FREQUENCY OF MORTALITY IN CARDIOGENIC SHOCK ASSOCIATED WITH ST ELEVATION MYOCARDIAL INFARCTION IN PATIENTS UNDERGOING PRIMARY PCI

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ABSTRACT

Objective: To determine the frequency of mortality in cardiogenic shock (CS) with ST elevation myocardial infarction (STEMI) in patients undergoing primary percutaneous coronary intervention (P.PCI).

Study Design: Cross sectional study.

Place and Duration of Study: Armed Forces Institute of Cardiology, CCU, Rawalpindi, from Oct 2012 to Apr 2013.

Methodology: One Hundred patients of MI with CS were included who met the inclusion criteria. Patients with structural heart defects (valvular heart disease), previous history of MI/NSTEMI, known case of DCM (dilated cardiomyopathy) and patients with previous history of cardiac intervention were excluded. ECG of all such patients was done and then was followed by P.PCI. Mortality was determined within two weeks after undergoing primary PCI.

Results: Among 100 STEMI patients with CS who underwent primary PCI 60 patients remained alive and 40 died within two weeks of primary PCI. There were more male patients (76) with CS as compared to female patients (24). Older patients (56-65 years) had an increased tendency of suffering from CS and had a higher mortality as compared to the younger population.

Conclusion: Majority of patients with acute MI and CS undergoing primary PCI as a modality of treatment survived indicating that mortality was significantly reduced with P.PCI. Mortality was same in both males and females however it was increased in older age group (56-65 years). Therefore all patients with MI complicated with CS should undergo P.PCI. If there is delay in transfer they should be managed conservatively then transferred for PCI as it will reduce mortality.

Keywords: Acute ST-elevation myocardial infarction, Cardiogenic shock, Primary percutaneous coronary intervention.

INTRODUCTION

Cardiogenic shock (CS) is one of the most fatal complications of ST-elevation myocardial infarction (STEMI), with a mortality of upto 70-80%[1]. CS complicates 5-8% of STEMI cases. Prompt diagnosis of CS with STEMI and early transfer of such patients to cardiac units for emergent coronary revascularization by primary percutaneous coronary intervention (P.PCI) leads to better clinical outcome. By restoring coronary perfusion ischemic injury to myocardium can be reversed, leading to recovery of ventricular function[2]. Primary PCI has reduced the mortality rate to 40-60%[3]. P.PCI restores blood flow to the hypoperfused myocardium, therefore preventing end organ damage. According to Jubin *et al*, P.PCI within 18 hours of onset of CS showed a marked reduction in mortality rates at 3 and 6 years. Best clinical outcomes can be achieved with earliest revascularization[4]. Acute ST-elevation myocardial infarction (STEMI) and its complications are the major causes of mortality and morbidity worldwide[5]. CS develops in 50% of patients within 6 hours and in 75% of patients within 24 hours. The American College of Cardiology 2013 guidelines recommend emergency revascularization with P.PCI in CS after STEMI despite delayed presentation (class IB)[6].

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With the improvement in management, the survival of patients with acute STEMI complicated by CS has increased. As the patient survival has increased, there is an increasing concern that medical management (fibrinolysis and supportive) alone may threaten the longevity of patients with CS. Medical management alone is not only associated with incomplete opening of the infarct related artery but also with increased risk of complications (intracranial hemorrhage) and hence increasing the mortality and morbidity[7]. Thus virtually every patient with acute STEMI complicated by CS must receive early revascularization by PCI. The pattern and frequency of CS has been extensively evaluated in the western population. However such data is not widely available for our population as very few studies have been done in Pakistan. P.PCI has recently been brought into practice in few hospitals of Pakistan.

The rationale of this study was to determine the mortality associated with CS in patients undergoing revascularization treatment with P.PCI in our setup. P.PCI is only available at few centers and is more expensive than fibrinolysis. The purpose of this study is to provide useful information about P.PCI so it can guide physicians and paramedics in our setup which will result in better management and prognosis. Evaluation of the role of effect modifiers like age, gender was a secondary goal.

METHODOLOGY

A cross sectional study was conducted at the indoor department of Armed forces institute of cardiology, Rawalpindi, Pakistan. The duration of study was 6 months from 5th October 2012 to 5th April 2013. Non probability Consecutive sampling technique was used for the purpose of data collection. Total 100 patients of cardiogenic shock with ST segment elevation myocardial infarction undergoing primary PCI were included in the study by taking P=50%, CI=95%, d=10%. Sample size was calculated using WHO calculator. Permission from hospital ethical committee as per AFIC-IERB-SOP-15 was taken prior

to starting study Inclusion criteria was patients diagnosed with MI and CS. Patients aged between 30-65 years, both males and females and patients presenting within 12 hours of chest pain were included. Whereas patients with structural heart defects (valvular heart disease diagnosed on ECHO), with previous history of MI/NSTEMI, known case of DCM and patients with previous history of cardiac intervention were excluded. STEMI was diagnosed when following two criteria was observed: primarily chest pain >30min and secondly 12 lead ECG criteria: (≥1mm ST segment elevation in atleast two anatomically contiguous limb leads (aVL, II, III), (≥2mm ST segment elevation in precordial leads V1 through V6 or a new LBBB (left bundle branch block)[22]. CS associated with MI was diagnosed using following clinical and hemodynamic parameters; clinical parameter included one of following cool clammy skin, altered sensorium, oliguria ≤ 30ml/hr and hemodynamic parameters included systolic BP ≤90 mmHg, vasopressors required to maintain b.p greater than 90mmHg, metabolic acidosis pH<7.35 and heart rate> 100/min[23]. Patients were selected on the basis of inclusion and exclusion criteria. All the patients were explained about the study and its purpose. Registration and patient selection was followed by verbal informed consent. A detail history followed by vital and general examination was performed on these patients. Demographic information including name, age, gender and hospital ID number was documented in the patients proforma. Standard 12 lead ECG of all such patients was done by trained staff on duty, ECG analysis was done by principal investigator under guidance of consultant cardiologist. Blood sample was taken for analysis of cardiac enzymes. Sample for arterial blood gases were done in the ER bed side. All patients were explained about P.PCI procedure, its complication and written consent proforma was filled in by patient/relative. Primary P.PCI was done by consultant cardiologist in catheterization lab of hospital. After P.PCI patients were monitored in CCU. Mortality of these patients was observed within two weeks of

P.PCI. Data was entered and analyzed in SPSS software 17.0. Mean and standard deviation were calculated for quantitative variables i.e., age (years). Frequency and percentages were calculated for qualitative variables that are gender and mortality.

RESULTS

Total 100 cases were included in this study. Mean age in the study was 54.46 ± 7.383 years (table-I). Out of 100 patients with CS who underwent primary PCI, 76 were males (76%) and 24 were females (24%) (figure). Among 100 patients with CS who underwent primary P.PCI 60 pa-

Table-I: Mean Age ± SD of cardiogenic shock with STEMI in patients undergoing primary PCI.

	n	Mean ± SD (Range)
Age (years)	100	54.46 ± 7.38 (30-65)

Table-II: Frequency and percentage & gender of mortality of cardiogenic shock with STEMI in patients undergoing primary PCI (n=100).

|	Mortality		p-value
	Yes n (%)	No n (%)	
Gender			
Male	30 (39.47)	46 (60.52)	0.848
Female	10 (41.67)	14 (58.3)	
Age (years)			
30-45	7 (17.5)	4 (6.67)	0.182
46-55	15 (37.5)	30 (50)	
56-65	18 (45)	26 (43.33)	

tients remained alive (60%) after two weeks of P.PCI and 40 patients died (40%) (table-II). According to age stratification among patients highest mortality was seen in age group 56-65 years, 26 (43.3%) patients remained alive and 18 (45%) patients died (table-II). Mortality was same for both males and females. Out of 76 male patients 46 (60.52%) remained alive and 30 (39.47%) died after undergoing P.PCI for CS. Out of 24 female patients 14 (58.3%) remained alive and 10 (41.67%) died after undergoing P.PCI for CS (table-II).

DISCUSSION

Coronary artery disease (CAD) is the most common cause of death worldwide. Acute STEMI is one of the most fatal diagnosis among CAD

with a mortality of 15-20%. The number of patients with acute MI complicated by cardiogenic shock has increased. Unfortunately such patients face significant mortality and morbidity. The early mortality rate from acute MI is approximately 30%[8].

Interpretation of the results showed that if patients with CS associated with STEMI receive revascularization in a timely manner, the mortality can be reduced and survival can be improved. A study by Hashmi *et al* at Pervez Elahi Institute of Cardiology from 2014-2017 included 351 patients with CS post STEMI, 70% were males and 29.9% were females with mean age of 65.4 ± 7.7 years. Mortality was 14.6% (p=0.014) with
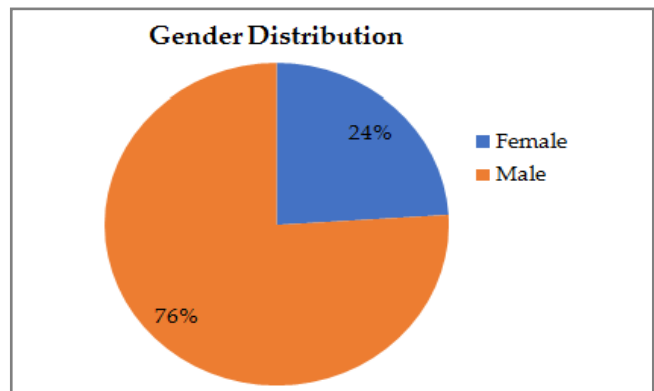
n=100, Males=76 (76%), Females=24 (24%)
Figure: Frequency of both genders in cardiogenic shock with STEMI in patients undergoing primary PCI.

revascularization and 85.4% without intervention[9]. Inova shock registry in 2017 showed better survival in CS with STEMI from 52.6% to 75% if patients underwent revascularization. Mortality was higher (95%) among old age ≥75 yrs. Use of revascularization showed 14% greater survival[10]. A study in Oman from 2013-2014 was similar to our study with a small sample size (63 vs 100). 79% were male and 21% were female with mean age 60 ± 12 yrs. P.PCI showed significant survival benefit of 54.2% (p=0.040)[11].

Coronary blood flow restoration via primary PCI is a preferred and effective method as it is associated with complete revascularization of the infarct related artery. Success depends on how rapidly reperfusion is achieved[12]. If patients with CS are given medical therapy (fibrinolysis) due to

non availability of PCI centers than all efforts must be made to transfer the patient to a tertiary care hospital for revascularization. Patients with cardiogenic shock who are admitted to non P.PCI centers have a high mortality. The standard of care for CSis early revascularization irrespective of time of delay[13].

CS is a medical emergency. CS may occur due to left ventricular (80% cases), right ventricular or biventricular dysfunction[14]. Management of CS involves hemodynamic support and specific treatment. Hemodynamic support involves three steps. First step is to make a rapid diagnosis based on history, physical examination, ECG and echocardiography. Second step is to stabilize the patient by using inotropes and vasopressors. Third steps involves evaluation of patients to assess the response to therapy. Specific management involves emergency coronary revascularization by primary PCI[15]. Primary PCI has a role in reducing both short and long term mortality[16]. In hospital mortality rate in patients with CS with STEMI is 39%. Mortality rates are higher in older population[17]. The duration of shock is very important because shock of longer duration can lead to end organ failure. The lesser the duration the benefits of primary PCI are more[18]. Between 2009-2011 the National Cardiovascular Data Registry (NCDR) demonstrated an in hospital mortality of 15.1% in patients with transient shock, 33.8% in patients with sustained shock and 65.9% in patients with sustained shock and recent cardiac arrest[19]. The SHOCK trial in New York Hospital revealed 30 day survival of 65% in patients who had successful PCI and 20% with unsuccessful PCI ($p<0.001$). These values were 61% and 15% at 1 year respectively (p<0.001)[20]. Very few studies have been done in Pakistan. However, those done describe an improvement in mortality in CS patients undergoing P.PCI similar to the ones described in western literature i.e. revascularization strategy in cardiogenic shockis associated with reduction in mortality from 80% to 50% and favorable in-hospital outcome[21]. Early reperfusion therapies are the effective methods to improve the survival in patients with cardiogenic

shock[22]. If P.PCI can be performed by an experienced operator in cardiac catheterization laboratory than it is considered as the treatment of choice. The key to salvage myocardium is to achieve normal coronary artery flow by using P.PCI as soon as possible[23]. Randomized trials have proved that transfer of patients for P.PCI to a cardiac center is associated with better clinical outcome. In hospital mortality was much high without revascularization (8%) as compared with revascularized group (1%)[24]. Hospitals and multidisciplinary, consultant lead, protocol driven approach are the effective pillars in timely delivery of P.PCI for STEMI with cardiogenic shock[25].

CONCLUSION

Patients with STEMI and cardiogenic shock undergoing P.PCI have improved clinical outcomes and decreased mortality as compared to patients who do not receive P.PCI. In our study 60% of patients who underwent P.PCI survived. Thus, all patients with CS should have a P.PCI done, even if P.PCI facility is far away they should be transferred as soon as possible irrespective of time of delay. More P.PCI centers should be established so that maximum number of patients can benefit from P.PCI, as this will help in decreasing the mortality of such patients.

CONFLICT OF INTEREST

This study has no conflict of interest to be declared by any author.

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