Original Research Article

In-hospital outcomes of Primary Percutaneous Coronary Intervention in patients presenting with acute ST Elevation Myocardial Infarction in a tertiary care hospital in Karachi

Abstract

Background

Although primary percutaneous coronary intervention (PPCI) is now frequently performed in Pakistan, there is little data available regarding its outcomes in tertiary care hospitals of Pakistan. This study was designed to determine the outcomes, and assess the factors influencing these outcomes of PPCI.

Methods

It is a retrospective study conducted on the data of patients who presented to the department of Cardiology, Dr. Ruth K.M. Pfau Civil Hospital Karachi from October 2017 to March 2019 with acute ST-elevation myocardial infarction (STEMI) and underwent PPCI. A total of 115 patients were included in this study.

Results

Out of the 115 patients, 111 had a successful PPCI. The total mortality was 2.6% (3 deaths). One of the patients was reported to have a stent thrombosis. No emergency coronary artery by-pass graft (CABG) was performed and none of the patients had a stroke or any major bleeding. An accelerated idioventricular rhythm (AIVR) was noted in 23 (20%) of the patients. Pre-procedure 87% of the patients had thrombolysis in myocardial infarction (TIMI) grade 0 and only 11.3% were having TIMI flow grade 1. Post procedure a vast majority of the patients (97%) achieved TIMI flow grade 3.

Conclusions

Our study reports a very high success rate of PPCI which is consistent with the data reported from the Western countries. A major limitation of our study was the relatively small sample size. A larger sample size would have better predicted outcomes considering this is one of the few such studies in this region. Further studies with larger sample size and long-term follow up outcomes are recommended.

Keywords: primary percutaneous coronary intervention, ST-elevation myocardial infarction, thrombolysis in myocardial infarction, Killip class, coronary artery disease

Introduction

Acute ST- segment elevation myocardial infraction (STEMI) is one of the major complications of coronary artery disease (CAD) with very high morbidity and mortality.[1] Elderly patients with underlying comorbidities may experience high mortality from STEMI.[2] As per one study, more than 30% of the Pakistani population bears the burden of heart diseases due to a high prevalence of myocardial infarction (MI) risk factors.[3,4] Acute reperfusion therapy with fibrinolytic agents has been the primary treatment strategy in STEMI since the late 1980s.[5]

However, a considerable body of evidence suggests primary percutaneous coronary intervention (PPCI) as being the most effective and preferable method of management of STEMI. PPCI has a lower complication rate as compared to pharmacological treatment i.e. thrombolysis as it significantly lowers the risk of re-occlusion, re-infraction and strokes.[1,5,6]

PPCI, a non-surgical technique, involves advancing, then inflating a balloon tipped catheter into an area of coronary artery stenosis followed by stent deployment. Over 100,000 procedures are now performed worldwide despite the socio-economic hurdles.[7] According to one study, primary PCI is now offered to every patient who comes with acute STEMI at a tertiary care hospital in Pakistan.[6] Outcomes of PPCI depend on various factors including age, left ventricular ejection fraction (LVEF), diabetes, smoking, lipoprotein a levels, time interval between onset of symptoms to treatment and anatomical factors of the coronary artery.[8] Although PPCI is now frequently performed in Pakistan as well, there is little data available regarding its outcomes in tertiary care hospitals of Pakistan.

Thus, we designed our study to determine the outcomes, and assess the factors influencing these outcomes, of PPCI performed at Department of Cardiology Dow University of Health Sciences (DUHS)/Dr. Ruth K.M. Pfau, Civil Hospital Karachi (CHK) in patients with acute STEMI. We also aim to recognize and improve upon the factors that may have a possible negative impact on outcomes.

Methods:

It is a retrospective study conducted on the data of patients who presented to the department of Cardiology, Dr. Ruth K.M. Pfau Civil Hospital Karachi from October 2017 to March 2019 with acute STEMI and underwent PPCI. A total of 115 patients were included in this study by non-probability consecutive sampling technique. All patients aged above 18 years presenting with STEMI were included in this study. Patients less than 18 years of age presenting with STEMI and those patients with STEMI who had already received thrombolytics were excluded from this study.

A Performa was filled out for all participants of the study including the age, gender, family history of coronary artery disease, smoking history, diabetes , hypertension, dyslipidemia, heart failure, alcoholism, chronic kidney disease, systolic and diastolic blood pressure, heart rate, chest auscultation for crackles, location of myocardial infarction [anterior, inferior, lateral or posterior], drugs given prior to angioplasty [aspirin, clopidogrel, prasugrel, heparin, Glycoprotein IIb/IIIa receptor antagonists], time taken to perform PPCI, success of procedure, thrombolysis in myocardial infarction (TIMI) flow grade, culprit vessel, number of diseased vessel, resolution of ST segment, ejection fraction at discharge and in hospital adverse events [death, major bleed, stroke, stent thrombosis].

By using software, SPSS version 23 data was analyzed. Baseline variables were reported as frequency and percentages for primary outcome qualitative variables like successful PCI, emergent coronary artery by-pass graft (CABG) and death, and for secondary outcome qualitative variables like stent thrombosis, ischemic stroke and major bleeding.

Results

Study population:

Baseline characteristics of the patients are mentioned in Table 1. Of the participants, 87 (75.7%) were male and 28 (24.3%) were female. Mean age of the patients was 55.7 with a standard deviation of 11.4. Among risk factors, hypertension and smoking had the highest prevalence,

56.6% and 44.3% respectively, while Diabetes Mellitus was present in 30.4% of the participants. Only 4 (3.5%) of the patients had a history of dyslipidemia and only 2 (1.7%) were alcoholics.

Majority of the patients (86.1%) were in KILLIP class 1 at presentation. Figure 1 shows the ejection fraction of these patients at baseline, 33% had an ejection fraction of 40-45% and only 18% had an ejection fraction more than 55%.

The median chest pain to ER time was 180 minutes and the median door to balloon time was 60 minutes.

Angiographic and procedural variables:

Table 2 presents all the angiographic and procedural variables of the participants undergoing PPCI. Left Anterior Descending (LAD) artery was the most common artery involved, implicated in 77 (67%) patients, followed by Right coronary artery (RCA) which was involved in 30 (26.1%) patients. Three quarters of the patients had involvement of a single vessel, 20 (17.4%) patients had 2 vessel disease and only 9 (7.8%) patients had 3 vessel disease. A total of 106 stents were used, of which 105 were BMS and just 1 was a DES.

Pre-procedure 87% of the patients had TIMI grade 0 and only 11.3% were having TIMI flow grade 1. Post procedure a vast majority of the patients (97%) achieved TIMI flow grade 3. TIMI risk score was calculated in all the participants (Table 3), 34% had a score of 2 and 24% had a score of 1. Most participants had a score of 4 or less.

Glycoprotein IIb/IIIa inhibitors were used in 87% of the patients. Heparin 7000 International Units (IU) was given to 77% of the patients while 5000 IU was given to the remaining 23%. Only 9 (7.8%) patients required inotropic support and 2 (1.7%) had to be resuscitated or cardioverted.

Outcomes and complications:

111 of the 115 patients had a successful PCI. The total mortality was 2.6% (3 deaths). One of the patients was reported to have a stent thrombosis. No emergency CABG was performed and none of the patients had a stroke or any major bleeding. An accelerated idioventricular rhythm (AIVR) was noted in 23 (20%) of the patients (Table 4).

Table 1 Characteristics of pa**tients** undergoing **P**PCI

Baseline demographics and clinical characteristics	**No. of patients (Total= 115)**	**Percentage**
Age	Mean=55.7 SD=11.4	
Gender		
Male	87	75.7
Female	28	24.3
Risk Factors		
Diabetes Mellitus	35	30.4
Hypertension	65	56.5
Smoking	51	44.3
Dyslipidemia	4	3.5
Familial hypercholesterolemia	2	1.7
Congestive Heart Failure	0	0
Alcoholic	2	1.7
Chronic Kidney Disease	0	0
Killip Class		
I	99	86.1
II	2	1.7
III	5	4.4
IV	9	7.8
Timing Variables [minutes]		
Chest pain to ER	Median=180 (IQ range= 120-420)	
Door to balloon	Median=60 (IQ range=30-90)	

Table 2 Angiographic and procedural characteristics of patients undergoing PPCI

Angiographic and procedural characteristics	**No. of patients (Total= 115)**	**Percentage**
Infarct related Artery		
Left Anterior Descending	77	67
Left Circumflex	8	7
Right Coronary Artery	30	26.1
Vessel Diseased		
One-vessel-disease	86	74.8
Two-vessel-disease	20	17.4
Three-vessel-disease	9	7.8
Type of Myocardial Infarction		
Anterior	72	62.60
Antero-lateral	4	3.5
Lateral	2	1.7
Inferior	34	29.56
Posterior	3	2.6
Stents Used	106	92.2
Use of stents		
BMS	105	91.3
DES	1	0.9
Plain old balloon angioplasty (POBA)	9	7.8
TIMI flow (pre procedure)		
0	100	87
I	13	11.3
II	2	1.7
III	0	0

TIMI flow (post procedure)		
0	2	1.7
I	1	0.9
II	0	0
III	112	97.4
Glycoprotein IIb/IIIa inhibitor use	100	86.9
Heparin Bolus		
5000	26	22.6
7000	89	77.4
Inotropic Support	9	7.8
CPR/cardioversion/defibrillation done	2	1.7

Table 3 TIMI risk score

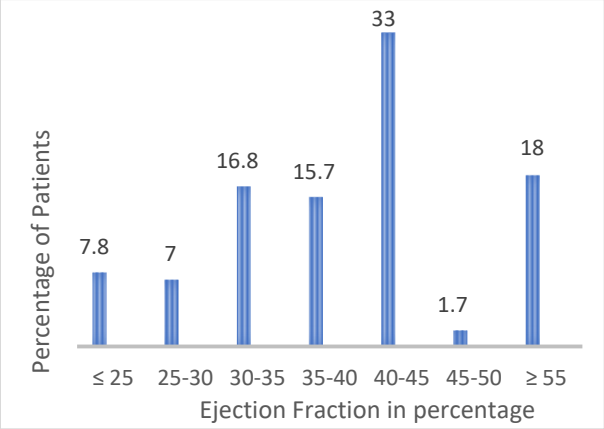
TIMI Risk Score	**No. of patients (Total= 115)**	**Percentage**
0	2	1.7
1	27	23.5
2	39	33.9
3	16	13.9
4	16	13.9
5	6	5.2
6	3	2.6
7	3	2.6
10	2	1.7
11	1	0.9

Table 4 Outcomes and complications

Immediate Outcome (In-	**No. of patients (Total=**	**Percenta**

hospital)	115)	ge
Accelerated Idioventricular Rhythm	23	20
Successful PCI	111	96.5
Emergency CABG	0	0
Death	3	2.6
Major bleeding	0	0
Stroke	0	0
Stent Thrombosis	1	0.9

Figure 1 Ejection Fraction of patients



Discussion

PPCI and fibrinolysis are the two treatment strategies for patients presenting with acute MI with ST elevations on electrocardiograms (ECG). While both improve outcomes by increasing cardiac perfusion, PPCI is the therapy of choice and multiple clinical trials have shown it to be superior.[9,10,11] This is the first study on outcomes of PPCI from our institute and is among the

few studies done in tertiary care hospital in Karachi. In our study, we reported the possible outcomes of PPCI in patients who presented with STEMI.

The total number of patients in our study was 115 and in-hospital outcomes like successful PPCI, emergent CABG, death, major bleeding, stroke and stent thrombosis were assessed. Successful PPCI was defined by post-procedural TIMI flow grade rate, resolution of symptoms, AIVR, ST segment resolution on ECG in the absence of major complications.

Our study reported 100 (87%) patients with a pre-procedural rate of Grade 0 TIMI flow while 13 (11.3%) patients had Grade 1 TIMI flow and only 2 (1.7%) patients had a Grade 2 TIMI flow. After receiving PPCI, 2 (1.7%) patients had Grade 0 TIMI flow and 1 (0.3%) patient had Grade 1 TIMI flow. No patients had Grade 2 TIMI flow. 112 (97.4%) patients of patients had a post-procedural Grade 3 TIMI flow rate meaning that 112 patients showed perfusion in arteries distal to the re-perfused coronary artery with flow comparable to normal arteries. These findings are consistent with successful PPCI for 96.5% of patients which is an encouraging outcome. In a study conducted in The University of Michigan, USA, the post-procedural TIMI flow was found to be </=2 in 6.9% of patients.[12] Our study showed a post procedural TIMI flow of </=2 in 2% of patients only. This may be attributable to the difference in sample sizes of both studies. The sample size of our study was 115 patients while the sample size of this study was relatively larger, numbered at patients. Grade 3 TIMI flow rate in our study was also significantly higher as compared to those reported in Northern India.[13]

The differences in outcome can also be due to discrepancies in the median Door to Balloon/ER to Balloon time. The median Door to Balloon time in our study was 60 minutes whereas, the median ER to Balloon time in the comparable study was 113 minutes in patients who had a post-procedural TIMI flow rate 3 and 120 minutes in patients who had a post-procedural TIMI flow rate of lesser than/equal to 2.[12] In either case, the ER- to-Balloon time was significantly greater in the comparable study which might account for more patients having post-procedural TIMI rates of lesser than or equal to 2. Door-to-Balloon time has been shown to have a significant impact on the outcome of primary PCI in patients with STEMI.[14] When comparing with studies conducted in developing countries, the Door-to Balloon time is still markedly higher. In a study conducted by the National Institute of Cardiovascular Diseases (NICVD) in Karachi, the mean Door-to-Balloon time was 98 minutes.[15] The Chest pain-to-ER time was found to have a median

of 180 minutes. This was comparable to a Chest-pain-to ER time of 125 minutes for patients presenting at NICVD.[15] This may be due to the more centralized location making it easier to access. Chest-pain to ER time has been observed to show a stronger association with outcomes than Door-to-balloon time.[16] This may also partially explain the higher success rate of compared study, which is at 98.2%.

Emergent CABG is an indication for patients who have 1) failed or unstable PPCI with ongoing ischemia or 2) high-grade left main or three vessel coronary disease with clinical or hemodynamic instability after successful or unsuccessful PCI of an occluded vessel.[17] In our study, no patients received emergent CABG. Nine patients were found to have three-vessel disease and 77 were found to have LAD artery blockage.

Mortality rate seen in our study was 2.6%. This is lesser than those reported in the western countries[18,19] as well as in centers in Karachi.[20] While this is encouraging, a limitation in our study was loss of follow-up. Due to overburdening of tertiary care resources, patients are discharged on a relatively quick basis and this can result in further aggravation of loss of follow-up. The encouraging aspects of our study were no reported strokes and major bleeding. There was only one case of stent thrombosis.

Conclusion

Our study reports a very high success rate of PPCI which is consistent with the data reported from the Western countries. A major limitation of our study was the relatively small sample size. A larger sample size would have better predicted outcomes considering this is one of the few such studies in this region. Further studies with larger sample size and long-term follow up outcomes are recommended.

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