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Mean Platelet Volume as a New Inflammatory Marker in Acute Pancreatitis and Its Relation to C-Reactive Protein and Ranson's Score on Admission

Akut Pankreatitte Yeni Bir İnflamatuar Belirteç Olarak Ortalama Trombosit Hacmi ve C-Reaktif Protein ile Başvuru Anındaki Ranson Skoru ile İlişkisi

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ABSTRACT

Aim: The study's aim is to evaluate mean platelet volume (MPV) as a marker of inflammation in patients with acute pancreatitis (AP) and to analyse the relationships among MPV, CRP (C-reactive protein) and Ranson's score.

Material and Methods: In this study, 119 patients with AP (mean age 53.8 ± 18.0 years) and 88 healthy control group (mean age 53.1 ± 6.8 years) were enrolled. Among the patients with AP, 75 were classified as having biliary AP, and 44 were classified as having nonbiliary AP. All patients' demographic data, clinical and laboratory findings and Ranson's scores were examined from the hospital's database.

Results: MPV was significantly lower among patients with AP than among the control group (p = 0.001). CRP was significantly higher among patients with AP than among the control group (p< 0.001). The difference in MPV between the biliary and nonbiliary AP group was statistically not significant. When we compared MPV based on patients' lengths of hospital stay, there was no significant difference. In correlation analysis, there was no correlation among CRP, Ranson's score and serum MPV levels.

Conclusion: We observed that MPV levels in the AP group were lower than healthy controls. Thus, like other inflammation markers, MPV might be a useful marker for AP diagnosis.

Keywords: Acute pancreatitis, Mean platelet volume, Inflammation

ÖZ

Amaç: Bu çalışmada akut pankreatitli (AP) hastalarda inflamasyon belirteci olarak ortalama trombosit hacmini (MPV) değerlendirmek ve MPV, CRP (C-reactive protein) ile Ranson skoru arasındaki ilişkiyi inceleme amaçlandı.

Gereç ve Yöntemler: Bu çalışmaya AP'li 119 hasta (ortalama yaş 53.8 ± 18.0 yıl) ve 88 sağlıklı kontrol grubu (ortalama yaş 53.1 ± 6.8 yıl) alındı. AP'li hastalardan 75'i biliyer AP, 44'ü biliyer olmayan AP olarak sınıflandırıldı. Tüm hastaların demografik verileri, klinik ve laboratuvar bulguları ve Ranson skorları hastanenin veri tabanından incelendi.

Bulgular: MPV, AP'li hastalarda kontrol grubuna göre anlamlı olarak daha düşüktü (p = 0.001). AP'li hastalarda CRP, kontrol grubuna göre anlamlı olarak daha yüksekti (p < 0.001). Biliyer ve biliyer olmayan AP grup arasındaki MPV farkı istatistiksel olarak anlamlı bulunmadı. Hastaların hastanede kalış sürelerine göre MPV değerlerini karşılaştırdığımızda anlamlı bir fark yoktu. Korelasyon analizinde CRP, Ranson skoru ve serum MPV seviyeleri arasında korelasyon yoktu.

Sonuç: AP grubunda MPV düzeylerinin sağlıklı kontrollere göre daha düşük olduğunu gözlemledik. Bu nedenle, diğer inflamasyon belirteçleri gibi MPV de AP tanısı için yararlı bir belirteç olabilir.

Anahtar Sözcükler: Akut pankreatit, Ortalama trombosit hacmi, İnflamasyon

INTRODUCTION

Acute pancreatitis (AP) is an inflammatory disease of the pancreas and it's characterized by abdominal pain and elevated levels of pancreatic enzymes (1,2). Abdominal pain in concur with elevation of plasma levels of pancreatic enzymes, which is known as amylase and lipase, that secreted by pancreatic acinar cells are the cornerstone of diagnosis (3). The pathogenesis of acute pancreatitis is not fully understood. However, there are known to be certain conditions that trigger this disorder. The most common risk factors for AP are gallstones and alcohol; and the incidence this disease has been increasing globally (4).

Of all AP patients, 15 to 25% will develop moderately severe AP or severe AP. According to epidemiologic studies, acute pancreatitis mortality fell from 14% to 2% between 1988 and 2003(5). The importance of severity prediction is well established and an early assessment of severity would diminish the financial burden of AP (6). Acute pancreatitis severity has been predicted using a variety of scoring methods. Ranson score is a frequently used scoring system that evaluates the severity of AP. APACHE II (Acute Physiology And Chronic Health Examination), Systemic Inflammatory Response Syndrome (SIRS), BISAP (Bedside Index Of Severity In Acute Pancreatitis) and CT Severity Index [CTSI] scoring systems are other scoring systems used to predict the severity of acute pancreatitis (7).

Mean platelet volume (MPV) is a sign of platelet activation and aggregation. MPV has been found in many studies to be related to inflammation resulting from disorders. Chronic inflammatory diseases with high-grade inflammation (i.e. inflammatory bowel disease, rheumatoid arthritis and familial Mediterranean fever) are characterised by changes in platelet size during active or remissive periods (8). However, MPV's role as an inflammation indicator in the pathophysiology of acute pancreatitis (AP) has not yet been clearly elucidated. Our study is aimed at evaluating MPV as a marker of inflammation in patients with AP and analysing the relationships among MPV, CRP and Ranson's score.

MATERIAL and METHODS

In this study, data from 119 AP patients admitted to our hospital from July 2015 to March 2016 were retrospectively analysed. As the control group, 88 healthy people were retrospectively enrolled. These controls were healthy adults with no history of acute or chronic inflammatory disease or drug use. In the study group, 75 patients were diagnosed with biliary AP, and 44 patients were diagnosed with nonbiliary AP. To diagnose acute pancreatitis, we evaluated the patients' physical examinations and laboratory and radiological findings. Patients who presented at least two of the following findings were diagnosed with AP: (i) characteristic abdominal pain (i.e. acute onset of persistent and severe epigastric pain that often radiates to the back); (ii) elevated levels of pancreatic enzymes – namely, serum amylase and/or lipase – higher than three times the upper normal limit; (iii) characteristic findings of AP in imaging studies, including abdominal ultrasonography or computed tomography (9).

Platelet numbers and MPV values from the first complete blood count (CBC) were recorded at the time of admission. The mean platelet volume (MPV), which is estimated by hematological analyzers based on volume distribution during a regular blood morphology test, is an accurate measurement of their dimension. MPV ranges from 7.5 to 10.5 fl (10). The patients' characteristics and biochemical parameters were also obtained from our database.

Ranson admission score of the all patients were calculated. Ranson's criteria were created in 1974 and it is a clinical estimation method used to estimate the severity of acute pancreatitis (11). The Ranson criteria include 11 parameters, with five parameters evaluated at admission and the other 6 after 48 hours of follow-up. Age over 55, WBC (white blood cell) count over 16,000 cells/cmm, blood glucose over 200 mg/dL (11 mmol/L), serum AST over 250 IU/L, and serum LDH over 350 IU/L are the five criteria for admission. For each parameter, one point is given. If the score is below three, mortality is below 3%. If the score is above six, mortality is predicted to be more than 40% (12). The study population was determined minimum as 74 using the G power program by taking impact size 0.863(based on similar study result), a=0.05, power (1-b)= 0.95 at a confidence level of 95% (version 3.1.9.6; Axel Buchner, Universität Düsseldorf).

Statistical Analysis

Data were analyzed by using a commercially available statistics software package MedCalc 16.8.4 (MedCalc Belgium). Kolmogorov-Smirnov and D'Agostino-Pearson tests were used to evaluate continuous variables in terms of normality. Normally distributed data were presented as mean ± standard deviation. Non-normally distributed data were presented as median and range. Comparison of percentages between different patient groups was made using the chi-square test. Mann-Whitney U-test was performed for normally distributed data for independent subgroups. P values below 0.05 were considered as statistically significant.

RESULTS

Of the 119 patients with AP, 34 (28.6%) were men and 85 (71.4%) were women. Of the 88 healthy control subjects, 30 (34.1%) were men and 58 (65.9%) were women. The mean ages of the patient and control groups were 53.8 ± 18 years and 53.1 ± 6.8 years, respectively. The groups were similar in terms of sex and age.

The distribution of patients according to the Ranson score was assessed at admission. The Ranson score was calcu-

lated as 0 in 30 (25.2%) patients, 1 in 43 (36.1%) patients, 2 in 29 (24.4%) patients, 3 in 15 (12.6%) patients, and 4 in 2 (1.7%) patients.

MPV levels were significantly lower in the AP patient group than in the control group (p = 0.001; Table 1, Figure 1).

In the correlation analysis, there was no correlation between MPV serum levels and CRP (p = 0.661) or Ranson's score assessed upon admission (p = 0.485). We also compared MPV values between biliary and nonbiliary AP patients. There were no significant differences between the two groups (p = 0.566).

Moreover, there was no relationship between MPV values and Ranson's admission scores. There were no significant associations between MPV and WBC count (p = 0,083), age (p = 0,814), glucose (p = 0,916), aspartate aminotransferase (AST) (p = 0.540), or lactate dehydrogenase (LDH) (p = 0.120; Table 2).

There was no statistically significant difference between the patients' MPV values based on their hospital stay durations (5.6±2.4, days) (p = 0.968).

DISCUSSION

Acute pancreatitis is a disease characterized by pancreatic inflammation that clinically appears with signs of specific abdominal pain and raised levels of pancreatic enzymes (1,2) (e.g. amylase and lipase). It is one of the most common diseases of the gastrointestinal tract, and it can cause mortality and morbidity, resulting in tremendous emotional, physical and financial burdens (13,14). MPV's role in pancreatitis-related inflammation is not fully understood, but many studies have pointed out that MPV may indicate inflammatory burden (15,16). In our study, we investigated MPV's role in AP's diagnosis and prognosis and found that MPV served as an inflammatory marker in patients with AP. When we compared the AP patient group and the healthy control group, the MPV values in patients with AP were markedly lower than those in the healthy control group.

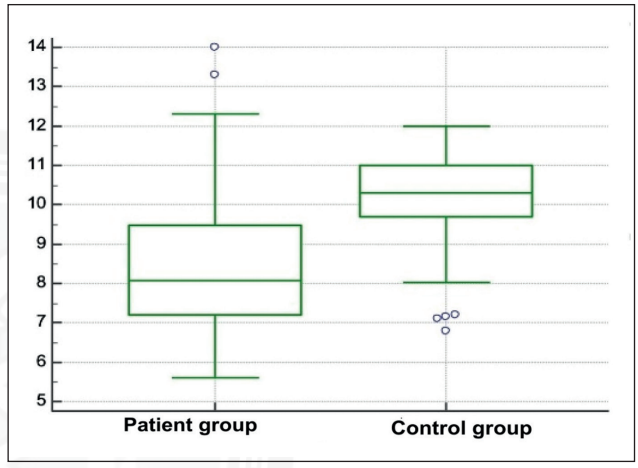

Figure 1: MPV levels between AP patients and control group

Table 1: Demographic characteristics and laboratory values.

	Patient Group (n=119)	Control Group (n=88)	p value
Age(year)	53.8 ±18.0	53.1±6.8	NS
Gender(F/M)	85 (71.4%) / 34(28.6%)	58 (65.9%) / 30(34.1%)	NS
WBC (/mm^{3}x10^3)	12.8±4.6	7.7±1.5	<0.001
Platelets (/mm^3)	261.1±78.8	301.9±76.4	0.003
MPV (fL)	8.4±1.7	10.1±1.06	0.001
CRP (mg/dl)	4.3±7.2	0.3±0.16	0,001
Amylase (µ/l)	1162±835	69.9±24.3	<0.001
AST (µ/l)	167.9±171.9	20.0±6.6	<0.001
Glucose(mg/dl)	149.2±66.1	85.6±8.1	<0.001
LDH (µ/l)	403.3±234.4	138.1±40.5	<0.001

NS: Not significant

Table 2: Coreletion MPV and Ranson admission score criterias

	Ranson Score	WBC (/mm^{3}x10^3)	Age (year)	Glucose (mg/dl)	AST (µ/l)	LDH (µ/l)	Duration of hospital stay (5.6±2.4, days)
MPV (fL)	r:0,06 p:0,485	r:0.159 p:0.083	r: -0.021 p:0.814	r:0.009 p:0.916	r:0.05 p:0.540	r:0.143 p:0.120	r:0.003 p:0.968
Ranson Score		r:0.191 p:0.037	r:0.393 p<0.001	r:0.221 p:0.016	r:0.459 p<0.001	r:0.566 p<0.001	r:0.162 p:0.078

There was no significant difference between the MPV values of the patients with biliary AP and those of the nonbiliary AP patients. The relationship between acute pancreatitis and MPV has been examined in many studies and shown to decrease (17,18). A meta-analysis investigating ten studies showed that MPV was lower at AP's onset than during the disease's remission, regardless of disease severity (19). Lei et al. reported that MPV had higher sensitivity than WBC, LDH and CRP in predicting AP with persistent organ failure on Day 1 after admission (20).

Ranson's scoring in acute pancreatitis provides information about the disease's prognosis (21). In our study, there was no significant correlation between MPV and Ranson's score on admission. Although in our study we could not find a significant correlation with MPV and Ranson criteria, which is an important prognosis predictor, there are studies showing a significant correlation relationship between its and other important prognostic predictor scoring systems such as APACHE II and mGPS (Modified Glasgow Prognostic Score) (17,22). In addition, MPV has been studied even in pancreatic cancers and has been shown to be a predictor of poor prognosis (23).

CRP, is a protein produced by the hepatocytes, is an acute phase reactant and is usually elevated in inflammatory conditions (24). Although we could not find a significant relationship between CRP and MPV in this study, there are studies in the literature showing that they are correlated in inflammatory diseases (25,26).

We compared the MPV value with the duration of hospital stay in patients with acute pancreatitis in order to determine the association of MPV with the duration of hospital stay, but no significant difference was found. This study was the first to investigate the relationship between MPV value and length of hospital stay.

There are some limitations of the present study. First of all, our study is a retrospective study with a limited number of patients. Secondly our data included in the study consisted of one-time measurements. We think that our findings might offer new evidence for additional research using larger sample sizes. Further prospective studies are needed on the role of MPV as a marker of inflammation in patients with AP.

In conclusion, MPV was detected lower in patients with acute pancreatitis than healthy group. MPV is a cheap and easily detectable marker that can be used as other inflammatory markers in the diagnosis of acute pancreatitis It may be useful as a new marker of inflammation in acute pancreatitis.

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None.

Author Contributions

The idea of presenting the study to the literature and collecting the data of the study:Barış Karagün, Tayyibe Saler. Analysis of patient's data, writing of article: Barış Karagün

Conflicts of Interest

The author of this article declare no conflicts of interest.

Financial Support

No financial support was used for this study.

Ethical Approval

Prior to the study, approval was obtained from the Adana Numune Training and Research Hospital Clinical Research Ethics Committee (Date: 26.04.2016, Decision No: 71) and the study was conducted in accordance with the "Helsinki Declaration".

Review Process

Extremely peer-reviewed and accepted.

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