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ORIGINAL ARTICLE / KLİNİK ÇALIŞMA

The relationship between serum rheumatoid factor level and SYNTAX score I in patients with acute myocardial infarction

Akut miyokart enfarktüslü hastalarda serum romatoid faktör düzeyi ile SYNTAX skoru I arasındaki ilişki

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ABSTRACT

Objective: Rheumatoid factor (RF) has been associated with an increased likelihood of developing coronary artery disease and cardiovascular mortality. This study aimed to evaluate the relationship between serum RF levels and SYNTAX score I (SSI) in patients with acute myocardial infarction.

Methods: This study included 418 consecutive patients who were diagnosed with acute myocardial infarction and underwent coronary angiography. The baseline serum RF levels of all patients were measured. The study population was divided into 2 groups, namely, ST-segment elevation myocardial infarction (STEMI) group (218 patients) and non-ST-segment elevation myocardial infarction (NSTEMI) group (200 patients). Each group was further divided into 2 subgroups, namely, SSI ≤22 group and SSI >22 group.

Results: In the STEMI group, RF levels were significantly higher in the SSI >22 group than that in the SSI ≤22 group (13.0 IU/mL [7.0-51.0 IU/mL] versus 11.0 IU/mL [4.0-37.0 IU/mL], respectively, p=0.002). In the NSTEMI group, RF levels were significantly higher in the SSI >22 group than that in the SSI ≤22 group (15.5 IU/mL [8.0-69.5 IU/mL] versus 13.0 IU/mL [4.0-36.0 IU/mL, respectively], p<0.001). Forward conditional logistic regression analysis demonstrated that neutrophil-to-lymphocyte ratio, total cholesterol level, positive RF, and left ventricular ejection fraction were independently associated with intermediate and high SSI in patients with STEMI. Furthermore, cardiac troponin T levels and positive RF were independently associated with intermediate and high SSI in patients with NSTEMI.

Conclusion: Serum RF concentrations are independently associated with SSI in patients with acute myocardial infarction.

ÖZET

Amaç: Romatoid faktör (RF), artmış koroner arter hastalığı ve kardiyovasküler mortalite ile ilişkilendirilmiştir. Bu çalışmanın amacı, akut miyokart enfarktüslü hastalarda serum RF düzeyleri ile SYNTAX skoru I (SSI) arasındaki ilişkiyi değerlendirmektir.

Yöntemler: Bu çalışmaya akut miyokart enfarktüsü tanısı alan ve koroner anjiyografi yapılmış ardışık 418 hasta alındı. Tüm hastaların bazal serum RF seviyeleri ölçüldü. Çalışma popülasyonu iki gruba ayrıldı; ST segment yükselmeli miyokart enfarktüsü (STEMI) grubu (n=218) ve ST segment yükselmesiz miyokart enfarktüsü (NSTEMI) grubu (n=200). Daha sonra her grup SSI'e göre iki alt gruba ayrıldı; SSI ≤22 grup ve SSI >22 grup.

Bulgular: STEMI grubunda, RF düzeyleri SSI> 22 grubunda SSI ≤22 grubuna göre anlamlı olarak yüksekti (13.0 IU / mL [7.0-51.0 IU / mL] vs. 11.0 IU / mL [4.0-37.0 IU / mL], sırasıyla, p = 0.002). NSTEMI grubunda, RF düzeyleri SSI> 22 grubunda SSI ≤22 grubuna göre anlamlı olarak yüksekti (15.5 IU / mL [8.0-69.5 IU / mL] vs. 13.0 IU / mL [4.0-36.0 IU / mL], sırasıyla, p <0.001). Lojistik regresyon sonucunda nötrofil lenfosit oranı, total kolesterol seviyesi, pozitif RF ve sol ventrikül ejeksiyon fraksiyonu STEMI hastalarında orta ve yüksek SSI ile bağımsız olarak ilişkilendirilmişken kardiyak troponin T seviyesi ve pozitif RF NSTEMI hastalarında orta ve yüksek SSI ile bağımsız olarak ilişkilendirilmiştir.

Sonuç: Serum RF konsantrasyonları, akut miyokart enfarktüsü olan hastalarda SSI ile bağımsız olarak ilişkilidir.

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Inflammation and autoimmunity play a potential role in the initiation and progression of atherosclerosis.[1-3] Several autoantibodies are involved in atherogenesis, such as β2-glycoprotein I, cardiolipin, heat shock protein, anti-nuclear antibody, and rheumatoid factor (RF).[4,5] RF is observed in various rheumatic and inflammatory diseases, including rheumatoid arthritis, Sjögren's syndrome, systemic lupus erythematosus, and polymyositis. Nevertheless, it can be observed in approximately 5% of the young and 25% of the elderly population. Recent studies have demonstrated a relationship between RF and coronary artery disease (CAD) in patients with rheumatoid arthritis [6,7] and in the general population.[5]

The SYNTAX score I (SSI) is useful for evaluating the severity and complexity of CAD and for determining the optimal treatment by identifying the risk of adverse events after percutaneous coronary intervention. A higher SSI corresponds to a complex condition, a bigger therapeutic challenge, and a potentially worse prognosis.

The relationship between RF levels and the severity and complexity of CAD has been reported in patients with stable CAD.[8] However, a similar association has not been investigated in patients with myocardial infarction (MI). In this study, we aimed to evaluate the relationship between serum RF levels and SSI in patients with acute MI.

METHODS

Study population and design

This single-center, prospective study included a total of 418 consecutive patients who were diagnosed with acute MI and underwent coronary angiography between October 2019 and April 2020. All patients were diagnosed and received optimal medical therapy following the European Society of Cardiology guidelines for the management of acute MI.[9,10] Patients aged <18 years or >80 years, patients with SSI of zero, coronary artery bypass grafting, hemodynamic instability, stent thrombosis, symptomatic acute or chronic infectious or inflammatory disease, chronic autoimmune or connective tissue disease that could cause high RF concentration, severe chronic kidney disease (glomerular filtration rate [GFR] <30 mL/min/1.73 m^2), chronic liver disease (alcoholic or nonalcoholic fatty liver disease, hepatitis B, hepatitis C, autoimmune liver disease, and cirrhosis), and neoplastic disease, and those who were receiving anti-inflammatory medications were excluded. The study population was divided into 2 groups, namely, ST-segment elevation myocardial infarction (STEMI) group (218 patients) and non-ST-segment elevation myocardial infarction (NSTEMI) group (200 patients). Each group was further divided into 2 subgroups, namely, SSI ≤22 group (low-score tertile) and SSI >22 group (intermediate and high-score tertile).

Abbreviations:

BMI	*Body mass index*
CAD	*Coronary artery disease*
CKD-EPI	*Chronic kidney disease epidemiology collaboration*
CRP	*C-reactive protein*
cTnT	*Cardiac troponin T*
GFR	*Glomerular filtration rate*
HPL	*Hyperlipidemia*
hs	*High-sensitivity*
HT	*Hypertension*
LDL	*Low-density lipoprotein*
LVEF	*Left ventricular ejection fraction*
MI	*Myocardial infarction*
NLR	*Neutrophil-to-lymphocyte ratio*
NSTEMI	*Non-ST-segment elevation myocardial infarction*
OR	*Odds ratio*
RF	*Rheumatoid factor*
SSI	*The SYNTAX score I*
STEMI	*ST-segment elevation myocardial infarction*

Body mass index (BMI) was calculated using the formula as follows: BMI=weight (kg)/ height^2 (m^2). The neutrophil-to-lymphocyte ratio (NLR) was calculated as the ratio of neutrophil count to lymphocyte count. The GFR was calculated using the chronic kidney disease epidemiology collaboration (CKD-EPI) equation.

The study was conducted in accordance with the Declaration of Helsinki. Ethics Committee of Çukurova University School of Medicine approved the study protocol (No. 92, October 4, 2019), and each participant provided informed consent.

Blood samples and laboratory analysis

Venous blood samples were obtained from each patient on admission to the cardiovascular intensive care unit before coronary angiography. C-reactive protein (CRP) levels were measured using a commercial kit (Abbott Diagnostics, US). The serum concentrations of cardiac troponin T (cTnT) were measured using a Cobas e 411 analyzer (Roche Diagnostics, Germany) by a commercial kit. Serum RF concentrations were measured using immunoturbidimetry. Positive results were defined by the manufacturer's instructions (RF >20 IU/mL).

Transthoracic echocardiography

Standard transthoracic echocardiographic examination of each patient was performed by an experienced

cardiologist. Measurements were obtained in accordance with the recommendations of the American Echocardiography Unit.[11] The biplane Simpson's method using the end-diastolic and end-systolic apical 4-chamber view was used for the estimation of left ventricular volume and the calculation of left ventricular ejection fraction (LVEF).[12]

SYNTAX score I measurements

Coronary lesions were evaluated by at least 2 experienced blinded interventional cardiologists. Patients with stenosis >50% in the left main coronary artery and/or >70% in any other coronary artery were considered to exhibit significant lesions. A blinded interventional cardiologist calculated SSI for each patient using the online calculator (www.syntaxscore.com). A low SSI was defined as ≤22, an intermediate score was defined as 23-32, and a high score was defined as ≥33.[13]

Statistical analysis

Data were analyzed using the SPSS version 22.0 (IBM Corp., Armonk, NY, USA). Continuous variables were expressed as median (minimum-maximum). Categorical variables were expressed as

Table 1. Baseline characteristics of study groups

	STEMI (n=218)			NSTEMI (n=200)		
Variable	SSI ≤22 (n=119)	SSI >22 (n=99)	*p*	SSI ≤22 (n=138)	SSI >22 (n=62)	*p**
Age (years)	54 (30-75)	56 (33-79)	0.064	56 (33-78)	58 (36-78)	0.005
Gender (male)	114 (95.8)	89 (89.9)	0.105	110 (79.7)	51 (82.3)	0.674
BMI (kg/m^2)	27.7 (18.6-39.6)	26.8 (19.4-38.8)	0.601	27.5 (19.5-39.8)	28.4 (22.5-35.2)	0.496
Heart rate (bpm)	73 (50-119)	74 (56-120)	0.151	73 (52-111)	75 (51-113)	0.801
HT	34 (28.6)	36 (36.4)	0.220	51 (37.0)	36 (58.1)	0.005
DM	36 (30.3)	20 (20.2)	0.104	56 (40.6)	27 (43.5)	0.694
HPL	38 (31.9)	45 (45.5)	0.041	49 (35.5)	24 (38.7)	0.664
Smoking	64 (53.8)	57 (57.6)	0.575	60 (43.5)	32 (51.6)	0.286
Hemoglobin (g/dL)	14.2 (10.4-17.8)	14.4 (10.7-17.5)	0.997	14.0 (10.0-16.6)	13.9 (8.3-15.4)	0.279
Leukocyte count, X 10^3/uL	10.7 (4.7-24.0)	11.9 (5.9-18.6)	0.001	8.8 (4.6-15.8)	9.0 (5.4-13.9)	0.765
NLR	2.6 (0.8-17.0)	3.2 (0.8-14.7)	0.014	2.0 (1.0-4.9)	3.0 (1.2-6.7)	0.018
Platelet count, X 10^3/uL	263 (140-509)	265 (181-1,158)	0.230	242 (144-391)	231 (158-327)	0.119
CRP (mg/dL)	0.3 (0.0-8.3)	0.4 (0.0-5.26)	0.095	0.5 (0.0-3.0)	0.3 (0.1-14.1)	0.161
GFR (mL/min per1.73 m^2)	96.7 (36.9-148.1)	98.6 (43.8-146.8)	0.665	100.8 (68.3 -145.8)	100.6 (73.4-144.8)	0.669
HDL cholesterol (mmol/L)	0.96 (0.57-1.6)	1.01 (0.54-1.6)	0.154	1.06 (0.52-1.84)	0.96 (0.62-1.84)	0.095
LDL cholesterol (mmol/L)	3.16 (1.56-5.97)	3.85 (1.84-6.78)	<0.001	3.62 (1.37-7.55)	3.67 (1.97-6.1)	0.600
Total cholesterol (mmol/L)	4.68 (2.82-7.47)	5.43 (2.95-7.89)	<0.001	5.2 (2.84-9.36)	5.12 (3.28-7.97)	0.966
Triglyceride (mmol/L)	1.61 (0.51-5.98)	1.49 (0.52-5.95)	0.823	1.61 (0.44-5.96)	1.68 (0.79-5.46)	0.483
cTnT (pg/mL)	146 (16-725)	179 (15-3703)	0.291	42 (15-517)	136 (17-754)	0.015
RF (IU/mL)	11.0 (4.0-37.0)	13.0 (7.0-51.0)	0.002	13.0 (4.0-36.0)	15.5 (8.0-69.0)	<0.001
Positive RF (>20 IU/mL)	30 (25.2)	39 (39.4)	0.003	19 (13.8)	20 (32.3)	0.002
Killip class ≥ 2	10 (8.4)	16 (16.2)	0.078	8 (5.8)	4 (6.5)	0.857
Mitral E/A ratio	0.73 (0.46-1.60)	0.70 (0.40-1.59)	0.206	0.70 (0.37-1.56)	0.69 (0.47-1.70)	0.807
LVEF (%)	54 (30-71)	51 (30-70)	0.001	62 (39-71)	57 (36-69)	0.004

Data are presented as number (percentage) or median (minimum-maximum).
*p value was calculated using the Mann–Whitney U test for continuous variables and the chi-square test for categorical variables. A p value <0.05 was considered significant.
BMI: body mass index; BP: blood pressure; CRP: C-reactive protein; DM: diabetes mellitus; GFR: glomerular filtration rate; HDL: high-density lipoprotein; HPL: hyperlipidemia; cTnT: cardiac troponin T; HT: hypertension; LDL: low-density lipoprotein; LVEF: left ventricular ejection fraction; NLR: neutrophil to lymphocyte ratio; NSTEMI: non-ST-segment elevation myocardial infarction; RF: rheumatoid factor; SSI: SYNTAX score I; STEMI: ST-segment elevation myocardial infarction.

Table 2. Age and myocardial infarction-based subgroup analysis of rheumatoid factor levels

		STEMI (n=218)			NSTEMI (n=200)		
Variable	n (%)	SSI ≤22 (n=119)	SSI >22 (n=99)	*p*	SSI ≤22 (n=138)	SSI >22 (n=62)	*p**
Age (years)							
<65	353 (84.4)	11.2 (4.0-37.0)	14.0 (6.9-51.0)	0.005	12.5 (4.0-36.0)	15.0 (8.0-37.0)	0.002
≥65	65 (15.6)	9.0 (6.6-24.0)	12.2 (7.0-48.0)	0.033	13.5 (7.0-18.0)	17.5 (8.3-69.0)	0.024

Data are presented as number (percentage) or median (minimum-maximum).
*p value was calculated using the Mann–Whitney U test. A p value <.05 was considered significant.
NSTEMI: non-ST-segment elevation myocardial infarction; SSI: SYNTAX score I; STEMI: ST-segment elevation myocardial infarction.

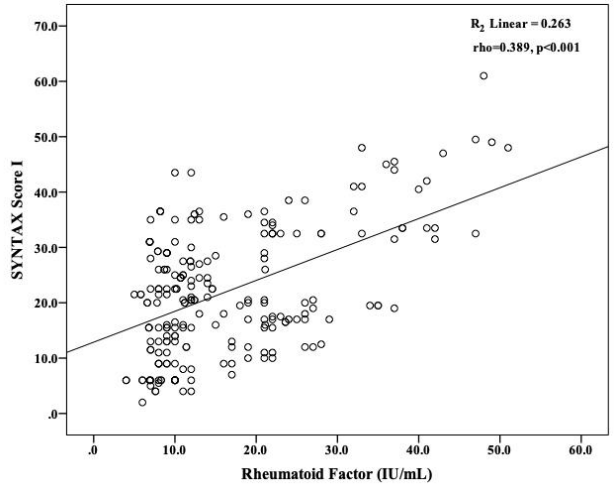

Figure 1. The correlation between rheumatoid factor level and SYNTAX score I in ST-segment elevation myocardial infarction. A p value <0.05 was considered significant.

number (percentage). The distribution of continuous variables was evaluated using the Kolmogorov–Smirnov test. The chi-square test was used for comparing categorical variables. The Mann–Whitney U test was used for comparing continuous variables. Multivariate logistic regression analysis with forward selection was used for determining the independent predictors of intermediate and high SSI in the STEMI and NSTEMI groups, separately. All significant parameters in the univariate analysis were selected for the multivariate model. A 2-tailed p value of less than 0.05 was considered significant.

RESULTS

This study included a total of 418 consecutive acute MI patients. The STEMI group included 218 patients, and the NSTEMI group included 200 patients. In the STEMI group, 119 patients exhibited SSI ≤22, and 99 patients exhibited SSI >22. In the NSTEMI group, 138 patients exhibited SSI ≤22, and 62 patients exhibited SSI >22.

In the STEMI group, the prevalence of hyperlipidemia (HPL), leukocyte count, NLR, low-density lipoprotein (LDL) cholesterol levels, and total cholesterol levels were significantly higher in the SSI >22 group than that in the SSI ≤22 group (p<0.05). RF levels were significantly higher in the SSI >22 group than that in the SSI ≤22 group (13.0 IU/mL [7.0-51.0 IU/mL] versus 11.0 IU/mL [4.0-37.0 IU/mL], respectively, p=0.002). LVEF was significantly lower in the SSI >22 group than that in the SSI ≤22 group (p=0.001). In the NSTEMI group, age, the prevalence of hypertension (HT), NLR, and cTnT levels were significantly higher in the SSI >22 group than that in the SSI ≤22 group (p<0.05). RF levels were significantly higher in the SSI >22 group than that in the SSI ≤22 group (15.5 IU/mL [8.0-69.5 IU/mL] versus 13.0 IU/mL [4.0-36.0 IU/mL], respectively, p<0.001). LVEF was significantly lower in the SSI >22 group than that in the SSI ≤22 group (p=0.004). The baseline characteristics of study groups are demonstrated in Table 1.

The correlation between RF levels and SSI in the STEMI and NSTEMI groups is shown in Figure 1 and Figure 2, respectively.

The positive reactions of RF in healthy individuals are much more frequent in those aged ≥65 years old.[14] In our study, most patients were aged <65 years. Age- and MI-based subgroup analysis of RF levels is demonstrated in Table 2.

Forward conditional logistic regression analysis demonstrated that NLR (Odds ratio [OR], 1.196; 95% confidence interval [CI], 1.070–1.335; p=0.002), total cholesterol level (OR, 1.017; 95% CI, 1.009–1.025; p<0.001), positive RF (OR, 1.056;

Table 3. Independent predictors of intermediate and high SSI in STEMI

	Univariate analysis		Multivariate analysis	
Variable	OR (95% CI)	*p*	OR (95% CI)	*p**
Age (years)	1.021 (0.991-1.052)	0.181	-	-
Leukocyte count, X 10^3/uL	1.133 (1.042-1.233)	0.004	-	-
NLR	1.148 (1.050-1.256)	0.002	1.196 (1.070-1.335)	0.002
CRP	1.055 (0.867-1.283)	0.593	-	-
LDL cholesterol (mmol/L)	1.016 (1.008-1.025)	<0.001	-	-
Total cholesterol (mmol/L)	1.014 (1.007-1.022)	<0.001	1.017 (1.009-1.025)	<0.001
Positive RF (>20 IU/mL)	1.051 (1.022-1.081)	0.003	1.056 (1.022-1.091)	0.002
Killip class ≥ 2	2.101 (0.907-4.868)	0.083	-	-
LVEF (%)	0.950 (0.921-0.980)	0.001	0.952 (0.919-0.986)	0.006

*A p value <0.05 was considered significant.
CI: confidence interval; CRP: C-reactive protein; LDL: low-density lipoprotein; LVEF: left ventricular ejection fraction; NLR: neutrophil to lymphocyte ratio; OR: odds ratio; RF: rheumatoid factor; SSI: SYNTAX score I; STEMI: ST-segment elevation myocardial infarction.

Table 4. Independent predictors of intermediate and high SSI in NSTEMI

	Univariate analysis		Multivariate analysis	
Variable	OR (95% CI)	*p*	OR (95% CI)	*p**
Age (years)	1.057 (1.021-1.094)	0.002	-	-
Hypertension	2.362 (1.281-4.354)	0.006		
NLR	1.647 (1.149-2.362)	0.007	-	-
HDL cholesterol (mmol/L)	0.971 (0.932-1.012)	0.159	-	-
cTnT (pg/mL)	1.005 (1.000-1.010)	0.031	1.026 (1.001-1.049)	0.018
Positive RF (>20 IU/mL)	1.085 (1.041-1.130)	<0.001	1.092 (1.046-1.138)	0.001
LVEF (%)	0.907 (0.855-0.961)	0.001	-	-

*A p value <0.05 was considered significant.
CI: confidence interval; cTnT: cardiac troponin T; HDL: high-density lipoprotein; LVEF: left ventricular ejection fraction; NLR: neutrophil to lymphocyte ratio; NSTEMI: non-ST-segment elevation myocardial infarction; OR: odds ratio; RF: rheumatoid factor; SSI: SYNTAX score I.

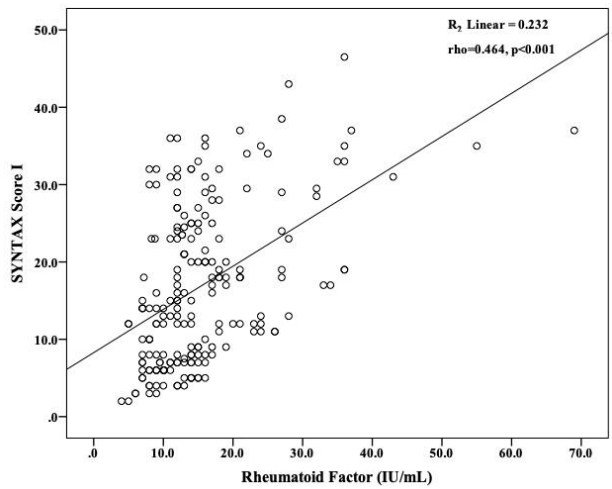

Figure 2. The correlation between rheumatoid factor level and SYNTAX score I in non-ST-segment elevation myocardial infarction. A p value <0.05 was considered significant.

95% CI, 1.022–1.091; p=0.002), and LVEF (OR, 0.952; 95% CI, 0.919–0.986; p=0.006) were independently associated with intermediate and high SSI in patients with STEMI (Table 3). Furthermore, cTnT levels (OR, 1.026; 95% CI, 1.001–1.049; p=0.018) and positive RF (OR, 1.092; 95% CI, 1.046–1.138; p=0.001) were independently associated with intermediate and high SSI in patients with NSTEMI (Table 4).

DISCUSSION

The major finding of this study is that RF levels are independently associated with intermediate and high SSI in both STEMI and NSTEMI patients. To the best of our knowledge, this is the first study in the literature that demonstrates the association between RF

and the severity and complexity of CAD in patients with acute MI.

SSI is used for the assessment of the severity and complexity of CAD.[15,16] RF is observed in several rheumatic and inflammatory diseases. Nevertheless, it can be observed in approximately 5% and 25% of the healthy young and elderly population, respectively. Several studies have demonstrated an association between RF and atherogenesis.[5,8,17-20] Edwards et al.[5] reported a relationship between RF levels and an increased likelihood of CAD. Qadan et al.[17] observed no correlation between RF levels and peripheral artery disease. Quisi and Alici[21] demonstrated a relationship between RF levels and no-reflow phenomenon during primary percutaneous coronary intervention in patients with acute STEMI. Alizade et al.[8] demonstrated that RF levels were independently associated with the severity and complexity of stable CAD. However, an association between RF levels and the severity and complexity of CAD in patients with acute MI has not yet been established. In this study, we determined that RF levels are independently associated with intermediate and high SSI in patients with acute MI.

The possible pathophysiologic mechanisms of these findings may be related to increased inflammation and autoimmunity. Current evidence supports the key role of inflammatory pathways and markers in all phases of atherosclerosis, including the initiation of atherogenesis, its progression, and the development of thrombotic complications.[22-25] Recent studies have demonstrated that CRP and NLR are associated with the severity and complexity of CAD.[26-30] In our study, patients with intermediate and high SSI exhibited higher levels of inflammatory markers, including leukocyte count and NLR. Furthermore, NRL was an independent predictor of intermediate and high SSI in patients with STEMI.

Several studies have demonstrated associations between CRP and autoantibodies, including RF in atherosclerosis.[31,32] Autoimmunity may induce atherogenesis with humoral factors and immunocompetent cells.[33] Edwards et al.[5] suggested that RF may play an important role in atherosclerosis independent of polyclonal B-cell activation and that atheroma formation may generate inflammatory tissue capable of producing and releasing RF.[5] Indeed, it was demonstrated that atherosclerotic plaques contain immunoglobulins and complements that suggest an immune complex activity[34] and that RF may play a direct pathogenic role in endothelial injury and trigger cardiovascular disease through immune complex formation.[3,35-40] Thus, it is possible that immunological factors may play a role independent of inflammation in RF-positive subjects. Given these data, we believe that increased inflammation and elevated RF levels are related to the severity and complexity of CAD in acute MI patients.

Altun et al.[41] revealed that high-sensitivity (hs)-cTnT and NLR were significantly correlated with the angiographic severity of CAD assessed by SSI. Furthermore, Bhatt et al.[42] demonstrated a relationship between peak troponin levels and SSI in acute coronary syndrome. In our study, cTnT levels were independently associated with intermediate and high SSI in patients with NSTEMI. Furthermore, NRL was independently associated with intermediate and high SSI in patients with STEMI.

In this study, patients with intermediate-to-high SSI exhibited lower LVEF than those with low SSI. As the severity of CAD increases, myocardial tissue exposed to ischemia increases. This naturally affects myocardial contraction that leads to wall motion abnormalities and reduces LVEF. Previous studies have reported similar findings.[43-45]

Clinical implication

Although hs-cTnT and SSI have comparable diagnostic accuracy, the former has greater prognostic accuracy.[46] The higher the cTnT levels, the greater the risk of death.[47,48] Other biomarkers, such as natriuretic peptides, CRP, and copeptin,[49] may also carry considerable prognostic value. However, the assessment of these markers has, so far, not been demonstrated to improve patient management and their added value in risk assessment. This study raises the importance of the potential role of autoimmunity in the pathogenesis of atherosclerosis. However, it did not determine the exact mechanism of RF during this process. Combined with the previously published data, the measurement of RF levels in patients with acute MI may be useful for risk stratification and prediction of the severity of CAD in these patients.

Limitations

First, this was a single-center study. A multi-center study that involves more patients could have more sig-

nificant results. Second, we did not measure inflammatory markers other than CRP and NLR. Third, we did not measure antibodies other than RF that might also be relevant to atherosclerosis. Antibodies including β2-glycoprotein I, cardiolipin, heat shock protein 60/65, and anti-nuclear antibody may be considered in further studies. Fourth, this study cannot determine the exact mechanism of RF in atherogenesis. Further investigation is required for determining the mechanisms of RF-underlying atherosclerosis. Fifth, this was a cross-sectional study, and there was no long-term follow-up. Thus, we could not provide any prognostic data in terms of future cardiovascular events. Sixth, other coronary artery severity measurements such as the number of vessels with lesions or Gensini score were not included. Seventh, data regarding clinical outcomes of the patients were not obtained.

Conclusion

Serum RF concentrations are independently associated with the severity and complexity of CAD assessed by SSI in patients with acute MI. This finding highlights the importance of inflammation and raises the possibility that autoimmune mechanisms may play a role in atherogenesis.

Ethics Committee Approval: Ethics committee approval was received for this study from the Ethics Committee of Çukurova University School of Medicine (Approval Date: October 4, 2019; Approval Number: 92).

Informed Consent: Informed consent was obtained from the patients who participated in this study.

Peer-review: Externally peer-reviewed.

Authorship Contributions: Concept - A.Q., Ö.G., İ.H.K.; Design - A.Q., G.A., İ.H.K.; Supervision - A.Q., İ.H.K.; Resources - Ö.G., G.A., T.Ş.; Materials - A.Q., Ö.G., G.A., T.Ş.; Data Collection and/or Processing - A.Q., H.A., Ö.G., G.A., T.Ş.; Analysis and/or Interpretation - A.Q., H.A., Ö.G.; Literature Search - A.Q., H.A.; Writing - A.Q., H.A.; Critical Revision - A.Q., İ.H.K., T.Ş.

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Conflict of Interest: None

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