DOI: 10.4274/MMJ.galenos.2024.32585
Medeni Med J 2024;39:175-182

Original Article

The Relationship Between the Modified Glasgow Prognostic and SYNTAX Scores in Patients with Non-ST Elevation Myocardial Infarction

ST Yükselmesi Olmayan Miyokard Enfarktüslü Hastalarda Modifiye Glasgow Prognostik ve SYNTAX Skorları Arasındaki İlişki

Ahmet KARADUMAN[1], Cemalettin YILMAZ[2], Mustafa Ferhat KETEN[3], Ismail BALABAN[3], Zeynep Esra GUNER[3], Mehmet CELIK[3]

[1]Tatvan State Hospital, Clinic of Cardiology, Bitlis, Türkiye
[2]Malazgirt State Hospital, Clinic of Cardiology, Mus, Türkiye
[3]University of Health Sciences Türkiye, Kartal Kosuyolu Yuksek Ihtisas Training and Research Hospital, Clinic of Cardiology, Istanbul, Türkiye

ABSTRACT

Objective: This study investigated the modified Glasgow prognostic score (mGPS) to determine its predictive value and how it could be compared with various inflammatory markers, including C-reactive protein (CRP) to albumin ratio and neutrophil-to-lymphocyte ratio, for determining the extent and severity of coronary artery disease (CAD) in patients with non-ST-elevated myocardial infarction (NSTEMI).

Methods: This study analyzed the cases of 295 patients with NSTEMI who had undergone coronary angiography. In an effort to determine the seriousness and scope of CAD in each patient, the Synergy between Percutaneous Coronary Intervention with Taxus and Cardiac Surgery (SYNTAX) score was calculated and then assessed. The study sample was divided into two separate groups based on the SYNTAX score: moderate to high SYNTAX (>22) and low SYNTAX (≤22).

Results: There were 295 patients (23.1% female, 76.9% male) included in the research, with an average age being 61.2±10.9 years, and the mean SYNTAX score being 7.3±10.4 (range: 0-40). Those with a SYNTAX score >22 were observed to possess significantly higher levels of CRP, CRP/albumin ratio, and mean mGPS 1-2 ratios compared with those with a SYNTAX score ≤22 (all p<0.001). Smoking [odds ratio (OR): 3.341, 95% confidence interval (CI): 1.531-7.294; p=0.002], CRP/albumin ratio (OR: 4.958, 95% CI: 1.335-18.418; p=0.017), and mGPS score of 1-2 (OR: 3.121, 95% CI: 1.430-6.814; p=0.004) were independent factors used to help predict a high SYNTAX score.

Conclusions: It seems possible to make use of the mGPS when estimating the degree and intricacies of CAD in patients with NSTEMI, as there appears to be a connection with higher SYNTAX scores.

Keywords: Modified Glasgow prognostic score (mGPS), SYNTAX score, coronary artery disease, non-ST-elevated myocardial infarction

ÖZ

Amaç: Bu çalışmada, non-ST yükselmeli miyokard enfarktüsü (NSTEMI) geçiren hastalarda koroner arter hastalığının (KAH) yaygınlığını ve şiddetini belirlemede, nötrofil-lenfosit oranı (NLO) ve C-reaktif protein (CRP)-albümin oranı gibi diğer enflamatuvar belirteçlerle karşılaştırıldığında, modifiye Glasgow prognostik skorunun (mGPS) öngörü değerini araştırmayı amaçladık.

Yöntemler: Çalışma, koroner anjiyografi yapılan 295 ardışık NSTEMI hastasını içermekteydi. Her hasta için, KAH şiddeti ve yaygınlığını belirlemek amacıyla Taxus ile Perkütan Koroner Girişim ve Kardiyak Cerrahi Arasındaki Sinerji Skoru (SYNTAX) skoru hesaplandı. Çalışma örneği, SYNTAX skoruna göre orta-yüksek SYNTAX (>22) ve düşük SYNTAX (≤22) olarak iki gruba ayrıldı.

Bulgular: İki yüz doksan beş hastanın (%23,1 kadın, %76,9 erkek) yaş ortalaması 61,2±10,9 yıl olup, ortalama SYNTAX skoru 7,3±10,4 (aralık: 0-40) idi. SYNTAX skoru >22 olan hastaların CRP düzeyleri, CRP/albümin oranı ve ortalama mGPS 1-2 oranları, SYNTAX skoru ≤22 olanlara göre anlamlı derecede yüksekti (hepsi p<0,001). Sigara içme [olasılık oranı (OO): 3,341, %95 güven aralığı (GA): 1,531-7,294; p=0,002], CRP/albümin oranı (OR: 4,958, %95 GA: 1,335-18,418; p=0,017) ve mGPS skoru 1-2 (OR: 3,121, %95 GA: 1,430-6,814; p=0,004), yüksek SYNTAX skorunun bağımsız öngördürücüleriydi.

Sonuçlar: Yüksek bir SYNTAX skoru ile ilişkili olduğu görülen mGPS, NSTEMI hastalarında KAH yaygınlığını ve karmaşıklığını tahmin etmek için kullanılabilir.

Anahtar kelimeler: Değiştirilmiş Glasgow prognostik skoru (mGPS), SYNTAX skoru, koroner arter hastalığı, ST yükselmesi olmayan miyokard enfarktüsü

Address for Correspondence: A. Karaduman, Tatvan State Hospital, Clinic of Cardiology, Bitlis, Türkiye
E-mail: ahmetkaradumanmd@gmail.com **ORCID ID:** orcid.org/0000-0002-4039-1259

Received: 24 March 2024
Accepted: 28 July 2024
Online First: 02 September 2024

Cite as: Karaduman A, Yilmaz C, Keten MF, Balaban I, Guner ZE, Celik M. The Relationship Between the Modified Glasgow Prognostic and SYNTAX Scores in Patients with Non-ST Elevation Myocardial Infarction. Medeni Med J. 2024;39:175-182

INTRODUCTION

Among the most dangerous health crises across the globe, cardiovascular diseases (CVD) are near the top of the list. Acute coronary syndrome (ACS) manifests clinically as unstable angina, non-ST segment elevation myocardial infarction (NSTEMI), and ST segment elevation myocardial infarction (STEMI). The Synergy between Percutaneous Coronary Intervention with Taxus and Cardiac Surgery (SYNTAX) score was formulated to evaluate the amount and level of intricacy of coronary artery disease (CAD), as well as late and early results[1-3]. Based on the angiographic results, the SYNTAX scoring method separates patients into numerous risk groups and provides insight into revascularization success and prognosis according to risk group. Controlled studies evaluating percutaneous coronary intervention (PCI) and coronary artery bypass graft surgery were similar in patients with SYNTAX scores that were considered low (<22)[4].

Inflammation certainly contributes to the progression and instability of atherosclerosis, as well as the onset of ACS, by causing vascular inflammation, plaque rupture, and subsequent thrombosis. Serum albumin (SA) is considered the most common and fundamental protein in human serum because it participates in several physiological functions. Reduced SA synthesis and enhanced catabolism are correlated with increased inflammatory response[5,6]. Decreased SA can result in high blood viscosity and endothelial dysfunction. Moreover, SA inhibits platelet activation and aggregation[7]. The C-reactive protein (CRP)-to-albumin ratio (CAR) was seen to predict the inflammatory state and prognosis on several occasions[8-10]. There has been research that exposes a connection between the severity of CAD and the CAR[11-13]. This study aimed to implement the modified Glasgow prognostic score (mGPS) to determine how well it predicted the severity and complexity of CAD in patients with NSTEMI by implementing the SYNTAX score, as the innovative mGPS considers CRP and reduced albumin levels while also having the capacity to help predict heart disease[14,15].

MATERIALS and METHODS

Study Population

The goal of this study was to evaluate relevant clinical information about patients admitted due to a health emergency between January and June 2019. NSTEMI patients who underwent coronary angiography with or without PCI were among those able to be included in the study. The University of Health Sciences Türkiye, Kartal Kosuyolu Yuksek Ihtisas Training and Research Hospital Clinical Research Ethics Committee approved our research plan (decision no: 2024/06/797) on March 19, 2024. The initial medical and socioeconomic parameters, including hyperlipidemia (HL), hypertension, smoking history, diabetes mellitus (DM), and history of cerebrovascular disease, were collected from the hospital records.

In total, 396 patient medical records were examined and evaluated retrospectively using our database. Patients who had a history of coronary artery bypass grafting or PCI (n=73), as well as those with end-stage kidney disease (n=15), cancer (n=6), and active infection (n=7) were excluded.

The ACS diagnostic standard and American Heart Association recommendations were used to diagnose ACS based on symptoms, electrocardiogram results, and other supplementary procedures. In the absence of sustained ST elevation, the presence of sudden chest pain or significant breathing difficulty suggested non-ST-elevated ACS. NSTEMI may additionally be classified based on myocardial necrosis indicators, such as cardiac troponin. NSTEMI is diagnosed when cardiac markers are increased and physical symptoms are consistent[16].

Laboratory Analysis

Upon admission to the hospital and before any reperfusion or heparin medication, a blood sample was extracted from each patient via the antecubital vein. A Sysmex XT2000i analyzer was used to perform complete blood counts (Sysmex Corporation, Kobe, Japan). An autoanalyzer was applied for the testing of total cholesterol, fasting blood glucose, potassium, sodium, creatinine, liver enzymes (aspartate aminotransferase, alanine aminotransferase), high-density lipoprotein, low-density lipoprotein, and triglyceride levels (Siemens Advia 2400 Chemistry System, Siemens Diagnostic, Tarrytown, USA). A Roche Diagnostics Cobas 8000 c502 analyzer (Roche Holding AG, Basel, Switzerland) was used to gage albumin and CRP levels.

Modified Glasgow Prognostic Score

Inflammation-based mGPS is linked to survival in cancer, heart failure, STEMI[14,17]. Previous research has demonstrated that the mGPS (0, 1, and 2) can be discriminated according to the degree of malnutrition. Patients were separated into three categories: Patients with raised hypoalbuminemia (<35 g/L) and CRP (>10 mg/L) were scored with a 2; those with just elevated CRP (>10 mg/L) were scored as 1; and patients possessing neither abnormality were scored as 0.

Coronary Angiography and SYNTAX Score

Coronary angiograms were acquired digitally for quantification (DICOM viewer; MedCom GmbH, Darmstadt, Germany). They were then assessed by two experienced interventional cardiologists who were restricted from comparing the data with the clinical data of the patients. Upon retrieval of a version from http://www.syntaxscore.com, the anatomical SYNTAX score was implemented to numerically evaluate the intricacy of coronary lesions. Using this score, the population sample was separated into two groups based on the severity of CAD: low (22), and moderate-high (>22).

Statistical Analysis

SPSS 19.0. (IBM Corp. Armonk, NY) for Windows was used to statistically analyze the data. Descriptive statistics; standard deviation, mean, minimum, maximum, and median for numerical variables; numbers and percentages for categorical variables. The chi-square test was used as a basis for comparison with the rates collected from the groups. By using the Mann-Whitney U test, comparisons could be made between the groups because the numerical variables failed to meet the condition of normal distribution. Logistic regression analysis was then performed to ascertain any independent predictors of a moderate to high SYNTAX score existed. The significance level was set as $p<0.05$ in all statistical analyses.

RESULTS

All in all, 295 patients, 68 women (23.1%) and 227 men (76.9%), with 31 being the youngest and 85 being the oldest, and a mean age of 61.2±10.9 years, were included in the study. The average patient SYNTAX score was 7.3±10.4 (minimum: 0-maximum: 40). The SYNTAX score of the patients were 22 or less in 238 (80.7%) and above 22 in 57 (19.3%). A flowchart of the study population is presented in Figure 1.

The mean body mass index (BMI), DM, HL, CVD, smoking rates, left ventricular hypertrophy, and heart valve disorder rates of patients with SYNTAX score >22 were statistically significantly higher than those scoring score 22 and below (p=0.015, p=0.008, p=0.003, p=0.039, p<0.001, p<0.001, p<0.001) (Table 1).

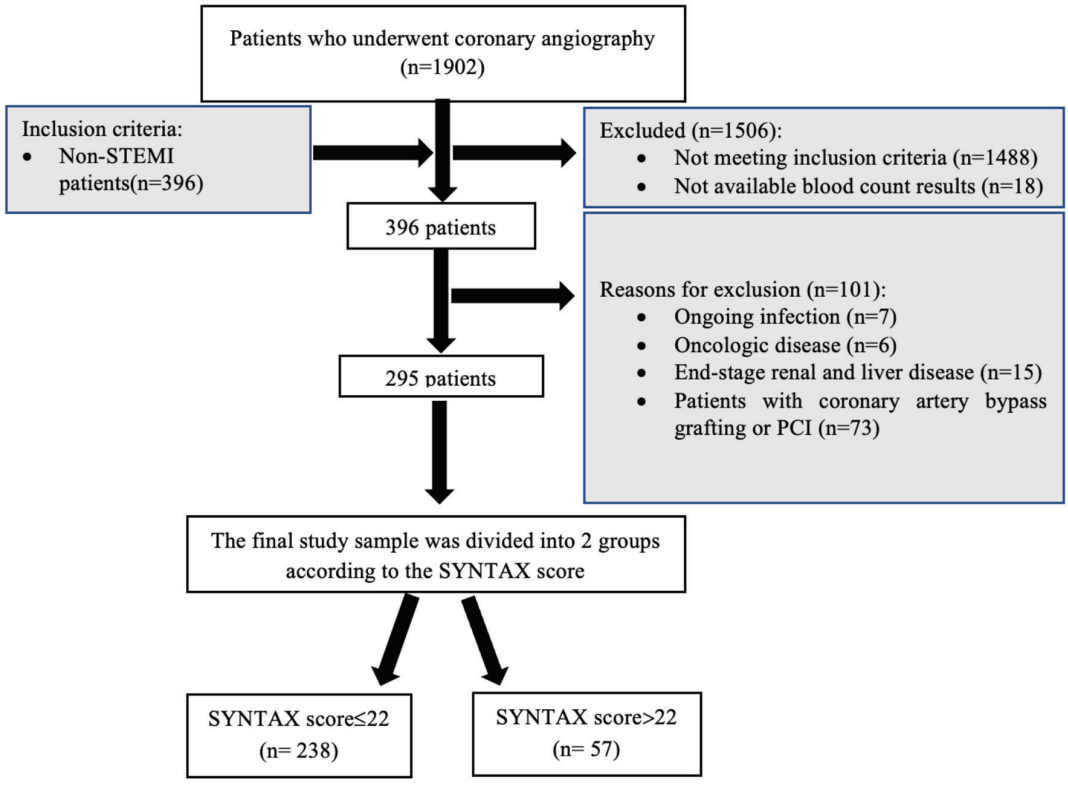

Figure 1. Flowchart of study population.

STEMI: ST segment elevation myocardial infarction, SYNTAX: Synergy between Percutaneous Coronary Intervention with Taxus and Cardiac Surgery, PCI: Percutaneous coronary intervention

Table 1. Baseline characteristics and laboratory and echocardiographic findings of the groups.					
Variables		**All**	**SYNTAX score ≤22 (n=238)**	**SYNTAX score >22 (n=57)**	**p-value**
Baseline characteristics					
Age (years), median (IQR)		62 (54-70.5)	61 (53-70)	64 (58-72)	0.133
Gender (female), n (%)		68 (23.1)	55 (23.1)	13 (22.8)	0.961
Body mass index (kg/m^2), mean ± SD		25.1±2.5	25.0±2.5	26.0±2.3	0.015
Atrial fibrillation, n (%)		8 (2.7)	6 (2.5)	2 (3.5)	0.654
Hypertension, n (%)		198 (67.1)	154 (64.7)	44 (77.2)	0.071
Diabetes mellitus, n (%)		87 (29.5)	62 (26.1)	25 (43.9)	0.008
Hyperlipidemia, n (%)		74 (25.3)	51 (21.6)	23 (40.4)	0.003
Cerebrovascular disease, n (%)		2 (0.7)	0 (0.0)	2 (3.5)	0.039
Current smoker, n (%)		150 (50.8)	109 (45.8)	41 (71.9)	<0.001
Laboratory findings					
Glucose (mg/dL), mean ± SD		132.38±67.4	132.24±72.74	134.65±55.50	0.505
BUN (mg/dL), mean ± SD		35.21±14.16	35.41±15.56	34.48±9.74	0.639
Creatinine (mg/dL), median (IQR)		0.85 (0.71-1.07)	0.83 (0.7-1.06)	0.95 (0.73-1.1)	0.061
Aspartate aminotransferase (U/L), median (IQR)		19.2 (16.6-24)	19.5 (16.9-24.5)	18.8 (16.3-23.8)	0.312
Alanine aminotransferase (U/L), median (IQR)		17.8 (12.6-23)	17.7 (12.7-22.8)	17.9 (12.3-28.0)	0.619
Sodium (mmol/dL), median (IQR)		138 (135-140)	138 (135-139.2)	137.5 (135.75-140)	0.419
Potassium (mmol/dL), mean ± SD		4.34±0.44	4.36±0.42	4.25±0.48	0.083
Calcium (mg/dL), mean ± SD		8.9±0.6	8.9±0.6	8.8±0.5	0.401
Magnesium (mg/dL), mean ± SD		1.9±0.3	1.9±0.3	2.0±0.3	0.761
LDL (mg/dL), median (IQR)		119 (89-149)	117 (88-146)	127 (100-157)	0.141
HDL (mg/dL), median (IQR)		40 (32-47)	40 (32-47)	37.5 (31-48)	0.332
Total cholesterol level (mg/dL), median (IQR)		192 (151-230)	190 (150-230)	206 (159.7-236)	0.167
Triglyceride (mg/dL), median (IQR)		141 (95.7-195.7)	140.5 (90.7-192)	152.5 (105-209)	0.440
Hemoglobin (g/dL), mean ± SD		13.6±1.7	13.6±1.8	13.6±1.5	0.976
WBC (x10^3/µL), median (IQR)		9 (7.4-10.6)	9 (7.4-10.8)	8.7 (7.3-9.8)	0.235
Neutrophil (x10^3/µL), median (IQR)		6.2 (4.8-7.7)	6.2 (4.7-7.9)	6 (5-7.2)	0.461
Lymphocyte (x10^3/µL), median (IQR)		2.04 (1.5-2.5)	2.1 (1.5-2.7)	2.0 (1.5-2.4)	0.202
Neutrophil/lymphocyte, median (IQR)		3.16 (1.99-4.84)	3.09 (1.98-4.90)	3.36 (2.26-4.55)	0.782
CRP (mg/dL), median (IQR)		4.4 (3.1-8.9)	3.68 (2.46-7.09)	10.6 (5.03-13.9)	<0.001
Albumin (g/dL), median (IQR)		3.9 (3.6-4.3)	3.9 (3.6-4.3)	3.9 (3.5-4.4)	0.991
CRP/albumin, median (IQR)		0.107 (0.077-0.216)	0.095 (0.072-0.188)	0.25 (0.14-0.35)	<0.001
Echocardiography					
Left ventricular ejection fraction, (%), median (IQR)		60 (60-65)	60 (60-65)	60 (50-65)	0.065
SPAP (mmHg), median (IQR)		20 (0-25)	0 (0-25)	25 (0-30)	<0.001
Left ventricular hypertrophy, n (%)		103 (35.5)	65 (27.9)	38 (66.7)	<0.001
Heart valve disorder, n (%)		9 (3.1)	3 (1.3)	6 (10.5)	<0.001
Angiographic characteristics					
LMCA, n (%)		8 (2.7)	6 (2.5)	2 (3.5)	0.680
LAD, n (%)		73 (24.7)	29 (12.2)	44 (77.2)	<0.001
CX, n (%)		74 (25.1)	43 (18.1)	31 (54.4)	<0.001
RCA, n (%)		81 (27.5)	44 (18.5)	37 (64.9)	<0.001
Risk scores					
mGPS, n (%)	0	198 (68.0)	179 (76.5)	19 (33.3)	<0.001
	1	75 (25.8)	48 (20.5)	27 (47.4)	
	2	18 (6.2)	7 (3.0)	11 (19.3)	

SYNTAX: Synergy between Percutaneous Coronary Intervention with Taxus and Cardiac Surgery, BUN: Blood urea nitrogen, HDL: High density lipoprotein, IQR: Interquartile range, LDL: Low density lipoprotein, LVEDD: Left ventricular end diastolic diameter, mGPS: Modified Glasgow prognostic score, SD: Standard deviation, SPAP: Systolic pulmonary artery pressure, CRP: C-reactive protein, WBC: White blood cell

The CRP and CRP/albumin mean mGPS 1-2 ratios of patients with SYNTAX scores >22 were statistically significantly higher than those with SYNTAX scores >22 (p<0.001 for all) (Table 1).

When the univariate effects of the factors thought to be risk factors for moderate to high SYNTAX scores were examined, it was determined that BMI increase, DM, HL, smoking, decreased ejection fraction, increased CRP/albumin ratio, and mGPS 1 or 2 (p=0.007, p=0.009, p=0.004, p=0.001, p=0.003, p<0.001, p<0.001, p<0.001) (Table 2). Smoking [odds ratio (OR): 3.341, 95% confidence interval (CI): 1.531-7.294; p=0.002], CRP/albumin ratio (OR: 4.958, 95% CI: 1.335-18.418; p=0.017) and mGPS score of 1-2 (OR: 3.121, 95% CI: 1.430-6.814; p=0.004) were found to be independent associates of moderate to high SYNTAX scores (Table 2). Furthermore, analysis of the respective receiver operating characteristic curves yielded the optimal cut-off values of CAR and mGPS for predicting high SYNTAX scores. A cut-off value of 0.109 for CAR [area under the curve (AUC): 0.811] had 89.47% sensitivity and 60.5% specificity, whereas a cutoff value of 2 for mGPS scores (AUC: 0.729) had 66.67% sensitivity and 76.5% specificity (Figure 2).

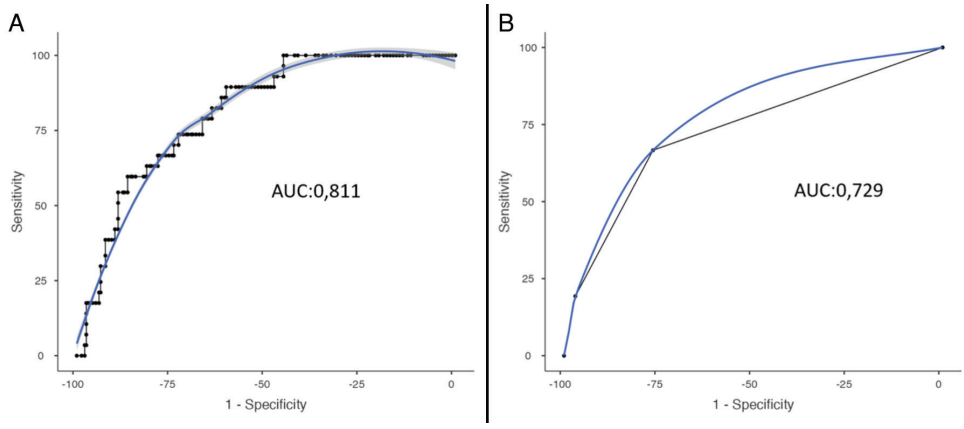

Figure 2. Receiver operating characteristic curves for the CRP/albumin ratio (A) and mGPS (B) scores for predicting high SYNTAX scores.

AUC: Area under the curve, SYNTAX: Synergy between Percutaneous Coronary Intervention with Taxus and Cardiac Surgery, CRP: C-reactive protein, mGPS: Modified Glasgow prognostic score

Table 2. Regression analysis of potential predictor factors for the high SYNTAX score.

	Univariate analysis				Multivariable analysis			
	p	OR	95%-CI		p	OR	95%-CI	
Age	0.136	1.021	0.994	1.049	0.345	1.017	0.982	1.054
Body mass index	0.007	1.178	1.046	1.328	0.258	1.098	0.934	1.290
Hypertension	0.074	1.846	0.941	3.620	0.959	0.978	0.421	2.270
Diabetes mellitus	0.009	2.218	1.220	4.033	0.588	1.278	0.526	3.105
Hyperlipidemia	0.004	2.454	1.329	4.531	0.704	1.183	0.496	2.821
Smoking	0.001	3.033	1.613	5.703	0.002	3.341	1.531	7.294
Left ventricular ejection fraction	0.003	0.932	0.889	0.977	0.237	0.965	0.911	1.023
CRP/albumin	<0.001	14.892	4.867	45.567	0.017	4.958	1.335	18.418
Neu/lym	0.621	0.984	0.924	1.048	0.364	0.941	0.826	1.073
mGPS (reference: 0) 1-2	<0.001	5.299	2.718	10.333	0.004	3.121	1.430	6.814

Multivariable analysis Cox & Snell R square: 0.193

SYNTAX: Synergy between Percutaneous Coronary Intervention with Taxus and Cardiac Surgery, CRP: C-reactive protein, Neu/lym: Neutrophil/lymphocyte, mGPS: Modified Glasgow prognostic score, OR: Odds ratio, CI: Confidence interval

DISCUSSION

Potential connections between the mGPS and SYNTAX scores of individuals with NSTEMI were thoroughly examined in this study. The study's essential conclusion was that in these patients, there appeared to be a strong link between the mGPS and SYNTAX scores. High mGPS and CRP-to-albumin ratio independently help predict SYNTAX score. Thus, in patients with NSTEMI, the mGPS may be associated with the degree and level of complexity of CAD and can be implemented to assess these factors in affected individuals.

Several scoring systems are used to evaluate the severity of angiographic CAD. The SYNTAX score was the most often used of these. The SYNTAX score was calculated by assessing the number, complexity, location, and effect of the lesions. The SYNTAX score should be consulted when describing the seriousness of CAD and to guide the operator in deciding on the best treatment approach. A number of clinical studies have looked into the association between the SYNTAX score and other factors. Minamisawa et al.[18] Found higher MACE rates in patients with high SYNTAX scores who experienced heart failure. Similarly, Bayam et al.[19] Found high MACE rates within the first 30 days in patients with NSTEMI and high SYNTAX scores. Therefore, the SYNTAX score is a useful tool for effective risk stratification in these patients.

Inflammation is a key factor in each stage of coronary atherosclerosis. There is a discernable association between CAD severity and adverse cardiovascular outcomes[20,21]. According to several studies, inflammatory markers, such as CAR and NLR, are linked to CAD severity and poor cardiovascular outcomes[12,22]. Although total white blood cell count appears to have a connection to the presence and severity of coronary atherosclerosis, as well as increased mortality and poor outcomes following acute myocardial infarction, NLR has been demonstrated to provide more accurate findings. A meta-analysis study involving 7,017 patients with CAD found that NLR was an effective tool for predicting severe stenosis in CAD[23]. A high NLR indicates a high level of inflammation, which can help explain why NLR has been linked to the severity and severity of CAD in previous studies. NLR was not found to be an independent predictor of moderate to high SYNTAX scores in our study.

CRP is not only a systemic inflammatory marker, but it is also one of the main acute-phase reactants, and it may be an active and direct component associated with the disruption of atherogenesis and atheromatous plaque. It was noted that independent links existed between CRP levels and the prevalence of CAD and recurrent cardiovascular events in individuals with stable CAD and ACS[24,25]. Additional evidence suggests that lower plasma albumin levels could be linked to the growth and progression of atherosclerosis[26]. Compared with the predictive values of these two markers independently, CAR is better suited to intricately perceive and specifically predict the systemic inflammatory state and prognosis in a variety of non-cardiac clinical disorders[8,9]. Recent studies have evaluated the predictive values of CAR and other inflammatory indicators, such as NLR, CRP, and albumin, in patients with ACS. These studies showed that CAR performs better than NLR, CRP, and albumin in predicting moderate-to-high SYNTAX score[12,13,27]. Our study also showed that CAR predicts a moderate-to-high SYNTAX score with a better probability than NLR.

The nutritional and inflammatory conditions of patients affect the severity and prognosis of many diseases. mGPS, calculated by high serum CRP level and low albumin levelIt has been studied mostly to demonstrate the prognostic status of patients with cancer. This scoring system has been used to determine the prognosis of the disease in patients with STE myocardial infarction, pulmonary embolism, inflammatory bowel disease, and heart failure, as well as in cancer patients[14-16,28,29]. However, an association between mGPS and CAD severity in patients with NSTEMI has not been established. Previous studies have shown that increased inflammatory response and worsening nutritional status in patients with ACS increase the prevalence of the disease. We found that the mGPS score was associated with a moderate to high SYNTAX score in patients with NSTEMI. The present study revealed that the mGPS score is an independent predictor of the severity of CAD.

There are a few limitations to this research. First, the retrospective design was based on a relatively small sample size at a single center. Second, coronary artery severity was assessed using visual coronary angiograms. Applying different methods, such as intravascular ultrasound, to analyze the degree of coronary atherosclerosis would have provided additional valuable information but were not used in this study. Third, we only examined albumin levels and baseline CRP at the time of administration. Changes observed with the following tests may have additional prognostic value. Fourth, given that we only obtained limited volume and event rate data, we were unable to assess the predictive utility of the mGPS for adverse cardiovascular events.

CONCLUSION

According to this study, the mGPS appears to have a significant relationship with the SYNTAX score and

is likely to be an available, easily quantifiable, and affordable parameter when determining the severity of coronary atherosclerosis. Therefore, identifying individuals with NSTEMI who are at high risk of CAD and in need of a more direct and aggressive approach to therapy and follow-up may be part of the cardiovascular examination. However, more expansive and prospective studies are necessary to assess the predictive and, especially, prognostic value of the mGPS in patients with NSTEMI.

Ethics

Ethics Committee Approval: The University of Health Sciences Türkiye, Kartal Kosuyolu Yuksek Ihtisas Training and Research Hospital Clinical Research Ethics Committee approved our research plan (decision no: 2024/06/797) on March 19, 2024.

Informed Consent: An informed consent for publication was obtained from all patients.

Author Contributions

Concept: A.K., C.Y., M.F.K., I.B., M.C., Design: A.K., C.Y., M.F.K., Z.E.G., M.C., Data Collection and/or Processing: A.K., I.B., Analysis and/or Interpretation: A.K., C.Y., I.B., Z.E.G., Literature Search: A.K., M.F.K., Z.E.G., M.C., Writing: A.K., C.Y., M.F.K., Z.E.G.

Conflict of Interest: The authors have no conflict of interest to declare.

Financial Disclosure: The authors declared that this study has received no financial support.

REFERENCES

1. Sianos G, Morel MA, Kappetein AP, et al. The SYNTAX Score: an angiographic tool grading the complexity of coronary artery disease. EuroIntervention. 2005;1:219-27.
2. Garg S, Sarno G, Serruys PW, et al. Prediction of 1-year clinical outcomes using the SYNTAX score in patients with acute ST-segment elevation myocardial infarction undergoing primary percutaneous coronary intervention: a substudy of the STRATEGY (Single High-Dose Bolus Tirofiban and Sirolimus-Eluting Stent Versus Abciximab and Bare-Metal Stent in Acute Myocardial Infarction) and MULTISTRATEGY (Multicenter Evaluation of Single High-Dose Bolus Tirofiban Versus Abciximab With Sirolimus-Eluting Stent or Bare-Metal Stent in Acute Myocardial Infarction Study) trials. JACC Cardiovasc Interv. JACC Cardiovasc Interv. 2011;4:66-75.
3. Libby P. Mechanisms of acute coronary syndromes and their implications for therapy. N Engl J Med. 2013;368:2004-13.
4. Doucet S, Jolicœur EM, Serruys PW, et al. Outcomes of left main revascularization in patients with acute coronary syndromes and stable ischemic heart disease: Analysis from the EXCEL trial. Am Heart J. 2019;214:9-17.
5. Don BR, Kaysen G. Serum albumin: relationship to inflammation and nutrition. Semin Dial. 2004;17:432-7.
6. Joles JA, Willekes-Koolschijn N, Koomans HA. Hypoalbuminemia causes high blood viscosity by increasing red cell lysophosphatidylcholine. Kidney Int. 1997;52:761-70.
7. Zhang WJ, Frei B. Albumin selectively inhibits TNF alpha-induced expression of vascular cell adhesion molecule-1 in human aortic endothelial cells. Cardiovasc Res. 2002;55:820-9.
8. Fairclough E, Cairns E, Hamilton J, Kelly C. Evaluation of a modified early warning system for acute medical admissions and comparison with C-reactive protein/albumin ratio as a predictor of patient outcome. Clin Med (Lond). 2009;9:30-3.
9. Ranzani OT, Zampieri FG, Forte DN, Azevedo LC, Park M. C-reactive protein/albumin ratio predicts 90-day mortality of septic patients. PLoS One. 2013;8:e59321.
10. Kinoshita A, Onoda H, Imai N, et al. The C-reactive protein/albumin ratio, a novel inflammation-based prognostic score, predicts outcomes in patients with hepatocellular carcinoma. Ann Surg Oncol. 2015;22:803-10.
11. Karabağ Y, Cağdaş M, Rencuzogullari I, et al. Relationship between C-reactive protein/albumin ratio and coronary artery disease severity in patients with stable angina pectoris. J Clin Lab Anal. 2018;32:e2245.
12. Çağdaş M, Rencüzoğullari I, Karakoyun S, et al. Assessment of relationship between C-reactive protein to albumin ratio and coronary artery disease severity in patients with acute coronary syndrome. Angiology. 2017;70:361-8.
13. Kalyoncuoglu M, Durmus G. Relationship between C-reactive protein-to-albumin ratio and the extent of coronary artery disease in patients with non-ST-elevated myocardial infarction. Coron Artery Dis. 2020;31:130-6.
14. Cho A, Arfsten H, Goliasch G, et al. The inflammation-based modified Glasgow prognostic score is associated with survival in stable heart failure patients. ESC Heart Fail. 2020;7:654-62.
15. Zehir R, Yılmaz AS, Çırakoğlu ÖF, Kahraman F, Duman H. Modified Glasgow Prognostic Score Predicted High-Grade Intracoronary Thrombus in Acute Anterior Myocardial Infarction. Angiology. 2023;75:454-61.
16. Amstardam EA, Wenger NK, Brindis RG, et al. 2014 AHA/ACC Guideline for the Management of Patients With Non-ST-Elevation Acute Coronary Syndromes: A Report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. J Am Coll Cardiol. 2014;64:139-228.
17. He L, Li H, Cai J, et al. Prognostic value of the Glasgow prognostic score or modified Glasgow prognostic score for patients with colorectal cancer receiving various treatments: a systematic review and meta-analysis. Cell Physiol Biochem. 2018;51:1237-49.
18. Minamisawa M, Miura T, Motoki H, et al. Prediction of 1-year clinical outcomes using the SYNTAX score in patients with prior heart failure undergoing percutaneous coronary intervention: sub-analysis of the SHINANO registry. Heart Vessels. 2017;32:399-407.
19. Bayam E, Kalçık M, Öztürkeri B, et al. The relationship between H2FPEF and SYNTAX scores in patients with non-ST elevation myocardial infarction. Acta Cardiol. 2021;76:870-7.
20. Nikolsky E, Grines CL, Cox DA, et al. Impact of baseline platelet count in patients undergoing primary percutaneous coronary intervention in acute myocardial infarction (from the CADILLAC trial). Am J Cardiol. 2007;99:1055-61.
21. Gaul DS, Stein S, Matter CM. Neutrophils in cardiovascular disease. Eur Heart J. 2017;38:1702-4.

22. Sari I, Sunbul M, Mammadov C, et al. Relation of neutrophil-to-lymphocyte and platelet-to-lymphocyte ratio with coronary artery disease severity in patients undergoing coronary angiography. Kardiol Pol. 2015;73:1310-6.
23. Li X, Ji Y, Kang J, Fang N. Association between blood neutrophil-to-lymphocyte ratio and severity of coronary artery disease: Evidence from 17 observational studies involving 7017 cases. Medicine (Baltimore). 2018;97:e12432.
24. Van Wijk DF, Boekholdt SM, Wareham NJ, et al. C-reactive protein, fatal and nonfatal coronary artery disease, stroke, and peripheral artery disease in the Prospective EPIC-Norfolk Cohort Study. Arterioscler Thromb Vasc Biol. 2013;33:2888-94.
25. Karadeniz M, Duran M, Akyel A, et al. High sensitive CRP level is associated with intermediate and high SYNTAX score in patients with acute coronary syndrome. Int Heart J. 2015;56:377-80.
26. Schillinger M, Exner M, Mlekusch W, et al. Serum albumin predicts cardiac adverse events in patients with advanced atherosclerosis – interrelation with traditional cardiovascular risk factors. Thromb Haemost. 2004;91:610-8.
27. Çakmak EÖ, Bayam E, Çelik M, et al. Uric Acid-to-Albumin Ratio: A Novel Marker for the Extent of Coronary Artery Disease in Patients with Non-ST-Elevated Myocardial Infarction. Pulse (Basel). 2021;8:99-107.
28. Celik AI, Bezgin T, Biteker M. Predictive role of the modified Glasgow prognostic score for in-hospital mortality in stable acute pulmonary embolism. Med Clin (Barc). 2022;158:99-104.
29. Zhao C, Ding C, Xie T, et al. Validation and optimization of the Systemic Inflammation-Based modified Glasgow Prognostic Score in predicting postoperative outcome of inflammatory bowel disease: preliminary data. Sci Rep. 2018;8:747.