Original Article

Pak Armed Forces Med J 2015; 65(Suppl): S56-59

DIFFERENCE IN MORTALITY BETWEEN ACUTE STEMI PATIENTS TREATED WITH THROMBOLYSIS AND PRIMARY PCI

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ABSTRACT

Objective: To compare the difference in mortality between acute ST elevation myocardial infarction (STEMI) patients treated with thrombolysis and primary percutaneous coronary intervention (PCI) at the Armed Forces Institute of Cardiology, Rawalpindi.

Study Design: Descriptive cross sectional study.

Place and Duration of Study: This study was conducted at AFIC / NIHD Rawalpindi from 1st July 2014 to Dec 2014.

Material and Methods: We retrospectively reviewed data from the Armed Forces Institute of Cardiology Acute Myocardial Infarction registry of 148 consecutive STEMI patients who were thrombolysed (January 1st 2014 until December 31st 2014), and of 1256 consecutive STEMI patients from the Primary PCI registry (17th October until 26th January 2015). Data on demographic and clinical parameters, and mortality was collected and analyzed using IBM SPSS version 21.

Results: Comparison of the primary PCI and thrombolysis groups was as follows – mean age: 58.4 years vs 61.0 years, males: 1144 patients (91.1%) vs 126 (85.1%), females: 112 patients (8.9%) vs 22 (14.9%), smokers: 384 patients (30.6%) vs 28 (19.4%), hypertensives: 370 patients (29.5%) vs 43 (29.1%), diabetics: 237 patients (18.9%) vs 30 (20.3%). The mean door-to-balloon time for primary PCI was 52.0 +/- 0.61 minutes and the mean door-to-needle time was 62.4 ± 1.27 minutes. There were 14 peri-procedural deaths in the primary PCI group (peri-procedural mortality rate 1.1%). The in-hospital mortality rate was 3.8% in the PPCI group and 18.9% in the thrombolysis group;

Conclusion: Primary PCI is a safer and more effective therapy than thrombolysis for the treatment of acute myocardial infarction.

Keywords: Primary percutaneous coronary intervention, Thrombolysis, Mortality.

INTRODUCTION

Ischemic heart disease is the leading cause of death in Pakistan[1]. ST Elevation Myocardial Infarction (STEMI) is usually due to rupture of an inflamed thin-capped fibroatheroma containing a lipid-rich necrotic core. This leads to secondary thrombosis which can cause coronary artery occlusion[2].

STEMI is defined by characteristic symptoms of myocardial ischemia associated with persistent electrocardiographic ST elevation and subsequent release of biomarkers of myocardial necrosis[3]. Diagnostic ST elevation in the absence of left ventricular (LV) hypertrophy or left bundle-branch block (LBBB) is defined by the European Society of Cardiology / ACCF / AHA / World Heart Federation Task Force for the Universal Definition of Myocardial Infarction as new ST elevation at the J point in at least 2 contiguous leads of 2 mm (0.2 mV) in men or 1.5 mm (0.15 mV) in women in leads V2–V3 and / or of 1 mm (0.1mV) in other contiguous chest leads or the limb leads.4 New or presumably new LBBB is considered a STEMI equivalent[3].

Effective reperfusion in STEMI can be achieved by either thrombolytic therapy or primary percutaneous coronary intervention (PCI) without preceding thrombolysis (known as primary angioplasty)[5]. Studies have collectively shown improved survival and reduced major adverse cardiovascular events with primary PCI compared with thrombolysis[5].

There have been several prospective controlled trials where patients presenting with acute MI within 12 hours of symptom onset were randomized to primary PCI or thrombolytic therapy. Primary PCI compared with thrombolysis resulted in a 25% reduction

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in death, a 64% reduction in reinfarction, a 95% reduction in intracranial hemorrhage, and a 53% reduction in stroke[6]. Treatment with primary PCI rather than thrombolysis has been shown to save 2 lives per 100 patients (where patients in shock are excluded), similar to the 2 lives saved per 100 patients treated with thrombolytic therapy rather than placebo[6,7].

Primary PCI salvages more myocardium than thrombolysis, resulting in smaller infarcts[8]. Recurrent ischemia is reduced, resulting in fewer unplanned revascularization procedures and earlier hospital discharge with lower cost[9].

Primary PCI is usually successful in recanalizing the epicardial infarct-related artery (IRA). Normal antegrade Thrombolysis in Myocardial Infarction [TIMI] grade 3 flow in the IRA is restored in 90% to 95% of patients after primary PCI compared with 30% to 40% after streptokinase, strongly correlating with early and late survival[10].

Primary PCI also reduces reperfusion injury, recurrent ischemia and reinfarction compared with thrombolytic agents[11]. Reinfarction is a common cause of death after reperfusion therapy in STEMI and leads to infarct extension, life-threatening arrhythmias, and mechanical complications such as rupture of the septum, free wall or papillary muscle[12].

Finally, hemorrhagic stroke and major bleeding occur far more frequently after thrombolysis compared with after primary PCI (1.1% vs 0.05%)[6]. Most STEMI patients die or are severely disabled after hemorrhagic stroke. Therefore avoiding this iatrogenic complication of thrombolysis contributes to the improved outcomes with primary PCI[13].

The prompt performance of primary PCI is now the preferred reperfusion modality for STEMI patients presenting at PCI-capable centers[5].

Objective

To compare the difference in mortality between acute STEMI patients treated with thrombolysis and primary PCI at the Armed Forces Institute of Cardiology; a large, multi-operator, tertiary care cardiology centre in Pakistan

MATERIALS AND METHODS

We conducted a descriptive cross-sectional study. Research approval was obtained from the institutional ethical review board. We retrospectively reviewed data from the Armed Forces Institute of Cardiology Acute Myocardial Infarction registry of 148 consecutive STEMI patients who were thrombolysed (January 1st 2014 until December 31st 2014), and of 1256 consecutive STEMI patients from the Primary PCI registry (17th October until 26th January 2015). The difference in dates of data collection between the two groups was due to the availability of the appropriate documentation.

The inclusion criteria for this study were as follows:

- Patients who presented to the Armed Forces Institute of Cardiology with STEMI, diagnosed on clinical history and ECG criteria
- Presence of ischemic symptoms <12 hours
- Patients treated with Primary PCI
- Patients who were thrombolysed with streptokinase

Patients who presented to the Emergency Room were initially triaged and the time of entry was noted as the door time. A 12 lead ECG was performed, and the patients were reviewed by the Cardiology registrar, who evaluated suitability for primary PCI or thrombolysis with 1.5 million units of streptokinase. Initial treatment consisted of 300 mg aspirin, 600 mg clopidogrel (or 300 mg if thrombolysis was planned), 5000 units of intravenous heparin, sublingual glyceryl trinitrate, and analgesia.

If Primary PCI was planned a “code white” protocol was initiated in the emergency room: the cath lab was prepared, blood samples were obtained, a consultant cardiologist was called, and informed consent was obtained from the patient for primary PCI. Trained medical staff accompanied the patient from the emergency room to the cath lab. In the cath lab the patient was scrubbed in their own clothes.

Local anaesthetic was infiltrated around the area of vascular access. Radial or femoral

arterial access was obtained. A guide catheter was advanced into the infarct related artery. The intracoronary lesion was crossed with a wire. The use of an intracoronary balloon, thrombus aspiration, or intracoronary glycoprotein IIb/IIIa inhibitors was determined by the operator on the basis of clinical and angiographic parameters. An intracoronary stent (bare-metal stent or drug-eluting stent) was deployed to maintain the patency of the vessel. The door to balloon time was noted. If, following coronary angiography, primary PCI could not be done patients were thrombolysed with streptokinase. After primary PCI, patients were moved to the coronary care unit, and if not contraindicated, received a 12 hour infusion of abciximab.

Data analysis

A data collection tool was developed regarding variables of interest. An analysis was carried out in SPSS version 21 for descriptive statistics. Different variables were expressed as mean, median and standard deviation. Chi-square statistics were used to establish any association between different characteristics

RESULTS

(n=1256) patients who underwent primary PCI and 148 patients received thrombolysis were (n=148). In the primary PCI group 1144 (91.1%) were male and 112 (8.9%) were female. In the thrombolysis group 126 (85.1%) were male and 22 (14.9%) were female. Mean age was 58.4 years in the primary PCI group and 61.0 years in the thrombolysis group. Smokers comprised 384 patients (30.6%) in the primary PCI group and 28 patients (19.4%) in the thrombolysis group. There were 370 patients (29.5%) with hypertension in the primary PCI group and 43 patients (29.1%) in the thrombolysis group. There were 237 diabetic patients (18.9%) in the primary PCI group and 30 patients (20.3%) in the thrombolysis group.

The mean door to balloon time for the primary PCI group was 52.0 ± 0.61 minutes (95% CI). The mean door to needle time was 62.4 ± 1.27 minutes (95% CI). There were 14 peri-procedural deaths in the primary PCI group (peri-procedural mortality rate 1.1%). Overall, there were 48 total deaths in the primary PCI group (in-hospital mortality rate 3.8%) compared with 28 deaths (in-hospital mortality rate 18.9%) in the thrombolysis group.

DISCUSSION

In this study we found a large difference in mortality (3.8% vs 18.9%) between STEMI patients treated with primary PCI and those given thrombolysis with streptokinase. The mortality rate in the primary PCI group is lower than that reported in most international studies.5 The mortality rate in the thrombolysis group however, is relatively higher than previously reported[5].

This study was not randomized and there may be differences in the clinical condition and subsequent management of patients in the thrombolysis group that might explain their higher mortality rate. Patients with absolute contraindications to primary PCI (such as severe intolerance of anti-platelet medications, and refusal to give informed consent for primary PCI) would automatically have been assigned to thrombolysis. It is possible that other patients with relative contraindications to primary PCI (severe renal failure, acute stroke, active gastrointestinal bleeding, severe anaemia, severe coagulopathy or a co-morbid disease with very short expected lifespan) were thrombolysed instead of treated with primary PCI. The inclusion of patients with such severe co-morbid conditions may have contributed to the increased mortality of the thrombolysis group.

AHA/ACC guidelines stipulate a target door-to-needle time of 30 minutes in patients receiving thrombolysis[3]. Patients in our study had a mean door-to-needle time in excess of 60 minutes. One reason for this delay may be logistical – at the Armed Forces of Cardiology, STEMI patients are not usually commenced on streptokinase infusion until they have been transferred from the emergency room to the coronary care unit, which is a cause of delay. However if the mean door-to-balloon time in patients who underwent primary PCI (which involves greater resource co-ordination and manpower than thrombolysis) was 52 minutes, this suggests that other factors may be at play.

Another possible explanation is that in general, sicker STEMI patients have been shown to have a longer wait before

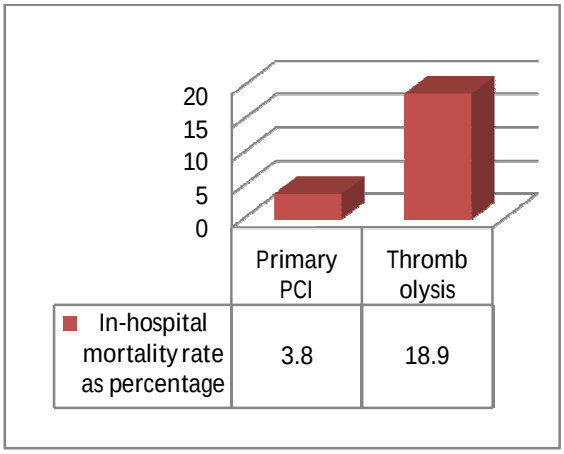

Figure-1: Showing difference in mortality between STEMI patients treated with primary PCI and thrombolysis.

reperfusion[14]. There is often a delay while patients are stabilized in the emergency room, prior to reperfusion. If these sick patients (with severe co-morbid conditions which may be relative contraindications to coronary angiography) are being thrombolysed instead of undergoing primary PCI, it may explain the very high mortality rate in the thrombolysis group.

What is overwhelmingly clear from the data is the superiority of primary PCI as a treatment modality for acute myocardial infarction compared to thrombolysis. As per AHA/ACC/ESC guidelines the target door-to-balloon time should be less than 90 minutes3 which is mostly being successfully achieved at the Armed Forces Institute of Cardiology. The high mortality in the thrombolysis group suggests that far fewer STEMI patients should be thrombolysed, especially those at higher risk – even if they have relative contraindications to coronary angiography.

CONCLUSION

Primary PCI is superior to thrombolysis in the treatment of STEMI as evidenced by the difference in in-hospital mortality between the two groups. Clinicians should ensure that all eligible patients who present with STEMI receive primary PCI because it maximizes the patient's chances of survival.

Conflict of Interest

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

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