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Original Article

The evaluation of mean platelet volume in infants with atopic dermatitis

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Abstract

Aim: Atopic dermatitis (AD) is a chronic, inflammatory skin disorder that commonly seen in the infancy period. Platelets are involved in the inflammation process. Mean platelet volume (MPV) is one of the inflammatory indicators that have been used in recent years. The aim of this study is to evaluate the relationship between the MPV and AD in infants.

Material and Methods: Sixty-four infants with AD aged between 2-12 months and, 50 healthy infants as control with same age and sex were included to study. MPV values of the subjects were compared between the groups. The AD group was also divided into 3 subgroups according to the Severity Scoring of Atopic Dermatitis (SCORAD) index. Correlation analyses of MPV were performed to each group.

Results: MPV levels were significantly lower in infants with AD when compared to healthy control (9.64±0.65 and 10.20±0.91, respectively, p<0.00). Both platelet and monocyte levels were significantly low in AD infants (p=0.037 and p=0.00, respectively). We also found that there was a positive correlation between platelet counts and the SCORAD index (r=0.259, p=0.039)

Conclusion: A decline in MPV and platelets may be considered as an indicator of inflammation in infants with AD.

Keywords: Atopic Dermatitis; Infant; Mean Platelet Volume.

INTRODUCTION

Atopic dermatitis (AD) is a relapsing, chronic inflammatory skin disorder characterized by scratching eczematous lesions (1). It often starts in infancy period and affects about 20% of children and also commonly seen in adults (2). The cause of the disease is not explained clearly yet, but it is related to specific immune and inflammatory process. Many cytokines and other inflammatory cells take a role in the pathogenesis of AD such as interleukin 10, 17 and 23 (3,4). There are numerous studies in the literature showing the relationship between AD and systemic inflammation (5-7). Studies on the use of new inflammatory markers in assessing or predicting the severity of the inflammation on AD maintained (1,8-10).

Mean platelet volume (MPV) is one of the new inflammatory markers that have been used in recent years. The number of platelets is increased during inflammation and their volume may be increased or decrease (11,12). The relationship between MPV and inflammation has been shown in many studies such as on familial Mediterranean fever (FMF), rheumatoid arthritis (RA) and children with cystic fibrosis and urticaria (13-16). The aim of our study is to evaluate the relationship between MPV and AD in infants.

MATERIAL and METHODS

This retrospective observational study was performed on infants diagnosed with atopic dermatitis in the pediatric allergy and pediatric outpatient clinic of Kahramanmaras Sutçu Imam University Medical Faculty Teaching Hospital between 2017 and 2018. A total of 64 infants aged between 2-12 months with AD were included. The diagnosis of the AD was made by a child allergy specialist according to the Hanifin Rajka criteria (17). The children who have had acute/chronic systemic diseases such as hepatic, renal, cardiovascular diseases, hematological diseases, diabetes mellitus, cancer and systemic inflammatory disorders, had viral, bacterial, protozoan, and helminthic infectious diseases, were excluded from the study. For comparison, 50 age- and sex-matched healthy controls were used. The control group consisted of children who have had no allergic diseases or the other systemic inflammatory and autoimmune disorders who admitted to our healthy outpatient clinic for routine controls. The written consent form was taken from all patients.

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AD severity was graded by the Severity Scoring of Atopic Dermatitis (SCORAD) index. An objective SCORAD score of <15 was classified as mild, 15-40 as moderate, and >40 as severe (18). According to these criteria, the AD group was divided into 3 groups as mentioned below
Demographic information and laboratory data were collected from the hospital records. The laboratory data consisted of complete blood counts (CBC), total immunoglobulin E (IgE) levels, performed prick test results, and food-specific IgE were taken at the first time of diagnosis.

Skin prick test kit (Stallergenes SA-France) were applied to the forearm of the patients with the same technique by a pediatric allergy specialist. Histamine (10 mg/ml) and physiological saline were used as positive and negative references. Reactions were evaluated 15 min after the application. The positive reaction of 3 mm or larger, the negative control was considered to be the positive test (19). Due to the frequent occurrence of allergies in infants under 1 year of age, milk, egg and wheat tests were studied.

Total Ig E levels were measured by Cobas C 411 device by electro chemiluminescence/sandwich method. Cow milk (f2) and egg white (f1) specific Ig E were measured by (CAP; Phadia) method and the values higher than 0.35 IU / ml were considered positive.

Neutrophil lymphocyte ratio (NLR) was calculated by dividing the absolute values of neutrophils to lymphocytes, eosinophil monocyte ratio (EMR) was calculated by dividing the absolute values of eosinophils to monocyte, eosinophil lymphocyte ratio (ELR) was calculated by dividing the absolute values of eosinophils to lymphocytes and platelet lymphocyte ratio (PLR) was calculated by dividing the absolute values of platelets to lymphocytes in CBC analysis. MPV was also recorded from CBC results.

The study was conducted in accordance with the Declaration of Helsinki and was approved by the Sütçü İmam University Ethics Committee.

Statistical Analysis

Statistical Package for Social Sciences (SPSS for Windows16.0 Chicago, USA) program was used to analyze the data. We expressed categorical variables as percentages and continuous variables as the mean ± standard deviation (SD). Differences in the continuous variables between groups were determined by t-test or the Mann-Whitney U test, as appropriate. Kolmogorov-Smirnov test was used to show whether the distribution of continuous variables was normal. Student-t-test and ANOVA were used for the comparison of normally distributed variables. Chi-square, Mann-Whitney U tests, and Kruskal-Wallis test were used for non-normally distributed variables. Pearson's and Spearman's correlations were used. Statistical significance was set at $p < 0.05$.

RESULTS

This study consisted of 64 infants with AD (41 male/23 female) and 50 healthy control group (27male/23 female). The mean ages of AD patients and control groups were 6.38±3.52 and 4.90±3.27 months, respectively. Demographic, clinical and laboratory data of the study population are given in Table 1.

The mean value of MPV in the AD group was significantly lower than the control group (9.64±0.65 and 10.20±0.91, respectively <0.00) (Table 1). There was also a significant difference between the groups according to EMR, platelet and monocyte counts (p=0.00, p=0.037, and p=0.00, respectively) (Table 1).

Table 1. Demographic and laboratory characteristics of study groups

	Case (n=64)	Control (n=50)	p
Age (months)[a]	6.38±3.52	4.90±3.27	0.024
Gender (male/female)	41/23	27/23	0.277
MPV (fl)[a]	9.64±0.065	10.20±0.91	0.000
Platelet (x10³mm³)[a]	377±91.2	422±137	0.037
WBCx (10³mm³)[a]	11.25±3.50	11.26±3.32	0.987
Neutrophil (mm³)[a]	2912±1613	2835±1550	0.795
Monocyte (mm³)[a]	656±310	1031±409	0.000
Lymphocyte (mm³)[a]	8187±1023	6853±2208	0.376
Eosinophil (mm³)[b]	559 (0-1980)	497 (60-1580)	0.342
EMR[b]	1.17 (0-4.09)	0.53 (0.07-1.66)	0.000
NLR[b]	3.04 (0.0-167)	0.43 (0.04-1.51)	0.379
PLR[b]	478.39 (4.24-27031)	66.18 (28.47-154.62)	0.390
ELR[b]	0.80 (0.0-46.32)	0.75 (0.01-0.20)	0.376
RDW[b]	15.30 (12.10-41.10)	14.48 (11.6-19.3)	0.240

[a]mean±standart deviation, [b]median (min-max.)
MPV: Mean platelet volume, WBC: White blood cell, EMR: Eosinophil monocyte ratio, NLR: neutrophil lymphocyte ratio, PLR: platelet lymphocyte ratio, ELR: eosinophil lymphocyte ratio, RDW: red cell distribution width

While the AD group was divided into 3 groups according to SCORAD indexes, 8 (12.5%) patients were classified as mild, 11(17,18%) patients were moderate and 45 (70,31%) patients were severe. There was no difference between these groups in terms of MPV, EMR, IgE, platelet and monocyte counts (p=0.803, p=0.219, p=0.575, p=0.147, p=0.644, respectively.) (Table 2).

When the correlation of SCORAD indexes with other parameters -which were statistically significant before- was done, there was a positive correlation between platelet counts and SCORAD index (r=0.259, p=0.039) (Table 3).

The prick test was negative in 71.9% of the AD patients, while the remaining had a positive skin reaction against milk and egg. When we divided to AD group according to skin test results and compare them between the whole group there were statistically significant differences between the groups in terms of age, MPV, monocyte and eosinophil count, EMR (Table 4). But when the laboratory data were compared according to skin test result in AD group, there was no statistically difference between the skin positive and skin test negative group in terms of age, MPV, monocyte and EMR(p=0.25, p=0.91, p=0.87 and 0.08, respectively). There was also significant difference in AD groups between IgE levels and SCORAD points according to skin tests (p=0.02, p=0.01, respectively) (Table 4).

Table 2. Comparison of laboratory and demographic data of study group according to SCORAD index

	Mild (n=8)	Moderate (n=11)	Severe (n=45)	P
Age,months[a]	8.5 (4-11)	6.7 (1-12)	5.9 (1-12)	0.150
Gender (M/F)	6/2	9/2	26/19	0.269
MPV[a]	9.7 (8.9-10.7)	9.6 (8.7-10.5)	9.6 (8.2-11)	0.803
Monocyte (mm3)[a]	655 (300-1360)	520 (60-14)	560 (190-1430)	0.644
EMR[a]	0.76 (0.9-1.46)	1.44 (0.53-2.56)	1.18 (0.0-4.09)	0.219
IgE (IU/ml)[a]	39.87 (0.0-154)	31.81 (18-87)	57.10 (0.0-388)	0.575
Platelet (mm3)[a]	318.2 (186-448)	383.6 (195-582)	386.3 (228-561)	0.147

[a]median (min-max.)
MPV: Mean platelet volume , EMR: Eosinophil monocyte ratio, IgE: Immunoglobulin E

Table 3. Correlations of MPV, EMR, Platelet count, Monocyte count and Ig E with SCORAD index of AD patients

	r	p
MPV	-0.093	0.467
EMR	0.187	0.139
Platelet	0.259	0.039
Monocyte	-0.001	0.993

MPV: Mean platelet volume, EMR: Eosinophil monocyte ratio, IgE: Immunglobulin E

Table 4. Comparison of laboratory data according to skin test results

	Skin test positive group (n=18)	Skin test negative group (n=46)	Control group (n=50	F	P
Age (months)[a]	7.5±2.9	5.9±3.6	4.9±3.2	4.03	0.02*
Gender (male/female)	14/4	27/19	27/23	1.57	0.21*
MPV (fl)[a]	9.7±0.6	9.6±0.6	10.2±0.9	7.32	0.01*
Platelet (10^3mm^3)[a]	394±86	370±92	422±137	2.49	0.08*
WBC (10^3mm^3)[a]	11.66±3.4	11.08±3.5	11.26±3.3	0.19	0.82*
Neutrophil (mm^3)[a]	2745±1216	2974±1752	2835±1550	0.15	0.85*
Monocyte (mm^3)[a]	602±342	550±300	1031±409	23.81	0.00*
Lymphocyte (mm^3)[a]	7550±2070	8437±1258	6853±2208	0.47	0.62*
Eosinophil (mm^3)[a]	723±282	494±403	497±284	3.4	0.03*
EMR[a]	1.46±0.8	1.05±0.83	0.53±0.32	16.15	0.00*
NLR[b]	0.37 (0.17-0.57)	0.41 (0-167)	0.34 (0.04-1.5)	0.75	0.47**
PLR[b]	59.47 (27.24-84.57)	55.78 (4.24-2703)	58.94 (28.47-254)	0.72	0.48**
ELR[b]	0.1 (0.06-0.17)	0.06 (0.0-46.32)	0.07 (0.01-0.20)	0.72	0.48**
RDW[b]	14.1 (12.2-17.5)	14.2 (12.1-41.1)	14.3 (11.6-19.30)	1.59	0.21**
IgE (IU/ml)[b]	38 (14-311)	18 (0-388)			0.02***
SCORAD point	64.5±15.8	49.9±14.9			0.01†

[a]mean±standart deviation, bmedian (min-max.) *Oneway ANOVA **Kruskal Wallis ***Mann-Whitney U†Student t test
MPV: Mean platelet volume, WBC: White blood cell, EMR: Eosinophil monocyte ratio, NLR: neutrophil lymphocyte ratio, PLR: platelet lymphocyte ratio, ELR: eosinophil lymphocyte ratio, RDW: red cell distribution width

DISCUSSION

Atopic dermatitis is a chronic skin disorder which is also associated with systemic inflammation. In this study, we aimed to investigate the relationship of MPV with inflammation in infants with the AD. We also examined the association of other inflammatory markers which can be easily obtained from the CBC data, shown in previous studies (1,8).

Platelets involve in the pathogenesis of inflammation-driven skin disorders such as atopic dermatitis, urticaria, and psoriasis (20-22). MPV is a parameter that can be obtained from CBC test results and shows the platelet activation (23). Megakaryopoiesis is affected by the releasing of some cytokines during inflammation such as IL-6 and TNF-α and this activated platelets are small in size due to degranulation (24,25). This situation implies that MPV may be an indirect inflammatory indicator (19). In previous studies, the changes in MPV were investigated. Uysal et al. showed that MPV was lower in children with cystic fibrosis than in healthy controls and this may be related to chronic inflammation (15). In another study conducted by Sert et al., MPV values were decreased in acute rheumatic fever (ARF) during the acute stage compared to healthy controls in children. They found that MPV values increased after treatment with contrast to C-reactive protein (CRP) and erythrocyte sedimentation rate (ESR) values (26). Tekin et al. showed that MPV values were lower in children with PFAPA (periodic fever, aphthous stomatitis, pharyngitis, and adenitis) syndrome compared to healthy controls even in the attack and in the attack-free period (25). Akelma et al.found significantly lower MPV levels in children with chronic urticaria when compared to healthy children (16). In accordance with these data, MPV values of the AD group were significantly lower than the control group, in our study. In contrast, there are also studies showing that MPV is elevated in some of the inflammatory events, such as asthma. Topal et al. found that MPV values were higher in children with atopic dermatitis compared to healthy controls in their study conducted by 128 preschool children. They found no difference between AD group and the control group by means of platelet count and they showed there was no correlation between the severity of AD and MPV (27). We found the number of platelet counts were significantly lower in the AD group. In the inflammatory processes the number of platelets may reduce due to released cytokines such as TNF-α, and this condition suggests that megakaryopoiesis may be affected by inflammation (28).

We also examined other markers that were claimed to be indicators of inflammation such as PLR, NLR, EMR, and ELR in our study. Jiang Yet al. showed that NLR was different between AD children and the control group and there was a correlation between NLR and AD severity (8). Batmaz examined the simple markers of inflammation in AD in her study with 252 AD children and she found that NLR and PLR were higher in AD group than the control group. Additionally there was positive a correlation between disease duration with these parameters (19). Doğru et al. examined the NLR and other markers in children with the AD. They found that there was no significant difference between the groups according to these markers (1). Similarly, we found that these markers were not different between the two groups. But, the EMR values of AD groups were statistically higher than the control group. This elevation may also be associated with a significantly higher rate of monocytes in the control group.

When we performed correlation analysis with SCORAD index, there was no correlation between MPV and other markers except for platelet counts. The lack of correlation between the SCORAD index and the MPV may be related to the low number of cases, or, the chronic inflammatory process that is already ongoing in the disease may be independent of severity. It is obvious that a large number of randomized controlled trials will be needed.

When we categorized AD group according to skin tests and compare them between each other and control group; there were only significant differences in terms of age, MPV, monocyte and eosinophil count and EMR. But when we compare these data in AD group according to skin test results there were no statistically difference except IgE levels and SCORAD points. These results showed that skin test positive group have had high allergic burden, but the absence of a difference between MPV and the groups indicates that more studies are needed to guide the inflammation.

The limitations of our study are the low number of cases and the fact that most of these cases consisted of children with severe atopic dermatitis. Compared to the control group, the study group consisted of older infants. Introduction of solid foods in this life period can cause increases in allergic susceptibility and AD. Since no known markers of inflammation were used in our study, an optimal cut-off value for MPV could not be calculated in predicting inflammation, which is another limitation of our study. More studies are needed on this issue.

CONCLUSION

In conclusion, we found that MPV values were significantly lower in infants with the AD than in healthy infants. MPV is one of the inexpensive, easily available inflammatory markers that can be used in the AD. We found no correlation between MPV and AD severity. Further prospective studies with larger cohorts are necessary to assess this issue.

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