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ORIGINAL ARTICLE

Comparison of clinical risk assessment systems in predicting three-vessel coronary artery disease and angiographic culprit lesion in patients with non-ST segment elevated myocardial infarction/ /unstable angina pectoris

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Abstract

Background: We wanted to compare the values of clinical risk assessments and scoring systems for predicting three-vessel diseases and culprit lesions by coronary angiography in patients with unstable angina pectoris (UAP), or non-ST segment elevation myocardial infarction (NSTEMI).

Methods: A total of 154 consecutive patients, (42 [27.3%] female, and 112 [72.7%] male, mean age: 63.0 ± 12.7 years) with UAP/NSTEMI were enrolled. Rizik and Braunwald classification, ACC/AHA risk assessment system, TIMI, GUSTO, GRACE and PURSUIT risk scores were determined, and the ROC curve was marked in accordance with the presence of three-vessel disease and culprit lesion.

Results: In patients with NSTEMI, the rates of three-vessel disease and culprit lesion were demonstrated to be higher. With respect to the presence of three-vessel disease, only the ACC/AHA risk assessment was manifested to have a predictive value. All risk scoring systems were demonstrated to bear predictive values with different sensitivity and specificity. The TIMI and GRACE risk scores were discovered to have higher predictive values. The presence of culprit lesions could not be predicted by any of the risk assessment or scoring systems.

Conclusions: Among risk assessment systems, only the ACC/AHA system can be used to predict three-vessel disease. It is possible to use all risk scoring systems for the same purpose. The predictive values of the TIMI and GRACE risk scores are higher. The culprit lesions cannot be predicted by any of the risk assessment or scoring systems. The use of cardiac enzymes seems more appropriate with very low sensitivity and specificity.

Key words: acute coronary syndrome, risk score, three-vessel disease, culprit lesion

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INTRODUCTION

Acute coronary syndrome (ACS) is the leading cause of mortality and morbidity in patients with coronary artery disease (CAD). ACS includes unstable angina pectoris (UAP), non-ST segment elevation myocardial infarction (NSTEMI), and ST segment elevation myocardial infarction (STEMI) [1]. The basic pathophysiological mechanism of ACS is a total or subtotal thrombotic occlusion of the coronary arteries due to atherosclerotic plaque rupture or erosion [1–3]. While total occlusion of a coronary artery results in STEMI, its subtotal occlusion leads to UAP/NSTEMI. ACS treatment strategies are planned on the basis of defined pathophysiological mechanisms [3]. While the main treatment of STEMI is urgent percutaneous or pharmacological coronary revascularisation, inten-

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sive medical therapy including antiplatelet, antithrombin and anti-ischaemic treatment, and an early invasive approach, are the main treatments for UAP/NSTEMI [4, 5]. Several clinical risk assessment systems are used to identify patients at high risk of UAP/NSTEMI. The Braunwald, Rizik and ACC/AHA risk classification systems are sufficient to give an impression of the clinical risk [6, 7]. Additionally, the TIMI, GUSTO, PURSUIT and GRACE scoring systems are widely used in routine clinical practice because of their proven value in large clinical trials [2, 8–13]. Indeed, it is impossible to separate the clinical risk from the extent of CAD. Although the prognostic values of risk assessment and scoring systems have been demonstrated in large-scale clinical studies, there have been only a limited number of studies comprehensively investigating the relationship between the extent of CAD or the presence of culprit lesions and the risk assessment and scoring systems. In fact, their value in predicting a coronary culprit lesion has not been documented until now.

The aim of this study was to compare the values of clinical risk assessments and scoring systems in predicting three-vessel disease and culprit lesion detected by coronary angiography in patients with UAP/NSTEMI.

METHODS

This prospective, cross-sectional study was conducted in the Cardiology Department of GATA Haydarpasa Training Hospital, Istanbul, Turkey, between October 2004 and March 2006. The study population comprised 154 consecutive patients who were diagnosed with UAP/NSTEMI and who had undergone coronary angiography.

Exclusion criteria:

1. Patients who had not undergone coronary angiography for any reason
2. Patients with a history of coronary bypass graft operation or percutaneous coronary intervention
3. Patients with a systemic disease (e.g. chronic inflammatory disease, rheumatic disease, a malignancy, vasculitis)
4. Patients with ACS after noncardiac surgery, or associated with gastrointestinal haemorrhage and stroke
5. Chronic haemodialysis patients

All consecutive patients were enrolled except patients excluded from the study. All patients gave informed consent, and the study was approved by the local Ethics Committee.

The diagnostic criteria and the treatment strategies proposed by the current guidelines were used in the study. UAP was diagnosed according to the following criteria: typical chest pain and/or electrocardiographic changes indicating myocardial ischaemia with negative cardiac enzymes. An NSTEMI diagnosis was based on elevated cardiac enzymes with typical chest pain and/or electrocardiographic changes suggestive of myocardial ischaemia. Typical chest pain was evaluated as follows: more than 20 min in duration, new-onset angina, and an increase in its frequency and duration or severity. ECG changes were either ST segment deviation or T wave changes. The cardiac enzymes evaluated in the study were cardiac troponin I (cTnI) and creatinine kinase-myocardial band (CK-MB). At least a two-fold increase in CK-MB was considered significant. In addition to the cardiac enzymes, routine biochemical parameters including C reactive protein values were also evaluated.

All patients were mainly treated with antiplatelets including acetylsalicylic acid and clopidogrel, heparin, a beta blocker, a statin and also an ACE inhibitor if indicated, as recommended by the current guidelines. The selection of the treatment and timing of the coronary angiography were left to the initiative of the coronary intensive care doctors. Coronary angiography was performed at the earliest time in patients with unstable haemodynamics, intractable arrhythmias, recurrent ischaemia and pulmonary congestion with reduced ejection fraction.

Risk assessment systems

Rizik's [7] and Braunwald's classifications [6], the ACC/AHA risk assessment system [2], and the TIMI [8, 9], GUSTO [10], PURSUIT [11] and GRACE [12, 13] risk scores were determined according to clinical and laboratory parameters, as previously described in the literature, in the study. The Rizik classification is organised according to the characteristics of the chest pain and ECG changes in patients with NSTEMI. Patients are evaluated in four classes: accelerated angina with or without ECG changes in class I, new-onset exercise angina in class II, new-onset resting angina in class III, and prolonged angina with ECG changes in class IV [7]. The Braunwald classification is a well-defined classification widely used in patients with UAP. Patients are assessed by determining the characteristics of the angina and their clinical status. According to the angina characteristics, three groups are defined: exercise angina in class I, subacute angina at rest in class II, and acute angina at rest in class III. Patients with UAP are similarly divided into three groups according to their clinical status: secondary unstable angina in class A, primary unstable angina in class B, and post-infarction unstable angina in class C [6]. In the ACC/AHA risk assessment system, patients are considered in three risk groups depending on the basis of the properties of their angina, ECG changes and cardiac enzymes: i.e. low, intermediate and high risk groups [2]. Indeed, the Braunwald, Rizik and ACC/AHA classification systems are not real score systems. Yet, all are effective tools that can be used to predict the patients' risk.

Risk scoring systems

The TIMI risk score [8, 9] is determined by giving one point to each of seven parameters, which are: age over 65 years, presence of ≥ three coronary risk factors, a prior history of ≥ 50% coronary stenosis, the existence of ST segment deviation, an angina attack within the last 24 h, the use of aspirin

in the last seven days, and an increase in cardiac markers. In the GUSTO risk score [10], points are awarded based on the following parameters: age groups, clinical history, vital signs and laboratory values. In the PURSUIT score [11] derived from the PURSUIT study, patients are scored according to age (as a decade), gender, and their symptomatic class within the last six weeks, the existence of heart failure symptoms, and the presence of ST depression in ECG. GRACE score [12, 13] is created by giving points for each parameter including: age group, systolic blood pressure, creatinine level, Killip class, cardiac arrest history, increased cardiac markers, and the degree of ST segment deviation.

Coronary angiography

Coronary angiography was performed using standard methods generally from the right femoral groin (Philips Integris V5000, Philips Medical Systems, Netherlands, 2000). If necessary, the left femoral groin or radial artery was used. Standard coronary views were taken in each procedure. The operators were allowed to take additional images for a better evaluation of coronary artery lesions.

Evaluation of coronary angiography

Coronary angiography was reviewed by two experienced invasive cardiologists blinded to the patients' data. The presence and extent of CAD were identified. More than 50% stenosis in any epicardial artery, or any side branch more than 2.5 mm in diameter, was considered as significant CAD. Coronary lesions that do not meet these criteria were categorised as nonsignificant CAD. The presence of coronary artery ectasia and/or slow flow were also detected. The extent of CAD was assessed in respect of the number of diseased vessels, i.e. one-, two- or three-vessel disease. Patients with left main CAD were excluded from the study. Each coronary lesion was examined for its location, length, severity, as well as the presence of thrombus, calcification, and ulceration. Thrombus-containing lesions, ulcerated lesions, total or subtotal thrombotic occlusion and lesions with irregular borders were considered angiographically culprit.

In the clinical risk assessment system, the distribution of CAD and culprit lesions was examined, and the groups in clinical risk assessment systems were compared to each other. ROC curves were delineated for risk assessment systems. For each risk scoring system, its ROC curve was marked in accordance with the presence of three-vessel disease and culprit lesion. Similar analysis was done for cardiac enzymes and CRP. Statistical significance was sought, and the area under the curve was compared. After a cut-off value was determined, its sensitivity and specificity were found in predicting for a defined status.

Statistical analysis

Student T test was used for continuous variables with normal distribution. Normal distribution was tested using the Kolmogorov-Smirnov test. Otherwise, Mann-Whitney U test was applied for analysis. Comparisons were performed using the Chi-square test for categorical variables. The Youden index derived from a ROC curve was used to find a cut-off value, its sensitivity and specificity values. Analysis was done using SPSS v.15.0 for Windows software. A p value of below 0.05 was considered statistically significant.

RESULTS

The mean age of the 154 patients was 63 ± 12 years. The study population consisted of 42 (27.3%) female and 112 (72.7%) male patients. Baseline clinical and demographic characteristics, and laboratory values, of patients are presented in Tables 1 and 2 respectively.

According to the diagnostic evaluation, 82 (53.3%) patients received a UAP diagnosis and 72 (46.7%) had one of NSTEMI. The distribution of patients in accordance with clinical risk assessment systems is summarised in Table 3. In the

Table 1. Baseline demographic and clinical characteristics of the study population

Demographic characteristics	
Age [years]	63 ± 12
Sex (M/F)	112 (72.7%)/42 (27.3%)
Height [cm]	167 ± 7
Weight [kg]	71 ± 8
BMI [kg /m^2]	25.4 ± 2.1
Clinical characteristics	
Risk factors:	
Diabetes	35 (22.7%)
Hypertension	91 (59.1%)
Hyperlipidaemia	55 (35.7%)
Smoking	64 (41.6%)
Family history	50 (32.5%)
SBP [mm Hg]	133.1 ± 20.4
DBP [mm Hg]	75.1 ± 14.1
Heart rate [bpm]	77.1 ± 16.6
Pulse pressure [mm Hg]	58.1 ±13.4
Medications	
Aspirin	88 (57.1%)
Clopidogrel	2 (1.3%)
Beta-blocker	40 (26.0%)
ACE-I	41 (26.6%)
ARB	17 (11.0%)
Statin	17 (11.0%)
Ca antagonist	40 (26.0%)
Nitrate	34 (22.1%)

M — male; F — female; BMI — body mass index; SBP — systolic blood pressure; DBP — diastolic blood pressure; ACE-I — angiotensin converting enzyme inhibitor; ARB — angiotensin receptor blocker

Table 2. Mean laboratory values of the study population

Parameters	Mean ± SD
WBC [×1000/mm³]	8.7 ± 2.7
Hb [mg/dL]	13.2 ±1.5
Hct [%]	39.1 ± 4.6
Platelet [×1000/mm³]	246.4 ± 62.5
Fasting glucose [mg/dL]	126.3 ± 63.3
Urea [mg/dL]	40.2 ± 13.4
Creatinine [mg/dL]	1.1 ± 0.4
Uric acid [mg/dL]	6.4 ± 1.3
Sodium [mmol/L]	140.0 ± 3.8
Potassium [mmol/L]	4.3 ± 0.6
Total cholesterol [mg/dL]	185.4 ± 43.5
Triglyceride [mg/dL]	151.9 ± 87.8
LDL-cholesterol [mg/dL]	126.8 ± 36.7
HDL-cholesterol [mg/dL]	35.1 ± 7.8
CRP [mg/L]	3.1 ± 1.5
CK-MB [ng/mL]	25.0 ± 61.8
CTnI [ng/mL]	5.1 ± 14.1

WBC — white blood cell; Hb — haemoglobin; Hct — haemotocrit; LDL — low density lipoprotein; HDL — high density lipoprotein; CRP — C-reactive protein; CK-MB — creatinine kinase-myocardial band; cTnI — cardiac troponin I

Table 3. Distribution of patients according to clinical risk assessment systems

Braunwald classification	
Class IB	23 (14.9%)
Class IIIB	131 (85.1%).
Rizik classification	
Class II	30 (19.5%)
Class III	124 (80.5%)
ACC/AHA risk classification	
Low risk	21 (13.6%)
Intermediate risk	53 (34.4%)
High risk	80 (51.9%)

Braunwald classification, three (1.9%) cases in class IIB were assessed as class IIIB. In the Rizik classification, six (3.9%) patients in class IV were analysed as class III. It is noteworthy that in Table 3, the study population is predominantly composed of medium or high risk patients.

The mean TIMI risk score of patients was 3.3 ± 1.5. The mean GUSTO risk score was 5.9 ± 3.5. It was 12.9 ± 1.9 for PURSUIT score, and 125.2 ± 34.2 for GRACE score.

Analysis of coronary angiography findings

CAD was angiographically detected in a total of 136 (88.3%) patients, whereas 16 (10.8%) patients had angiographic slow flow, and two (1.4%) patients were found to be normal. One hundred and three (75.7%) of 136 patients had significant CAD according to the criteria described in the study protocol. Of these 103 patients, 58 (56.3%) received a diagnosis of NSTEMI, while 45 (43.7%) patients were diagnosed with UAP. The distribution of CAD in 103 patients was: 30 (20.3%) with one-vessel, 26 (17.6%) with two-vessel, and 47 (31.8%) with three-vessel disease. In addition, 49 (47.6%) patients had angiographically a culprit lesion. Only one patient had nonsignificant CAD. Among these 49 patients, 33 (67.3%) were likely plaque ruptures, ten (20.4%) were small filling defects consistent with thrombus and six (12.2%) were subtotal occlusions. There was only one angiographically culprit lesion in 36 (73.4%) patients, whereas 13 (26.5%) patients had two culprit lesions.

Comparison of the distribution of three-vessel disease and angiographically culprit lesion according to the clinical diagnosis. The distribution of three-vessel disease in 103 patients was statistically different between the clinical diagnosis groups. While 38 (65.5%) patients had three-vessel disease in patients with NSTEMI, the number was only nine (20%) in patients with UAP ($p < 0.05$). Correspondingly, in point of the distribution of angiographically culprit lesions between the clinical diagnosis groups, the difference was found to be statistically significant ($p < 0.05$). The rate of culprit lesions in patients with NSTEMI was 44.8%, whereas it was only 24.7% in patients with UAP ($p < 0.05$).

Comparison of clinical risk assessment systems in terms of the distribution of three-vessel disease and angiographically culprit lesion. Among the clinical risk assessment systems including Braunwald, Rizik and ACC/AHA classifications, the distribution of three-vessel disease and culprit lesions is shown in Table 4. Among clinical risk assessment systems, it was only in the ACC/AHA system that the distribution of three-vessel disease was found to be statistically significant. The percentage of three-vessel disease was 60% in the high-risk group, whereas it was 22.7% and 14.3% in the intermediate and low risk group, respectively ($p < 0.05$). We did not find any statistical significance in terms of the distribution of culprit lesions for all risk assessment systems.

Predictive values of clinical risk assessment and scoring systems. Predictive values were determined using ROC curves according to the area under the curve (AUC) and p values.

Prediction of three-vessel disease. Among the clinical risk assessment systems, the ACC/AHA system was found to have a weak predictive value (AUC: 0.68, $p < 0.05$). Others were not found to have any predictive value ($p > 0.05$, for

Table 4. Distribution of three-vessel disease and culprit lesion into clinical risk assessment systems in patients with significant coronary artery disease (n = 103)

	Number of diseased vessels			P*	Culprit lesion	P*
	One vessel	Two vessels	Three vessels			
Braunwald classification						
Class IB (n = 13)	5 (38.5%)	5 (38.5%)	3 (23.1%)	> 0.05	7 (53.8%)	> 0.05
Class IIIB (n = 90)	25 (27.8%)	21 (23.3%)	44 (48.9%)		42 (46.7%)	
Rizik classification						
Class II (n = 18)	7 (38.9%)	6 (33.3%)	5 (27.8%)	> 0.05	9 (50%)	> 0.05
Class III (n = 85)	23 (27.1%)	20 (23.5%)	42 (49.4%)		40 (47,1%)	
ACC/AHA risk classification						
Low risk (n = 7)	4 (57.1%)	2 (28.6%)	1 (14.3%)		3 (42.9%)	
Intermediate risk (n = 31)	13 (41.9%)	11 (35.5%)	7 (22.6%)	**< 0.05**	16 (51.6%)	> 0.05
High risk (n = 65)	13 (20%)	13 (20%)	39 (60%)		30 (46.2%)	

*Chi-square test

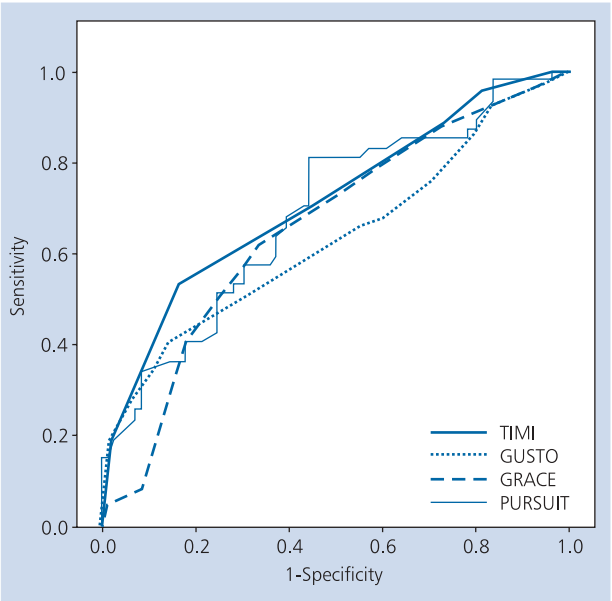

Figure 1. ROC curves of all scoring systems in predicting three--vessel disease

all). Among the risk scoring systems, all of them were shown to have a predictive value. The ROC curves of all scoring systems are presented in Figure 1 and Table 5. The cut-off values with sensitivity and specificity are summarised in Table 6. When all data was evaluated, it was observed that the TIMI and GRACE risk scores had more predictive value than the others. However, the TIMI and GUSTO scores had a higher specificity, whereas the GRACE score was found to have a higher sensitivity. The PURSUIT score had relatively low sensitivity and specificity.

Prediction for the angiographically culprit lesion. The predictive value of all risk assessment systems, and all risk scoring systems, was shown to be statistically insignificant ($p > 0.05$, for all).

The role of cardiac enzymes and CRP. Mean CK-MB, cTnI and CRP values were respectively 25.0 ± 61.8 mg/dL, 5.1 ± 14.1, and 3.1 ± 1.5. The CK-MB and cTnI values, but not CRP, were found to be statistically significant in predicting three-vessel disease. The cut-off value of CK-MB was 4.05 (sensitivity 66%, specificity 77%), whereas it was 1.42 for cTnI (sensitivity 61%, specificity 82%). Likewise, CK-MB and cTnI,

Table 5. ROC curve data of all scoring systems in predicting three-vessel disease

Variables	AUC	P	95% confidence interval	
			Lower bound	Upper bound
TIMI score	0.71	< 0.001	0.61	0.81
GUSTO score	0.63	0.022	0.52	0.74
GRACE score	0.68	0.001	0.58	0.78
PURSUIT score	0.65	0.007	0.54	0.76

Table 6. Cut-off values with sensitivity and specificity of all scoring systems in predicting three-vessel disease

Risk score	Cut-off value	Sensitivity [%]	Specificity [%]
TIMI score	4.5	53	83
GUSTO score	8.5	40	85
GRACE score	119	80	55
PURSUIT score	13.5	61	66

but not CRP, were demonstrated to have a predictive value in determining an angiographically culprit lesion. For this case, the cut-off values of CK-MB and cTnI were found to be 2.5 (sensitivity 60%, specificity 52%), and 0.08 (sensitivity 62%, specificity 57%) respectively.

DISCUSSION

Our study revealed that three-vessel disease and angiographically culprit lesion(s) were shown to have a predictive value using the initial clinical risk assessment systems and cardiac enzymes in patients with UAP/NSTEMI. The frequency of three-vessel disease and culprit lesions in patients with NSTEMI appeared to be higher than those in patients with UAP. Of the clinical risk assessment systems, only the ACC/AHA system was found to have a predictive value (AUC: 0.68, $p < 0.05$). All of these risk scoring systems were also shown to have a predictive value with different sensitivity and specificity in terms of the presence of three-vessel disease. However, the TIMI and GRACE risk scores had more predictive value compared to the others (AUC: 0.71, $p < 0.001$, AUC: 0.68, $p = 0.001$, respectively). The cut-off values were '> 4' for the TIMI score, '> 8' for the GUSTO score, '119' for the GRACE score and '13.5' for the PURSUIT score. The TIMI and GUSTO scores had a higher specificity, whereas the GRACE score was found to have a higher sensitivity. The PURSUIT score had relatively a lower sensitivity and specificity. Our results also indicated that all risk assessment and scoring systems did not seem to have a predictive value regarding the presence of a culprit lesion. However, it was demonstrated that the cardiac enzymes have a predictive value in determining three-vessel disease as well as an angiographically culprit lesion, with a low sensitivity and specificity.

Risk assessment in patients with ACS is crucial in predicting the clinical outcomes and determining the treatment strategy. Many clinical and laboratory parameters have been used in determining the risk for the patient. The risk scoring systems, developed in large-scale studies, have been commonly used. The value of all scoring systems has been confirmed for short- and long-term prognosis. However, there are studies still ongoing to improve the predictive value of clinical risk scores or to make them easier to use. In a recent study, the AMIS model [14] was reported to have a predictive value for cardiovascular outcomes in patients with ACS as a simple risk score in which seven parameters available at first patient contact, such as age, blood pressure, heart rate, etc. were used. In another current study [15] using some biomarkers such as interleukin-6, B-type natriuretic peptide, aldosterone, and matrix metalloproteinase-9 were shown to improve the performance of the risk score.

The prognosis of the patients cannot be considered independently of the severity of CAD. In a study by Huang et al. [16], the prognostic value of the atherosclerotic burden determined using coronary scoring systems (i.e. Gensini, Leaman and ACC coronary scoring) was explored. It was reported that Gensini score had a higher prognostic value. This result suggests the prediction of atherosclerotic burden, as well as the risk for the patient, may have a prognostic significance. Therefore, assessing the relationship between a risk scoring system and the severity of CAD may be useful with regard to evaluating the clinical value of a scoring system. In addition, the presence of a culprit lesion is an integral part of the assessment in patients with ACS. Nevertheless, the number of studies dealing with the relationship between the risk scoring systems and the severity of CAD are limited. To the best of our knowledge, no study investigating the relationship between the presence of a culprit lesion and risk scoring systems has been demonstrated until now. Our study has aimed to shed light on the relationship between almost all of the scoring systems and the severity of CAD or the presence of a culprit lesion.

The ECG and presentation with chest pain give an idea about the risk for the patient. The Braunwald classification [6] has been used in the risk assessment of patients for a long time. The Rizik classification [7] has been developed on the basis of chest pain and ECG changes. In both classifications, higher categories are associated with higher clinical risk. However, the risk factors in the patients, the laboratory values and comorbid conditions are not evaluated. Although both help us to comment on the risk factors for the patient indirectly, it is obvious that these risk assessment systems can provide only limited guidance regarding the clinical risk. Similarly, ACC/AHA risk classification [2] was established by using more comprehensive parameters, including physical examination and cTnI. In our study, it has been demonstrated that only the ACC/AHA risk classification has a predictive value in terms of the presence of three-vessel disease. Using more comprehensive parameters in this risk classification may account for our result.

The best-known and most commonly used risk score is the TIMI risk score [8, 9]. In addition, the GUSTO [10], PURSUIT [11, 12] and GRACE [12, 13] scores have been developed, and clinically used. These risk scores have been clearly shown to reflect early and long-term adverse clinical outcomes. A recent study by Zhong et al. [17] revealed that these scoring systems are still valuable for the patients' prognosis using current definitions and treatments. In this study, the prognostic value of TIMI flow grade and combined clinical risk score derived from the TIMI 11 B [18] trial and GRACE research were investigated in 279 patients with ACS. It was concluded that a combined risk score could be used for the prediction of a composite end-point.

The TIMI risk score is a simple and effective method used to determine early and long-term risk. The relationship between the extent of CAD and TIMI risk score has been shown in a limited number of studies. In the PRISM-PLUS study [19], the prevalence of CAD has been shown to increase as the TIMI score increases. Garcia et al. [20] reported that the TIMI risk score correlated with the severity of CAD in 688 patients with NSTEMI. In another study by Lakhani et al. [21], the cut-off value of TIMI risk score was reported to be '> 4' for prediction of the extent of CAD, as we have found. Our findings are fully consistent with the results of these studies. Similarly to the TIMI risk score, the GUSTO risk score may be effective in predicting three-vessel disease by using a cut-off value of '> 8' according to our study results. Nevertheless, these two scores had a low sensitivity and relatively higher specificity.

We also assessed the relationship between the GRACE and PURSUIT risk scores and three-vessel disease. Both of the risk scores were shown to have a predictive value for three-vessel disease. The cut-off values of these risk scores were found to be respectively '119' and '13.5'. Even though the prognostic value of the GRACE risk score has been clearly demonstrated in many large scale studies, its relation with the severity of CAD has not been analysed. Our study revealed that the GRACE score may be used in predicting three-vessel disease using a cut-off value of 119 with a high sensitivity and low specificity. Similarly, the PURSUIT risk score had a predictive value for three-vessel disease using a cut-off value of 13.5 with relatively low sensitivity and specificity. In a study by Brilakis et al. [22], a higher PURSUIT risk score was reported to be associated with a greater likelihood of three-vessel disease or left main CAD. That result was also consistent with our findings. When evaluated according to all of the risk scores regarding the prediction of three-vessel disease, it can be concluded that the TIMI and GRACE risk scores have more predictive value than the others. The main differences are in regard of their sensitivity and specificity. The TIMI risk score and the GUSTO risk score had a higher specificity, whereas the GRACE score was shown to have a higher sensitivity. The PURSUIT risk score had a low specificity and sensitivity.

There have been a very limited number of studies regarding the prediction of culprit lesions. In these studies, biochemical markers such as cardiac enzymes, CRP, etc. have been commonly used. In 2004, Sanchais et al. [23] reported that high CRP levels were associated with the presence of angiographic thrombus. Similarly, a study by Magalhayes et al. [24] indicated that cTnI, CRP and fibrinogen levels were higher in patients with NSTEMI in whom the ischaemia-related artery was detected by coronary angiography. In our study, cardiac enzymes appeared to be associated with the presence of a culprit lesion, but their specificity and sensitivity were very low. To the best of our knowledge, the predictive value of the risk assessment system for the presence of culprit lesions has not been previously reported. However, we could not show a predictive value of any of the risk assessment or scoring systems for the presence of a culprit lesion.

Limitations of the study

The size of the study population was limited because of our strict exclusion and inclusion criteria. However, our results can be applicable for a similar patient population. Another limitation of our study was using the number of affected vessels for the severity of CAD, as used in most of the studies in the literature. Essentially, the atherosclerotic burden can be identified using more detailed scoring systems such as Gensini, Syntax score etc., though these are cumbersome. In our study, there were only six patients with left main coronary disease. They could not be evaluated in a separate group. Therefore, these patients were excluded from the study. Additionally, the culprit lesions were detected using coronary angiography. It is well known that coronary angiography has a limited value in determining lesion characteristics. IVUS has an indisputable advantage in this regard.

CONCLUSIONS

In conclusion, the patients' diagnosis gives limited information about the presence of three-vessel disease and a culprit lesion. Patients with NSTEMI have a greater likelihood of three-vessel disease and culprit lesions. Only an ACC/AHA risk assessment can be used for the prediction of three-vessel disease. Among all risk scoring systems, the TIMI and GRACE scores have more predictive value for the presence of three-vessel disease. While the TIMI and GUSTO risk scores have a high sensitivity using a cut-off value of > 4 and > 8 respectively, a cut-off value of 119 for the GRACE risk score has a higher specificity. The PURSUIT risk score has a lower sensitivity and specificity with a cut-off value of 13.5. In addition, all risk assessment and scoring systems do not predict the presence of a culprit lesion. The use of cardiac enzymes seems more appropriate in predicting with very low sensitivity and specificity. These findings may prove useful in the management of patients with UAP/NSTEMI.

Conflict of interest: *none declared*

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Porównanie przydatności systemów klinicznej oceny ryzyka w prognozowaniu choroby trójnaczyniowej i istotnych angiograficznie zwężeń u chorych z zawałem serca bez uniesienia odcinka ST lub z niestabilną dławicą piersiową

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Streszczenie

Wstęp: Badanie przeprowadzono w celu porównania wartości oceny ryzyka na podstawie cech klinicznych i skal punktowych w prognozowaniu choroby trójnaczyniowej i istotnych zwężeń stwierdzonych w koronarografii u chorych z niestabilną dławicą piersiową (UAP) lub zawałem serca bez uniesienia odcinka ST (NSTEMI).

Metody: Do badania włączono 154 kolejnych chorych [42 (27.3%) kobiety i 112 (72.7%) mężczyzn, średnia wieku: 63,0 ± ± 12,7 roku] z UAP/NSTEMI. Oceniono ryzyko, stosując klasyfikację Rizika i Braunwalda, system ACC/AHA, skale TIMI, GUSTO, GRACE i PURSUIT oraz wyznaczono krzywe ROC w zależności od obecności choroby trójnaczyniowej, a także istotnego zwężenia.

Wyniki: U pacjentów z NSTEMI częstość choroby trójnaczyniowej i istotnych zwężeń była największa. Jedynie system oceny ryzyka ACC/AHA miał wartość prognostyczną w odniesieniu do choroby trójnaczyniowej. Wszystkie skale punktowe cechowały się wartością prognostyczną, jednak różniły się czułością i swoistością. Skale TIMI i GRACE miały najwyższą wartość prognostyczną. Nie wszystkie skale punktowe mogą służyć do oceny ryzyka istotnego zwężenia.

Wnioski: Spośród systemów oceny ryzyka tylko system ACC/AHA może być przydatny w prognozowaniu choroby trójnaczyniowej. Można w tym celu zastosować wszystkie punktowe skale oceny ryzyka. Wartość prognostyczna skal TIMI i GRACE jest najwyższa. Żadna skala ryzyka nie pozwala na prognozowanie obecności istotnego zwężenia. Bardziej odpowiednim wskaźnikiem są w tym przypadku enzymy sercowe cechujące się bardzo małą czułością i swoistością.

Słowa kluczowe: ostry zespół wieńcowy, skala ryzyka, choroba trójnaczyniowa, istotne zwężenie

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