

# Outcomes of Transradial Approach in Terms of Procedural Failure, in Patients Undergoing Percutaneous Coronary Intervention

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## ABSTRACT

**Objective:** To evaluate the outcomes of transradial approach in terms of procedural failure in patients undergoing percutaneous coronary intervention.

**Methods:** We have enrolled a total of 276 patients who consented for percutaneous coronary intervention through trans-radial approach at National Institute of Cardiovascular diseases, Karachi. Baseline and clinical data were collected in a structured questionnaire. Patients were assessed at the end of completion of PCI for the achievement of TIMI grade 3 flow by angiography under the supervision of experienced consultant having >5 years' experience of intervention. All the data entered and analysed using SPSS version 22.0.

**Results:** Overall mean age of study subjects was 44.86±12.22 years, with range of 52 (18–70) years and among them 194 (70.28%) were males and 82 (29.71%) were females. The overall mean fluoro time was 10.95±4.83 minutes, with range of 22.1 (3.4–25.5) minutes. Our study's findings have shown no significant association of procedure failure was found with respect to gender, age, CRF, smoking, and obesity, p value <0.05. Significant association of procedure failure was observed in patients with hypertension, diabetes mellitus, family history of ischemic heart disease, hyperlipidemia and fluoro time >10 minutes.

**Conclusion:** Transradial approach becomes the primary choice of vascular access for PCI. The transradial approach eliminates access site complications after PCI. Thus, patients discharge from hospital within 48 hours post-procedure and can mobilize within few hours post-procedure.

**Keywords:** Percutaneous Coronary Intervention, Trans-radial approach, Access outcome, Ischemic heart disease, Pakistan

## INTRODUCTION

Acute ischemic heart disease is becoming common in developing countries including Pakistan. Luckily, most of the Pakistani hospitals in major cities are now performing percutaneous coronary intervention (PCI) for myocardial revascularization. Percutaneous coronary intervention is the gold standard treatment in patients with acute ST-segment elevation myocardial infarction (STEMI) but it can also be performed in patients with non-STEMI during acute phase or electively after few days.<sup>1,2</sup> There are two most commonly access are used for PCI, radial and femoral.<sup>3</sup> Currently, radial access is far most common and preferred access used by the interventionalist because of multiple reasons such as the radial artery is easily compressible, bleeding is under control and the risk of hemorrhagic consequences is considerably diminished. There is no need for postoperative bed rest, allowing for faster recovery and earlier discharge.<sup>4,5</sup> Recently published guidelines now focusing on the usage of trans-radial access for PCI to reduce the risk of post-procedural complications and also to reduce hospital stay. In a larger scale study, Radial Versus Femoral Randomized Investigation in ST Elevation Acute Coronary Syndrome (RIFLE-STEACS) authors documented reduction in adverse clinical events including morbidity and mortality when access taken through radial route as compared to femoral route in patients with ST-segment elevation myocardial infarction (STEMI).<sup>6</sup> However, sometimes, smaller number of patients may experience adverse outcome after PCI when performed even after trans-radial route but the frequency is quite low. Comorbid conditions such as female gender, age >75 years, previous history of coronary artery bypass grafting (CABG), and cardiogenic shock are an independent predictors of trans-radial access associated complications.<sup>7,8</sup> But, none of the study has been conducted in which these predictors were assessed in Asian population.<sup>9</sup> Therefore, we aimed to conduct this study to determine the outcomes of transradial approach in terms of procedural failure in patients undergoing percutaneous coronary intervention.

## MATERIAL AND METHODS

This prospective cross-sectional study was conducted after taken ethical approval from the Institutional review board of National

Institute of Cardiovascular diseases, Karachi. All consecutive 276 were enrolled between the periods of 24<sup>th</sup> December 2019 to 23<sup>rd</sup> June 2020. Patients diagnosed on coronary angiography as having significant (≥70%) disease in coronary arteries undergoing PCI by transradial approach, patients of age ≥18 years and ≤70 years of either gender, normal volume radial pulse, and a good collateral flow via the palmer arch as indicated by a Positive Allen's test, and electively referred for PCI were included in this study. Patients with previous history of CABG with LIMA grafting, patients with ACS, cardiogenic shock, left main artery stenting, requiring TPM placement, no attendant available, and not consenting to participate in the study were excluded. The investigator collected the data on a prescribed questionnaire which was include baseline characteristics, demographic and clinical data. Those patients who fulfilled inclusion criteria of the study were asked for written consent from the patient. All patients were treated with guideline directed medications before and during the procedure (PCI). Patients were assessed at the end of completion of PCI for the achievement of TIMI grade 3 flow by angiography under the supervision of experienced consultant having >5 years' experience of intervention. The data were analyzed on Statistical package of social sciences (SPSS version-22).

## RESULTS

Among total 276 patients, overall mean age of study subjects was 44.86±12.22 years, and among them 194 were males and 82 were females. The overall mean fluoro time was 10.95±4.83 minutes, with range of 22.1 (3.4–25.5) minutes. Diabetes mellitus was present in 72 (26.1%) patients, 137 (49.6%) were hypertensive, CRF was present in 5 (1.8%) patients, hyperlipidemia was found in 54 (19.6%) patients, 114 (41.3%) patients were smokers, 46 (16.7%) patients were obese, and 105 (38.0%) had family history of ischemic heart disease. Right radial artery was used in 247 patients and left radial artery was used in 29 patients. Single vessel PCI was done in 175 patients and multivessel PCI was done 101 patients. As far as stents that were used are concerned, it was found that BMS was used 36.2%, DES was used 44.6%, Combination of DES+BMS was applied 17.4%, and other stents was used 1.8%. Table.1

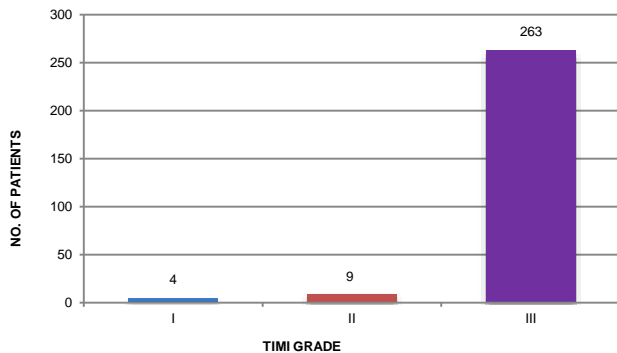
Among total 276 patients, TIMI grade I was found in 1.4% patients, II was found in 3.3% patients, and III was found in 95.3% patients, graph no. 01.

Total 276 procedures were performed among which total 13 patients were not able to achieve TIMI Grade III so the procedure failure was observed in 13 (4.71%) patients while 263 (95.28%) patients were achieved TIMI grade III and their procedure was successful, Graph no. 02.

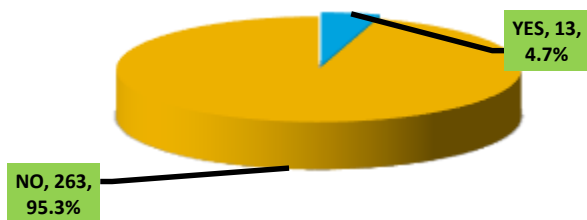
Our study's findings has shown no significant association of procedure failure was found with respect to gender, age, CRF, smoking, and obesity, p value <0.05. Significant association of procedure failure was observed in patients with hyperlipidemia, family history of ischemic heart disease, diabetes mellitus, hypertension and fluoro time >10 minutes, table no 2 & 3.

Table 1: Demographic profile of patients (n=276).

Variable	Mean ± SD n(%)
Age (years)	44.86±12.22
Gender	Male 194(70.3%)
	Female 225(29.7%)
Comorbidities	Single 83(30.07%)
	Double 135(48.91%)
	Three 52(18.84%)
	Four 6(2.17%)



Graph 1: frequency distribution of TIMI grade achieved



Graph 2: Percentage Of Procedure Failure

Table 2: frequency of procedure failure according comorbidities

Comorbidities	Procedure Failure		P-Value
	YES (N=13)	NO (N=263)	
Diabetes Mellitus	Yes (n=72)	0	0.028*
	No (n=204)	13	
Hypertension	Yes (n=137)	10	0.044*
	No (n=139)	3	
CRF	Yes (n=5)	0	0.616***
	No (n=271)	13	
Hyperlipidemia	Yes (n=54)	6	0.013*
	No (n=222)	7	
Smoking	Yes (n=114)	6	0.716***
	No (n=162)	7	
Obesity	Yes (n=46)	0	0.099***
	No (n=230)	13	
Family History	Yes (n=105)	10	0.003**
	No (n=171)	3	

CRF: Chronic Renal Failure

Table 3: Frequency And Association Of Procedure Failure According Fluoro Time

Fluoro Time Minutes	PROCEDURE FAILURE			P-Value
	YES (n=13)	NO (n=263)	Total	
≤ 10 min	10	117	119	0.022*
> 10 min	3	146	157	
TOTAL	13	263	276	

## DISCUSSION

Coronary artery interventions through radial artery have shown significant reduction in complications, transradial access site bleeding complications range from 0.8% to 5.7%. Studies from Pakistan report figures of 1.5% to 8.4%.<sup>10,11</sup> In a previously conducted study, transradial access reduced major bleeding by 73% (0.05%) and there was a trend for reductions in the composite of death, myocardial infarction (MI), or stroke (2.5%) as well as death (1.2%).<sup>12</sup> During percutaneous coronary intervention using transradial access, there was a tendency for a higher risk of inability to cross the lesion with wire, balloon, or stent (4.7%). Radial access reduced hospital stays by 0.4 days (95% CI 0.2-0.5, P = .0001).<sup>13,14</sup> The meta-analysis also shows that the transradial approach for coronary procedures is a highly safe and effective technique for both transcatheter diagnostic and therapeutic procedures, in comparison to the standard transfemoral access. Besides advantages of trans-radial approach vs. trans-femoral approach, the earlier one is more challenging to access and it requires skilled interventionalist. The access failure rate is lower in trans-femoral route (2.4%) vs. trans-radial route (7.2%).<sup>13,15</sup> Ideally, trans-radial approach should be taken after performing Allen's test but in daily routine most of the interventional cardiologist take this route just palpating the pulse and assessing the volume of radial artery. An older study conducted by this method on 100 consecutive patients in which their mean age was 53 years and success rate was more than 95%.<sup>16</sup> Similar results has been shown in our study but in our study the mean age patients was comparatively younger (44.86±12.22 years). This shows increased burden of ischemic heart disease in our country as the young population is being affected most commonly. The reason could be poor lifestyle, bad dietary habits, or lack of awareness regarding this disease. Findings from our study has shown that more than 95% of the patients did not show any complication related to radial artery access for PCI while only 13 patients (4.71%) showed failure. In a previously conducted study by Carvalho MS and colleagues also observed slightly higher rates of radial artery failure (5.8%) and that could be due to older population enrolled in their study.<sup>17</sup> The significant factors associated with trans-radial access failure were presence of diabetes mellitus, hyperlipidemia, and family history of premature ischemic heart disease (p <0.05). While, >10 minutes fluoroscopy time was associated with significantly higher rates of complications as compared to fluoroscopy time was <10 minutes in our study, p <0.05. Same findings were observed in a previously conducted international study. The study suggested that the transradial access for PCI is a safe and effective as compared with trans-femoral access.<sup>18,19</sup>

There are multiple limitations of our study. Most importantly, our study was conducted in a single center but advantage of our center is that it covers whole of the Sindh province and half of the Baluchistan province. Secondly, it should be comparative study through which failure and success rates would be compared with trans-femoral routes also. Patients were selected consecutively and no randomization was performed. Lastly, our study's sample size was small hence it may not be the true representation of the whole population.

## CONCLUSION

Transradial approach becomes the primary choice of vascular access for PCI. The transradial approach eliminates access site complications after PCI. Time to mobilization, length of hospital

stay, and costs all are reduced after transradial percutaneous coronary intervention.

## REFERENCES

- Smilowitz NR, Feit F. The History of Primary Angioplasty and Stenting for Acute Myocardial Infarction. *Curr Cardiol Rep.* 2016;18(1):5.
- Jain A, Jagadheesan K, Satheesh S, Anantharaj A. Primary PCI for acute myocardial infarction in a patient with situs inversus totalis and dextrocardia. *J Cardiol Cases.* 2021;23(6):267-70.
- Batra MK, Rai L, Khan NU, Mengal MN, Khowaja S, Hassan Rizvi SN, et al. Radial or femoral access in primary percutaneous coronary intervention (PCI): Does the choice matters? *Indian Heart J.* 2020;72(3):166-71.
- Lindner SM, McNeely CA, Amin AP. The Value of Transradial: Impact on Patient Satisfaction and Health Care Economics. *Interv Cardiol Clin.* 2020;9(1):107-15.
- Lee CW, Cho SC. The Transradial Approach for Coronary Intervention: More Comfort, Better Outcome. *Korean Circ J.* 2018;48(8):728-30.
- Romagnoli E, Biondi-Zoccai G, Sciahbasi A, Politi L, Rigattieri S, Pendenza G, et al. Radial versus femoral randomized investigation in ST-segment elevation acute coronary syndrome: the RIFLE-STEACS (Radial Versus Femoral Randomized Investigation in ST-Elevation Acute Coronary Syndrome) study. *J Am Coll Cardiol.* 2012;60(24):2481-9.
- Hu J, Cai X, Wang X, Chen L, Xu D, Li J. Risk factors of failed transradial approach for percutaneous coronary interventions in Chaoshan Chinese: a locally retrospective analysis. *Int J Clin Exp Med.* 2015;8(7):11770-6.
- Sandoval Y, Bell MR, Gulati R. Transradial Artery Access Complications. *Circ Cardiovasc Interv.* 2019;12(11):e007386.
- Rahman N, Ullah I, Farhad A, Adnan G. Distal transradial artery access for coronary angiography in a patient having rheumatoid arthritis-related severe arthropathies. *BMJ Case Rep.* 2021;14(10).
- Bajraktari G, Rexhaj Z, Elezi S, Zhubi-Bakija F, Bajraktari A, Bytyci I, et al. Radial Access for Coronary Angiography Carries Fewer Complications Compared with Femoral Access: A Meta-Analysis of Randomized Controlled Trials. *J Clin Med.* 2021;10(10).
- Dworeck C, Redfors B, Volz S, Haraldsson I, Angeras O, Ramunddal T, et al. Radial artery access is associated with lower mortality in patients undergoing primary PCI: a report from the SWEDEHEART registry. *Eur Heart J Acute Cardiovasc Care.* 2020;9(4):323-32.
- Mason PJ, Shah B, Tamis-Holland JE, Bittl JA, Cohen MG, Safirstein J, et al. An Update on Radial Artery Access and Best Practices for Transradial Coronary Angiography and Intervention in Acute Coronary Syndrome: A Scientific Statement From the American Heart Association. *Circ Cardiovasc Interv.* 2018;11(9):e000035.
- Senguttuvan NB, Reddy PMK, Shankar P, Abdulkader RS, Yallanki HP, Kumar A, et al. Trans-radial approach versus trans-femoral approach in patients with acute coronary syndrome undergoing percutaneous coronary intervention: An updated meta-analysis of randomized controlled trials. *PLoS One.* 2022;17(4):e0266709.
- Lee WC, Wu PJ, Fang CY, Fang HY, Wu CJ, Liu PY. The comparison of efficacy and safety between transradial and transfemoral approach for chronic total occlusions intervention: a meta-analysis. *Sci Rep.* 2022;12(1):7591.
- Soud M, SayedAhmad Z, Kajiy M, Alahdab F, Darmoch F, Al-Khadra Y, et al. The efficacy and safety of transradial and transfemoral approach in treatment of coronary chronic total occlusion: a systematic review and meta-analysis. *Expert Rev Cardiovasc Ther.* 2020;18(11):809-17.
- Agarwal T, Agarwal V, Agarwal P, Thakur S, Bobba R, Sharma D. Assessment of collateral hand circulation by modified Allen's test in normal Indian subjects. *J Clin Orthop Trauma.* 2020;11(4):626-9.
- Carvalho MS, Cale R, Goncalves Pde A, Vinhas H, Raposo L, Teles R, et al. Predictors of Conversion from Radial Into Femoral Access in Cardiac Catheterization. *Arq Bras Cardiol.* 2015;104(5):401-8.
- Chiarito M, Cao D, Nicolas J, Roumeliotis A, Power D, Chandiramani R, et al. Radial versus femoral access for coronary interventions: An updated systematic review and meta-analysis of randomized trials. *Catheter Cardiovasc Interv.* 2021;97(7):1387-96.
- Rahman F, Jneid H. The continuing promise of the radial access for coronary interventions. *Catheter Cardiovasc Interv.* 2021;97(7):1397-8.