ORIGINAL ARTICLES

In Hospital Outcome of Pharmaco-invasive Therapy versus Primary PCI In ST-segment elevation Myocardial Infarction in Dhaka, Bangladesh

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Abstract:

Background & Objectives: In many low middle income countries (LMIC), it is difficult to treat patients with ST-segment elevation Myocardial Infarction (STEMI) with timely PPCI. Thus, many undergo fibrinolysis. Whether early fibrinolysis followed by timely coronary angiography provides a clinical outcome similar to that of primary percutaneous coronary intervention (PPCI) after acute STEMI in LMIC settings remains a question. In this observational study we primarily aimed to compare in-hospital outcomes of primary PCI versus pharmaco-invasive strategy (immediate fibrinolysis followed by coronary angiography with possible PCI within 3-24 hours) for reperfusion in eligible patients with STEMI at a tertiary cardiac care center.

Methods: This prospective observational study was done in Ibrahim Cardiac Hospital & Research Institute, Dhaka from April 2022 to July 2022 where consecutive patients presenting with STEMI were enrolled and divided into two groups: those who underwent primary PCI (Group-I) and those who underwent immediate fibrinolysis with subsequent coronary angiography with PCI within 3 to 24 hours (Group-II). The main outcomes analyzed were all-cause death, cardiogenic shock, acute left ventricular failure, life threating arrhythmia, acute stent thrombosis, CVD, Contrast induced nephropathy (CIN), re-infarction, target-vessel revascularization, and major bleeding up to 7 days.

Results: A total 122 patients presented with acute STEMI, 61 in each group. One group underwent primary PCI and another group treated with fibrinolysis by tenecteplase. The mean age of the studied patients was 53.86±9.72 years (range 18-75 years). Eighteen percent of patients presented with Extensive Anterior MI,19.7% showed Anterior MI, 21.3% showed Antero-septal MI, 21.3% showed Inferior MI, 9.8% showed Inferior with posterior and 3.3% showed Lateral MI. 35.5% had Single vessel disease, 31.1% had double vessel disease,28.7% had triple vessel disease, LM with LAD was 0.8% and 0.8% had recanalized infarct related artery in both groups overall. In group-I 45.9% of PPCI were undertaken in LAD and 32.8% patient. of group-II was done PCI in LAD. There were no significant differences between two groups in primary outcome and mortality.

Conclusion: Immediate fibrinolysis followed by coronary angiography within 3-24 hours resulted in similar short-term outcomes in patients with STEMI compared to PPCI. Our study suggests that, compared with PPCI, fibrinolysis performed in the hospital setting is associated with similar mortality rates, acute CVD, CIN and acute left ventricular failure in with PPCI than STEMI.

Key Words: Primary percutaneous coronary intervention; Pharmacoinvasive; ST-segment myocardial Infarction.

Introduction:

Primary percutaneous coronary intervention (PPCI) is considered the preferred reperfusion strategy in patients with ST-elevation myocardial infarction (STEMI), provided it can be performed expeditiously by an experienced team[1], based on studies comparing PPCI with

in-hospital fibrinolysis (FL)[2]. International guidelines also underscore the objective of a total ischemic time <2 h in STEMI, which may not always be achievable if a PPCI strategy is chosen.

Thrombolysis is preferred for patients who have STEMI for less than 3 hours if the medical contact-to-balloon time is more than 90 min or if the delta time (i.e. medical contact-to-balloon time minus medical contact-to-thrombolysis time) is more than 60 min.

Unfortunately, these delays clearly have an unfavorable impact on morbidity and mortality,[3] therefore early fibrinolysis followed by timely angiography often provides a faster reperfusion option in many patients than transfer for standard primary PCI.[3]

Importantly, the relative benefit of PPCI over fibrinolytic therapy is time-dependent.[4] The benefit of PPCI over prehospital FL is not clear among patients managed early in the prehospital setting. The Comparison of primary Angioplasty and Pre-hospital fibrinolysis In acute Myocardial infarction (CAPTIM) trial[5] was the first large-scale trial comparing the two strategies. It showed that PPCI was not associated with lower mortality rates than prehospital FL. That study was terminated before reaching its target sample size, however. Researchers in the more recent Strategic Reperfusion Early after Myocardial Infarction (STREAM) trial[6] also reported similar rates of mortality between prehospital FL or PPCI. Both studies were undersized to assess a difference in mortality. In a real-life French nationwide registry of STEMI, prehospital FL was associated with reduced mortality in comparison with PPCI[7]. Hence, the benefit of allocating resources to developing proximity centers with 24/7 PCI facilities over prehospital FL and transfer to hub PCI centers may be questionable.

In light of encouraging results of trials comparing these 2 management strategies for STEMI which could give those patients more flexible options for emergent reperfusion.

Methods:
Study design : This prospective, observational single center study included 122 patients with STEMI who were admitted to the coronary care unit (CCU) at Ibrahim Cardiac Hospital & Research Institute, Dhaka in the period from April 2022 to July 2022. All patients were candidates for reperfusion therapy. We aimed primarily to compare in-hospital outcomes of primary PCI versus Pharmaco-invasive strategy (immediate fibrinolysis then coronary angiography with possible PCI (within 3-24 hours) for reperfusion in eligible patients with STEMI. *Key inclusion*

criteria were: patients of both sexes aged 18 years or older with chest pain lasting more than 30 min, ST segment elevation in 2 contiguous leads of at least 1 mm except = 2 mm in V2-3 or presumed new onset left bundle branch block (LBBB). Successful reperfusion after thrombolytic therapy in patients who underwent pharmaco-invasive strategy was defined as at least 50 % ST segment resolution in the lead with maximum elevation in baseline ECG, improvement of chest pain. K*ey exclusion criteria* were: absolute contraindications for thrombolytic therapy, evidence of mechanical complications of MI including cardiogenic shock, noncardiac condition limiting life expectance to less than 6 months, evidence of pre-existing multi-vessel disease not amenable for revascularization, evidence of pre-existing more than stage 2 chronic kidney disease (CKD) defined as creatinine clearance less than 60 ml/Kg/min, evidence of pre-existing peripheral vascular disease precluding rapid emergent vascular access and patient refusing to give consent.

Study medication : Tenecteplase was the fibrinolytic agent used in those scheduled for pharmaco-invasive strategy and was given in the standard dosing regimen (It should be administrated on the basis of body weight, with a maximum dose of 50mg Tenecteplase) and was combined with low molecular weight enoxaparin (30-mg intravenous bolus followed by subcutaneous injection of 1 mg per kilogram of body weight [0.75 mg per kilogram for patients =75 years of age] every 12 hr) except for patients 75 years of age or older, in whom the intravenous bolus was half of the dose. In patients who were scheduled for PPCI; clopidogrel in a 600-mg loading dose (300mg for patients >75 years of age) followed by 75 mg daily for 6 month or Ticagrelor 180 mg loading dose followed by 90 mg twice daily for 6 month. In those scheduled for pharmaco-invasive strategy, clopidogrel in a loading dose 300 mg was given followed by 75 mg daily. Aspirin (300 mg) immediately followed by 75 mg daily was applied in all patients. Beta blockers and ACEIs were given to all patients.

Primary PCI
Un-fractionated heparin (UFH) of 10000 units' bolus dose was given after sheath insertion. The procedure was done according to the standard technique for coronary angiography and PCI. Transradial approach was done in all patients using 6 Fr sheaths. Diagnostic coronary angiography was done to explore non-infarct related artery. XB or Judkin left guide catheters were used for PCI of lesions in the left system, while Judkin right catheters for lesions in right coronary artery (RCA). Thrombus

aspiration and glycoproteins inhibitors (Eptifibatide or Tirofiban intracoronary bolus followed by intravenous infusion for 12 hr) were used in lesions with heavy thrombus burden and or impaired TIMI flow after the procedure. The operator determined the length and diameter of implanted stents. Sheaths were removed immediately or 4hours after post procedure.

Study protocol

After initial presentation and full clinical assessment, purposive sampling was done and patients were enrolled and divided into two groups, Group (I): Primary PCI. Group (II): Pharmaco-invasive strategy (immediate fibrinolysis followed 3 to 24 hour later by coronary angiography and PCI). (Figure 1).

Study Flow Chart
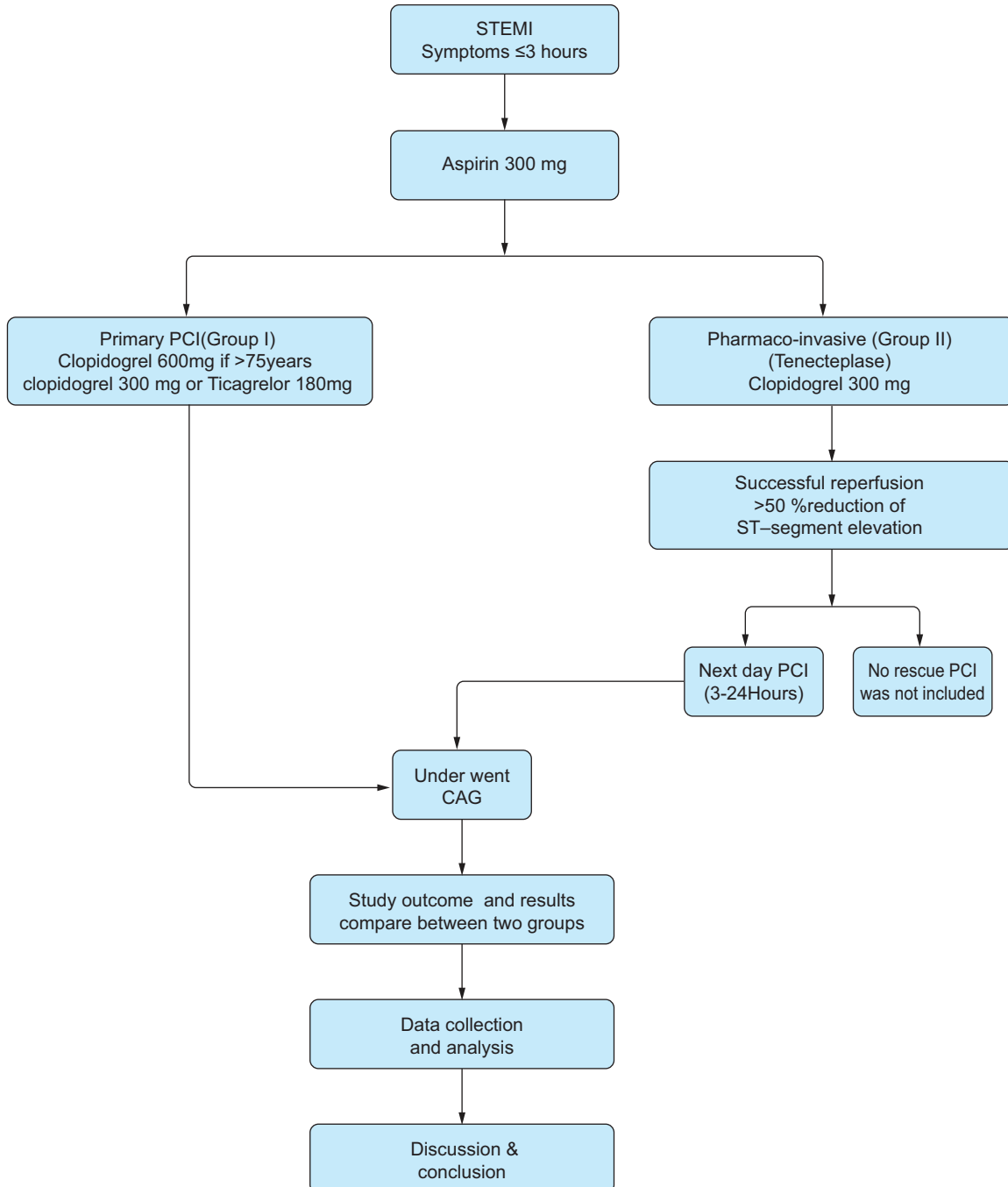
Study outcome

The main outcomes analyzed were all-cause death, cardiogenic shock, acute left ventricular failure, life threating arrhythmia, acute stent thrombosis, CVD, Contrast induced nephropathy(CIN),re-infarction, target-vessel revascularization, and major bleeding up to 7 days.

Statistical analysis

Data management and statistical analysis were done using IBM SPSS software version 23. Numerical data was summarized as mean and standard deviation or median and range. Categorical data was summarized as numbers and percentages. Comparisons between the two groups as regard numerical variables were done using independent t test and Categorical data were analyzed by chi- square($X2$) test. A p-value of less than 0.05 was considered significant in all statistical analyses.

Results:

One hundred twenty two (n=122) consecutive patients with STEMI who were admitted to the coronary care unit (CCU) at Ibrahim Cardiac Hospital & Research Institute, Dhaka in the period from April 2022 to July 2022 were included.

- Mean age : 53.86±9.97 years
- Male : Female : 88.5:11.5
- LVEF:46.03±5.750%

Table-I

Baseline characteristics & Risk factor

| Characteristics	Primary PCI-Group-I (n=61) %	Pharmaco Invasive-Group-II (n=61) %	P-value
Male	52(85.2%)	56(45.9%)	
Female	9(14.8%)	5(4.1%)	
Risk Factor			
HTN	39(63.9)	37(30.3%)	0.179
DM	29(47.5%)	30(24.6%)	0.290
DL	47(77%)	36(29.5%)	0.065
Family History	23(37.7%)	14(11.5%)	0.433
Smoking Habit	28(45.9%)	29(23.8%)	0.064
Ex-smoker	9(14.8%)	14(11.5%)	
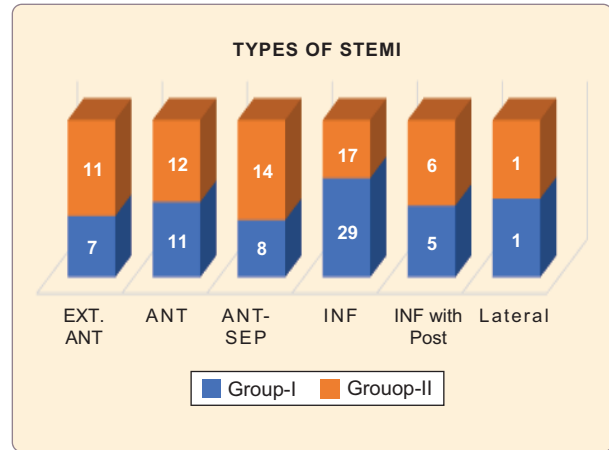
Group-I-Primary PCI, Group-II-Pharmaco-Invasive
Fig.-1: *Types of STEMI*
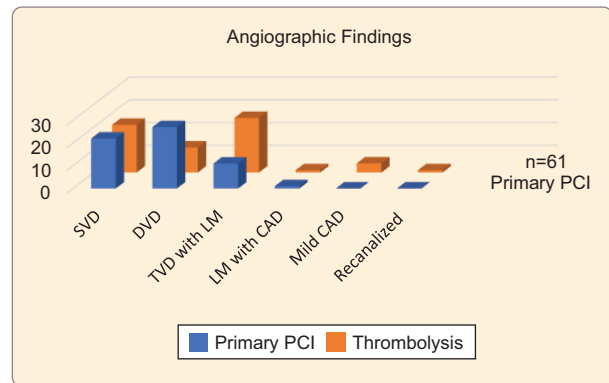
Group-I-Primary PCI, Group-II-Pharmaco-Invasive
Fig.-2: *Angiographic Findings*
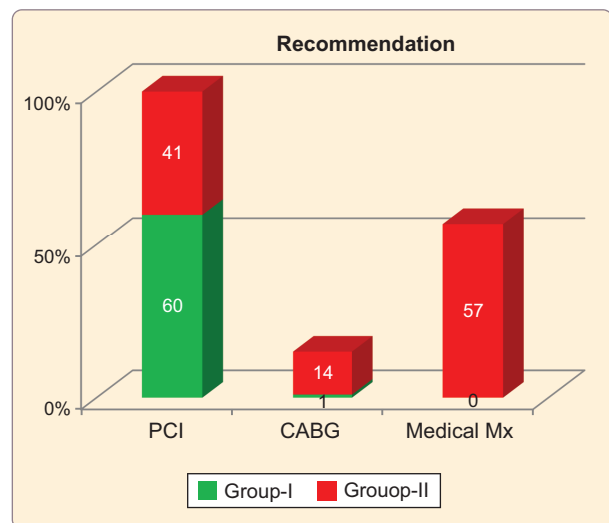
Group-I-Primary PCI, Group-II-Pharmaco-Invasive
Fig.-3: Recommendation after Coronary Angiogram

Table-II
Use of GPI and P2Y12

Use of drug	PPCI(n=61)	Pharmaco-Invasive(n=61)	P value
GPI	1(1.6%)	2(3.3%)	0.895
Clopidogrel	14(23%)	14(23%)	0.165
Prasugrel	34(55.7%)	2845.9%)	0.214
Ticagrelor	13(21.3%)	19(31.1%)	0.132

Table-III
In Hospital Outcomes

Out come	Group-I N=61(%)	Group-II N=61(%)	P-Value
Cardiogenic shock	4(6.6%)	3.3	0.143
LVF	9(14.8%)	5.7	0.378
Arrhythmia	3(4.9%)	4.1	0.114
Acute stent thrombosis	1(1.6%)	0	—
CVD	1(1.6%)	0	—
CIN	1(1.6%)	0.8	0.897
All cause mortality	1(1.6%)	0.8	0.897
Re-infarction	0	0	
TVR	0	0	

Discussion:

Immediate fibrinolysis followed by coronary angiography 3-24 hours later resulted in similar short- term outcome and earlier effective reperfusion in patients with STEMI compared to PPCI. The mean age of whole study population was 49.6 years ranging from 30 to 65 years. These results were in accordance with Sobhy M et al. who conducted a registry assessing the current situation of Egyptian patients with acute STEMI. The mean age in the registry was 56.01 ± 10.61 years.[7]

Our study suggests that, compared with PPCI, FL followed by PCI performed in the hospital setting is associated with similar mortality rates in patients with STEMI.

Large-scale trials with longitudinal follow-up are necessary to determine late outcomes between two groups.

Limitation: Limitation of this study is lack of longitudinal follow-up. However, primary percutaneous coronary intervention has been associated with long-term reductions in mortality and reinfarction in RCTs, but there was no conclusive evidence for a long-term benefit in mortality and reinfarction in observational studies.

Reference :

1. Task Force on the management of ST-segment elevation acute myocardial infarction of the European Society of Cardiology (ESC). ESC guidelines for the management of acute myocardial infarction in patients presenting with ST-segment elevation. Eur Heart J. 2012;33:2569–19.

2. 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.

3. Armstrong P, Gershlick A, Goldstein P, Wilcox R, Danays T, Bluhmki E, et al. The Strategic Reperfusion Early after Myocardial Infarction (STREAM) study. Am Heart J. 2010;160(1):30-5.

4. Pinto DS, Kirtane AJ, Nallamothu BK, Murphy SA, Cohen DJ, Laham RJ, et al. Hospital delays in reperfusion for ST-elevation myocardial infarction: implications when selecting a reperfusion strategy. Circulation. 2006;114:2019–25.

5. Bonnefoy E, Lapostolle F, Leizorovicz A, Steg G, McFadden EP, Dubien PY, et al. Primary angioplasty versus prehospital fibrinolysis in acute myocardial infarction: a randomised study. Lancet. 2002;360:825–9.

6. Armstrong PW, Gershlick AH, Goldstein P, Wilcox R, Danays T, Lambert Y,et al. Fibrinolysis or primary PCI in ST-segment elevation myocardial infarction. N Engl J Med. 2013;368:1379–87.

7. Danchin N, Puymirat E, Steg PG, Goldstein P, Schiele F, Belle L, et al. Five-year survival in patients with ST-segment-elevation myocardial infarction according to modalities of reperfusion therapy: the French. Registry on Acute ST-Elevation and Non-ST-Elevation Myocardial Infarction (FAST-MI) 2005 Cohort. Circulation. 2014;129:1629–36.