Original article

Comparison of ST-segment resolution influencing in hospital outcome after primary percutaneous coronary intervention and fibrinolysis (with streptokinase) in patients with acute ST-segment elevation myocardial infarction

Rahman MH[1], Afrin SF[2], Islam MA[3], Shahriar MS[4], Zahid MA[5], Badiuzzaman M[6]

Abstract:

Background: Coronary artery disease (CAD) is the most common cause of mortality & morbidity in all over the world. Reperfusion therapy is the cornerstone for treating acute ST-segment elevation myocardial infarction. Effective reperfusion in STEMI can be achieved by either fibrinolysis or primary percutaneous coronary intervention (PPCI). PPCI generally produces better outcomes than fibrinolysis but is not widely available. ST-segment abnormalities play a fundamental role in assessment and decision making for patients with STEMI. ***Methods***: This quasi-experimental study was conducted in the Department of Cardiology, National Heart Foundation Hospital and Research Institute. Group I underwent primary PCI and group II received fibrinolytic therapy as reperfusion therapy for acute STEMI. ***Results***: The mean ST-segment resolutions were significantly more in group I than group II at 60 minutes (63.54±20.98 vs 33.97±15.88%, p<0.001) and at 90 minutes (73.15±18.76 vs 60.06 ±23.33%, p<0.015). However, the difference is not significant at 180 minutes after procedure (74.48±18.09 vs 65.33±21.20%, p=0.064). In our study we observed that significantly higher number of patients of group II developed acute LVF (33.3% vs 6.1%, p=0.005) and cardiogenic shock (18.2% vs 3.0%, p=0.046) than group I and Rescue PCI was needed in 5 (15.2%% vs 0%, p=0.020) patients of group II than group I. ***Conclusion***: ST-segment resolution occurs earlier and more completely after Primary percutaneous coronary intervention than fibrinolysis (with Streptokinase) with better in hospital outcome in patients with acute STEMI.

Keywords: ST-segment Elevation Myocardial Infarction; primary PCI; fibrinolysis; ST-resolution; outcome

Bangladesh Journal of Medical Science Vol. 15 No. 02 April'16. Page :252-256

Introduction

Coronary artery disease (CAD) is the most common cause of mortality & morbidity in all over the world. It is the leading cause of death in developed countries and second leading cause of death in developing countries and by the year 2020 ischemic heart disease (IHD) will hold the first place in the WHO's list of leading cause of disability[1]. Reperfusion therapy is the cornerstone for treating acute STEMI[2]. Effective reperfusion in STEMI can be achieved by either fibrinolytic therapy or primary Percutaneous coronary intervention (PCI) without antecedent fibrinolysis (also generally known as primary angioplasty) [3]. Fibrinolysis and PCI may also be combined in a variety of ways, depending on the timing of PCI after fibrinolytic administration, the clinical condition of the patient, and whether PCI is applied routinely or selectively after lytic therapy. Randomized trials have collectively demonstrated enhanced survival and

1. Md.Hasanur Rahman, Assistant Professor, Dept. of Cardiology, Ibrahim Cardiac centre and Research Institution
2. Syeda Fahmida Afrin, Associate Professor, Dept. of Biochemistry, Ibn Sina Medical College
3. Md. Aminul Islam, Major, Army Medical Core
4. Md, Saqif Shahriar, Assistant Registar, NICVD
5. Md. Abu Zahid, Consultant, Upozila Health Complex
6. Mohammad Badiuzzaman, Professor Cardiology, NHFH & RI

Corresponds to: Md.Hasanur Rahman, Assistant Professor, Dept. of Cardiology, Ibrahim Cardiac centre and Research Institution. **E-mail:** drmdhasanurrahman@yahoo.com.

freedom from major adverse cardiovascular events with primary PCI compared with fibrinolysis, and as a result, the expeditious performance of primary PCI has become the preferred reperfusion modality for patients with STEMI presenting at appropriately equipped centers[3]. Primary Percutaneous coronary intervention generally produces better outcomes than fibrinolysis but is not widely available. Compared to fibrinolysis, PCI more frequently opens infarct arteries, and an "open artery" may provide benefit independent of myocardial salvage, the latter being associated with ST resolution. With fibrinolysis, successfully recanalized infarct arteries (often with ST resolution) are more prone to reocclusion with reinfarctions, as compared to PCI [2]. Simple and rapid measures are needed for timely assessment of the quality of reperfusion therapy in acute STEMI. Although successful recanalization of the epicardial vessel is a necessary condition, it is the microvascular flow that most strongly correlates with outcome. ST-segment changes reflect myocardial rather than epicardial flow and hence yield prognostic information beyond that provided by coronary angiogram alone[4].

The current theory holds that ST-segment resolution or recovery after reperfusion therapy signifies effective microvascular perfusion, myocardial tissue perfusion and myocardial salvage[5].

Methodology

This Quasi Experimental study was conducted in the department of Cardiology, National Heart Foundation Hospital and Research Institute, Dhaka, Bangladesh from 22 October 2013 to 21 October 2014. Purposive sampling was done. All the patients of acute ST-segment elevation myocardial infarction admitted in coronary care unit (CCU) of National Heart Foundation Hospital and Research Institute, Dhaka and who fulfill the inclusion and exclusion criteria. There were two study groups. Group I: consisted of 33 patients with acute STEMI treated with Primary PCI. Group II: consisted of 33 patients with acute STEMI treated with fibrinolytic therapy ST segment elevation acute myocardial infarction is defined as persistent ST segment elevation of ≥ 1 mm in at least 2 contiguous limb leads or ≥ 2 mm ST segment elevation in at least 2 contiguous chest leads in the setting of positive cardiac enzyme results. This study was approved by the ethical committee of National Heart Foundation Hospital and Research Institute, Dhaka,

Inclusion criteria:

- Patients with acute STEMI who were admitted in National Heart Foundation Hospital and Research Institute, Dhaka during the study period.
- **For Primary PCI:**

Patients with acute STEMI who presented within 12 hours of onset of symptoms and were agreed for Primary PCI.

- **For Fibrinolysis with Streptokinase:**

Patients with acute STEMI who presented within 12 hours of onset of symptoms, were not agreed for Primary PCI and had no contraindications for Streptokinase (thrombolytic) therapy.

Exclusion criteria:

- Patients age >75 years.
- Patients have any other co-morbid conditions like malignancy, CKD (S.Creatinine>2 mg/dL), coagulation or bleeding disorder.
- Patients with valvular heart disease and acute STEMI.
- Causes of ST-segment elevation in ECG other than acute MI.
- Unwilling to participate.

Results:

Table I. Distribution and comparison of patients by cardiovascular risk factors (n=66)

Risk factors	Group I (n=33) f (%)	Group II (n=33) f (%)	P value
Smoking			
Current	17(51.5)	14(42.4)	[a]0.805[NS]
Former	5(15.2)	8(24.2)	
Never	6(18.2)	6(18.2)	
Recent	5(15.2)	5(15.2)	
Hypertension			
Present	23(69.7)	18(54.5)	[a]0.205 [NS]
Absent	10(30.3)	15(45.5)	
Diabetes Mellitus			
Present	19(57.6)	23(69.7)	[a]0.306 [NS]
Absent	14(42.4)	10(30.3)	
Family history of premature CAD			
Present	17(51.5)	11(33.3)	[a]0.135 [NS]
Absent	16(48.5)	22(66.7)	
Dyslipidaemia			
Present	21(63.6)	12(36.4)	[a]0.027[S]
Absent	12(36.4)	21(63.6)	
Obesity			
Present	6(18.2)	7(21.2)	[a]0.757[NS]
Absent	27(81.8)	26(78.8)	

Table II. Comparison of ST-segment resolution between group I and II at 60, 90 and 180 minutes after procedure (n=66)

ST-segment resolution	Group I (n=33)	Group II (n=33)	P value
	Mean±SD	Mean±SD	
At 60 minutes after procedure (%)	63.54±20.98	33.97±15.88	[b] <0.001[S]
At 90 minutes after procedure (%)	73.15±18.76	60.06±23.33	[b] 0.015[S]
At 180 minutes after procedure (%)	74.48±18.09	65.33±21.20	[b] 0.064[NS]

This Quasi Experimental study was conducted in the Department of Cardiology, National Heart Foundation Hospital and Research Institute, Dhaka, Bangladesh. Total 66 patients were studied and they were grouped on the basis of their treatment modality. Group I underwent primary PCI and group II received fibrinolytic therapy as reperfusion therapy for acute ST-segment elevation myocardial infarction (STEMI). Comparison of ST-segment resolution after primary PCI and fibrinolysis (with streptokinase) was done.

There were no significant difference in baseline coronary risk factors between Group I and Group II.

Table II shows that the mean ±SD ST-segment resolution at 60 minute after procedure was 63.54±20.98 % in group I and 33.97±15.88% in group II. The mean ±SD ST-segment resolution at 60 minutes after procedure in group I was significantly higher than group II (p<0.001).

The mean ±SD ST-segment resolution at 90 minutes after procedure was 73.15±18.76 % in group I and 60.06±23.33% in group II. The mean ±SD ST-segment resolution at 90 minutes after procedure in group I was significantly higher than group II (p<0.015).

The mean ±SD ST-segment resolution at 180 minutes after procedure was 74.48±18.09 % in group I and 65.33±21.20% in group II. The mean difference between two groups was not statistically significant (p=0.064).

Table III shows that at 60 minute after procedure the complete resolution of ST segment occurred significantly more in group I than group II (39.4% vs 12.1%, p=0.006). At 90 minutes after procedure the complete ST segment resolution was in group I (66.7% vs 36.4%, p=0.038) and the difference was also significant. But at 180 minutes after procedure the complete ST segment resolution was similar in both the groups (66.7 vs 42.4%, p=0.125).

Acute LVF developed in 2(6.1%) patients of group I and 11(33.3%) patients of group II. Significantly higher number of patients of group I developed acute LVF than group II (p=0.005). Cardiogenic shock developed in 1(3.0%) patients of group I and 6(18.2%) patients of group II. Patients of group I developed significantly more cardiogenic shock than group II (p=0.046). Tamponade and stroke did not developed in any patients in both the groups. Bleeding occurred in 5(15.2%) patients of group I and in 2(6.1%) patients of group II with no significant difference (p=0.230). Renal failure developed in 5(15.2%) patients of group I and in 3(9.1%) patients of group II with no significant difference (p=0.451). Rescue PCI was needed in 5(15.2%) patients of group II (p=.020). Death occurred in 1(3.0%) patients of group I and 2(6.1%) patients of group II with no significant difference (p=0.555) (Table XIII).

Table III. Comparison of postprocedural ST segment resolution status between two groups (n=66)

Postprocedural ST segment resolution status	Group I (n=33)	Group II (n=33)	P value
	f(%)	f(%)	
At 60 minute after procedure			
No resolution	4(12.1))	14(42.4)	[a]0.006[S]
Partial resolution	16(48.5)	15(45.5)	
Complete resolution	13(39.4)	4(12.1)	
At 90 minute after procedure			
No resolution	1(3.0))	4(12.1)	[a]0.038[S]
Partial resolution	10(30.3)	17(51.5)	
Complete resolution	22(66.7)	12(36.4)	
At 180 minute after procedure			
No resolution	1(3.0))	3(9.1)	[a]0.125[NS]
Partial resolution	10(30.3)	16(48.5)	
Complete resolution	22(66.7)	14(42.4)	

Discussion:

The mean age of group I and II patients were 53.00±8.77

Table IV. Distribution and comparison of adverse outcome after 60, 90 and 120 minutes of procedure between two groups (n=66)

Adverse outcome after procedure	Group I (n=33) f(%)	Group II (n=33) f(%)	P value
Acute LVF			
Present	2(6.1)	11(33.3)	[a]0.005[S]
Absent	31(93.9)	22(66.7)	
Cardiogenic shock			
Present	1(3.0)	6(18.2)	[a]0.046[S]
Absent	32(97.0)	27(81.8)	
Stroke			
Present	0(0.0)	0(0.0)	--ψ
Absent	33(100)	33(100)	
Tamponade			
Present	0(0.0)	0(0.0)	--ψ
Absent	33(100)	33(100)	
Bleeding from any site			
Present	5(15.2)	2(6.1)	[a]0.230[NS]
Absent	28(84.8)	31(93.9)	
Renal failure			
Present	5(15.2)	3(9.1)	[a]0.451[NS]
Absent	28(84.8)	30(90.9)	
Rescue PCI			
Present	0(0.0)	5(15.2)	[a]0.020[S]
Absent	33(100)	28(84.8)	
Death			
Present	1(3.0)	2(6.1)	[a]0.555 NS
Absent	32(97.0)	31(93.9)	

and 51.96±8.76 years. In the present study, there were 87.9% male in group I and 93.9% in group II. During admission the most frequent complaints of group I and II patients was chest pain (84.8% vs 75.8%) and chest discomfort (15.2% vs 24.2%) with a mean duration of 5.06±2.72 and 4.77±2.54 hours respectively. ST elevation was found in leads II, III, aVF in 20(60.6%) patients of group I and 14 (42.4%) patients of group II, in leads V1-V3 in 2 (6.1%) patients of both the groups, in leads V1-V4 in 2(6.1%) patients in group I and 11 (33.3%) in group II, in leads V1-V5 in 3(9.1%) patients in group I and 4 (12.1%) in group II, in leads

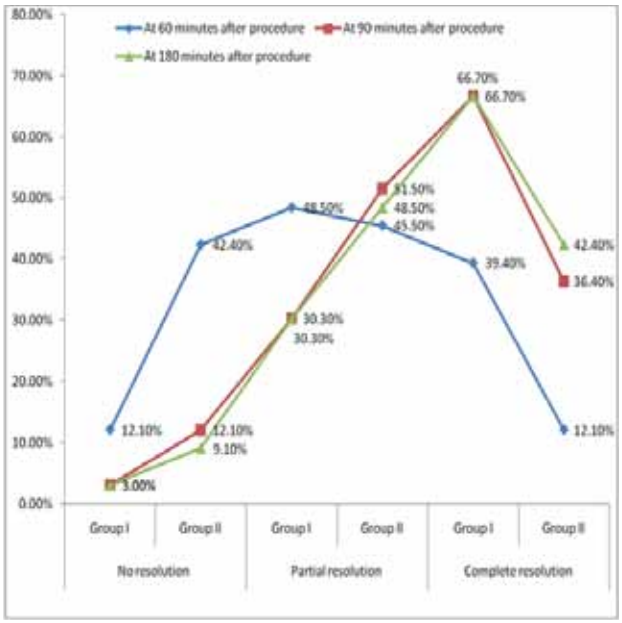

Figure 1: Line graph showing distribution of grade of ST segment resolution of both groups by time after the procedure

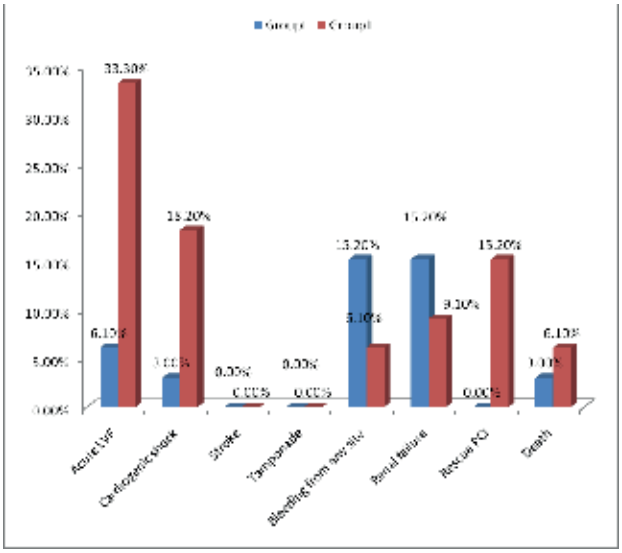

Figure 2: Distribution of adverse outcome of procedure

V1-V6 in 3 (9.1%) patients in group I and none (0%) in group II and in leads V1-V6, I, aVL in 3 (9.1%) patients in group I and 2 (6.1%) in group II. The difference in ECG finding between two groups was not significant (p=0.059). The mean ST-segment resolutions were significantly more in group I than group II at 60 minutes (63.54±20.98 vs 33.97±15.88%, p<0.001) and at 90 minutes (73.15±18.76 vs 60.06±23.33%, p<0.015). However the difference is not significant at 180 minutes after procedure (74.48±18.09 vs 65.33±21.20%, p=0.064). The complete resolution of ST segment occurred significantly

more in group I than group II at 60 minute after the procedure (39.4% vs 12.1%, p=0.006) and also complete resolution of ST segment occurred more in group I than group II at 90 minutes after the procedure (66.7% vs 36.4%, p=0.038) although at180 minutes after procedure (66.7 vs 45.5%, p=0.190) the difference was not significant. In our study we observed that significantly higher number of patients of group II developed acute LVF (33.3% vs 6.1%, p=0.005) and cardiogenic shock (18.2% vs 3.0%, p=0.046) than group I and Rescue PCI was needed in 5(15.2%% vs 0%, p=.020) patients of group II than group I. Tamponade and stroke did not developed in any patients in both the groups. No significant difference was observed between two groups in the development of bleeding from any site (15.2% vs 6.1%, p=0.230), renal failure (15.2%) vs 9.1%, p=0.451) and death (3.0% vs 6.1%, p=0.555). This observation was supported by the study of Falsoleiman, et al[6].

Conclusion:

ST-segment resolution occurs earlier and more completely after Primary percutaneous coronary intervention than fibrinolysis (with Streptokinase) with better in hospital outcome in patients with acute ST-segment elevation myocardial infarction. The mean ST-segment resolutions were significantly more in group I than group II at 60, and 90 minute after the procedure. The complete resolution of ST segment occurred significantly more in group I than group II at 60 and 90 minute after the procedure. Although the complete resolution of ST segment occurred similarly in group I than group II at 180 minutes after the procedure. Significantly higher number of patients of group II developed acute LVF and cardiogenic shock and needed more rescue PCI than group I. No significant difference was observed between two groups in the development of bleeding from any site, renal failure and death.

Conflict of interest: None

Reference:

1. Murrary, C.J., Lopez, A.D.,. Mortality by cause for eight regions of the world: global burden of disease study. *Lancet* 1997;**349**:1269-1276.
2. Wong, C.K., la Barra, S.L., Herbison, P. Does ST resolution achieved via different reperfusion strategies (fibrinolysis vs percutaneous coronary intervention) have different prognostic meaning in ST-elevation myocardial infarction? A systematic review. *Am Heart J* 2010;160:.842-48.
3. Stone, G.W. Angioplasty Strategies in ST-Segment–Elevation Myocardial Infarction; Part II: Intervention after Fibrinolytic Therapy, Integrated Treatment Recommendations, and Future Directions. *Circulation* 2008**; 118**:552-66.
4. Schroder, R. Prognostic Impact of Early ST-Segment Resolution in Acute ST-Elevation Myocardial Infarction. *Circulation* 2004; **110:**506-10.
5. Ndrepepa, G.1., Alger, P., Kufner, S., Mehilli, J.1., Schömig, A., Kastrati, A. ST-segment resolution after primary percutaneous coronary intervention in patients with acute ST-segment elevationmyocardial infarction. *Cardiol J* 2012; **19**:61-69.
6. Falsoleiman, H., Fatehi, G.H., Dehghani, M., Shakeri, M.T., Bayani, B., Ahmadi, M.,. Clinical Outcome, and Survival between Primary Percutaneous Coronary Intervention Versus Fibrinolysis in Patients Older than 60 Years with Acute Myocardial Infarction. *Heart Views* 2012; **13:**129-31.