

# Assessment and Measurement of Site Pressure Pain by using NPRS in patients undergoing PCI with Radial Versus Femoral Approach

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## ABSTRACT

**Background:** There are few studies on assessment and measurement of site pressure pain after percutaneous coronary intervention (PCI) using Numeric Pain Rating Scale (NPRS). We compared the PCI procedure using radial or femoral approaches during hospitalization.

**Aim:** To assess and measure of site pressure pain by using NPRS in patients undergoing coronary invasive procedures in trans-radial versus trans-femoral approach and to determine the association of access site pressure pain and morbidities in trans-radial versus trans-femoral approaches.

**Methods:** The cross-sectional analytical study enrolled systematic random sample of 75 patients (both genders) with coronary artery disease that underwent coronary invasive procedures from Punjab Institute of Cardiology & Sheikh Zayed Hospital, Lahore. Data were obtained on pressure pain at puncture site of patient following procedure and recorded on questionnaire using Numeric Rating Pain Scale (NRPS). Data was analyzed using SPSS version 21.

**Results:** There were total of 52 males and 23 females in both groups with P-value 0.572. The transradial access group consisted of males 24(32%) and females 9(12%), whereas the transfemoral group was comprised of 14(18.7%) females and 28(37.3%) males. The mean age of the patients were 50.86 ±8.9 and 52.06 ±8.093 years in both groups. Mean BMI of the patients with transfemoral and transradial approach were 26.74±3.89 and 27.81±5.33. There was insignificant difference in level of pain with age and gender with p-values 0.052, 0.064. Statistically significant level of pain was associated with overweight patients resulting p -value 0.299 > 0.05

**Conclusion:** It is concluded that those patients who underwent angiography through transfemoral approach experienced more discomfort as compared to the patients having transradial approach.

**Keywords:** Percutaneous coronary intervention PCI, Numeric Pain Rating scale, NPRS .

## INTRODUCTION

Coronary artery disease (CAD) is one of the most common causes of morbidity and mortality in both under developing and developed countries. About 80% of these deaths occurred in under developed countries. Cardiovascular diseases led to more than 17.5 million deaths in year 2012 globally<sup>1</sup> 0333-424106. The reasons for higher cardiovascular mortality in under developed countries are not very well known. Although the risk factor burden in these countries has increased over the past few decades. It may be that the cardiovascular mortality rates are lower in developed countries due to better control of risk factors, better access to proven pharmacological therapies and revascularization<sup>2</sup>.

By end of year 2020 it will be the leading cause of death worldwide. The United Nations formally recognized non-communicable diseases, including cardiovascular diseases, as a major concern for global health and set out an ambitious plan to dramatically reduce the effect of these diseases in all regions<sup>3</sup>. An increased awareness of these global noncommunicable disease goals has expanded attempts to track and benchmark national efforts at reducing CVD and other non-communicable diseases<sup>4</sup>.

Modern technology and improvement in cardiologists' skills in interventions have provided multiple treatment

options for patients with CAD. These effective coronary interventions (angiography / angioplasty) provide direct visualization of anatomical structure of coronary artery and helpful in measuring the different heart functions<sup>5,6</sup>.

Coronary invasive procedures (CIP) are techniques used to detect vascular blockage via coronary angiography (CA) or to treat the blockage with angioplasty and implant stents to keep the lumen open using small inflatable balloon catheters. According to National Cardiovascular Data Registry (NCDR) radial and femoral arteries are the access sites for puncture to carry out the CIP (2008)<sup>7</sup>. Since the introduction of angiographic techniques, femoral artery is the preferred vascular route to carry out the procedure but a recent shift has been more towards radial approach. It is because of the advantageous effects of access site comfort, short bed rest and free ambulation to use the bath room facility<sup>8</sup>. Pain assessment associated with puncture site in both approaches (radial/femoral) is not much considered by health care providers as it may have effect on patients' behaviour and compliance to treatment plan<sup>9</sup>.

Pain assessment and its measurement guide the health care providers to manage pain. It is systematic process to assess patient's pain experiences in physiological, emotional, cognitive and social dimensions. Various pain scales (Numeric Pain Rating Scale and Visual Analogue Scale etc.) are important to measure the pain intensity<sup>10</sup>.

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### MATERIALS AND METHODS

The study was approved by the University of Health Sciences, Lahore and conducted at Punjab Institute of Cardiology (PIC) and Sheikh Zayed Hospital (SZH), Lahore. A Systematic Random Sample of 75 patients was registered from Angiography department of selected Institutions. Male and female with age > 30 and < 65 years and positive Allen’s Test for radial access were included and patient of Negative Allen’s Test were exclude.

### RESULTS

A total of 75 patients of undergoing coronary invasive procedures were enrolled in the study, whereas 52 (69.0%) were male and 23(31.0%) were females the mean age was 51.39 ±8.54 years. All the patients entered into study were observed for BMI and categorized into three group’s i-e normal, overweight and obese. Each patient’s BMI was calculated using the BMI formula i-e based on height and weight of patient and score of BMI 30 or greater was classified as being obese (Department of Health and Human Services, 2007). The number of patients under normal BMI was 29(38.7%), over weighted 26 (34.7%) and obese were 20(26.7%) shown in (Table & Graph-1).

Different variables were used to assess the risk factors for cardiac disease and analyzed in SPSS. Out of 75 patients, History of hypertension noted in 50 with a p-value of 0.02 and diabetes mellitus found in 35 patients (p-value of 0.57),32(43%) patients found smokers p-value of 0.041, 23(31%) patients included in the study were presented with hyperlipidemia History of heart disease was reported by total 37(49%) patients in both the radial and femoral groups having p-value 0.490, Patients with previous PCI history 36(48%) having p-value 0.381 (Table 2)..

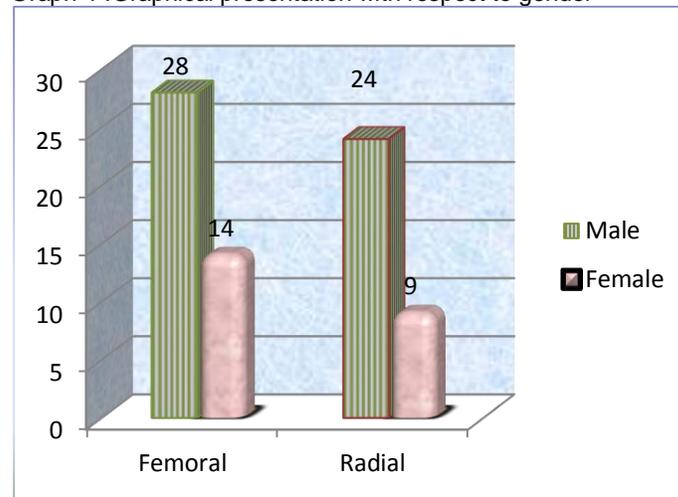
Site pain pressure was assessed using a 0-10 point NRPS as 0 representing no / absence of pain, 10 means most intense pain, while mild has just pain or discomfort as compared to tolerable pain with moderate level. Post procedural access site pain in transfemoral group felt at mild and moderate level 64.2% vs. 23.8% respectively. While on same rating scale in radial group felt at mild and moderate level 42.4% vs. 33.3% with p-value 0.416 (Table: 3 and in Pie charts)

BMI categorized group. Highest number of patients i-e 33(44%) out of total 75 sample were fall into overweight BMI. Percentages of overweight patients were calculated and association was measured using Pearson Chi-square test. Statistically significant level of pain was associated with overweight patients resulting p -value 0.219 > 0.05 (Table 4).

Table-1: Study Characteristics with Research

		Frequency	Mean ± S.D.
<b>Age</b>			51.39 ± 8.54
<b>Gender</b>	Male	52 (69.0%)	50.62 ± 8.48
	Female	23 (31.0%)	53.13 ± 8.58
<b>BMI</b>	Normal	29 (38.7 %)	26.74±3.89
	Over weight	26 (34.7 %)	
	Obese	20 (26.7 %)	

Graph-1 :Graphical presentation with respect to gender



Pie Charts: 1

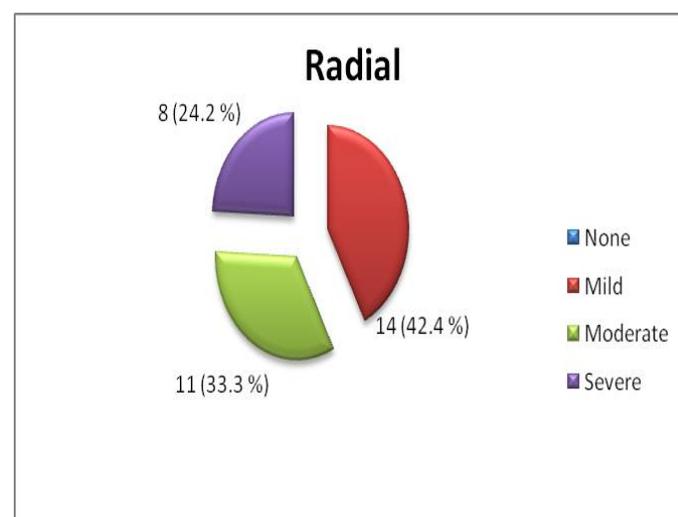
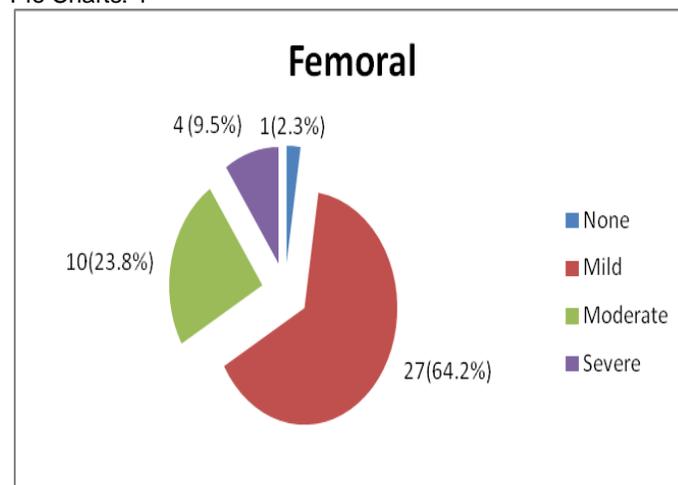


Table 2 : Clinical characteristics of patients.

Variables(yes)	Trans-femoral (n=42)	Transradial (n=33)	p- Value
Hypertension	29(69%)	21(64%)	0.02
Diabetes Mellitus	20(48%)	15(45%)	0.57
Smoking	19(45)	13(39%)	0.041
Dyslipidemia	14(33%)	09(27%)	0.038
Family History	18(43%)	19(58%)	0.206
Hyper-cholesterolaemia	31(74%)	18(55%)	0.016
Previous MI	25(59%)	19(58%)	0.490
Previous PCI	19(45%)	17(51%)	0.381

Table 3 : Comparison of access site pressure pain in trans-radial versus trans-femoral approach.

Pain Rating	Group		Total
	Femoral	Radial	
None	1(2.3%)	0 (0 %)	1(2.3)
Mild	27(64.2%)	14 (42.4 %)	41(54.1%)
moderate	10(23.8 %)	11(33.3 %)	21(28.0 %)
severe	4(9.5 %)	8(24.2 %)	12(16.0 %)
Total	42	33	75

P value: 0.416

Table 4: Association of access Site Pain Pressure with BMI in Trans-radial versus Trans-femoral approaches.

Pain Rating	BMI Group		
	Normal	Over Weight	Obese
None	4 (16.6%)	9 (27.7 %)	0 (.0%)
Mild	8 (33.3 %)	11 (33.3 %)	4 (22.0 %)
Moderate	8 (33.3 %)	12 (36.3 %)	11 (61.1 %)
Severe	4 (16.6 %)	1(3.0 %)	3 (16.6 %)
Total	24	33	18

P value: 0.219

## DISCUSSION

This cross sectional analytical study was utilized to explore the experiences of pain at puncture site (femoral/radial) after coronary invasive procedures and findings are compared and contrasted in relation to current literature.

Many studies have been conducted on complication of coronary angiography or angioplasty in both the trans-radial approach versus the trans-femoral approach. However limited literature was available on safety and efficacy of the trans-radial approach vs. trans-femoral approach but only one study that typically focuses on patient perceived pain differences in both two approaches was available internationally.

The result of mild pressure pain felt by patient in trans-femoral group 64.2% vs 42.4% in transradial and moderate pain felt in trans-femoral group 23.8% as compare with 28% in transradial with p-value >0.05. The findings confirmed the study of Yousaf A.A et al (2010) who studied both coronary angiography and interventions using single transradial guiding catheter. He found a feasible and highly success in the use of single catheter with accurate procedure time, fluoroscopy time and mean contrast volume. It was also safe, patients' felt comfort and no

procedural complication in all the cases. It indicates that transradial artery approach can be safely used in routine procedures as an alternative to conventional trans-femoral approach<sup>11</sup>.

Goyal et al., (2006) concluded in their study, the benefits of radial procedure as operators will be more confident in utilizing this approach. The findings from researchers' own data shown in results section indicated the better health care outcomes with improved patients' satisfaction and comfort level when CA / PCI is performed via transradial approach<sup>12</sup>. Further benefits that may help to improve patients' comfort are early mobilization and use of bath room facility that encourages a higher turnover of patients with appropriate education and discharge resources. The information for pain at puncture site (radial/femoral) was rated on NRPS and analyzed statistically. The findings revealed that there was no difference in access site pain levels in patients undergoing a transradial access as compared to transfemoral one. These results were consistent with the study conducted by Wang L. (2016) on patient perceived access site pain associated to the route of vascular access as there was no statistically significant difference found in both the transradial vs. transfemoral approach<sup>13</sup>.

In order to find out the answer of question "Is there a difference in post-procedural access site pressure pain in patients undergoing coronary invasive procedures between trans-radial versus trans-femoral approach?" present study was carried out. Although present study was limited by small sample size and lack of reliability testing, findings showed that the transradial access site to be an equally effective and safe approach to coronary angiography / angioplasty as the transfemoral approach. In this study, patients enrolled in both group were differ in number but baseline characteristics of were not significantly much different which is confirmed by the results of those conducted by Hildick-Smith, et al (2014), Ziakas, et al. (2014) and Louvard, et al. (2015)<sup>14,15,16</sup>.

It was observed that overall highest number of patients i.e., 33 (44%) were from the overweight group which measured the statistically significant level of association with pain resulting p-value 0.299 > 0.05. Only one study I found in literature that focused on BMI level with pain tolerance after procedure. In this study, results showed the statistically significant negative correlation between patient BMI and reported levels of access site pain as the patients with a lower BMI score reported higher levels of post-procedural access site pain compared to patients with higher BMI scores.

The cumulative results of 104 patients in randomized, single centre pilot trial Johan Höglund, Ulf Stenestr and Tim Tödt et al (2015) on post post-procedural bed rest time for either 1.5 or 5 h and patients' discomfort was measured as self-perceived grade of pain in the back. The results of that study revealed a significantly lower rate of perceived back pain also after 2 h of mobilisation and decreased the patients' pain, both during and after the bed rest. There was a different trend in comfort level of patients with femoral approach as all these patients felt more discomfort due to restricted mobilization for long hours on bed compare to tranaradial one<sup>17</sup>.

## CONCLUSION

Both vascular access techniques should not be considered opposite or mutually exclusive, but rather provide the interventionalist with a wider spectrum of therapeutic options. It is observed that those patients who underwent angiography through transfemoral approach experienced more discomfort as compared to the patients having transradial approach.

It is also concluded from research that patients who underwent through transfemoral approach experienced more discomfort as compare to the transradial. Among patients undergoing diagnostic cardiac catheterization, transradial access leads to improved quality of life after the procedure, is strongly preferred by patients, and reduces hospital costs.

## REFERENCES

1. World Health Organization. Global status report on noncommunicable diseases 2014. World Health Organization; 2014.
2. Yusuf S, Rangarajan S, Teo K, Islam S, Li W, Liu L, Bo J, Lou Q, Lu F, Liu T, Yu L. Cardiovascular risk and events in 17 low-, middle-, and high-income countries. *New England Journal of Medicine*. 2014 Aug 28;371(9):818-27.
3. Roth GA, Johnson C, Abajobir A, Abd-Allah F, Abera SF, Abyu G, Ahmed M, Aksut B, Alam T, Alam K, Alla F. Global, regional, and national burden of cardiovascular diseases for 10 causes, 1990 to 2015. *Journal of the American College of Cardiology*. 2017 Jun 26;70(1):1-25.
4. Bonita R, Magnusson R, Bovet P, Zhao D, Malta DC, Geneau R, Suh I, Thankappan KR, McKee M, Hospedales J, de Courten M. Country actions to meet UN commitments on non-communicable diseases: a stepwise approach. *The Lancet*. 2013 Feb 16;381(9866):575-84.
5. Armendaris MK, et al. (2008). Incidence of vascular complications in patients submitted to percutaneous transluminal coronary angioplasty by transradial and transfemoral arterial approach. *Acta Paul Enferm*, 21(1):107-11
6. Aqm Reza, Ahmw Islam, S Munwar, S Talukder, T Ahmed, (2012) A Miah Tran-Radial Percutaneous Coronary Intervention (PCI) is Safe and Alternative to Conventional Trans-Femoral Approach: Our Experiences at Apollo Hospitals Dhaka *Cardiovasc.j*. 5(1): 57-61
7. Davenport J.J., Lam L., Whalen-Glass R.; et al. The successful use of alternative routes of vascular access for performing pediatric interventional cardiac catheterization, *Catheter Cardiovasc Interv* 72 2008 392
8. Sacco RL, Roth GA, Reddy KS, Arnett DK, Bonita R, Gaziano TA, Heidenreich PA, Huffman MD, Mayosi BM, Mendis S, Murray CJ. The heart of 25 by 25: achieving the goal of reducing global and regional premature deaths from cardiovascular diseases and stroke: a modeling study from the American Heart Association and World Heart Federation. *Circulation*. 2016 Jun 7;133(23):e674-90.
9. Madlen Uhlemann, Sven Möbius-Winkler, Meinhard Mende, Ingo Eitel, Georg Fuernau, Marcus Sandri, Volker Adams, Holger Thiele, Axel Linke, Gerhard Schuler, Stephan Gielen. The Leipzig Prospective Vascular Ultrasound Registry in Radial Artery Catheterization : Impact of Sheath Size on Vascular Complications. *JACC: Cardiovascular Interventions* 2012; 5(1): 36-43
10. Cooper, C.J., El-Shiekh, R.A., Cohen, D.J., Blaesing, L., Burket, M.W., Basu, A. & Moore, J.A. (1999). Effect of transradial access on quality of life and cost of cardiac catheterization: A randomized comparison. *American Heart Journal*, 138(3), 430-436
11. Youssefa A.A., Dr. Chiung-Jen Wu b, Both sides coronary angiography and intervention using a single transradial guiding catheter *Journal of Saudi Heart Association*, doi:10.1016/j.jsha.2010.02.281
12. Goyal, A., Tricoco, P., Melloni, C., Mills, J. S., Thomas, K. L., Adams, G. L., et al. (2006). Highlights from the American Heart Association Scientific Sessions. *American Heart Journal*, 151(2), 295-307
13. Wang L, Yang Y, Zhou Y, Xu B, Zhao L. Prevalence of transradial coronary angiography and intervention in China: Report from the Transradial coronary intervention Registration Investigation in China (TRI-China). *Int J Cardiol* 2016;145:246– 247.
14. Hildick-Smith DJ, Walsh JT, Lowe MD, et al. Transradial coronary angiography in patients with contraindications to the femoral approach: an analysis of 500 cases. *Catheter Cardiovasc Interv*. 2014;61(1):60–66
15. Ziakas, A., Klinke, P., Mildemberger, R., Fretz, E., Williams, M.B., Siega, A.D., Kinloch, R.D. & Hilton, J.D. (2014). Comparison of the radial and femoral approaches in left main PCI: A retrospective study. *Journal of Invasive Cardiology*, 16(3), 129-132
16. Louvard, Y., Benamer, H., Garot, P., Hildick-Smith, D., Loubeyre, C., Rigattieri, S., Monchi, M., Lefevre, T. & Hamon, M. (2015). Comparison of transradial and transfemoral approaches for coronary angiography and angioplasty in octogenarians (the OCTOPLUS study). *American Journal of Cardiology*, 94, 1177-1180
17. Joan Joseph Castillo (2014). Research Population. Retrieved 06 Nov. 2012 from Explorable: <http://explorable.com/research-population.html>
18. Tzinieris IN , Papaioannou GI , Dragomanovits SI, Minimizing femoral access complications in patients undergoing percutaneous coronary interventions: a proposed strategy of bonylandmark guided femoral access, routine access site angiography and appropriate use of closure devices, *Hellenic Journal of Cardiology* (2007)48(3):127-133.