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ORIGINAL ARTICLE

Comparison of Diagnostic Accuracy of TIMI and Grace Risk Scores for Prediction of Severity of Disease in Coronary Arteries in Non-ST-Elevation Myocardial Infarction Patients

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ABSTRACT

Background and objective: The timing of interventions in cases of non-ST segment elevation myocardial infarction (NSTEMI) is subject to risk classification. Among patients with current non-ST-elevation myocardial infarction (NSTEMI), a small research assessed two risk scores: TIMI and GRACE.

Methods: Retrospective observational study of 68 patients over 4 years. Hospital admission TIMI and GRACE values were calculated. Mortality, re-infarction, heart failure, stroke, cardiac shock, and resuscitation were in-hospital endpoints. A 4-year follow-up showed all-cause and cardiac mortality. All data was analyzed using SPSS 22.0.

Results: There were 42 (61.8%) males and 26 (38.2%) females with mean age 63.4 years. Most common clinical outcomes were hypertension, hyperlipidemia, diabetes, ischemia stroke and renal insufficiency. 22 (32.4%) cases were smokers. In terms of both short-term and long-term outcomes, we discovered that GRACE risk scores outperformed TIMI risk scores.

Conclusion: Continuous TIMI and GRACE scores can predict NSTEMI outcomes in patients in a simple and promising way. GRACE exceeded TIMI both in-hospital and long-term outcomes.

Keywords: GRACE, TIMI, NSTEMI, Outcomes

INTRODUCTION

Acute non-traumatic chest pain (ANTCP) is the second leading cause of emergency room visits in industrialized nations. Nearly 70% of ANTCP patients who have a major adverse cardiac event (MACE) have an electrocardiogram (ECG) that shows a non persistent ST-elevation acute coronary syndrome (NSTE-ACS). To avoid needless admissions, costs related to additional testing, and incorrect discharges, it is vital for primary care emergency centers (PCECs) and emergency departments (EDs) to appropriately manage ANTCP suspected of NSTE-ACS[1-3].

On the one hand, patients require more ANTCP visits due to inadequate discharges, and within six weeks, some of those patients develop MACE. Acute myocardial infarction (AMI) was discovered to have occurred in 5 to 10% of patients discharged from the emergency room after receiving non-coronary ANTCP, according to a study conducted in the United States in 2010[4] Acute coronary syndrome (ACS) is present in 20% of patients undergoing ANTCP and likely NSTE-ACS visits, according to research by Owens et al.[5]. After diagnostic cardiac testing, half of the hospitalized patients who were suspected of having ACS were found not to have the condition. Only 10% of the time do these tests identify a heart problem, even though they cost $10 billion a year, or $3,000 to $6,000 each patient.

The leading cause of death worldwide is still cardiovascular disease[6]. The frequency of acute coronary syndromes (ACS) has increased dramatically in China over the past 30 years[7]. Heart attacks that do not involve ST-segment elevation are more common than those that do, and they are an integral aspect of acute coronary syndromes (ACS)[8]. Patients suffering from non-ST-elevation myocardial infarction (NSTEMI) have a range of clinical outcomes, including no complications or premature mortality, as stated in reference[9]. In order to make informed decisions about treatment, risk assessment was essential. According to the guidelines, individuals who are designated as high-risk upon admission should be treated with more aggressive and intrusive methods[10]. It is, therefore, essential to have a simple and reliable method of determining an individual's risk. In a study conducted on a Caucasian population, researchers evaluated GRACE and TIMI, two of the most popular prereperfusion ACS prediction algorithms[11]. Both GRACE and the user-friendly TIMI have demonstrated their usefulness in clinical settings, according to research1[2,13].

This observational study set out to accomplish two goals: first, to find out how accurate the GRACE and TIMI risk scores are at predicting outcomes; and second, to look at how patients with NSTEMI were distributed across the risk tertiles over the current reperfusion period.

MATERIALS AND METHODS

The study was conducted in cardiology department Timergara Teaching Hospital during April 2022 to November 2022. Total 68 patients were included in this study. Individuals admitted to the hospital with symptoms consistent with suspected acute coronary syndrome (ACS), abnormal electrocardiogram (ECG) findings indicative of ischemia, elevated cardiac biomarkers, and a history of coronary artery disease were all 18 years of age or older. I cited as [14]. Non-included were those with STEMI. Patients with a history of trauma, surgery, or other serious medical conditions were excluded. We enrolled non-ST-elevation myocardial infarction (NSTEMI) patients who presented with acute chest pain, elevated biomarkers for cardiomyocyte necrosis, and certain electrocardiogram (ECG) abnormalities, such as transient ST-segment elevation, depression (permanent or temporary), horizontal or inverted T waves, pseudo-normalization of T waves, or a normal ECG.

Risk ratings were computed using GRACE and TIMI upon admission. The following criteria must be met: age 65 or older, three coronary artery disease risk factors, coronary stenosis of 50% or more, usage of aspirin for at least seven days, acute angina with two or more episodes within a 24-hour period, and a positive cardiac marker using UA/NSTEMI TIMI. For 0–2, it was mild, for 3–4 it was medium, and for 5–7 it was high; for negatives, it was 0.

The GRACE score upon admission was established by age, heart rate, systolic blood pressure, initial blood creatinine (Cr), Killip categorization, cardiac arrest, initial cardiac enzymes positive, and ST-segment deviation. Individuals whose hemoglobin levels were less than 108, medium-risk, and high-risk, respectively, were classified as patients. These online risk calculators were utilized: https://www.outcomes-

umassmed.org/risk_models_grace_orig.aspx.according per the 2020 ESC standards. cited as[14].

We reserve the two risk ratings' prediction accuracy and convenience for use in determining the optimal risk score for our research population. Our method for categorizing TIMI medium-risk patients in GRACE ≥ 140 and GRACE < 140 groups was the combined score methodology.

Wilcoxon rank-sum tests on continuous medians with IQRs. Mantel-Haenszel $\chi 2$ tests were used to compare categorical variables as percentages. All data was analyzed with SPSS 22.0.

RESULTS

There were 42 (61.8%) males and 26 (38.2%) females with mean age 63.4 years. Most common clinical outcomes were hypertension, hyperlipidemia, diabetes, ischemia stroke and renal insufficiency. 22 (32.4%) cases were smokers.(table 1)

Table-1: Demographics of the presented cases

Variables	Frequency (68)	Percentage
Age	63.4	
Gender		
Male	42	61.8
Female	26	38.2
Clinical outcomes		
hypertension	30	44.1
hyperlipidemia	15	22.1
diabetes	13	19.1
ischemia stroke	6	8.8
renal insufficiency	4	5.8
Smokers		
Yes	22	32.4
No	46	67.6

The mean Grace score was 136.8 and mean TIMI score was 2.99 among all cases. Majority of the patients in GRACE score had high risk in 52 (76.5%) cases and in TIMI score majority of the cases 48 (70.6%) had medium risk among hospital events. All cause mortality in GRACE score was 16 (23.5%) and in TIMI score was 9 (13.2%) and cardiac mortality was 8 in GACE and 2 in TIMI score.(table 2)

Table-2: Impact of TIMI and GRACE risk scores on the incidence of in-hospital events and long-term consequences in patients

Variables	GRACE score	TIMI score	P Value
Hospitalized events			
High Risk	52 (76.5%)	14 (20.6%)	<0.005
Medium Risk	12 (17.6%)	48 (70.6%)	<0.001
Low Risk	4 (5.9%)	6 (8.8%)	0.327
All-Cause mortality			
Yes	16 (23.5%)	9 (13.2%)	<0.002
No	52 (76.5%)	59 (86.8%)	
Cardiac Mortality			
Yes	8 (11.8%)	2 (2.9%)	<0.002
No	60 (88.2%)	66 (97.1%)	

DISCUSSION

The best time to intervene in cases of non-ST-elevation myocardial infarction (NSTEMI) in the reperfusion era is still debatable, as is the best way to manage these patients in the long run based on their risk scores[15,16,17]. Also, because Asian and Caucasian patient features differ significantly, it is important to study NSTEMI patients' TIMI and GRACE risk scores[18]. To ensure that our study accurately assessed the discriminative power of GRACE and TIMI risk scores among East Asian NSTEMI patients, we omitted individuals with acute coronary syndrome (ACS), as these patients would most likely necessitate prompt aggressive invasive treatment according to risk classification. Within the framework of conventional clinical practice, this initial investigation examined the predictive power of these two primary risk scores for both in-hospital and out-of-hospital outcomes, as well as outcomes occurring more than four years later. East Asian populations differed significantly from Caucasian ones at their most basic level. Compared to the original GRACE cohort, our population had a higher prevalence of ischemia, stroke, diabetes, high blood pressure, and renal insufficiency, but a lower prevalence of hyperlipidemia, angina, myocardial infarction, bypass grafting for coronary and heart failure [19]. Potentially explaining the strikingly low hyperlipidemia prevalence in our sample are racial and lifestyle disparities between East Asians (5.2% vs. 43.6%). Similarly, whilst dyslipidemia was present in 53% of patients in European and American cohorts, it was only 9.5% in a massive Korean registry included 27,852 patients who had suffered an acute myocardial infarction[20]. For East Asian patients with non-ST-elevation myocardial infarction (NSTEMI), our study indicated that GRACE outperformed TIMI in predicting hospitalized events and long-term outcomes. The predictive power of both of these scores has already been studied for various ethnic NST-ACS/NSTEMI groups, including Latinos, Portuguese, and Britons[21,22,23]. A recent NSTEMI trial indicated that the GRACE score outperformed the TIMI score in predicting mortality within 28 days (AUC: 0.87 vs. 0.54)[24]. With an area under the ROC curve of 0.616 for the TIMI risk score and 0.750 for the GRACE risk score, another Korean study comparing 2184 individuals with NSTEMI came to these conclusions[25].

Almost no research has examined the long-term effects of these two risk ratings in East Asian populations. No research attempted to put a number on how much disagreement was anticipated between GRACE and TIMI risk scores. We learned that most patients were classified as high-risk by GRACE, although TIMI considered them medium-risk. Following previous research showing that TIMI typically labels high-risk patients as medium-risk, we found that GRACE high-risk individuals are as likely to suffer in-hospital events and long-term outcomes, just like the TIMI high group[13]. Because of this, doctors may begin to disregard these patients. Previous research that focused solely on Caucasian participants found the same thing. Using of TIMI score while the CMNW (Cheshire, Merseyside while North Wales Cardiac Network) score, respectively, an English investigation identified that sixty percent of the 104 patients with NSTE-ACS were deemed high risk, and sixty-four percent were deemed medium risk[22]. The predictive value is increased and diagnostic accuracy is improved by merging the TIMOTHY and GRACE scores, without sacrificing scoring convenience. We did not find any other study that specifically targets East Asian patients with non-ST-elevation myocardial infarction (NSTEMI), looks at the discrepancy in risk ratings, and finds the best way to stratify patients based on their risk for both short-term and long-term complications in the hospital.

In the end, a flawless risk score requires both accuracy and usefulness in categorization. One major drawback of the GRACE risk score is the "complexity" that people think it is, which means that it requires certain calculators to be used at healthcare facilities. In contrast, the TIMI score was widely utilized in emergency rooms and was considered to be easier to understand and implement than other risk assessments[26]. Risk ratings can be cumbersome and time-consuming to utilize at the bedside, which could discourage clinicians from doing so. Additionally, most patients who needed intrusive therapy did not end up in the emergency room. By merging the two scores, you can increase the composite risk score's diagnostic accuracy without sacrificing scoring convenience. This combination enhances patient care in routine clinical practice by making it easier to score more patients in the emergency room. It reaches a similar discriminative potency as the GRACE score while keeping the ease of use of the TIMI score.

CONCLUSION

Continuous TIMI and GRACE scores can predict NSTEMI outcomes in patients in a simple and promising way. GRACE exceeded TIMI both in-hospital and long-term outcomes.

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