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Outcome of primary percutaneous coronary intervention among cases undergoing transradial technique

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Abstract---Objective: To assess the outcome of primary percutaneous coronary intervention among patients undergoing transradial technique. Material and methods: An observational study was conducted at Department of Intervention Cardiology, Peshawar institute of Cardiology during in the period from November, 2022 to April, 2023. Total 121 patients presenting with STEMI undergoing PPCI through transradial technique. Mortality and forearm hematoma were assessed. Chi Square test was used for association keeping P value < 0.05 as significant. Results: Mean age recorded was 50.13±18.42 years, there were 82 (67.8%) male while 39 (32.3%) female patients. Success rate was 91.7%. Mortality rate was 4.1% while forearm hematoma was observed in 5.8% patients. Conclusion: primary percutaneous coronary intervention through transradial technique is an effective approach with 91.7% success rate.

Keywords---primary percutaneous coronary intervention, STEMI, mortality, transradial.

Introduction

Transmural myocardial ischemia resulting in myocardial damage or necrosis constitutes an acute ST-elevation myocardial infarction (STEMI) ¹. Myocardial ischemia injury needs to be validated by abnormal cardiac biomarkers according to the current therapeutic definition of myocardial infarction (MI) ². Myocardial ischemia is a clinical condition that involves chest discomfort, and abnormal EKG readings. When any or all of the coronary arteries that bring blood to the heart get blocked, it causes an ST-elevation myocardial infarction. Plaque rupture, erosion, fissuring, or dissection of coronary arteries, leading to an obstructive thrombus, is typically the cause of this sudden disruption of blood flow. Hypertension, dyslipidemia, diabetes mellitus, smoking, and a family history of coronary artery disease are key risk factors for ST-elevation myocardial infarction ^{3, 4}.

STEMI treatment centers on recanalizing the blocked vessel in order to restore blood flow to the heart muscle ⁵. Thrombolytic treatment and primary percutaneous coronary intervention (PPCI) are the most frequently employed techniques for reperfusion, but there are others. Compared to thrombolysis, PPCI has been demonstrated to be more effective in the treatment of STEMI in terms of mortality, stroke, and re-infarction in multiple studies across multiple demographics ⁶.

The use of PPCI in relevant cases, in conjunction with result-oriented pharmaceutical therapy, reduces morbidity and mortality rates across a wide range of sub-groups with variable risk levels, delivering substantial benefits to the medical community ^{7, 8}. As device technology and antithrombotic medication continue to advance, more and more patients around the world opt for PCI for a wider variety of lesion complexity ^{9, 10}. Transfemoral and transradial access are both viable options for PPCI. Although there is a distinct learning curve to acquire transradial abilities, the transradial method is gaining favor as a result of less bleeding issues ¹¹.

Despite its long history, cardiologists have generally preferred the transfemoral over the transradial approach, and its use has been limited to a narrow subset of procedures due to a lack of appropriate physician training, experience, and exposure, as well as technological constraints ^{12, 13}. However, despite the transradial technique's rapid adoption by cardiologists in our area, there is a learning gap and little data to support its safety for PPCI of STEMI patients in our demography. There is an urgent need to look into the mortality and complication rates related PPCI utilizing a transradial approach because to the dearth of research in this field.

Material and Methods

We conducted this observational study was conducted at Department of Intervention Cardiology, Peshawar institute of Cardiology during in the period

from November, 2022 to April, 2023. This study included 121 patients who went to the ER within 12 hours thought non probability consecutive sampling. We included STEMI patients of either gender having age between 20 to 80 years. The study eliminated individuals with cardiogenic shock, non-palpable radial artery, puncture site infection, and arteriovenous fistula surgery possibility. All trial participants received a diagnostic angiography and PPCI of the culprit artery with or without stenting. All patients signed a procedure and research consent form. Staged PCI was planned for the culprit artery. Experienced consultant interventional cardiologists performed all PPCI operations radially. All patients received STEMI-guided pre-, peri-, and post-procedure pharmacological therapy. All the demographic data including age, gender and comorbid along with mortality rate and forearm hematoma was noted for each patient.

We calculated the sample size using openepi calculator, using previous frequency of success rate of PPCI through transradial technique 97.1%¹⁴, margin of error 3% and confidence interval 95%. All the data was analyzed using IBM statistics 22. Variables having categories were presented as frequencies and percentages while numerical variables were presented as mean and standard deviation. Association of outcomes was done through Chi Square test using $P < 0.05$ as significant.

Results

This study was conducted on 121 patients. The mean age of the patients was 50.13 ± 18.42 years. Regarding the gender distribution there were 82 (67.8%) male while 39 (32.3%) female patients in our study. Regarding comorbid hypertension was observed in 45.5% patients, diabetes in 51.2% patients and hyperlipidemia was observed in 27.3% while about 34.7% patients were smokers. The success rate of the procedure was 111 (91.7%). The outcomes in our study were mortality and forearm hematoma. The mortality rate was 5 (4.1%) while forearm hematoma was observed in 7 (5.8%) patients. Regarding the association of outcomes with age we observed that there was not significant association between mortality and forearm hematoma with age, however mortality rate was higher in patients above 45 years while forearm hematoma was also observed to be higher in patients above 45 years of age.

Table 1 Demographics

Demographics	Statistics
Age (Years)	50.13±18.42
Hypertension	55 (45.5%)
Diabetes	62 (51.2%)
Smoking	42 (34.7%)
Hyperlipidemia	33 (27.3%)

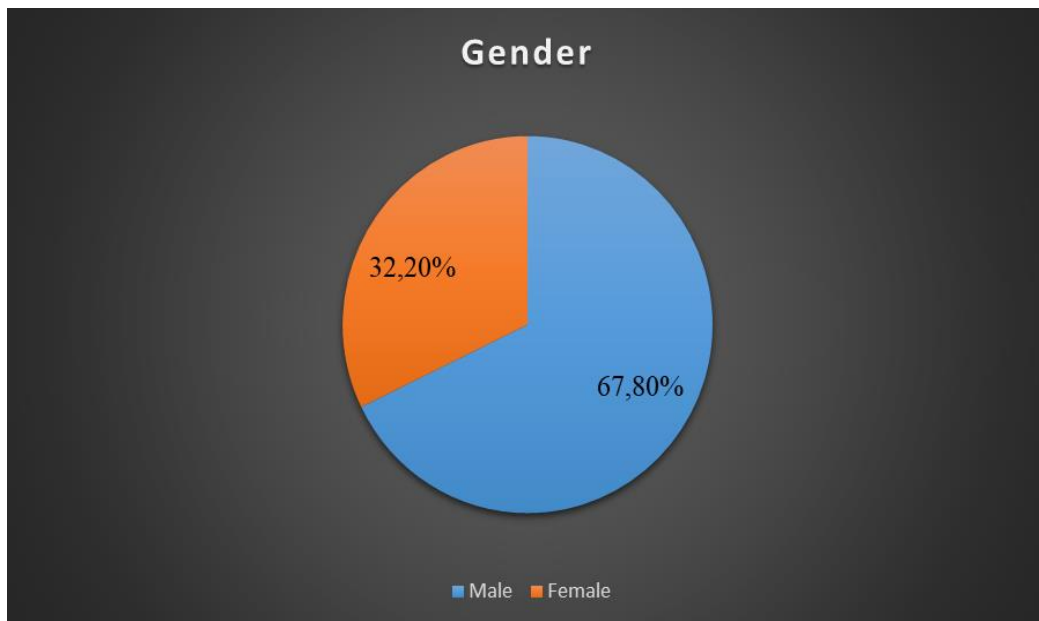
Table 2 Outcomes of PPCI through transradial technique

Outcomes	Statistics
Mortality	5 (4.1%)
Forearm hematoma	7 (5.8%)

Table 3 Association of outcomes with age

Outcomes		Age distribution				P value
		20 to 45 years		> 45 years		
		n	%	n	%	
Mortality	Yes	1	20.0%	4	80.0%	0.24
	No	54	46.6%	62	53.4%	
Forearm hematoma	Yes	2	28.6%	5	71.4%	0.35
	No	53	46.5%	61	53.5%	

Graph 1 Gender distribution



Discussion

The main goal of treating STEMI is to unblock the vessel that is blocking blood flow to the heart muscle so that the heart muscle can get blood again. Reperfusion early on has been shown to lead to better outcomes¹⁵. There are many ways to get blood flowing again, but thrombolytic therapy and PPCI are the most frequent. Different studies with different groups of people have shown that PPCI is a more effective and successful way to treat STEMI than thrombolysis when it comes to death, stroke, and re-infarction¹⁶.

When used with drug treatments that focus on getting results, PPCI lowers the rates of death and illness in a wide range of subgroups with different levels of risk, which is a huge benefit to the field of medicine¹⁷. Many individuals with severe lesions worldwide choose PPCI. This is because device technology and antithrombotic therapy are always getting better and changing. Both the transfemoral and the transradial methods can be used to do PPCI. Transradial approach is becoming more common because it causes less bleeding problems.¹⁸

We conducted this study on 121 patients presenting with STEMI who underwent PPCI with transradial approach. In our study male patients outnumbered the female patients while majority of the patients were having age > 45 years. The most prevalent comorbid in our study was diabetes followed by hypertension, same finding have been reported by a study which showed that majority of their patients were male and majority of their patients were above 50 years of age. They also reported higher frequency of diabetes as comorbid.¹⁹

We observed that the success rate of transradial approach with PPCI in our study was 91.7%, which is in line with a study which reported success rate above 90% in their findings¹⁴. The mortality rate in our study was 4.1% while forearm hematoma was 5.8%, similar findings were reported by a study in which the hospital mortality rate was 3.9% while forearm hematoma was 5.6%.¹⁹ We also observed that mortality rate and forearm hematoma was higher in the age group above 45 years however the difference was not statistically significant.

A study showed that around 11% of patients who had PPCI over a transradial method died. One of the major glitches with PPCI through transradial entry was a forearm hematoma. In one study, 3% of patients who had PPCI had a forearm hematoma²⁰. In another study, that number was almost 4%²¹. A study showed that a transradial PCI that was done on its own was very successful 95% of the time²².

An observational study showed that regular transradial approach for PPCI in patients with STEMI is safe and possible. During the time of the study, 96.1% of treatments were done using transradial access as the main entry point. Crossover of the entry sites was needed for less than 4% of all procedures, and the number of times it was needed kept going down over time²³. In line with these results, there was no need for a crossover in our study group.

Periprocedural bleeding is one of the major worrying problems that can happen with percutaneous treatments. It is linked to more death and illness. Several medications have been tried and suggested to reduce the risk of bleeding. However, in many researches, using a transradial approach was linked to a lower risk of bleeding²³. In line with these results, only about 5.8% of the patients in our study had a forearm hematoma after the treatment. This was strongly linked to the patients' demographics, such as age, diabetes, and hypertension. It has also been seen that the transradial method is linked to less contrast volume and less time spent on fluoroscopy¹⁹. So, transradial access is safe for PPCI in our group of people with acute STEMI, since the hospital death rate was only 4.1% and only 5.8% had a forearm hematoma after the procedure.

Conclusion

From our study we conclude that the success rate of primary percutaneous coronary intervention in patients undergone transradial technique was 91.7%, with 4.1% mortality rate and 5.8% hematoma of forearm.

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