Outcome of primary percutaneous coronary intervention versus thrombolysis in ST segment elevation myocardial infarction in tertiary Centre

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Abstract:

Introduction: As myocardial infarction has become leading cause of death throughout the world, reperfusion therapy either by fibrinolysis or with primary percutaneous coronary intervention (PCI) in appropriate patients becomes necessary. The study aims to evaluate the outcome of patients with ST segment elevation myocardial infarction treated with PCI and fibrinolysis in our setting.

Methods: Retrospective analysis for risk factors, complication and in-hospital mortality was done in patients presented with acute ST segment elevation myocardial infarction to emergency department of Manmohan cardiothoracic vascular and transplant centre from April 2012 to April 2013.

Results: Total 36 patients were admitted in the study period with ST elevation myocardial infarction and candidate for reperfusion. Half of them had undergone primary PCI. Patients on PCI group were having more Anteroseptal wall involvement, diabetes mellitus, higher Killip class at admission and few patients presented later than 24 hours than in fibrinolysis group. The overall complication rate and in-hospital mortality were similar in both groups (P= 0.062, 0.572 respectively).

Conclusion: This study showed similar mortality and complication rate in primary PCI group and Fibrinolytics group in spite the fact that patients in the PCI group had higher baseline risk.

Keywords: Fibrinolysis, PCI, myocardial infarction

Introduction

Coronary artery disease has become the leading cause of death around the world accounting for 12.8% of total death.[1] Mortality rates in patients with acute ST elevation myocardial infarction (STEMI) has declined substantially in past 2 decades in the developed countries[2] However, studies have suggested different outcomes in different regions of the world with acute coronary syndrome[3,4]. These variations have been attributed to differences in the disease itself, in use of invasive cardiac procedures or socioeconomic characteristics.

Based on current clinical trial data and guidelines, there are two reperfusion strategies for patients with STEMI, namely fibrinolysis or primary percutaneous intervention (PCI). The superiority of primary PCI has been supported over fibrinolysis in current guidelines if door to balloon time is achieved in timely fashion. With fibrinolysis, only 60-70% patients achieve thrombolysis in myocardial infarction

(TIMI) 3 flow at 90 minutes[5,6]. Moreover, hemorrhagic stroke associated with fibrinolysis occurs in <1% of patients; but it remains a catastrophic complication with mortality rate of >50% in individual patients[7]. In addition 10-20% patients will experience reocclusion of infarct vessel after successful fibrinolytic reperfusion[8].

However, in developing countries like Nepal, it is still in the growing phase to have skilled PCI centre that can function 24 hours a day 7 days a week. Moreover, financial constrains make invasive strategy costly and impractical in many individuals. Fibrinolysis is an alternative for them with lower overall efficacy.

So we aim to study to compare the in-hospital mortality and other complications in patients who presented with acute STEMI who received either PCI or fibrinolysis in our setting.

Methods

Medical records of 36 patients from April 2012 through April 2013 who had presented to the emergency department of Manmohan Cardiothoracic Vascular and Transplant Center were retrospectively reviewed. These patients had come with STEMI with elecrocardiographic evidence of ST segment elevation of ≥ 1mm in ≥2 contiguous leads without prior history of PCI, coronary artery bypass graft (CABG) or fibrinolytic therapy. Most of the patients had chest pain of less than 12 hours duration, but those having persistent chest pain up to 24 hours were taken in fibrinolysis group and up to 48 hours with persistent chest pain, electrical instability or cardiogenic shock in PCI group.

The choice of reperfusion technique was determined by treating physician based on time of presentation, socioeconomic status and other relevant factors. All patients received aspirin 300mg, clopidogrel 300 mg loading dose at the diagnosis of STEMI. They also received antianginals, high dose atorvastatin and other medicines as per standard of care. Use of glycoprotein IIb/IIIa antagonist was done in the catheterization lab in some of patients on discretion of interventioalist. Stent size selection was primarily assessed on visual assessment of lesion length and diameter. The patients on fibrinolytics were continued on aspirin 75 mg and clopidogrel 75 mg daily whereas patients on PCI were given aspirin 150 mg and clopidogrel 75mg twice daily despite type of stents used. Patients were initially remained in coronary care unit and later shifted to ward as step down unit before discharge.

Information was collected regarding age, gender, history of hypertension, diabetes mellitus, smoking, family history of premature coronary artery disease. Similarly duration of chest pain, shortness of breath, diaphoresis, presenting vital signs and Killip classification was collected from the records from all cases. Any complications during the hospital stay, duration of stay in critical care ward and total hospital stay was also collected. The in-hospital mortality was recorded from the record.

Data were entered into the Microsoft excel and then statistical analysis was done with IBM Statistical Package for Social Sciences software, version 20 (SPSS Inc). Descriptive statistics were presented as means and standard deviations and categorical variables reported in percentages.

Results

There were total 36 patients in the study duration who presented with acute ST segment elevation myocardial infarction (table 1). Exactly half of the patients underwent primary PCI. Although most patients were presented within 24 hours of onset of chest pain, 3 patients had ongoing chest pain, ventricular arrhythmias and/or cardiogenic shock and they underwent PCI after 24 hours, but they had the symptom onset within 48 hours. The two groups were more or less matched with respect to gender and age. However, patients undergoing primary PCI were younger, more likely to have involvement of anteroseptal wall on the presenting ECG, higher Killip class and more often diabetic.

Table 1: Characteristics of acute STEMI patients (N=36)

	PPCI (N=16)	Fibrinolytics (N=16)
Males	14 (88.2%)	13 (81.9%)
Age		
40-49	7(43.75%)	2 (12.5%)
50-59	5 (31.5%)	9 (56.7%)
60-69	3 (18.8%)	4 (25%)
70 and above	1 (6.3%)	1 (6.3%)
LV wall involvement		
Anteroseptal	9 (56.7%)	4(25%)
Anterolateral	1 (6.3%)	1(6.3%)
Extensive anterior	2 (12.5%)	4(25%)
Inferior	3 (18.8%)	6 (37.5%)
Inferior wall with RV extension	1(6.3%)	1 (6.3%)
Killip classification		
Class I	9 (56.3%)	12 (75%)
Class II	0	1(6.3%)
Class III	3 (18.8%)	1 (6.3%)
Class IV	4 (25%)	2(12.5%)
Hypertension	10 (62.5%)	12 (62.5%)
Diabetes mellitus	10 (62.5%)	1 (6.3%)
Smoking habit	10 (62.5%)	8 (50%)
Family history of premature CAD	2 (12.5%)	1 (6.3%)
Duration of chest pain		
Within 1 hour	2 (12.5%)	1(6.3%)
1-3 hour	4 (25%)	6 37.5%)
3-6 hour	5 (31.3%)	2 (12.5%)
6-12 hour	1 (6.3%)	5 (31.5%)
12- 24 hour	1 (6.3%)	2 (12.5%)
24-48 hour	3 (18.8%)	0
Breathlessness	6 (37.5%)	7 (43.75%)
Diaphoresis	14 (87.5%)	14 (87.5%)

Five patients in the primary PCI group had pulse rate <60 beats per minute, in which one had pulse rate of 30 beats per minute and one patient had unrecordable pulse. None of fibrinolysis group had bradycardia in the study population. Five patients each in both groups had tachycardia. Two patients in PCI group had severe hypotension, none in the fibrinolysis group. However, 9 patients in the fibrinolysis group had systolic BP more than 140 mmHg. Two of them had BP of 200/110 mmHg and first BP was reduced with intravenous agents, mostly glycerile trinitrate and then only fibrinolytic therapy was instituted. Five patients in the PCI group had BP higher than 140/90 mmHg.

Out of 16 patients in fibrinolysis group, 12 (75%) patients were given enoxaparin after the fibrinolytic therapy. In the PCI group, 2 were given tirofiban and 9 were given eptifibatide. Five patients were not given any intravenous antiplatelet agents. The various complications and death is compared in the two groups in table 2:

Table 2: Outcomes in STEMI

Complications	PPCI	Fibrinolysis	P value
None	7	11	0.062
Bradycardia	0	2	
Cardiogenic shock with acute kidney injury and liver dysfunction	0	1	
Pneumonia	2	1	
Pseudoaneurysm	1	0	
Refractory shock	4	0	
Complete heart block	1	0	
Ventricular septal rupture	0	2	
Need of inotropic agent	6	5	0.203
Duration of inotrope			0.312
<1 day	2	1	
1-3 days	2	1	
>3 days	2	3	
Duration of CCU stay			0.16
<3 days	2	5	
3-5 days	6	8	
>5 days	8	3	
Duration of hospital stay			0.009
< 5 days	2	10	
5-7 days	5	4	
> 7 days	9	2	
In-hospital death (%)	3 (16.7)	3 (16.7)	0.572

In the PCI group, all patients were stented. The vascular access site was right femoral artery in all cases. Intraaortic balloon pump was used in one case due to refractory cardiogenic shock. The type of stent used and the culprit arteries are depicted in figure 1 and 2.

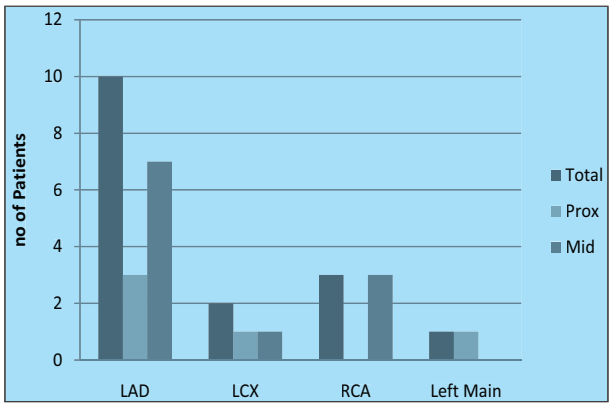

Figure 1: Culprit coronary artery in Primary PCI patients

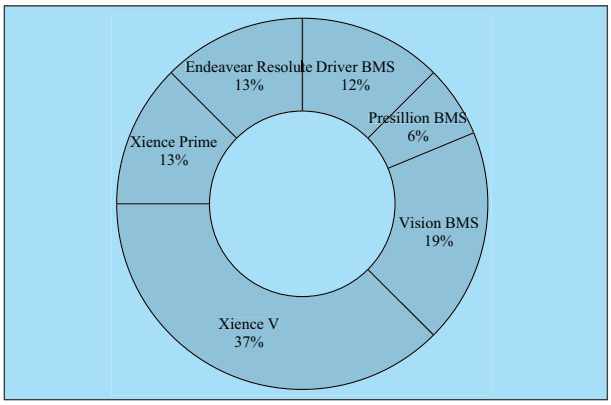

Figure 2: Types of stents used in primary PCI

Discussion

Acute ST elevation myocardial infarction is most often caused by rupture of atherosclerotic plaque and formation of occlusive thrombus there in. So if this thrombus could be lysed with fibrinolytic therapy, the restoration of blood flow would occur and the ischemic myocardium gets blood supply. The benefits of all currently available fibrinolytic agents have been demonstrated in clinical trials[9,10].

Despite clear benefits of fibrinolytics over no reperfusion therapy, there are concerns for efficacy as well as safety. PCI has potential benefits of specific and confirmed recanalization of the culprit vessel as well as knowledge of the detailed coronary anatomy. Attainment of TIMI 3 flow is much more common with primary PCI: 93 to 96 percent in the PAMI and CADILLAC trials of more than 5400 patients[11,12]. Our study did not show the significant difference between in-hospital mortality or other complications between the fibrinolytic group and PCI group. This is in contrast with international studies. The major reason for this is patient in the PCI group were having higher baseline risk as indicated as higher percentage of Anteroseptal involvement, diabetes mellitus, higher Killip class and refractory cardiogenic shock. Patients in PCI group were enrolled even after 24 hours as they were having evidence of ongoing ischemia as having recurrent angina, ventricular arrthymia or hemodynamic consequences. Still the mortality and complication rates are similar between these two groups. This finding indirectly signifies that PCI is more effective than the fibrinolysis in patients with STEMI.

In our study, mortality occurred in 3 patients in each group and all of these patients were in cardiogenic shock. Two of them had ventricular septal rupture and were in refractory shock and surgical management could not be done. This mortality rate of 66% in patients with cardiogenic shock is comparable to international data i.e. 32% in NRMI-213, 46.4% in SHOCK registry14 and 59.1% in American College of Cardiology-National Cardiovascular Data Registry (ACC-NCDR)[15].

There were some limitations of the study. Firstly it was retrospective study of consecutive cases over some fixed time period. The non-randomization of study will have different baseline characteristics. The sample size was limited and was from a single institution. The follow-up was not done in the study which could have shown significant differences.

Conclusion

The study showed similar mortality and complication rate in primary PCI group and Fibrinolytics group in spite the fact that patients in the PCI group had higher baseline risk. This study suggests primary angioplasty have more favorable outcome as shown in multiple randomized control studies done in the Western world. With increasing awareness and improving health care facilities in the country, the volume of primary PCI is going to increase in the future.

Conflict of interests

None declared

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References

1. World Health Organization [internet]. WHO media center; June 2011 [cited May 2013]. Available from http//:who.int/mediacentre/factsheets/fs310/en/
2. Boersma E, Mercado N, Poldermans D, Gardien M, Vos J, Simoons ML. Acute myocardial infarction. Lancet 2003; 361:847–58.
3. Fox KA, Goodman S, Bigonzi F, Le Louer V, Cohen M, the ESSENCE trial investigators. Inter-regional differences and outcome in unstable angina. Analysis of the international ESSENCE trial. Eur Heart J 2000; 21:1433–9.
4. Cohen M, Pacchiana C, Corbalan R, Isea Perez JE, Ponte C, Oropeza ES, et al. Variation in patient management and outcomes for acute coronary syndromes in Latin America and North America. Results from the Platelet IIb/IIa in Unstable Angina: Receptor Suppression Using Integrilin Therapy (PURSUIT) trial. Am Heart J 2001; 41:391–401.
5. Holmes DR Jr, Califf RM, Topol EJ. Lessons we have learned from the GUSTO trial. Global Utilization of Streptokinase and Tissue Plasminogen Activator for Occluded Arteries. J Am Coll Cardiol 1995; 25:10S.
6. Chesebro JH, Knatterud G, Roberts R, et al. Thrombolysis in Myocardial Infarction (TIMI) Trial, Phase I: A comparison between intravenous tissue plasminogen activator and intravenous streptokinase. Clinical findings through hospital discharge. Circulation 1987; 76:142
7. Gore JM, Granger CB, Simoons ML, et al. Stroke after thrombolysis. Mortality and functional outcomes in the GUSTO-I trial. Global Use of Strategies to Open Occluded Coronary Arteries. Circulation 1995; 92:2811.
8. Ohman EM, Califf RM, Topol EJ, Candela R, Abbottsmith C, Ellis S, et al. Consequences of reocclusion after successful reperfusion therapy in acute myocardial infarction. Circulation 1990; 82(3):781-91.
9. Effectiveness of intravenous thrombolytic treatment in acute myocardial infarction. Gruppo Italiano per lo Studio della Streptochinasi nell'Infarto Miocardico (GISSI). Lancet 1986; 1:397-402.
10. Randomised trial of intravenous streptokinase, oral aspirin, both, or neither among 17,187 cases of suspected acute myocardial infarction: ISIS-2. ISIS-2 (Second International Study of Infarct Survival) Collaborative Group. Lancet 1988; 2:349-60.
11. Mehta RH, Harjai KJ, Cox D, et al. Clinical and angiographic correlates and outcomes of suboptimal coronary flow in patients with acute myocardial infarction undergoing primary percutaneous coronary intervention. J Am Coll Cardiol 2003; 42:1739.
12. Stone GW, Grines CL, Cox DA, et al. Comparison of angioplasty with stenting, with or without abciximab, in acute myocardial infarction. N Engl J Med 2002; 346:957.
13. Tiefenbrunn AJ, Chandra NC, French WJ, Gore JM, Rogers WJ. Clinical experience with primary percutaneous transluminal coronary angioplasty compared with alteplase (recombinant tissue-type plasminogen activator) in patients with acute myocardial infarction: a report from the Second National Registry of Myocardial Infarction (NRMI-2). J Am Coll Cardiol 1998; 31:1240-5.
14. Webb JG, Sanborn TA, Sleeper LA, Carere RG, Buller CE, Slater JN et al. Percutaneous coronary intervention for cardiogenic shock in the SHOCK Trial Registry. Am Heart J 2001; 141:964-70.
15. Klein LW, Shaw RE, Krone RJ, Brindis RG, Anderson HV, Block PC et al. Mortality after emergent percutaneous coronary intervention in cardiogenic shock secondary to acute myocardial infarction and usefulness of a mortality prediction model. Am J Cardiol 2005; 96:35-41.