous Coronary Intervention: A Single Center Experience. Cardiology. 2021;146(5):531-537. doi: 10.1159/000517076
7. Lin CJ, Lee WC, Lee CH, Chung WJ, Hsueh SK, Chen CJ, et al. Feasibility and safety of chronic total occlusion percutaneous coronary intervention via distal transradial access. Front Cardiovasc Med. 2021;8:673858. doi: 10.3389/fcvm.2021.673858
8. Ahmed F, Kakepoto N, Sandeelo IK. Radial artery occlusion following transradial coronary intervention. PHJ. 2019;52(1).
9. Ali S, Abdullah MS, Abdelrahman K, Ali A, Faisal F, Ali A. Total radial artery occlusion following transradial access: Complete recanalization via the anatomical snuffbox. Methodist Debakey Cardiovasc J. 2020;16(4):314. doi: 10.14797/mdcj-16-4-314
10. Aykan AC, Gokdeniz T, Gul I, Kalaycıoglu E, Cetin M, Hatem E, et al. Comparison of low dose versus standard dose heparin for radial approach in elective coronary angiography? Int J Cardiol. 2015;187:389-392. doi: 10.1016/j.ijcard.2015.03.314
11. Scalise RF et al. Radial artery access for percutaneous cardiovascular interventions: contemporary insights and novel approaches. J Clin Med. 2019;8(10):1727. doi: 10.3390/jcm8101727
12. Schlosser J, Herrmann L, Böhme T, Karlheinz B, Nikolaus L, Thomas N, et al. Incidence and predictors of radial artery occlusion following transradial coronary angiography: the proRadial trial. Clin Res Cardiol. 2022:1-1. doi: 10.1007/s00392-022-02094-z. Epub ahead of print.
13. Brancheau D, Jain SK, Alexander PB. Same-day dual radial artery puncture examination in patients requiring percutaneous coronary intervention and the incidence of radial artery occlusion. Ther Adv Cardiovasc Dis. 2018;12(3):77-84. doi: 10.1177/1753944717774973
14. Mizuguchi Y, Scott J, Vilander G. Marx L, Quirk M, Lindberg J, et al. Efficacy and safety of the distal transradial approach in coronary angiography and percutaneous coronary intervention: a Japanese multicenter experience. Cardiovasc Interv Ther. 2020;35(2):162-167. doi: 10.1007/s12928-019-00590-0
15. Pancholy S, Coppola J, Patel T, Roke-Thomas M. Prevention of radial artery occlusion-patent hemostasis evaluation trial (PROPHET study): a randomized comparison of traditional versus patency documented hemostasis after transradial catheterization. Catheter Cardiovasc Interv. 2008;72:335-340. doi: 10.1002/ccd.21639
16. Voon V, AyyazUlHaq M, Cahill C, Mannix K, Ahern C, Hennessy T, et al. Randomized study comparing incidence of radial artery occlusion post-percutaneous coronary intervention between two conventional compression devices using a novel air-inflation technique. World J Cardiol. 2017;9(11):807. doi: 10.4330/wjc.v9.i11.807
17. Hahalis G, Aznaouridis K, Tsigkas G, Davlouros P, Xanthopoulou I, Koutsogiannis N, et al. Radial Artery and Ulnar Artery Occlusions Following Coronary Procedures and the Impact of Anticoagulation: ARTEMIS (Radial and Ulnar ARTE ry Occlusion M eta-Analys IS) Systematic Review and Meta Analysis. J Am Heart Assoc. 2017;6(8):e005430. doi: 10.1161/JAHA.116.005430
18. Sadaka MA, Etman W, Ahmed W, Kandil S, Eltahan S. Incidence and predictors of radial artery occlusion after transradial coronary catheterization. Egypt Heart J. 2019;71(1):1-9. doi: 10.1186/s43044-019-0008-0
19. Munir U, Khan R, Nazeer N, Akhter J, ul Hassan A, Hanif B. Frequency and Predictors of Radial Artery Occlusion in Patients Undergoing Percutaneous Coronary Intervention. Cureus. 2022;14(5). doi: 10.7759/cureus.25505

Author's Contribution:

SNB, MU: Conceived, designed and did statistical analysis & editing of manuscript.
IJ, MU: Did data collection and manuscript writing.
SNB: Did review and final approval of manuscript. He is also responsible for the integrity and accuracy of the study.