HEART FAILURE IN PATIENTS WITH SEGMENT ELEVATION MYOCARDIAL INFARCTION UNDERGOING PRIMARY PCI AND ITS ASSOCIATION WITHISCHEMIC TIME

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ABSTRACT

Objective: To measure the frequency of heart failure in patients with segment elevation myocardial infarction treated with PPCI and to associate it with ischemic time.

Study Design: A descriptive cross-sectional study.

Place and Duration of Study: This study was conducted at the Emergency Department, Catheterization Laboratory and Coronary Care Unit of Armed Forces Institute of Cardiology and National Institute of Heart Diseases, Rawalpindi from May 2018 to December 2018.

Material and Methods: All patients presenting to Emergency Department with acute STEMI and undergoing PPCI were included while STEMI patients who already have established heart failure on arrival to ER were excluded from the study. All patients with the diagnosis of STEMI treated with PPCI were assessed. The initial standard 12 lead ECG, recorded immediately after the patient's admission to the emergency department, were considered as baseline. Continuous bedside monitoring was carried out and any of the symptoms or signs of heart failure according to KILLIP class occurring over the following 72 hours were noted. All patients were separated in defined groups and were compared for different variables and will be recorded on a data collection tool.

Results: Total 500 patients of STEMI were recruited for the study out of which 384 (76.9%) were male patients while 116 (23.0%) were female patients. Mean age of the patients was found to be 58 ± 8.6 years. The most common risk factor was hypertension in 445 (89.0%) patients followed by smoking history in 373 (74.7%), Diabetes Mellitus, Family history of coronary artery disease, Grade III obesity and Previous PCI/CABG. Within ≤90 minutes of ischemic time only five patients developed heart failure in next 72 hours, 16 (3.2%) patients developed heart failure in 91-150 minutes, 49 (9.8%) patients in 151-360 minutes and 65 (13.1%) patients developed heart failure >360 minutes.

Conclusion: Total ischemic time was associated with mortality. The present study suggests that additional efforts are needed to shorten total ischemic time including patient and pre-hospital systemic delay for better prognosis after primary PCI.

Keywords: Myocardial infarction, PPCI, STEMI.

INTRODUCTION

Segment Elevation Myocardial infarction is a global epidemic. As a leading cause of morbidity and mortality, this is a major public health problem. It is caused by a prolonged period of blocked blood supply that affects a large area of the heart. Segment Elevation Myocardial Infarctions (STEMIs) are caused by the sudden occlusion of a major coronary artery. For 25 years, clinical research has focused on ways to quickly open these blocked arteries, which reduces the chance of dying from a STEMI[1].

This was accomplished first by clot dissolving "thrombolytic" drugs, which unfortunately are in effective 33% of the time and can cause life-threatening bleeding[2]. Re-occlusion causing a repeat heart attack often occurs following their use. Restoring blood supply to the affected heart muscle using immediate or "direct" coronary angioplasty and stenting has been demonstrated to be an option markedly

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superior to thrombolytic therapy for treatment of STEMIs[2].

In order to provide emergent STEMI care, a medical center must have 24/7 interventional cardiology facilities and personnel as well as cardiac surgery backup[3].

Controversy still surrounds the best treatment of STEMI patients who do not have easy access to medical centers capable of providing coronary angioplasty. Data suggests that every 10-minute delay in treatment can result in a 1% higher chance of dying from an acute myocardial infarction a substantial risk of death and disability and calls for a quick response[2,4].

In STEMI patients, Ischemia Time was a better predictor than Door to Balloon time for infarct size, clinical outcomes and mortality. The focus of STEMI care should be directed at early initiation of therapy and minimizing ischemia time rather than on door to balloon time alone[5].

A recent analysis of 12,675 STEMI patients in the FITT-STEMI (Feedback Intervention and Treatment Times in ST-Elevation Myocardial Infarction) trial emphasizes the strong impact of time delays on mortality, particularly in STEMI patients with cardiogenic shock or out-of-hospital cardiac arrest. In shock without out-of-hospital cardiac arrest, every 10 min treatment delay between 60-180 min from the first medical contact resulted in 3.3 additional deaths per 100 PCI-treated patients, and in 1.3 additional deaths after out-of-hospital cardiac arrest without cardiogenic shock. In stable STEMI patients, time delays were substantially less relevant (0.3 additional deaths per 100 PCI-treated patients for every 10 min delay between 60–180 min from the first medical contact). Thus, high-risk STEMI patients with cardiogenic shock or out-of-hospital cardiac arrest are those who benefit most from expediting all steps of the care pathway[6].

Heart Failure is associated with various quantitative and qualitative parameters. Qualitative include Gender, presence of Diabetes Mellitus, hypertension, smoking, obesity, family history of coronary artery disease, history of previous PCI/CABG. Quantitative parameters include Age, infarct size, left ventricular ejection fraction (LVEF), Killip class, serum creatinine may all predict the development HF after PPCI during hospitalization[7].

Current guidelines for ST-elevation myocardial infarction (STEMI) recommend early revascularization with optimal ischemic time <120 min and door-to-balloon time <90 min[7].

Between December 2008 and April 2013, 786 patients with STEMI were treated in STEMI center, and 262 of these had cardiac magnetic resonance imaging 3-5 days after the index event. Ischemic time is time from symptom onset to device activation, while door to balloon time is the time hospital arrival to device activation. Patients were divided into three groups according to Ischemic time (<120, 120-239, ≥240 min) and into four groups according to Door to balloon time (<30, 30-59, 60-89, ≥90 min). Baseline demographics including age, cardiac risk factors, and infarct location were similar between groups. The infarct size and 30-day mortality rate significantly increased across Ischemic time groups but did not correlate with Door to balloon time groups[8-9].

There is little contemporary data available regarding development of acute heart failure after PPCI in our local population based on ischemic time. This study will help to identify the patients who are at risk of developing acute heart failure after PPCI correlating with ischemic time.

MATERIAL AND METHODS

This was a descriptive Cross sectional study, carried out at the Emergency Department, Catheterization Laboratoryand Coronary Care Unit ofArmed Forces Institute of Cardiology and National Institute of Heart Diseases, Rawalpindi, Pakistan from May 2018 till December 2018. All patients presenting to Emergency Department withacute STEMI and undergoing PPCI were included while STEMI patients who already have established heart failure on arrival to ER were excluded from the study. Data was collected after the approval by ethical committee of AFIC

& NIHD and informed consent of patients were taken. All patients with the diagnosis of STEMI treated with PPCI were assessed. The initial standard 12 lead ECG, recorded immediately after the patient's admission to the emergency department, were considered as baseline. Continuous bedside monitoring was carried out and any of the symptoms or signs of heart failure accor-ding to KILLIP class occurring over the following 72 hours were noted. All patients were separated in defined groups and were compared for different variables and will be recorded on a data collection tool. Statistical analysis was performed using statistical software SPSS 23.

RESULTS

Total 500 patients of STEMI were recruited for the study out of which 384 (76.9%) were male patients while 116 (23.0%) were female patients. Mean age of the patients was found to be 58 ± 8.6 years. The most common risk factor was hyper+-tension in 445 (89.0%) patients followed by smoking history in 373 (74.7%), Diabetes Mellitus, Family history of coronary artery disease, Grade III obesity and Previous PCI/CABG as shown in table.

Following is the graphical representation of association of ischemic time with heart failure. This shows that in ≤90 minutes of ischemic time only five patients developed heart failure in next 72 hours, 16 (3.2%) patients developed heart failure in 91-150 minutes, 94 (9.8%) patients in 151-360 minutes and 65 (13.1%) patients developed heart failure >360 minutes as shown in the figure.

DISCUSSION

The principle of 'time is muscle, time is life' is generally accepted to guide acute myocardial infarction management decisions. Timely myocardial reperfusion with primary PCI is the central therapy for STEMI. Armed Forces Institute of Cardiology & National Institute of Heart Diseases has developed rapid reperfusion strategies with primary PCI for patients with STEMI.10

In the context of modern STEMI treatment, this study investigated whether ischemic time was associated with development of heart failure and adverse in-hospital outcome. The major finding was; less the ischemic time and less is the development of heart failure in patients with STEMI undergoing primary PCI[12].

Previous studies have shown that an important gap still exists between the clinical

Table: Showing risk factor profile of the patients.

Variables	n(%)
Age (mean ± S.D)	58 ± 8.6 years
Gender	
Male	384 (76.9%)
Female	116 (23.0%)
Diabetes Mellitus	329 (65.9%)
Hypertension	44 5(89.0%)
Smoking History	373 (74.7%)
Grade-III Obesity	93 (18.6%)
Family History of Coronary Artrey Disease	329 (65.9%)
Previous PCI/CABG	87 (17.5%)

performance of timely reperfusion therapy and the guideline-recommended timing for patients with STEMI. The CPACS-1 study, which including 2973 patients admitted to 51 hospitals in 18 provinces of China between September 2004
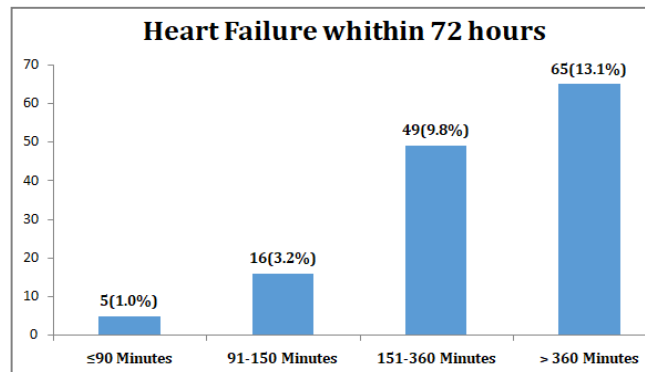

Figure: Graphic representation of association of ischemic time with heart failure.

and May 2005, showed that only 6.6-16.3% of patients with STEMI underwent PCI within twelve hours of symptom onset[6]. To bridge the substantial evidence–practice gap, the CPACS-2 study was conducted in 75 hospitals throughout

China between October 2007 and August 2010 with the aim of improving the quality of care for acute coronary syndrome by implementing clinical pathways which showed that most patients with STEMI were not treated with PCI in a timely fashion, with significant delays in total ischemic time[11]. According to previous studies and our clinical observations, the significantly longer total ischemic time can be accounted for mainly by patients' lack of knowledge about heart attack symptoms and underuse of ambulances, the delay in obtaining informed consent, and the procedural complexity of hospital admission and PCI team activation. Thus, further improvement of the quality of reperfusion therapy for patients with STEMI , through patient education and redesign of procedures involving EMS, emergency departments, and cardiac catheterization, is critically needed[12,13].

These results are similar to those of a German chest pain unit registry study, but differ from those of a retrospective study conducted in the UK,a registry study conducted in Italy[10] and a prospective study conducted in the USA[11]. The significant variation in ischemic time among countries indicates that pre-hospital delay is a widespread issue for patients with STEMI, and that urgent measures should be taken to address it. Results of previous studies have suggested that patient awareness about cardiac arrest symptom, EMS usage, and traffic could account for the difference in onset-to-door time between off-hours and regular hours. Therefore, further efforts must focus on patient knowledge about high-risk chest pain and use of EMS, and the optimization of EMS procedures for patients with STEMI[12,14].

These findings indicate the need to improve public education about heart attacks and redesign the health care system for patients with STEMI[15]. They also underline the importance of shortening total ischemic time and implementing quality improvement initiatives for reperfusion programs to improve the prognoses of patients with STEMI[16-17].

CONCLUSION

Total ischemic time was associated with mortality. The present study suggests that additional efforts are needed to shorten total ischemic time including patient and pre-hospital systemic delay for better prognosis after primary PCI.

CONFLICT OF INTEREST

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

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