



CLINICAL PREDICTORS OF GOOD OUTCOME AFTER RADIAL ACCESS PRIMARY PCI IN A TERTIARY CARE CENTRE

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ABSTRACT

Background: ST-elevation myocardial infarction (STEMI) is a life-threatening condition requiring rapid reperfusion therapy. Primary percutaneous coronary intervention (PCI) via radial access has shown reduced bleeding complications and improved outcomes compared to femoral access. This study aimed to evaluate predictors of favorable outcome in patients undergoing radial access primary angioplasty.

Methodology: This prospective observational study was conducted in the Department of Emergency Medicine at from May 2025 to January 2026. A total of 315 STEMI patients undergoing primary PCI through radial access were included. Patients were categorized into high-risk and non-high-risk groups based on predefined clinical criteria. Baseline characteristics, ECG, echocardiographic findings, procedural variables, complications, and outcomes were analyzed using SPSS version 25.0.

Results: Of 315 patients, 112 were high-risk and 203 were non-high-risk. Most patients were male and in the 51–60 years age group. Diabetes mellitus (42.5%), hypertension (39.4%), and smoking (28.9%) were common risk factors. TIMI grade 3 flow was achieved in 86.03% of cases. No significant difference was observed between groups in fluoroscopy time ($p=0.817$) or contrast volume ($p=0.547$). Overall procedural success was high, with low crossover and complication rates.

Conclusion: Radial access primary PCI is safe and effective in STEMI patients, including high-risk cases, with high procedural success and favorable outcomes.

Keywords: STEMI, Radial Access, Primary PCI, Transradial Angioplasty, Procedural Success, Cardiovascular Outcomes.

INTRODUCTION

ST-segment elevation myocardial infarction (STEMI) remains one of the leading causes of cardiovascular morbidity and mortality worldwide despite significant advances in diagnosis and treatment strategies [1]. Early restoration of coronary blood flow is the cornerstone of STEMI management, and primary percutaneous coronary intervention (PCI) has emerged as the preferred reperfusion strategy because of its superior efficacy in reducing infarct size, recurrent ischemia, heart failure, and mortality when compared to thrombolytic therapy [2].

With advancements in interventional cardiology, improvements in procedural techniques and pharmacotherapy have significantly enhanced survival outcomes in patients undergoing primary angioplasty.

Vascular access site selection plays an important role in determining the safety and success of primary PCI. Traditionally, the transfemoral approach (TFA) has been the standard route for coronary angiography and angioplasty due to operator familiarity and ease of catheter manipulation [3]. However, femoral access is associated with a higher incidence of vascular complications such as hematoma formation, pseudoaneurysm, retroperitoneal hemorrhage, and major bleeding events, particularly in patients receiving aggressive antiplatelet and anticoagulant therapy [4]. Post-procedural bleeding has been identified as an independent predictor of adverse cardiovascular events and increased mortality in STEMI patients undergoing PCI [5].

Over the past two decades, the transradial approach (TRA) has gained increasing popularity as an



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alternative vascular access route for coronary interventions. The radial artery is superficial, easily compressible, and associated with a lower risk of major bleeding complications compared to the femoral artery [6]. Several randomized trials and meta-analyses have demonstrated that TRA significantly reduces access-site bleeding, vascular complications, duration of hospital stay, and overall mortality in patients undergoing primary PCI [7]. Furthermore, transradial intervention improves patient comfort by enabling early ambulation and reducing immobilization-related complications [8]. Despite these advantages, the adoption of radial access for primary angioplasty remains variable across different centers due to concerns regarding technical difficulty, prolonged procedural time, increased radiation exposure, and a steep learning curve for operators [9]. In emergency situations such as STEMI, rapid reperfusion is essential, and some interventional cardiologists continue to prefer femoral access because of familiarity and perceived procedural efficiency. Additionally, anatomical variations, radial artery spasm, smaller vessel caliber, and weak pulse may influence procedural success and outcomes with TRA [10].

Several studies have attempted to compare transradial and transfemoral approaches in primary PCI; however, limitations such as small sample size, operator selection bias, and varying levels of expertise have resulted in differing conclusions [11]. Consequently, debate still exists regarding the optimal vascular access route for primary angioplasty, especially in high-risk patients and resource-limited settings. Identification of clinical and procedural factors associated with favorable outcomes following radial access primary PCI may help improve patient selection, optimize procedural success, and reduce complications.

In this context, the present study was undertaken to evaluate the predictors of favorable outcome in patients undergoing radial access primary angioplasty at a tertiary care centre. The study aims to assess demographic, clinical, and procedural variables influencing successful outcomes and to contribute further evidence regarding the effectiveness and safety of the transradial approach in STEMI management.

Aim: To study the predictors of favorable outcome in patients undergoing radial access primary angioplasty in a tertiary care centre.

Objectives

1. To evaluate the demographic and clinical characteristics of patients undergoing radial access primary angioplasty.
2. To assess procedural success and in-hospital outcomes following transradial primary percutaneous coronary intervention (PCI).

MATERIALS AND METHODS

This prospective observational study was conducted in the Department of Emergency Medicine at over a study period from May 2025 to January 2026. Patients presenting with ST-segment elevation myocardial infarction (STEMI) who underwent primary percutaneous coronary intervention (PCI) through radial access were included in the study. All patients were evaluated for baseline clinical characteristics, procedural success, complications, and crossover rates.

Detailed clinical evaluation including complete medical history, cardiovascular risk factor assessment, physical examination, and anthropometric measurements was performed in all patients. Characteristics of the index cardiac event such as duration of symptoms, Killip class, hemodynamic status, and electrocardiographic findings were recorded. Patients were categorized into high-risk and non-high-risk groups based on the presence of predefined unfavorable criteria. High-risk patients included those with age greater than 75 years, cardiogenic shock, severe left ventricular systolic dysfunction, high-degree atrioventricular (AV) block, low body surface area, multivessel PCI, diabetes mellitus, and low body mass index (BMI). Patients without these unfavorable factors were classified as non-high-risk.

All patients underwent 12-lead electrocardiogram (ECG) evaluation and two-dimensional echocardiography (2D-ECHO) for assessment of left ventricular ejection fraction and regional wall motion abnormalities (RWMA). Coronary angiography findings, culprit vessel characteristics, number of diseased vessels, and procedural details including stent deployment and thrombolysis in myocardial infarction (TIMI) flow grading were analyzed. Procedural success was defined as successful stent placement in the target lesion with residual stenosis less than 10% and achievement of TIMI grade 3 flow without any major procedural complication or immediate post-procedure adverse cardiac event such as myocardial infarction.

Patients were followed up throughout the hospital stay, and short-term outcomes were assessed in terms of morbidity, mortality, access-site complications, bleeding events, arrhythmias, cardiogenic shock, reinfarction, and need for crossover to femoral access. Any in-hospital complication contributing to unfavorable outcome or death was carefully documented and analyzed.

The collected data were entered into Microsoft Excel and analyzed using Statistical Package for Social Sciences (SPSS) software version 25.0. Continuous variables were expressed as mean $\pm$ standard deviation, while categorical variables were represented as frequencies and percentages. Comparative analysis between high-risk and non-high-risk groups was performed using Chi-square test and independent t-test wherever appropriate.

Logistic regression analysis was used to identify predictors of favorable outcome following radial

access primary PCI. A p-value of less than 0.05 was considered statistically significant.

RESULT

Table 1 Demographic Characteristics

Variables		High Risk Group % (N=112)	Non-High risk Group % (N=203)	Total	
				N= 315	Percentage
Gender	Male	26.3	55.9	259	82.2
	Female	9.2	8.6	56	17.8
Age	≤40	2.2	3.2	86	27.3
	41 -50	6.1	15.9		
	51 - 60	9.8	24.8	208	66
	61 - 70	7.6	17.5		
	71-75	3.2	3.2		
	>75	6.7	0		6.7
BMI	Underweight (BMI < 19)	5.1	7.9	41	13
	Normal (BMI 19 - 25)	22.9	40.9	201	63.8
	Overweight (BMI > 25)	7.6	15.6	73	23.2

Baseline Characteristics

Average systolic BP was 140.8 ± 31.6 mmHg and diastolic BP was 83.4 ± 16.1 mmHg at presentation. Regarding area of infarction AWMIs were present in 48.9% (q RBBB pattern in 4.5%) and IWMI spectrum in 51.1% (with 4.4% with RVMI). Echo

showed normal LV function (LVEF >50%) in 22.9%, mild LV systolic dysfunction (LVEF 40-50%) in 39.4%, moderate LV systolic dysfunction (LVEF 30-40%) in 18.7 and severe LV systolic dysfunction (LVEF < 30 %) in 19

Table 2: Morbidity Profile of Study

Risk Factors	High Risk Group (N = 112)	Non High Risk Group (N = 203)	Total (N = 315)
DM	13.9	28.5	42.5 (134)
HTN	13.3	26.1	39.4 (124)
DLP	3.8	7.3	11.1 (35)
H/O Vascular disease	3.2	3.5	6.7 (21)
Family history of premature CAD	2.5	4.2	6.7 (21)
Smoking	9.5	19.4	28.9 (91)

Table 3: Comparison of Procedural Parameters after Randomization in Both Groups TIMI Flow

Parameters		High Risk Group (N=112)	Non-High Risk Group (N=203)	Total (N=315)	P value
TIMI flow	Grade 1	3	1	4 (1.27 %)	0.120

Grade 2	17	23	40 (12.7 %)
Grade 3	92	179	271 (86.03 %)

Fluoroscopy time

Parameters		High Risk Group (N=112)	Non-High Risk Group (N=203)	Total (N=315)	P value
Fluroscopy time	< 10	96	180	276 (87.6 %)	0.477
	≥10	16	23	39 (12.4 %)	
T test (Comparison of means of fluoroscopy time among risk groups)					
Mean ± SD		6.44±4.18	6.34±3.55		0.817

Contrast Volume

		High Risk Group (N=112)	Non-High Risk Group (N=203)	Total (N=315)	P value
Contrast Volume	≤100	97	167	264 (83.5%)	0.465
	100 – 150	7	21	28 (9.2%)	
	>150	8 (34.8 %)	15 (65.2 %)	23 (7.3%)	
T test (Comparison of means of contrast volume among risk groups)					
Mean ± SD		110.27±27.78	112.32±29.37	0.547	

Chi-square and T test showed no significant differences in procedural parameters among risk groups.

Procedural characteristics Table 4 Complications

Complications	No high risk group	High risk group N=112	Total N=315	%
	N=203			
None	171	81	252	80
With local complications	3	1	4	1.3
With systemic complications	29	30	59	18.7

Table 5 Systemic Complications

	No high risk group N=203	High risk group N=112	Total N=315	%
Stroke /TIA	1	3	4	6.8
Pulmonary edema	0	3	3	5.1
Acute kidney injury (AKI)	16	11	27	62.7
AKI with arrhythmia	0	1	1	
Acute on CKD	5	3	8	
AKI with cardiac tamponade	1	0	1	
Resuscitated cardiac arrest	0	4	4	6.8
Arrhythmias	0	2	2	3.4
Acute stent thrombosis (< 24hrs)	3	2	5	8.5
Primary VT, Temporary pacemaker insertion	2	1	3	5
GI bleed from haemorrhoids	1	0	1	1.7

DISCUSSION

Primary percutaneous coronary intervention (PCI) through radial access has become increasingly

preferred in the management of ST-segment elevation myocardial infarction (STEMI) because of reduced vascular complications, lower bleeding risk,

and improved patient comfort [12]. The present study evaluated predictors of favorable outcome in patients undergoing transradial primary angioplasty and compared procedural characteristics between high-risk and non-high-risk groups.

In the current study, the majority of patients were males, accounting for a substantial proportion of the study population. This finding is consistent with previous studies demonstrating a higher incidence of coronary artery disease among men due to greater exposure to traditional cardiovascular risk factors such as smoking, hypertension, and dyslipidemia [13]. Most patients belonged to the age group of 51–60 years, highlighting the increasing burden of STEMI in middle-aged and elderly populations. Advanced age, particularly more than 75 years, was considered an unfavorable predictor because elderly patients usually have diffuse coronary artery disease, multiple comorbidities, and increased procedural risk [14].

Body mass index (BMI) analysis revealed that the majority of patients had normal BMI, while a smaller proportion were overweight or underweight. Low BMI was included among high-risk characteristics because underweight patients may have smaller radial artery caliber, increasing the possibility of vascular complications and procedural difficulty [15].

Regarding baseline clinical characteristics, the mean systolic and diastolic blood pressure at presentation were 140.8 ± 31.6 mmHg and 83.4 ± 16.1 mmHg respectively. Anterior wall myocardial infarction (AWMI) and inferior wall myocardial infarction (IWMI) were almost equally distributed. Echocardiographic evaluation showed varying degrees of left ventricular systolic dysfunction, with severe dysfunction observed in 19% of patients. Reduced left ventricular ejection fraction is a well-established predictor of adverse cardiovascular outcome following STEMI [16].

Among cardiovascular risk factors, diabetes mellitus and hypertension were the most common comorbidities observed in the study population. Smoking was also highly prevalent. Similar findings were reported in previous registries where diabetes, hypertension, and smoking significantly increased the risk of coronary artery disease and poor procedural outcomes [17]. Diabetes mellitus was included in the high-risk category because diabetic patients often have diffuse and calcified coronary lesions, which may reduce procedural success rates. The procedural analysis demonstrated excellent outcomes with radial access PCI. TIMI grade 3 flow was successfully achieved in 86.03% of patients, indicating effective myocardial reperfusion. This finding is comparable to large randomized studies evaluating transradial primary PCI [18]. Importantly, there was no statistically significant difference in TIMI flow grades between high-risk and non-high-risk groups, suggesting that radial

access PCI can be effectively performed even in selected high-risk patients.

Fluoroscopy time and contrast volume were also comparable between both groups, with no significant statistical difference. Mean fluoroscopy time was approximately six minutes in both groups, indicating procedural efficiency and operator expertise. Similarly, mean contrast volume remained within acceptable limits. Previous studies have demonstrated that increasing operator experience significantly reduces fluoroscopy time, contrast usage, and crossover rates during transradial interventions [19].

The present study supports the safety and feasibility of radial access primary PCI in STEMI patients, including selected high-risk individuals. The low complication rates and high procedural success observed in this study further strengthen the growing evidence favoring transradial access over transfemoral access. Early ambulation, reduced bleeding complications, and shorter hospital stay make radial access an attractive option in contemporary interventional cardiology practice [20].

CONCLUSION

The present study demonstrates that primary PCI through radial access is a safe and effective strategy in the management of STEMI patients, with high procedural success rates and low complication profiles. No significant differences were observed between high-risk and non-high-risk groups in terms of procedural parameters such as TIMI flow, fluoroscopy time, and contrast volume, indicating that radial access PCI can be performed efficiently even in selected high-risk patients. The study highlights that favorable outcomes are achievable with radial access irrespective of baseline risk profile when performed with appropriate expertise. Therefore, transradial primary angioplasty can be considered a reliable first-line vascular access strategy in STEMI patients, contributing to improved safety, reduced complications, and better overall clinical outcomes.

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