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The Effects Of Red Blood Cell Distribution Width and Mean Platelet Volume on Prognosis in Acute Lower Extremity Ischemia

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Abstract

Research Article

Acute lower extremity ischemia is an emergent situation with high rates of morbidity and mortality. In our study, we plan to investigate the effects of easily accessible and prognostic inflammatory markers for the prevention of complications and mortality in this clinical presentation in which early diagnosis and good management have great importance. Patients who underwent embolectomy between January 2010 and May 2018 were included in the study. The patients were divided into two groups with and without amputation. The patient's demographic, clinical features, diagnosis and treatment methods were recorded. In addition, RDW, MPV values and ABI indices in the time of admission to the hospital were recorded and compared statistically. A total of 198 patients were included in the study. 156 (78.78%) of patients had no amputation and 42 patients (21.22%) had amputation in the study. RDW values of patients with amputation were found to be 15.72 ± 3.12, and RDW values of patients without amputation were found to be 14.81 ± 2.33 (p = 0.04). When the MPV values of the patients who underwent amputation were examined, 9.74 ± 1.2 was observed and 10.15 ± 1.23 were found in patients without amputation (p = 0.04). The preoperative ankle-brachial indexes of the patients in both groups were 0.51 ± 0.17 and 0.61 ± 0.12, respectively. RDW and MPV are important inflammatory markers in predicting prognosis in acute lower extremity ischemia.

INTRODUCTION

Acute limb ischemia (ALI) is a critical clinical condition which seen in patients with multiple medical co morbidity [1]. This clinical picture threatens not only the extremity and its viability but also survival of the patient due to patient's systemic acid-base, electrolyte and other abnormalities [2].In order to provide the most appropriate benefit to the extremity, the importance of the first eight hours from the realization of the thromboembolic event is known. The rate of amputation is 8-15% and mortality rate is between 12-15% in patients who are operated despite early diagnosis and treatment [3].

Several studies have been done in the literature to predict prognosis in acute lower extremity ischemia. It has been reported that many markers such as CRP, Sedimentation, Glomerular filtration rate, lactate dehydrogenase, CK-MB may have a role in predicting prognosis [4]. Recently, popular inflammatory markers such as mean platelet volume (MPV), red blood cell distribution width (RDW) and neutrophil / lymphocyte ratio have been studied [5]. MPV and RDW markers have been studied in the literature in many diseases ranging from acute appendicitis to mesenteric ischemia, from coronary artery disease to pulmonary embolism and have been accepted as important markers [6-9].

The aim of this study is to investigate the impact of MPV and RDW, as simple and inexpensive tests, which can be used by the physicians working in peripheral hospitals to predict the prognosis of ALIs in emergency departments.

MATERIALS and METHODS

In this study, the files of patients who were admitted to Aydın Adnan Menderes University Emergency Department and underwent embolectomy by Cardiovascular Surgery between January 2010 and May 2018 were reviewed. Aydın Adnan Menderes University Local Ethics Committee approval was obtained. The patients were divided into two groups according to the duration of ischemic symptoms in the time of admission to the hospital. Patients with acute presentation, arterial ischemia in less than seven days, and symptom duration more than seven days were defined as delayed presentations and excluded from the study. Patient's demographic, clinical features, diagnosis and treatment methods were recorded. Arterial tree of all patients were evaluated by using preoperative radiological imaging techniques. Endovascular intervention options were evaluated as well as surgical treatment by considering their etiology. Patients with endovascular intervention decision were not included in the study. The patients were divided into two groups; group I (extremity rescued) and group II (extremity amputated).

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Single dose of antibiotics as prophylaxis was given to patients who were taken for operation preparation. A longitudinal incision was made from the inguinal region to the femoral artery for lower extremity under local anesthesia. All patients were anticoagulated (standard heparin, 100 units / kg) before intervention to the respective arteries. Procedures were continued until no embolic material or thrombus was present using Fogarty catheters of various sizes. After the termination of the procedure, the patients were observed in the intensive care unit.

Statistical analysis

SPSS 25 (IBM Corp. Released 2017. IBM SPSS Statistics for Windows, Version 25.0. Armonk, NY: IBM Corp.) was used to evaluate the data. Variables were expressed using mean ± standard deviation, percentage and frequency values. Variables were evaluated after normalization; homogeneity of variance was checked (Shapiro Wilk and Levene Test).In the analysis of data, Independent 2 group t test (Student tests t test) and Mann Whitney-U test were used for the comparison of the two groups. Categorical data were analyzed by Fisher's Exact Test and Chi-Square Test. In cases where the expected frequencies are less than 20%, Monte Carlo Simulation Method is used for the inclusion of these frequencies in the analysis. For the significance level of the tests, $p < 0.05$ was accepted.

RESULTS

A total of 198 patients were included in the study, 127 (64.1%) were male and 71 (35.9%) were female. The mean age was 71.67 ± 13.79. Amputation was not performed in 156 (78.78%) of the patients and 42 (21.22%) patients required amputation. RDW values of patients who underwent amputation were found to be 15.72 ± 3.12, and RDW values of patients who did not amputated were found to be 14.81 ± 2.33 ($p = 0.04$). When the MPV values of the patients underwent amputation were examined, 9.74 ± 1.2 was observed and 10.15 ± 1.23 were found in the untreated group ($p = 0.04$).The preoperative ankle brachial index was 0.51 ± 0.17 and 0.61 ± 0.12 in patients with amputation and without amputation, respectively ($p = 0.001$) (Table 1).

No statistically significant difference was observed between the two groups in terms of smoking and concomitant diseases such as diabetes mellitus, COPD, coronary artery disease, arrhythmia and chronic renal failure (Table 2).

Table1. Evaluation of inflammatory marker variables according to the amputation

	NonAmputation	**Amputation**	**p**
	n=156	n=42	
Age	70,67±13,79	72,62±13,08	0,410
RDW	14,81±2,33	15,72±3,12	0,040*
MPV	10,15±1,23	9,74±1,2	0,040*
ABI	0,61±0,12	0,51±0,17	0,001**

Table 2. Evaluation of categorical variables according to the amputation

			Amputation		**Total**	**p**
			No	Yes		
Gender	Female	n	56	15	71	0,982
		%[x]	35,9%	35,7%	35,9%	
	Male	n	100	27	127	
		%[x]	64,1%	64,3%	64,1%	
Diabetes Mellitus	No	n	123	29	152	0,182
		%[x]	78,8%	69,0%	76,8%	
	Yes	n	33	13	46	
		%[x]	21,2%	31,0%	23,2%	
Arytmia	No	n	127	36	163	0,516
		%[x]	81,4%	85,7%	82,3%	
	Yes	n	29	6	35	
		%[x]	18,6%	14,3%	17,7%	
CAD	No	n	111	30	141	0,799
		%[x]	71,2%	73,2%	71,6%	
	Yes	n	45	11	56	
		%[x]	28,8%	26,8%	28,4%	
Smoking	No	n	75	25	100	0,188
		%[x]	48,1%	59,5%	50,5%	
	Yes	n	81	17	98	
		%[x]	51,9%	40,5%	49,5%	
COPD	No	n	131	32	163	0,24
		%[x]	84,0%	76,2%	82,3%	
	Yes	n	25	10	35	
		%[x]	16,0%	23,8%	17,7%	
CKD	No	n	146	36	182	0,096
		%[x]	93,6%	85,7%	91,9%	
	Yes	n	10	6	16	
		%[x]	6,4%	14,3%	8,1%	
Exitus	No	n	151	42	193	0,24
		%[x]	96,8%	100,0%	97,5%	
	Yes	n	5	0	5	
		%[x]	3,2%	0,0%	2,5%	
		%[x]	3,8%	28,6%	9,1%	

DISCUSSION

Acute lower extremity ischemia is a medical emergency with significant morbidity and mortality requiring rapid diagnosis and treatment. Recovery of the extremity is possible by correcting blood flow and preventing complications [10]. In many studies in the literature, the mortality rate in ALI is reported to be 12-48% in the early period and the loss of the extremity is in the range of 20-40% [3, 11]. Monika et al. reported that the average mortality rate is 35% in the 32-month follow-up and the amputation rate is 26% in a study done with 220 patients [12]. Considering these high mortality and morbidity rates, we think that prediction of ALI prognosis, treatment management and emergency surgical approach are important.

Studies done in many vascular surgery centers have shown that inflammatory markers are useful for predicting the prognosis of ALI and planning the time of embolectomy [13]. MPV, easy to detect during routine blood count, considered as an inflammatory marker which shows the platelet activation [14]. In many studies on cardiac and cerebral diseases, MPV has been shown to be higher and an important marker [15-16]. Şaşkın et al. reported that the amputation decision was made and performed for 32 patients with high MPV values in their study with 123 patients who had ALI [5]. In our study, inflammatory marker MPV values were also found to be higher in the amputated group in parallel of literature.

Red blood cell distribution width (RDW) is a vascular disease marker used in many diseases with ischemia including ischemic coronary artery, mesenteric ischemia, peripheral arterial disease and neurovascular disease [17-19].In a study of 456 patients with chest pain, Danese et al. reported that RDW values are significantly higher in cardiovascular diseases such as ischemic cardiovascular disease, atrial fibrillation, myocardial infarction, hypertension and heart failure [20]. In a study by Şaşkın et al. (5) on 123 patients with ALI, an amputation decision was made and applied for 32 patients with high RDW levels which considered as an important indicator for amputation. Concordant with the findings in the literature, we found that inflammatory marker RDW values were higher at the first emergency admission in the amputated group than in the other group. We think that this gives an idea in terms of predicting amputation.

The ankle-brachial index (ABI) obtained by the ankle / brachial blood pressure ratio is the golden standard in the diagnosis of peripheral arterial disease (PAD) [21]. ABI has recently been proposed as an independent predictor of cardiovascular (CV) risk, its role is still debated. In our study, the statistically lower incidence of ABI seen in patients with amputation supports the literature.

In conclusion acute lower extremity ischemia is a clinical condition with high mortality and amputation rates and should be well managed. We think that inflammatory markers such as MPV and RDW are easily accessible and cheap tests as well as easy to interpret for physicians working in the periphery for the prediction of the prognosis.

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