Comparison of Prediction Between TIMI (Thrombolysis in Myocardial Infarction) Risk Score and Modified TIMI Risk Score in Discharged Patients From Emergency Department With Atypical Chest Pain

Mohsen Abbasnezhad 1; Hassan Soleimanepour 2; Mohamadreza Sasaei 3; Samad EJ Golzari 4; Saeid Safari 5; Maryam Soleimanepour 6; Robab Mehdizadeh Esfanjani 7

1Department of Cardiology, Tabriz University of Medical Sciences, Tabriz, IR Iran
2Cardiovascular Research Center, Tabriz University of Medical Sciences, Tabriz, IR Iran
3Students’ Research Committee, Tabriz University of Medical Sciences, Tabriz, IR Iran
4Medical Philosophy and History Research Center, Tabriz University of Medical Sciences, Tabriz, IR Iran
5Department of Anesthesiology and Critical Care, Iran University of Medical Sciences, Tehran, IR Iran
6Gastroenterology Research Center, Tabriz University of Medical Sciences, Tabriz, IR Iran
7Neurosciences Research Center, Tabriz University of Medical Sciences, Tabriz, IR Iran

*Corresponding Author: Hassan Soleimanepour, Cardiovascular Research Center, Tabriz University of Medical Sciences, Tabriz, IR Iran. Tel: +98-940646834, Fax: +98-48352278, E-mail: soleimanepourh@tbzmed.ac.ir

Received: July 31, 2013; Revised: November 29, 2013; Accepted: January 1, 2014

Background: Chest pain is one of the most common causes of the admission to the emergency departments. It, however, can be due to numerous diseases some of which are life threatening.

Objectives: In the current study, we evaluated the prognostic value of TIMI (Thrombolysis in Myocardial Infarction) and Modified TIMI risk scores to stratify the risk for patients with atypical chest pain in the emergency department.

Patients and Methods: In a prospective-analytic study, we collected data from 1020 patients with atypical chest pain enrolled to the study. All eligible patients were visited by the emergency medicine residents who were trained for this study. Based on the criteria in both systems, the emergency medicine attending decided on either discharging or hospitalizing patients. Patients were allocated into 2 equal groups randomly. In order to predict the opposing accidents in 30 days (coronary revascularization, myocardial infarction, and all-cause death) TIMI risk scores and Modified TIMI risk scores were assessed based on TIMI risk score (0 or 1) and Modified TIMI risk score (0 or 1).

Results: No significant difference could be observed between both groups regarding demographic characteristics, ejection fraction, left ventricle hypertrophy, TRS criteria, risk factors and the history of coronary artery stenosis. None of the atypical chest pain patients discharged based on TIMI and modified TIMI risk scores experienced any adverse events.

Conclusions: The results obtained from this study support the idea that the TIMI and modified TIMI risk scores might be valuable tools that could be used to stratify the risk of patients with atypical chest pain in the emergency department.

Keywords: Thrombolysis; Myocardial Infarction; Emergency Department; Atypical Chest Pain

1. Background

Chest pain is one of the most common reasons of the patients’ referral to the emergency departments (EDs). It, however, can be due to numerous diseases some of which are life threatening. Cardiovascular diseases, aortic dissection, pulmonary embolism, pneumothorax, and pericarditis are some of the fatal diagnoses associated with chest pain. Acute coronary syndrome (ACS), as one of the most important causes of chest pain with a high associated mortality rate, is of great importance and should be diagnosed as early as possible (1). Approach to the chest pain, either typical or atypical, consists of a primary rapid evaluation of differentiating its being typical or a typical. Atypical chest pain cannot rule out MI especially in the female or diabetic patients; therefore, numerous studies have been performed on the more appropriate diagnosis of ACS emergency setting (2).

In other words, atypical chest pain is a common clinical problem which the physicians working in the internal medicine, emergency medicine, and cardiology departments are faced with. Atypical chest pain is mostly seen in the young female patients which is a rarely of the coronary arteries origin. However, whenever of a cardiac origin, it is associated with an additional 7% mortality rate compared with male patients at the same age. Most of these patients undergo angiography to rule out the chance of the coronary artery disease (3). Therefore, one of the major problems is to determine if the existing chest pain is related to ACS or not. A definite criterion is essential to assist us in deciding on if the patient requires hospitalization for further evaluations (4-6).

Implication for health policy/practice/research/medical education:

Atypical chest pain is a common clinical problem which the physicians working in the internal, emergency, and cardiology departments are faced with. In the current study we investigated the prognostic value of TIMI and Modified TIMI risk scores to risk stratify patients with atypical chest pain being discharged from the emergency department. We concluded that both TRS and MTRS could be used for risk prediction in patients discharged with atypical chest pain from the EDs.

Copyright © 2014, Iranian Red Crescent Medical Journal; Published by Kowsar Corp. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.
TIMI Risk Score (TRS) which is used to determine the risk for patients with ACS and is mostly used for patients having chest pain syndrome with unstable angina or myocardial infarction without ST segment elevation (NSTEMI). The scoring uses seven major criteria, each measured as one score, as following (7-11):

1. Age older than 65 years
2. Coronary artery stenosis of more than 50%
3. More than two cardiac disease risk factors
4. History of taking aspirin in the previous seven days
5. Incidence of more than one spell of chest pain within the previous 24 hours
6. ECG changes rather than STEMI
7. Elevated serum levels of cardiac biomarkers

Score Interpretation for TIMI scoring system would be as featured as % risk at 14 days of all-cause mortality, new or recurrent MI, or severe recurrent ischemia requiring urgent revascularization:

<table>
<thead>
<tr>
<th>Score</th>
<th>Risk %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Score of 6-7</td>
<td>≥ 40.9 % risk</td>
</tr>
<tr>
<td>Score of 5</td>
<td>26.2 % risk</td>
</tr>
<tr>
<td>Score of 4</td>
<td>19.9 % risk</td>
</tr>
<tr>
<td>Score of 3</td>
<td>13.2 % risk</td>
</tr>
<tr>
<td>Score of 2</td>
<td>8.3 % risk</td>
</tr>
<tr>
<td>Score of 0-1</td>
<td>4.7 % risk</td>
</tr>
</tbody>
</table>

The criteria used in Modified TIMI Risk Score (MTRS) are comparable to that of TRS; while in Modified TIMI, the scoring stays between 0-10 and a score of 5, if positive (with a total maximum score of five), reflects cardiac biomarker changes or ECG (6).

2. Objectives

In the current study, we evaluated the risk of the patients with atypical chest pain using previously-introduced risk scores of TIMI and Modified TIMI.

3. Patients and Methods

In a prospective-analytic study carried out in the ED of Shaheed Madani hospital, Tabriz, IR Iran from 2011-2012, patients over 25 years old and with atypical chest pain were included. The Exclusion criteria were as following: age younger than 25 years old, diagnosed STEMI, pregnancy, hospitalization due to other reasons (chronic renal failure requiring dialysis, myocardial contusion, pregnancy), and cases for which follow-up was not practical. This study was approved by the Ethics Committee of "Tabriz University of Medical Sciences" and registered under the Code Number of 8966. After obtaining written informed consents from all patients, ECGs were taken and cardiac Troponin-I enzyme (cTnI) were checked on admission and 12 hours post-symptoms onset. Echocardiography and left ventricle hypertrophy were of no significant difference in both groups (Table 1, Figure 2).

4. Results

Within the one-year period of the study, 1020 patients with atypical chest pain were allocated to the study from which 20 people were excluded due to unavailability of follow-up for adverse events (MI, revascularization, death) and finally 1000 people (500 people for each group) including 595 (59.5 %) males and 405 (40.5%) females were studied. The mean age of the studied patients was 47.72 ± 13.59 years (the youngest and oldest patients were 25 and 91 years old, respectively). Demographic characteristics, ejection fraction, and left ventricle hypertrophy were of no significant difference in both groups (Table 2).

None of the atypical chest pain patients discharged based on TIMI and modified TIMI risk scores experienced any adverse events. No statistically significant difference was observed between both groups regarding TRS criteria, risk factors and the history of coronary artery stenosis; however, a significant difference was detected regarding the number of patients using aspirin (Tables 2 -4).

5. Discussion

From all patients with atypical chest pain referring to the ED, almost 7% have been reported to have ECGs with the signs of ischemia or MI and only do 6-10% of the patients have primary positive cardiac enzymes. Rest of the patients, despite not fulfilling the required diagnostic criteria, could also have ACS demanding further tests for confirming or ruling out ACS (5). TIMI Risk Score has been reported to be of high success rate in many studies. In a study carried out by Chase et al. it was suggested that the higher the TRS, the more increased the probability of one-month adverse events (death, acute myocardial infarction, and coronary revascularization) (7). In a recent study carried out by Kelly, patients having chest pain with normal ECG, TRS of zero and normal cardiac enzyme levels have been reported to be highly improbable to experience adverse events (8).
**Table 1.** Demographic Characteristics and Echocardiographic Findings in Two Groups  

<table>
<thead>
<tr>
<th></th>
<th>Group I</th>
<th>Group II</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age Mean ± SD, y</td>
<td>47.58 ± 5.13</td>
<td>47.84 ± 13.66</td>
<td>0.761</td>
</tr>
<tr>
<td>Ejection Fraction, Mean ± SD</td>
<td>57.24 ± 4.72</td>
<td>57.25 ± 5.24</td>
<td>0.983</td>
</tr>
</tbody>
</table>

**Figure 1.** Flow Diagram of Study

**Table 2.** Comparison of the TIMI in Both Groups  

<table>
<thead>
<tr>
<th>TIMI Criteria</th>
<th>Group I, No. (%)</th>
<th>Group II, No. (%)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>More than 3 risk factors</td>
<td>16 (3.2)</td>
<td>13 (2.6)</td>
<td>0.572</td>
</tr>
<tr>
<td>Age over 65 years old</td>
<td>51 (10)</td>
<td>39 (7.8)</td>
<td>0.185</td>
</tr>
<tr>
<td>Stenosis history</td>
<td>9 (1.8)</td>
<td>15 (3)</td>
<td>0.215</td>
</tr>
<tr>
<td>ST segment changes</td>
<td>8 (1.6)</td>
<td>0</td>
<td>NA</td>
</tr>
<tr>
<td>More than two chest pain reports within previous 24 hours</td>
<td>11 (2.2)</td>
<td>17 (3.4)</td>
<td>0.250</td>
</tr>
<tr>
<td>Aspirin Consumption</td>
<td>27 (5.4)</td>
<td>64 (12.8)</td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td>Increased cardiac enzymes</td>
<td>0</td>
<td>0</td>
<td>NA</td>
</tr>
</tbody>
</table>
Table 3. Comparison of the Risk Factors Between Two Groups

<table>
<thead>
<tr>
<th>Risk Factors</th>
<th>Group I, No. (%)</th>
<th>Group II, No. (%)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypertension</td>
<td>165 (33)</td>
<td>148 (29.6)</td>
<td>0.246</td>
</tr>
<tr>
<td>Diabet mellitus</td>
<td>41 (8.2)</td>
<td>34 (6.8)</td>
<td>0.401</td>
</tr>
<tr>
<td>Cigarette smokers</td>
<td>97 (19.4)</td>
<td>102 (20.4)</td>
<td>0.692</td>
</tr>
<tr>
<td>Familial history</td>
<td>27 (5.4)</td>
<td>21 (4.2)</td>
<td>0.375</td>
</tr>
<tr>
<td>Hyperlipidemia</td>
<td>79 (15.8)</td>
<td>74 (14.8)</td>
<td>0.661</td>
</tr>
</tbody>
</table>

Table 4. History of Coronary Artery Stenosis

<table>
<thead>
<tr>
<th>History of Coronary artery stenosis</th>
<th>Group I, No. (%)</th>
<th>Group II, No. (%)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiac catheterization</td>
<td>3 (6)</td>
<td>3 (6)</td>
<td>NA</td>
</tr>
<tr>
<td>Previous angioplasty</td>
<td>10 (2.0)</td>
<td>4 (8)</td>
<td>0.106</td>
</tr>
<tr>
<td>Coronary artery bypass graft</td>
<td>2 (4)</td>
<td>10 (2)</td>
<td>0.020</td>
</tr>
</tbody>
</table>

Although TRS enables us to classify the unselected ED chest pain population and achieve solid decisions, it is prone to missing 2-5% of the patients with myocardial infarction (4). In another study by Almagro et al. TRS was shown to be an appropriate predicted tool either in long-term or short-term in patients with atypical chest pain referring to the EDs (12). On the other hand, MTRS has been introduced as a superior scoring system of the risk evaluation in patients with undifferentiated chest pain referring to the EDs (6, 13). Unlike other studies, our study revealed that both TRS and MTRS have the equal predictive values in patients with atypical chest pain referring to the ED and none is superior to the other. Adverse complications could occur both in TRS and MTRS systems requiring precise clinical judgment and multi-element follow up for all patients.

5.1. Limitations

One of the limitations of the current study was its being single center studying only Iranian patients. In addition, we were not able to follow almost 20 patients. Another factor which may have posed selection bias leading to misclassification is the fact that our trained researchers were present in the emergency department for only 12 hours a day and seven days a week.

In conclusion both TRS and MTRS could be used for risk prediction in patients discharged with atypical chest pain from the EDs. However, future multi-center studies with higher sample volumes are recommended to approve the result obtained from the current study.

Acknowledgements

The authors are grateful to all the health personnel and patients who participated in the study, in addition to the data collectors, supervisors and administrative staff of Emergency department of Madani Hospital, Tabriz, Iran. Special thanks to Research Vice Chancellor Tabriz University of Medical Sciences for all the material and financial support in our study. “This article was written based on a dataset of specialty degree, registered in Tabriz University of Medical Sciences.”

Authors’ contributions

Mohsen Abbasnezhad, Hassan Soleimanpour, Mohamadreza Sanaie and Samad EJ Golzari, performed the clinical data collection, literature review, and drafting the manuscript. Saeid Safari, Maryam Soleimanpour and Robab Mehdizadeh Esfanjani undertook the major parts of the study design and performed the statistical analysis. All of the authors were involved in either managing the patients or writing the manuscript. All authors read and approved the final manuscript.

Financial Disclosure

There is no financial disclosure.

Funding Support

This article was supported by Research Vice Chancellor of Tabriz University of Medical Sciences, Tabriz, IR Iran.

References


لینک های مفید:

- عضویت در خبرنامه
- کارگاه های آموزشی
- سرویس ترجمه تخصصی STRS
- فیلم های آموزشی
- بلاگ مرکز اطلاعات علمی
- سرویس های ویژه