ORIGINAL ARTICLE

Feasibility of Primary PCI as the Reperfusion Strategy for Acute ST elevation MI at PIMS

Mohammad Naeem Malik[1], Sidra Zahoor[2], Asad Riaz[3], Muhammad Ahmad[4], Mohammad Farhan[5]

Author`s Affiliation

[1]Associate Professor, Department of Cardiology
[2-5]Resident, Department of Cardiology
Pakistan Institute of Medical Sciences, Islamabad

Author`s Contribution

All the authors contributed equally to this work; they designed the article, did data collection, did a thorough search, analyzed the data, wrote, reviewed and approved the final form of this manuscript.

Article Info

Received: July 13, 2017
Accepted: Dec 19, 2017

Funding Source: Nil
Conflict of Interest: Nil

Address of Correspondence
Dr. Sidra Zahoor
sidrazahoor@hotmail.com

ABSTRACT

Objective: To determine the feasibility of primary PCI in terms of frequency of patients with acute ST elevation MI found to have a first-medical-contact to needle time of 90 minutes.

Methodology: The descriptive, cross sectional case series was conducted at department of Cardiology, PIMS, Islamabad from January 2017 to April 2017

Results: A total of 350 patients were enrolled into the study, 67% (235) of which were males and 33% (115) females. Mean age of the participating population was 54 ±7.8 years. The mean first medical contact needle time was 2.3±1.1 hours, out of which a vast majority (73%) fell into the 90 minutes range. The patients had a median first medical contact to needle time of 74 minutes.

Conclusion: The study concluded that majority of patients presenting to the emergency department with acute STEMI were found to be feasible for primary PCI as the reperfusion strategy with an FMC to needle time of less than 90 minutes. Therefore, accelerated efforts need to be made to develop this center as a primary PCI capable facility providing such standards of care to patients with ST-elevation MI.

Key Words: First Medical Contact, Myocardial Infarction, Percutaneous Coronary Intervention

Introduction

Ischemic heart disease takes a heavy toll on a country's economy. It is the leading cause of death in Europe and North America.[1] According to AHA estimates, the overall prevalence of CAD in the USA over 1999-2006 has been 7.6% (Female 10.4% versus males 4.8%) [2]. The annual number of adults per 100 having a diagnosed heart attack or fatal coronary heart disease was reported as 125 in males and 10 in females in 55-75 years age group.[2] Approximately 0.8 million Americans sustain a new coronary event every year and approximately 5 million develop a recurrent episode.[1] One of every six deaths was caused by coronary artery disease in 2007.[1] With the advent of reperfusion and thrombolytic therapy, diminutive annual mortality rates for patients with acute MI have been noted in the Western world. The scarcity of literature reporting prevalence, annual incidence, mortality rate and economic burden exists in Pakistan but several single Centre studies are available. One such study found STEMI in 40.5% of the patients admitted to the hospital with ACS.[3] Another such study revealed that in-hospital mortality was 13.2%, the commonest cause of which was pump failure (42%).[4]

Reperfusion therapy is the primary goal of management of STEMI or new LBBB reporting to the hospital within 12-24 hours after symptom onset.[1] An inverse relation between time to treatment and survival benefit has been demonstrated in multiple trials.[5, 6] Significant reductions in 30 days mortality rate (15%) after thrombolytic therapy in patients with STEMI was reported in GUSTO I trial. Associated with it were significantly higher rates of TIMI 3

flow at 90 minutes after thrombolysis.[7] Unavailability of rtPA associated with high costs (US$ 2200 per episode of MI versus 300US$ per episode of MI with streptokinase) in a resource-poor country like Pakistan culminates in use of SK for thrombolytic therapy in patients with STEMI despite its proven inferiority.[1] This practice is supported by a meta-analysis examining 30-35 day mortality and major adverse events with use of different thrombolytic agents in the treatment of acute MI which showed no significant difference in mortality with any of the thrombolytic agents.[8] The overall rate of intracerebral hemorrhage (0.5% versus 0.7%) or stroke (OR 1.29 versus 1.13) from any cause was also lower for SK versus tPA.[8] ASSENT 4 PCI which aimed to evaluate the efficacy of fibrinolysis plus PCI versus PCI alone was stopped prematurely on account of high in-hospital mortality and event rates for death, shock and heart failure within 90 days.[9] FINESSE trial demonstrated a higher rate of patients having an open artery on angiography who had received fibrinolysis plus Glycoprotein IIB/IIIA inhibitors.[10]Other trials have shown that fibrinolysis prior to PCI in patients who present with acute MI results in worse outcomes.[11]

25 to 35% of patients with an index event of STEMI die before receiving medical attention, the most common cause leading to which is ventricular fibrillation.[12] The prognosis is remarkably improved for the patients who are able to receive medical attention especially in terms of in-hospital mortality rates (11.2% in 1990 versus 9.4% in 1999, the effect arising mainly due to increasing number of patients receiving fibrinolysis and PCI).[13, 14] In an analysis by the National Registry of Myocardial Infarction (NRMI), the rate of in-hospital mortality was 5.7% versus 14.8% among those receiving reperfusion therapy and those who were eligible for but unable to receive such therapy respectively.[15]

Owing to the established superiority of primary PCI over fibrinolysis as the reperfusion strategy; and an extremely small number of centers in Pakistan offering this therapy as the standard of care, this study was carried out to establish the feasibility of primary PCI for treatment of STMEI in PIMS, Islamabad.

Methodology

This descriptive, cross-sectional case series was conducted at Department of Cardiology, PIMS, Islamabad from January 2017 to April 2017. Non-probability consecutive sampling technique was used for the data collection. All patients more than 18 years of age with or without a history of typical ischemic chest pain and an ECG showing STEMI ± Q waves; with raised cardiac markers or echocardiography showing new regional wall motion abnormalities were included in the study.

Exclusion criteria of the study includes severe liver/kidney disease, age less than 18 or more than 80 years, informed consent not given, previous history of MI and oncological or hematological disorder patients.

Myocardial Infarction was considered as rise and/or fall in cardiac troponin with at least one value above the 99th centile of upper normal range utilizing an assay with less than 10% coefficient of variation at the level of detection together with evidence of ischemia (defined as any symptom of ischemia, ECG changes suggestive of new ischemia, development of pathological Q waves or imaging evidence of infarction). Included in the definition was sudden cardiac death with evidence of myocardial ischemia (new ST elevations, LBBB or coronary thrombus) and biomarker elevation greater than 3 times ULN for post PCI patient and greater than 5 ULN for post CABG patients. Documented stent thrombosis is also included in this definition. Feasibility for primary PCI was defined as patients having first medical contact to needle time of less than 90 minutes. First Medical Contact was defined as the point at which the patient is initially assessed either by a physician or a paramedic in the pre-hospital setting or the patient arrives at the hospital emergency department without having pre-hospital medical attention. The door to needle time was measured as the time elapsed between the patient reporting to the emergency department and being started on reperfusion therapy. First Medical Contact to needle time was measured as the time elapsed between the first medical contact and start of reperfusion therapy.

Patients presenting with new onset ST elevation MI fulfilling the inclusion criteria were selected by nonprobability nonpurposive consecutive sampling. Written informed consent was obtained from all patients according to the consent form provided in Annexure 1.

Detailed data were collected on a structured proforma as provided in Annexure 2. Relevant history for inclusion and exclusion criteria was sought from the patients or their attendants. Baseline CBC, coagulation profile, renal function testing and blood sugars were sent to the laboratory. Time to first medical contact was taken as that mentioned on computer generated emergency department slip. Feasibility times were recorded.

Data were recorded and analyzed using SPSS (21.0). For qualitative data (gender, the location of MI, the feasibility of PCI) frequency and percentages were calculated and for quantitative data (age, FMC to needle time) mean and standard deviations were analyzed.

Results

A total of 350 patients were enrolled into the study, 67% (235) of which were males and 33% (115) females and clinical diagnosis was as depicted in table I.

Table 1: Distribution of patients according to clinical diagnosis

Gender	**n (%)**
Male	235 (67)
Female	115 (33)
Clinical Diagnosis	
Anterior Wall MI	47.7%
Inferior Wall MI	30.5%
Lateral wall MI	11.1%
Inferoposterior MI	10.5%

The mean age (years) of the participating population was 54 ±7.8. The mean first medical contact to needle time was 2.3±1.1 hours, out of which a vast majority (73%) fell into the 90 minutes range. The patients had a median first medical contact to needle time of 74 minutes. The percentage of patients with inferior wall MI falling into the feasibility FMC to needle time range was greater as compared to those with anterior wall MI (81% versus 64%). The average time lapse from symptom onset to FMC was 7.1±1.6 hours and was lower in males as compared to females (6.8±1.2 and 7.5±1.3 hours) and also lower in patients with inferior wall MI as compared to those with anterior wall MI (4.1±0.8 and 7.9±0.2 hours).

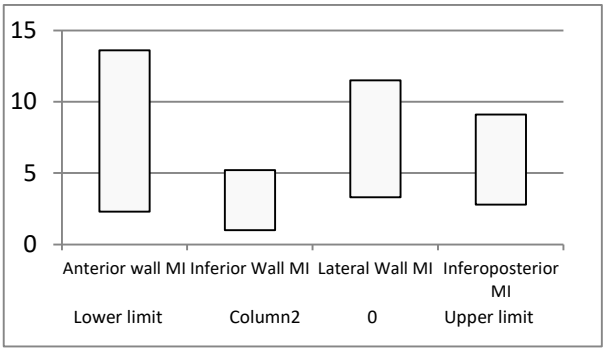

Table II:		**Mean±SD**
Age (years)		54±7.8
Average time (hours) lapse from symptoms onset to first medical contact	overall	7.1±1.6
	Male	6.8±1.2
	Female	7.5±1.3
	Inferior wall MI	4.1±0.8
	Anterior wall MI	7.9±0.2
First medical contact to needle time (hours)		2.3±1.1
		n (%)
Male		235 (67%)
Female		115 (33%)
FMC to needle time < 90 mins		256 (73%)
Percentage of feasibility FMC to needle time	Inferior wall MI	85(81%)
	Anterior wall MI	106 (64%)

Discussion

The use of thrombolytic therapy as a means of revascularization in patients with acute myocardial infarction is still widely prevalent especially in centers not offering primary PCI. Extensive data on utility and benefit conferred by PCI has cast shadows on the risk-benefit balance for patients receiving thrombolytic therapy. Further added to this is the fact that streptokinase is still the standard of care in almost all non-PCI capable facilities despite the availability of newer agents with proven superiority. In a pooled meta-analysis, the use of fibrinolytic therapy decreased the incidence of death at 35 days from acute myocardial infarction from 11.5 to 9.6%.[16] But its use is limited by several potential disadvantages like significant number of patients with myocardial infarction having contra-indications to fibrinolytic therapy (27%), lesser chances of successful

reperfusion (85%) and a higher incidence of reocclusion of the infarct-related artery within 3 months (25%).[17, 18,19] These limitations can be bypassed by primary PCI. This necessitated the need to determine the feasibility of primary PCI as the reperfusion strategy in patients with acute ST-elevation MI. The comparative rates of death from acute myocardial infarction after fibrinolysis and primary PCI have found to be favoring primary PCI as the reperfusion strategy (9% versus 7% respectively).[20] similar trend in rates of non-fatal reinfarction and stroke have also been noted. But such effects cannot be projected at centers where a greater time lapse between first medical contact and start of treatment can be anticipated. Primary PCI is said to be feasible and preferable if a skilled interventional cardiologist and catheterization laboratory with adequate emergency surgical backup are available and if the procedure can be started within 90 minutes after initial medical contact with the patient.[21] In patients treated with primary PCI, every 30 minute delay is said to increase the relative risk of 1 year mortality by 7.5%.[22] In one similar intentioned study [23], a door to balloon time of less than 90 minutes was achieved in 79.7% comparable to 73% in our study. To minimize the effect of transfer on time to reperfusion and to achieve guideline door-to-balloon times, target FMC to balloon times are projected to be attained with feasibility in the center studied and hence accelerated efforts must be ensured to accomplish that.

Conclusion

An overwhelming majority of patients presenting to the emergency department with acute STEMI were found to be feasible for primary PCI as the reperfusion strategy with an FMC to needle time of less than 90 minutes. Therefore, accelerated efforts need to be made to develop this center as a primary PCI capable facility providing such standards of care to patients with ST-elevation MI.

References

1. Griffin BP. Manual of Cardiovascular Medicine, 4th ed. USA: Lippincott Williams & Wilkins; 2013.
2. Mozaffarian D, Benjamin EJ, Go AS, et al . Heart disease and stroke statistics—2015 update: a report from the American Heart Association. Circulation. 2015;131:e29–322.
3. Jafary MH, Samad A, Ishaq M, Jawaid SA, Ahmad M, Vohra EA. Profile of Acute Myocardial Infarction (AMI) in Pakistan. Pak J Med Sci. 2007; 23(4): 485-489.
4. Siddiuqi AH, Kayani AM. Acute Myocardial Infarction - Clinical Profile of 1000 Cases. Pakistan Heart Journal 2007; 33(1-2): 42-45.
5. Schomig A, Mehilli J, Antoniucci D, et al. Mechanical reperfusion in patients with acute myocardial infarction presenting more than 12 hours from symptom onset: A randomized controlled trial. JAMA. 2005;293:2865-2872.
6. Hochman JS, Lamas GA, Buller CE, et al. Coronary intervention for persistent occlusion after myocardial infarction. N Engl J Med. 2006;355:2395-2407.
7. An international randomized trial comparing four thrombolytic therapy for acute myocardial infarction. The GUSTO investigators. N Engl J Med. 1993;329:673-682.
8. Dundar Y, Hill R, Dickson R, Walley T. Comparative efficacy of thrombolytics in acute myocardial ischemia: A systematic review.QJM 2003; 96(2): 103-113. (accessed 22nd March, 2016).
9. Primary versus tenecteplase-facilitated percutaneous coronary intervention in patients with ST-segment elevation acute myocardial infarction (ASSENT-4 PCI): randomised trial. Lancet. 2008;371:559-568.
10. Keeley EC, Boura JA, Grines CL. Comparison of primary and faciliatated percutaneous coronary intervention for ST-elevation myocardial infarction: quantitative review of randomised trials. Lancet. 2006;367:579-588.
11. Di Mario C, Dudek D, Piscione F, et al. Immediate angioplasty versus standard therapy after thrombolysis in the Combined Abciximab REteplase Stent Study in Acute Myocardial Infarction (CARESS-in-AMI): an open, prospective, randomised, multicentre trial. Lancet. 2008;371:559-568.
12. Rogers WJ, Canto JG, Lambrew CT, et al. Temporal trends in the treatment of over 1.5 million patients with myocardial infarction in the U.S. from 1990 through 1999: the National Registry of Myocardial Infarction 1, 2 and 3. J Am Coll Cardiol 2000;36:2056-2063.
13. Furman MI, Dauerman HL, Goldberg RJ, Yarzebski J, Lessard D, Gore JM. Twenty-two year (1975 to 1997) trends in the incidence, in-hospital and long-term case fatality rates from initial Q-wave and non-Q-wave myocardial infarction: a multi-hospital, community-wide perspective. J Am Coll Cardiol 2001;37:1571-1580.
14. Zheng ZJ, Croft JB, Giles WH, Mensah GA. Sudden cardiac death in the United States, 1989 to 1998. Circulation 2001;104:2158-2163.
15. Gibson CM. NRMI and current treatment patterns for ST-elevation myocardial infarction. Am Heart J 2004;148:Suppl:S29-S33.
16. Fibrinolytic Therapy Trialists' (FTT) Collaborative Group. Indications for fibrinolytic therapy in suspected acute myocardial infarction: collaborative overview of early mortality and major morbidity results from all randomised trials of more than 1000 patients. Lancet 1994;343:311-322[Erratum, Lancet 1994;343:742.]
17. Juliard J-M, Himbert D, Golmard J-L, et al. Can we provide reperfusion therapy to all unselected patients admitted with acute myocardial infarction? J Am Coll Cardiol 1997;30:157-164.
18. Anderson JL, Karagounis LA, Becker LC, Sorensen SG, Menlove RL. TIMI perfusion grade 3 but not grade 2 results in improved outcome after thrombolysis for myocardial infarction: ventriculographic, enzymatic, and electrocardiographic evidence from the TEAM-3 Study. Circulation. 1993;87:1829-1839.
19. Gibson CM, Karha J, Murphy SA, et al. Early and long-term clinical outcomes associated with reinfarction following fibrinolytic

administration in the Thrombolysis in Myocardial Infarction trials. J Am Coll Cardiol 2003;42:7-16.

20. Keeley EC, Boura JA, Grines CL. Primary angioplasty versus intravenous thrombolytic therapy for acute myocardial infarction: a quantitative review of 23 randomised trials. Lancet 2003;361:13-20.
21. Antman EM, Anbe DT, Armstrong PW, et al. ACC/AHA guidelines for the management of patients with ST-elevation myocardial infarction -- executive summary: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (Writing Committee to Revise the 1999 Guidelines for the Management of Patients with Acute Myocardial Infarction). Circulation 2004;110:588-636[Erratum, Circulation 2005;111:2013.]
22. De Luca G, Suryapranata H, Ottervanger JP, Antman EM. Time delay to treatment and mortality in primary angioplasty for acute myocardial infarction: every minute of delay counts. Circulation 2004;109:1223-1225.
23. Le May MR, So DY, Dionne R, Glover CA, Froeschl MP, Wells GA, Davies RF, Sherrard HL, Maloney J, Marquis JF, O'brien ER. A citywide protocol for primary PCI in ST-segment elevation myocardial infarction. New England Journal of Medicine. 2008 ;358(3):231-40.