TIMI Risk Score as A Predictor for No-Reflow Phenomenon in Patients Undergoing Primary Angioplasty for Acute STEMI

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Abstract

Background: Angiographic no-reflow phenomenon after primary Percutaneous Coronary Intervention (PCI) in patients with acute ST-elevation myocardial infarction (STEMI) may result in unfavorable outcome.

Objectives: The aim of the study was to evaluate the TIMI risk score of STEMI as a predictor of no-reflow phenomenon after primary PCI.

Patients and Methods: We analyzed 627 patients presenting with acute STEMI and underwent primary PCI within 24 hours of symptoms onset, we divided the patients into high risk patients (TIMI risk score >5) and low risk patients (TIMI risk score 0-4).

Results: The rate of no-reflow phenomenon was significantly higher in the high risk group compared to the low risk group (22% vs. 6.9% p<0.001), the c-statistics predictive value of the TIMI score for no reflow was 0.78 (p<0.001). After application of multivariate regression analysis, TIMI risk score of STEMI was an independent predictors of no-reflow phenomenon odds ratio 1.71 (CI 95% 1.31-2.1).

Conclusion: TIMI risk score of STEMI on admission can predict angiographic no-reflow phenomenon after primary PCI.

Key Words: No-reflow – STEMI – Primary PCI – TIMI risk score.

Introduction

REPERFUSION therapy, either pharmacological or mechanical, is the treatment of choice of patients with acute ST elevation acute myocardial infarction (STEMI) [1]. The primary Percutaneous Coronary Intervention (PCI) is superior to fibrinolysis and this has been demonstrated in several studies [2,3]. However, it has been observed that the benefit of primary PCI has been reduced in patients developing no-reflow phenomenon. Thus, prediction of patients developing no-reflow has great clinical importance to identify this group of patients at higher risk and to optimize their therapeutic management [4-6].

Risk stratification using the Thrombolysis in Myocardial Infarction (TIMI) risk score for STEMI is a simple assessment based on clinical data of patients at hospital admission [7]. It is applied to patients with acute STEMI to predict mortality and to identify patients at high risk of developing other adverse events [8].

Aim of the work:

The aim of the study was to evaluate the thrombolysis in myocardial infarction (TIMI) risk score of STEMI as a predictor of no-reflow phenomenon.

Patients and Methods

The current study was conducted on 627 patients admitted with acute STEMI and were subjected to primary percutaneous coronary interventions. All patients were admitted to Cairo University Hospitals, Critical Care Department, starting from December 2004 to January 2013.

We included patients who presented with STEMI fulfilling the following criteria: Prolonged (>30 minutes) ischemic chest pain, ECG: ST segment elevation (≥1 mm) in 2 or more contiguous leads or new LBBB or ECG findings suggestive of posterior infarction and Presentation <24 hours from symptom onset.

We excluded patients who presented with acute STEMI and had contraindication to primary angioplasty and those with acute in-stent thrombosis.

Data collection:

Data were collected through reviewing patients’ medical records, angiographic films and reports and follow-up records.
**Procedural data:**

Unless contra-indicated all patients received; Aspirin 300mg, nitroglycerin infusion, oxygen supplementation and intravenous bolus of 5000-10000 units of Heparin. All patients received Clopidogrel (loading 300-600mg at the operator’s discretion, followed by 75mg per day).

Diagnostic coronary angiography was done aiming at: A) Assessment of the extent and number of affected coronaries. B) Identification of infarct related artery (IRA) and the site of occlusion (proximal, mid-segment or distal). C) Determination of TIMI flow grading before and after the procedure.

Under clinical, electrocardiographic and hemodynamic monitoring; All patients were subjected to primary intervention aiming at salvage of the myocardium at the distribution of the IRA, Coronaries were accessed through right femoral artery, using modified Seldinger technique. Variety of guiding catheters and guide wires were used and different modalities were used including; PTCA without stenting, PTCA and stenting, pre-stenting thrombectomy device or direct stenting. Balloon, stent size and type selection was primarily based on visual assessment of vessel size and lesion length.

**TIMI risk score for STEMI:**

TIMI risk score for STEMI was calculated for each patient using the variables obtained at admission according to the published criteria (Table 1) [7].

After the analysis of the post intervention data, patients were classified into two groups: The low risk group (TIMI risk score 0-4) and the high risk group (TIMI risk score ≥5).

<table>
<thead>
<tr>
<th>Clinical risk indicators</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>History:</td>
<td></td>
</tr>
<tr>
<td>Age, yrs</td>
<td>3</td>
</tr>
<tr>
<td>≥75</td>
<td>2</td>
</tr>
<tr>
<td>65-74</td>
<td>1</td>
</tr>
<tr>
<td>History of diabetes, hypertension or angina</td>
<td></td>
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<tr>
<td>Examination:</td>
<td></td>
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<tr>
<td>Systolic blood pressure ≤ 100mmHg</td>
<td>3</td>
</tr>
<tr>
<td>Heart rate &gt;100/minute</td>
<td>2</td>
</tr>
<tr>
<td>Killip class II-IV</td>
<td>2</td>
</tr>
<tr>
<td>Weight &lt;67kg</td>
<td>1</td>
</tr>
<tr>
<td>Presentation:</td>
<td></td>
</tr>
<tr>
<td>Anterior ST elevation or left bundle branch block</td>
<td>1</td>
</tr>
<tr>
<td>Time to reperfusion therapy &gt;4 hours</td>
<td>1</td>
</tr>
<tr>
<td>Total possible points</td>
<td>14</td>
</tr>
</tbody>
</table>

Table (1): Elements of the TIMI risk score.

**Statistical analysis:**

Data were collected and coded prior to analysis using the professional statistical Package for Social Science (SPSS 17). All data were expressed as mean and Standard Deviation (SD). Frequency tables for all categorical data. Student t-test (unpaired) after checking normality was used for all continuous data. Mann Whitney test was used when the value of standard deviation was violated. Chi-square test was used for all categorical data to test for the presence of an association. Receiver Operating Characteristics (ROC) curve analysis was conducted to explore the discriminate ability of TIMI risk score to predict no reflow. p-value <0.05 and area under the curve AUC ≥0.75 were considered significant.

**Results**

After the analysis of the post intervention data 78 patients (12.4%) developed no-reflow phenomenon (TIMI flow grade less than 3) after primary PCI.

Based upon the TIMI risk score of STEMI, patients were classified as low risk group with TIMI risk score 0-4 (n=401, 64%) high risk group with TIMI risk score ≥5 (n=226, 36%). The prevalence of no-reflow phenomenon was significantly higher in the high risk group compared to the low risk group. (22% vs. 6.9% respectively, p<0.001).

The ROC curve analysis showed that TIMI risk score for STEMI was highly predictive of no-reflow phenomenon with a c-statistics of 0.78 (CI 95% 0.71-0.85), a cut off value of TIMI risk score 4 predicted no-reflow Fig. (1).

![ROC curve for TIMI score & no-reflow](image)

Fig. (1): ROC curve analysis showing the power of TIMI risk score to predict no reflow.

Average TIMI risk score for STEMI was significantly higher in the patients who developed no-reflow compared those with optimal flow post intervention (4.4 ± 1.7 vs. 2.8 ± 1.7 respectively, p<0.001).
Multivariate regression analysis was done to determine the independent predictors of no-reflow phenomenon. As TIMI risk score increase by one unit the odds of no reflow increased by 1.71, (CI 95% 1.31-2.1, p < 0.001).

**Discussion**

The TIMI risk score of STEMI is a clinical stratification that uses the data obtained at hospital admission to classify patients into high risk and low risk groups \[9,10\]. Although this score was initially developed to predict mortality \[10,11\], an important result in our study is can also predict no-reflow phenomenon which bears poor hospital outcome.

Our results showed that the Average TIMI risk score for STEMI was statistically significant higher in the patients who developed no-reflow after primary PCI (4.4 ± 1.7) compared to those with optimal flow (2.8 ± 1.7) \(p<0.001\), and that the prevalence of no-reflow was significantly higher in the high risk group (TIMI risk score ≥5) compared to the low risk group (22% vs. 6.9% respectively, \(p<0.001\)).

This was in concordance with González-Pacheco et al., \[12\] who reported an overall frequency of no-reflow after primary PCI of 16.4%, with significantly higher prevalence of this phenomenon in the high-risk group than in the low-risk group (22.4% vs. 13.6% respectively, \(p\)-value 0.01).

Jeong et al., \[13\] also reported a statistically significant higher TIMI risk score on admission in the no-reflow group compared to the optimal flow group (5.5 ±2 vs. 3.8 ±2.2 respectively, \(p\)-0.004).

**Conclusions:**

TIMI risk score of STEMI can predict no-reflow phenomenon and thus can be used to stratify STEMI patients into low or high risk for angiographic no-reflow.

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**References**


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