

# CLINICAL OUTCOMES AND COMPLICATIONS BETWEEN FEMORAL AND RADIAL ARTERY APPROACH OF CORONARY ANGIOGRAPHY

Naresh Kumar Khurana<sup>a</sup>, Suresh Kumar<sup>b</sup>, Kashif Majeed<sup>a</sup>, Tariq Shakoor<sup>a</sup>, Nighat Saleh<sup>c</sup>, Mohsin Raza Khan<sup>d</sup>

<sup>a</sup>Central Park Teaching Hospital, Lahore. <sup>b</sup>Bolan Medical College, Quetta, Balochistan, Pakistan. <sup>c</sup>Institute of Public Health, Quetta, Balochistan, Pakistan. <sup>d</sup>Federal Medical College, Islamabad, Pakistan.

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## ABSTRACT:

### INTRODUCTION:

*Coronary Angiography has become the most suitable invasive procedure to image coronary atherosclerotic burden. The access of choice still comes down to operators' experience and comfort level.*

### AIMS & OBJECTIVE:

*To compare the clinical outcomes and complications between femoral and radial artery approach of Coronary Angiography.*

### MATERIAL & METHODS:

*This cross-sectional research was conducted at the Cardiology Department of Central Park Teaching Hospital, Lahore, over a period of one year. Total 96 patients enrolled who fulfilled the inclusion criteria. Two groups of participants were formed. In group-A, angiography was done through femoral artery and in group-B, angiography was done through radial route. Then patients were followed-up for 6 months and outcomes were noted.*

### RESULTS:

*The mean age of patients in femoral artery group of this study was 53.15±9.10years while mean age of patients in radial artery group was 50.72±10.46years. Death occurred in 4 (8.7%) patients in femoral artery group while in 3 (6.5%) radial artery group patients. MI occurred in 2 (4.3%) femoral artery patient group while in 0 (0.0%) patients which were included in radial artery group. Hematoma formed in 5 (10.9%) patients in femoral artery group while in 2 (4.3%) patients in radial artery group. Stroke / TIA, pseudoaneurysm, arteriovenous fistula, arterial occlusion and nerve injury did not occur in any patient in any group. Major bleeding occurred in 2 (4.3%) patients in femoral artery group while in 0 (0.0%) patients in radial artery group. The difference was insignificant ( $p>0.05$ ).*

### CONCLUSION:

*Complications are high in femoral artery but insignificant results have been obtained. So radial approach can be obtained as preferred method for coronary angiography.*

### KEY WORDS:

*Clinical outcomes, complications, femoral artery approach, radial artery approach, Coronary Angiography.*

**Correspondence :** Naresh Kumar Khurana, Central Park Teaching Hospital, Lahore. Email: nareshkhurana@yahoo.com

**Author's Contribution:** NKK: Study design and concept. SK: Questionnaire design. KM: Data collection and interpretation. TS: Data analysis and interpretation. NS: Data collection. MRK: Data collection.

## INTRODUCTION:

Coronary Angiography has become the most commonly performed invasive procedure to image coronary atherosclerotic burden. The access of choice still comes down to operators experience and comfort level. Data from European and American studies have shown a gradual acceptance and trend towards radial access for angiography and angioplasty though it has longer fluoroscopy time and more tedious for the operator but the patients comfort, early mobility and fewer access associated complications has been the main driving force in this trend. In Pakistan, the absence of sufficient data concerning vascular access options is leading to a situation where the choice is increasingly based on individual preferences. These preferences are influenced by the varying levels of importance attached to the associated benefits and risks.<sup>1</sup>

Currently the optimal choice of vascular access site for coronary angiography procedures remains a topic of ongoing debate. Each option, whether utilizing the radial or femoral artery, comes with its own set of advantages and disadvantages. The optimal choice of vascular access site for coronary angiography procedures remains a topic of ongoing debate. Each option, whether utilizing the radial or femoral artery, comes with its own set of advantages and disadvantages. However, local studies have yet to determine which access site is superior. Route selection for coronary angiography procedures still exists into gray area. Benefits and complications of each access (Radial vs. Femoral) vary significantly. The levels of importance depend on factors such as the patient's preference, suitable anatomy, and the operator's decision.

Clinical investigations have indicated that radial access is linked to a lower likelihood of major bleeding in comparison to femoral access.<sup>2, 3</sup> Furthermore, according to the twenty three meta-analysis of randomized

trials revealed no substantial disparities in mortality between femoral and radial routes.<sup>4</sup> Less mortality ratio was noted in radial vs. femoral i.e, 1.2% vs. 1.8%. The rates of myocardial infarction and stroke both follow similar pattern in mortality. Results of complication were lower in radial access but not statistically significant i.e, 2.0% vs. 2.9% myocardial infarction, and stroke 0.1% vs. 0.5%. Presently, radial access comprises only 6% to 12% of procedures on a global scale<sup>3, 5-8</sup>.

Compared with femoral approach, access to radial artery requires shorter period of time to lie flat and shorter bed rest period following the procedure. Radial access has benefit of quicker discharge as compared to femoral access.<sup>9,10</sup> The major advantage of radial route is the reduction of vascular complications such as hematoma, pseudo aneurysm formation and arteriovenous fistula.<sup>11-13</sup>

In 1948, Radner S reported for the first time about Radial approach.<sup>14</sup> Due to the small size of vessel, this technique was not adopted until 1989. Later on Campeau recommended this as the best approach for coronary angiography.<sup>15</sup> Due to its advantages, less vascular complication and early mobilization of patients, radial approach has become the best choice for cardiac catheterization.

## MATERIAL AND METHODS:

This comparative cross-sectional research was conducted at the department of cardiology, Central Park Teaching Hospital, Lahore over a period of one year from 2021-2022. Non-probability convenient sampling technique was used. Two groups of participants were formed i.e, Group A: comprised of participants who underwent coronary angiography / angioplasty procedure through femoral approach and Group B: comprised of participants who underwent same procedures through radial access.

Sample size: Total 92 patients (46 patients in each group) were selected by using 95% confidence level, 5% absolute precision

with expected percentage femoral artery as 1.8% and radial artery as 1.2%<sup>1</sup>.

Sample Selection Criteria:

Inclusion criteria: Both genders of age range 35-70 years, diagnosed with ACS (STEMI, NSTEMI and Unstable Angina) undergoing angiography were included.

Exclusion Criteria: Patients with inadequate femoral vascular access (for instance, severe peripheral vascular artery disease precluding both right and left femoral approaches), inappropriate right or left radial approach using Allen's test, individuals using warfarin, dabigatran, or other oral anticoagulants within the last

7 days, those with known coagulation disorders (such as INR more than 2.0 and platelets <100,000/mm<sup>3</sup>), individuals with allergies to aspirin, clopidogrel, prasugrel, and ticagrelor, those with renal dysfunction (creatinine more than 200 umol/L), allergy with contrast (dye), and participants who had undergone coronary artery bypass surgery were excluded from the study.

Data Collection: After taking informed consent, data collection was performed. A full history was taken, particularly age, sex, address, diabetes mellitus, hypertension who are on medication were inquired. Patients were randomly divided

**Table 1: Characteristics of patients in both groups**

	Group	
	Femoral	Radial
<b>n</b>	46	46
<b>Age (years)</b>	53.15±9.10	50.72±10.46
<b>Male</b>	22 (47.8%)	28 (60.9%)
<b>Female</b>	24 (52.2%)	18 (39.1%)
<b>BMI (kg/m<sup>2</sup>)</b>	26.65±4.35	27.16±5.07

**Table 2: Comparison of adverse outcome in both groups**

	Group		Total	p-value
	Femoral	Radial		
<b>Death</b>	4 (8.7%)	3 (6.5%)	7 (7.6%)	0.7172
<b>MI</b>	2 (4.3%)	0 (0.0%)	2 (2.2%)	0.2473
<b>Stroke / TIA</b>	0	0	0	0.5000
<b>Major Bleeding</b>	2 (4.3%)	0 (0.0%)	2 (2.2%)	0.2473
<b>Minor bleeding</b>	44 (95.7%)	46 (100%)	90 (97.8%)	0.2473
<b>Hematoma</b>	5 (10.9%)	2 (4.3%)	7 (7.6%)	0.2725
<b>Hematoma size*</b>	17.60±2.51	11.00±1.41		0.0001
<b>Pseudoaneurysm</b>	0	0	0	0
<b>Arteriovenous Fis-tula</b>	0	0	0	0
<b>Arterial Occlusion</b>	0	0	0	0
<b>Nerve Injury</b>	0	0	0	0

\* = Significant difference

in two groups. In group 1, PCI was done through femoral artery and in group 2, PCI was done through radial artery. The patients were followed for a duration of 6 months, during which their outcomes were documented. Categorization of bleeding complications were as follows, bleeding at access site, retroperitoneal or other forms of bleeding. Whereas, vascular complications were categorized into peripheral embolization, occlusion of radial or femoral arteries due to access site, arterial dissection or pseudoaneurysm. All bleeding endpoints were further specified as requiring transfusion, prolonging the hospital stay, or resulting in a hemoglobin drop exceeding 3.0 g/dl. Access site bleeding also encompassed hematomas exceeding 10 cm for femoral access or 2 cm for radial access.

**Data Analysis:** All data was entered and analyzed using computerized software i.e. SPSS version 20. Qualitative data like gender and Occupation, socio economic class, outcome of previous procedure were presented in form frequency (%). Quantitative data like age were presented in form of Mean  $\pm$  S.D. Chi-square test was applied to compare the qualitative outcome (as per operational definition) in both study groups (Femoral and Radial). P-value  $<$  0.05 was taken as significant.

### RESULTS:

In this study, the mean age of patients in femoral artery group was  $53.15 \pm 9.10$  years while mean age of patients in radial artery group was  $50.72 \pm 10.46$  years. In femoral artery group, there were 22 (47.8%) males and 24 (52.2%) females. In radial artery group, there were 28 (60.9%) males and 18 (39.1%) females. In this study, the mean BMI of patients in femoral artery group was  $26.65 \pm 4.35$  kg/m<sup>2</sup> while mean BMI of patients in radial artery group was  $27.16 \pm 5.07$  kg/m<sup>2</sup>. Table 1

In this study, death occurred in 4 (8.7%) patients in femoral artery group while in 3 (6.5%) patients in radial artery group. In this study, MI occurred in 2 (4.3%) patients in femoral artery group while in 0 (0.0%) patients in radial artery group. In this study, stroke / TIA did not occur in any patient in any group. In this study,

major bleeding occurred in 2 (4.3%) patients in femoral artery group while in 0 (0.0%) patients in radial artery group. Minor bleeding occurred in 44 (95.7%) patients in femoral artery groups and in 46 (100%) in radial artery groups. The difference was insignificant ( $p > 0.05$ ). In this study, hematoma formed in 5 (10.9%) patients in femoral artery group while in 2 (4.3%) patients in radial artery group. The difference was insignificant ( $p > 0.05$ ). In this study, the mean hematoma size in femoral artery group was  $17.60 \pm 2.51$  cm while mean hematoma size in radial artery group was  $11.00 \pm 1.41$  cm. In this study, pseudoaneurysm, arteriovenous fistula, arterial occlusion and nerve injury did not occur in any patient in any group. (Table 2)

### DISCUSSION:

Advancements in technology have made smaller diagnostic catheters and equipment for percutaneous transluminal coronary angioplasty more accessible. This increased availability of compact equipment has led to the growing global popularity of the radial approach as an alternative to femoral approach.<sup>16, 17</sup>

In our trial, femoral artery group patients were having mean age  $53.15 \pm 9.10$  years while mean age of patients in radial artery group was  $50.72 \pm 10.46$  years. In femoral artery group, there were 24 (52.2%) females and 22 (47.8%) males. In radial artery group, there were 18 (39.1%) females and 28 (60.9%) males. Death occurred in 4 (8.7%) patients in femoral artery group while in 3 (6.5%) patients included in radial artery group. MI occurred in 2 (4.3%) patients included in femoral artery group while in 0 (0.0%) in radial artery group patients.

Hematoma formed in 5 (10.9%) patients in femoral artery group while in 2 (4.3%) patients in radial artery group. Stroke / TIA, pseudoaneurysm, arteriovenous fistula, arterial occlusion and nerve injury did not occur in any patient in any group. Femoral artery group was having major bleeding in 2 (4.3%) patients while radial artery group had no major bleeding complication 0 (0.0%). Minor bleeding occurred in 44 (95.7%) patients

in femoral artery groups and in 46 (100%) in radial artery groups. The difference was insignificant ( $p > 0.05$ ).

A recent meta-analysis of 23 randomized trials uncovered no statistically significant difference in mortality between the radial and femoral approaches<sup>4</sup>. Nevertheless, it's worth noting that the mortality rate was lower in the radial group, standing at 1.2% compared to 1.8% in the femoral group. The rates of myocardial infarction (MI) and stroke followed a similar trend, with lower numerical values in the radial group, although without statistical significance (MI: 2.0% vs. 2.9% for radial vs. femoral; Stroke: 0.1% vs. 0.5% for radial vs. femoral). At present, radial access constitutes only 6% to 12% of procedures worldwide.<sup>3,5-8</sup>

The advantages of the radial approach encompass a reduced likelihood of access site complications, early patient mobility, enhanced patient satisfaction, and lower costs. Transradial procedures can be performed by cannulating either the right or left radial artery<sup>18,19</sup>. Jolly et al. reported that radial artery access significantly reduced major bleeding by 73% in comparison to femoral access (0.05% vs. 2.3%,  $p < 0.001$ ) and observed a trend toward a reduction in the composite outcome of death, myocardial infarction, and stroke (2.5% vs. 3.8%,  $p = 0.058$ )<sup>4</sup>. Bhat et al. noted a higher incidence of hematoma (14.5% vs. 0%,  $p < 0.005$ ) and post-procedure access bleeding (7% vs. 3%,  $p = 0.039$ ) in the transfemoral group compared to the transradial group. The failure rates were nearly identical. Notably, none of the patients in the study experienced myocardial infarction, stroke, acute renal failure, or infections following the procedure.<sup>20</sup>

Over the years, Radial access for PCI has been adopted by many interventional cardiologists as an alternative vascular access site. In several European countries, Canada and Japan, the transradial approach is the preferred access strategy for PCI, but in United states it's adaptation is slow.<sup>3,21-23</sup> Previous studies have shown that as compared to transfemoral PCI, Tranradial PCI is associated with shorter duration of stay,<sup>24</sup> fewer access site complications<sup>4</sup> improved quality of life and better patient satisfaction<sup>25</sup> and earlier mobility of patients. These well-documented clinical benefits, in addition to reduced LOS, transform transradial approach as an economically suitable strategy.<sup>26,27</sup> However, these clinical benefits for TRI are associated with increased access site crossover<sup>28</sup> and reduced procedural success<sup>29</sup> thus resulting in increased resource utilization.<sup>11</sup> With the passage of time, increased operator expertise improves the success rate and procedure duration for TRI.<sup>30,31</sup>

The cardiovascular services line is under great pressure to provide cost-effective and quality care treatment. Physicians and hospital administrators tries to cope with the potential economic benefits that TRI might offer compared to TFI.<sup>32</sup> For better understanding of the economic impact of transradial approach, we compared the costs and quality outcomes between transradial and transfemoral approaches in a large-volume tertiary care center.

#### **CONCLUSION:**

Complications are high in femoral artery but insignificant results have been obtained. So radial approach can be obtained as preferred method for coronary angiography. So that least complications would occur in future.

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