Indian Heart Journal xxx (2016) xxx–xxx

Contents lists available at ScienceDirect

Indian Heart Journal

journal homepage: www.elsevier.com/locate/ihj

Original Article

A comparison of rescue and primary percutaneous coronary interventions for acute ST elevation myocardial infarction

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ARTICLE INFO

Article history:
Received 14 August 2015
Accepted 28 February 2017
Available online xxx

Keywords:
Angioplasty
Infarction
Reperfusion

ABSTRACT

Objective: To perform a comparative analysis of in-hospital results obtained from patients with acute ST elevation myocardial infarction (STEMI), who underwent rescue or primary percutaneous coronary intervention (PCI). The aim is to determine rescue PCI as a practical option for patients with no immediate access to primary PCI.

Methods: From the Cardiology PCI Clinic of the National Hospital of Sri Lanka (NHSL), we selected all consecutive patients presenting with acute STEMI </= 24 h door-to-balloon delay for primary PCI and </= 72 h door-to-balloon delay, (90 min after failed thrombolysis) for rescue PCI, from March 2013 to April 2015 and their in-hospital results were analyzed, comparing rescue and primary PCI patients.

Results: We evaluated 159 patients; 78 underwent rescue PCI and 81 underwent primary PCI. The culprit left anterior descending (LAD) vessel (76.9% vs. 58.8%; P = 0.015) was more prevalent in rescue than in primary patients. Thrombus aspiration was less frequent in rescue group (19.2% vs. 40.7%; p = 0.004). The degree of moderate-to-severe left ventricular dysfunction reflected by the ejection fraction <40% (24.3% vs. 23.7%; P = 0.927) and prevalence of multivessel disease (41.0% vs. 43.8%; P = 0.729) revealed no significant difference. Coronary stents were implanted at similar rates in both strategies (96.2% vs. 92.6%; P = 0.331). Procedural success (97.4% vs. 97.5%; P = 0.980) and mortality rates (5.1% vs. 3.8%; P = 0.674), were similar in the rescue and primary groups.

Conclusion: In-hospital major adverse cardiac events (MACE) are similar in both rescue and primary intervention groups, supporting the former as a practical option for patients with no immediate access to PCI facilities.

1. Introduction

Percutaneous coronary intervention (PCI) and fibrinolytic therapy and are two efficient methods used to advocate restoration of myocardial circulation in patients with acute myocardial infarction (AMI).[1] However, in patients undergoing fibrinolytic treatment, the restoration of normal epicardial flow of thrombolysis in myocardial infarction (TIMI) grade 3 is not achieved in a significant number of cases.[2,3] This promotes rescue PCI strategy, early after failure of fibrinolytic treatment, as a viable treatment option.

Class IA evidence has established that primary PCI is apparently the preferred therapy for acute ST-elevation myocardial infarction (STEMI).[4,5] In order for PCI to be of maximal benefit to the patient, however, the procedure must be performed within an ideal time interval at a well-equipped facility with skilled staff, that provides 24/7 service; this kind of environment is not readily accessible under different circumstances for all STEMI patients. Furthermore, there is a difference in prevalence of using primary PCI, between countries as well as areas within the same country.

In Sri Lanka, difficulties to reach centers that offer primary PCI in a timely manner makes rescue PCI a crucial therapeutic option for patients who fail reperfusion. The clinical impact and the

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http://dx.doi.org/10.1016/j.ihj.2017.02.019

selection of the precise strategy is still controversial, however it still yields non inferiority when compared with those of a primary procedure.[6–9]

Therefore, depending on available facilities for early PCI, both primary and rescue PCI strategies are proving to be effective for coronary reperfusion.[10] The objective of this study was to perform a comparative analysis of the outcomes of rescue and primary PCI performed at the Cardiology Unit-5, NHSL over a period of 2 years (March 2013–April 2015).

2. Methods

This was a cross-sectional study conducted at Cardiology Unit-5, National Hospital of Sri Lanka (NHSL). Consecutive patients presenting with an acute ST elevation myocardial infarction (STEMI) who underwent primary or rescue PCI with either balloon or coronary stent implantation, performed by a single unit invasive cardiologist members, within the study period from March 2013 to April 2015, were recruited at the time of the procedures. Those who received prior thrombolysis at the first contact point for the current event underwent rescue PCI due to failed thrombolysis while those who did not receive prior thrombolysis at the first contact point underwent primary PCI. Successful or failed thrombolysis is diagnosed based on an ECG done 90 min after administration of thrombolytics. Failed thrombolysis is defined when there is <50% ST segment resolution in a single lead showing maximum ST elevation in the baseline ECG,[11–13] persistent ongoing chest pain or cardiogenic shock (i.e. patients who required inotropic support to maintain a minimum systolic blood pressure of 90 mmHg before the PCI intervention). Patients underwent rescue PCI according to the discretion of the clinician, within the first 72 h of the acute event. In our study, streptokinase was the only fibrinolytic agent administered before rescue PCI was performed.

We analyzed case reports where primary PCI was performed within the first 24 h of AMI onset and rescue PCI was performed within the first 72 h of AMI onset i.e. 90 min after failed thrombolysis. The PCI procedure reports were collected from 2 cath labs by conventional means, and recorded on a prespecified database sheet. This report contains the clinical and angiographic baseline data, and procedural results. Occurrence of major in-hospital adverse cardiac events till the time of discharge was documented from patient records.

A diagnosis of STEMI was reached when patients presented with chest pain and ST elevation in two consecutive leads or with new onset LBBB (Left Bundle Branch Block) in electrocardiogram (ECG).[14] We have taken ST elevation in ECG as 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 (0.1 mV) in other contiguous chest leads or the limb leads.[15] The diagnosis of acute STEMI was made either at the NHSL or the peripheral hospitals where patients were transferred from.

In the event of a coronary stent implantation, all the patients were administered aspirin, clopidogrel, statin and heparin. Abciximab (Reopro) was administered at the operator's discretion, and was the only GP IIb/IIIa blocker recorded in the study.

We classified the AMI location as being anterior or non-anterior in relation to the culprit AMI vessel. The left ventricular ejection fraction and the diameter of stenosis of the vessels were analyzed with a qualitative method (visual), performed in 2 cath labs. Successful PCI was defined as a TIMI flow grade 3.[16] Major adverse cardiac events (MACE) were documented until the patient was discharged: recurrent chest pain associated with ECG changes as criteria for reinfarction, performance of a new PCI of the culprit vessel as target vessel-revascularization (TVR), in-hospital coronary artery bypass graft (CABG) surgery and all-cause deaths were taken into account.

Statistical analysis was done with SPSS 17.0 and STATA 13. All continuous variables were expressed as mean ± SD, while counts and percentages were used to express discrete variables. Chi-square test for evaluating dichotomous variables and the Student *t*-test for continuous variables were included in the univariate analysis. To establish the independent influence of each baseline variable in the in-hospital mortality rate, we used the Cox regression model. Characteristics which demonstrated a p value ≤ 0.25 with the log rank test were included into the model. P values ≤ 0.05 were considered significant.

Ethical clearance was obtained from the Ethics Review Committee of NHSL. Permission was taken from Director, NHSL to conduct the study at the Institute of Cardiology. Consent was not sought from the patients as data were extracted from patients' records and no additional investigations were done.

3. Results

From March 2013 to April 2015, 250 patients underwent primary and rescue PCI in Unit 5 of the Institute of Cardiology, NHSL, out of which 159 patients (63.6% from a total of 250 patients) fulfilled the aforementioned criteria. The data was analyzed in a comparative fashion: 78 (49.05%) patients underwent rescue PCI within 72 h door-to-balloon delay and 81 (50.94%) patients underwent primary PCI within 24 h door-to-balloon delay. Demographics and angiographic variables of the study population were analyzed (Table 1). Additionally, data regarding the use of a common glycoprotein inhibitor as well as the results of the PCI procedure were also recorded (Table 2).

4. Discussion

4.1. Significance of variables between the two strategies

In our study, rescue PCI (49.1%) was adapted as frequently as primary PCI (50.9%) to treat patients presenting with acute STEMI. Rescue and primary PCI procedures showed no significant association with regard to the patient's age group, sex, diabetes, active smoking or location of the myocardial infarctions. The angiographic variables revealed that, at the time of the rescue procedure, the reduction in ejection fraction was not discernible when compared to primary PCI. There was no notable difference in

Table 1
Baseline variables according to PCI procedure.

Characteristics	Rescue (n = 78)	Primary (n = 81)	p vlue
Age	52.31 [11.90]	53.14 [12.48]	0.669
Age >70	5 (6.4%)	7 (8.6%)	0.594
Females	12 (15.4%)	13 (16%)	0.908
Diabetes Mellitus	29 (38.2%)	33 (44.0%)	0.466
Previous Intervention	1 (1.4%)	5 (6.5%)	0.114
Anterior MI	53 (67.9%)	45 (55.6%)	0.108
Multivessel CHD	32 (41.0%)	35 (43.8%)	0.729
EF on admission	45.80%[8.01]	47.24%[8.10]	0.275
EF on discharge	48.88%[8.44]	51.50%[6.00]	0.049
Thrombus Aspiration	15 (19.2%)	33 (40.7%)	0.003
Culprit Vessel – LAD	60 (76.9%)	47 (58.8%)	0.015
SDT Time (mins.)	153.36 [258.88]	265.50 [644.31]	0.160
Severity of lesion			0.005
70%–99%	51 (65.4%)	35 (43.2%)	0.005
100% (total occlusion)	27 (34.6%)	46 (56.8%)	0.005
Hospital Stay (days)	5.48 [1.42]	5.14 (1.24)	0.129

(MI – Myocardial Infarction, CHD – Coronary heart disease, EF – Ejection Fraction, LAD – Left anterior descending, SDT – Symptom-to-door time).

Please cite this article in press as: M.B. Faslur Rahuman, et al., A comparison of rescue and primary percutaneous coronary interventions for acute ST elevation myocardial infarction, Indian Heart J (2017), http://dx.doi.org/10.1016/j.ihj.2017.02.019