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Platelet distribution width (PDW) data of patients with nasal polyposis: is it important for clinical severity?

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Abstract

Objective: The purpose of the present study was to investigate whether high platelet distribution width (PDW) levels correlated with nasal polyps or not.

Methods: The study was performed retrospectively in 99 patients who underwent endoscopic sinus surgery for nasal polyposis. Data were collected from the routine preoperative hemograms of the patients. The study group was compared with an age- and sex-matched control group including 150 healthy subjects. The Mann-Whitney U test was used to compare the results of the two groups.

Results: The PDW level for the study group was 14.49±2.08, while for the control group it was 13.76±2.14. The PDW levels of the study group were higher than those of the control group, and this difference was statistically significant ($p<0.05$).

Conclusion: The rise of the PDW levels in patients with nasal polyposis should be investigated for the diagnostic value, and the rise of PDW levels in patients with nasal polyposis may be used for its diagnostic evaluation.

Keywords: Platelet distribution width, nasal polyposis, inflammation.

Özet: Nazal polipozisi olan hastaların trombosit dağılım aralığı (TDA) verileri: Klinik ciddiyet açısından önemli mi?

Amaç: Bu çalışmanın amacı yüksek trombosit dağılım aralığı (TDA) düzeylerinin nazal polipler ile korele olup olmadığını araştırmaktı.

Yöntem: Nazal polipozis için endoskopik sinüs cerrahisi geçirmiş 99 hastada retrospektif çalışma yapıldı. Hastaların rutin preoperatif hemogramlarının verileri toplandı. Çalışma grubu, yaş ve cinsiyet açısından eşleştirilmiş 150 sağlıklı kişiden oluşan kontrol grubu ile karşılaştırıldı. İki grubun sonuçlarını karşılaştırmak için Mann-Whitney U testi kullanıldı.

Bulgular: Çalışma ve kontrol gruplarının TDA düzeyleri sırasıyla 14.49±2.08 ve 13.76±2.14 idi. Çalışma grubunun TDA düzeyleri kontrol grubundan daha yüksek olup bu farklılık istatistiksel açıdan anlamlı idi ($p<0.05$).

Sonuç: Nazal polipozisi olan hastalarda TDA düzeylerinde yükselme tanısal değer açısından araştırılmalıdır ve nazal polipozisi olan hastalarda TDA'daki yükselme tanısal değerlendirme için kullanılabilir.

Anahtar sözcükler: Trombosit dağılım aralığı, nazal polipozis, enflamasyon.

Nasal polyposis is a result of inflammation, but its pathogenesis is not completely understood. Nasal polyposis is not a unique disease that appears by a single stimuli.[1] It is estimated that symptomatic nasal polyposis is seen in 1–2% of Europe's population.[2] Nasal polyps were seen in 3.6% of patients with chronic rhinitis and in 4.8% of patients with asthma.[3] Nasal polyps occurred much more frequently in patients with chronic rhinitis or pansinusitis. Asthma incidence is also high in patients with nasal polyposis. Almost 20–50% of patients with nasal polyposis suffers from bronchial asthma and 20–40% of patients with bronchial asthma develops nasal polyps.[4] Mucosal edema is the primary pathology in the formation of nasal polyps. Nasal polyps are found in 1–4% of the population. They

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are more frequently seen in patients with asthma, aspirin hypersensitivity, and cystic fibrosis.[5] Nasal congestion, nasal flow, impaired sense of smell, and sneezing are the main complaints of patients. Endoscopic examination and computed tomography are used in the diagnosis of nasal polyps.[6]

Inflammation has an important role in the formation of nasal polyps. Studies performed in patients with nasal polyps found high levels of interleukin-2, -4, -5, -8, -10, -12, interferon-gamma, tumor necrosis factor-alpha, and -beta in the nasal secretions.[7] Activated eosinophils are involved in the formation of nasal polyps.[8] It was also determined that in nasal polyp tissue, eosinophils survive longer than normal tissue.[9,10] It is known that platelets play a key role in tissue repair and hemostasis.

In studies performed recently, platelets had determinant functions in the inflammation process. A study performed on lungs of allergen-sensitized mice showed that platelets play a part in the collection of eosinophils and have a role in inflammation development.[11] Furthermore, increased CD40L expression was shown in the activated platelets and CD40L had a role in platelet activation and directly stimulated endothelium inflammation.[12] After understanding the role of platelets in inflammatory processes, studies investigating the parameters that show platelet activation in certain diseases have increased. In most of these studies, the number of platelets in patients is significantly different from those in controls regarding mean platelet volume (MPV) and platelet distribution width (PDW) levels. PDW is a parameter that indicates the platelet activity and is included in routine hematological tests. The increase in the level of PDW means an increase in circulating platelets of different sizes, which indicates oscillation of young and more portly inflammatory and metabolically more active platelets from the marrow to the blood. On the other hand, a low PDW level means platelets in circulation have sizes closer to each other, indicating that they are metabolically and inflammatory less active and older platelets.[11] PDW gives information about the inflammatory processes of some diseases.[13,14]

In the present study, we examined the relation between nasal polyps and PDW retrospectively in 99 patients who underwent endoscopic sinus surgery for nasal polyposis. The measurement of PDW is very easy and practical for several minutes with the result of CBC parameters of the autoanalyzer. Thus, the rise of platelet PDW levels in patients with nasal polyposis may be used for its diagnostic evaluation.

Materials and Methods

Our study was conducted between December 2009 and March 2015 with 99 patients who applied to the ENT outpatient clinic because of nasal polyposis and who underwent endoscopic sinus surgery the results of the patient group were compared with those of a control group (150) that was similar in age, sex, and the number of patients. Hemogram (CBC) results from the autoanalyzer (ABX Micros; HORIBA Ltd., Kyoto, Japan) were investigated, retrospectively. Patient files were analyzed from the archives of the hospital computer automation program and data on white blood cell (WBC) count, red blood cell (RBC) count, hemoglobin (Hb), hematocrit (Hct), platelets (PLT), MPV and PDW were obtained and compared with those of the control group. Approval for the study was granted by the hospital ethics committee (no. 21.03.2016/20). Patients with chronic inflammatory diseases, acute infection, and diabetes mellitus patients with hypertension history were excluded from the study.

Data were analyzed using SPSS for Windows (Version 21.0; SPSS Inc., Chicago, IL, USA). In this study, nonparametric statistical tests were preferred because of abnormal distribution. Chi-square test was used for comparison of categorical variables. For quantitative variables, the Mann-Whitney U and Spearman correlation tests were used. $p<0.05$ was considered significant.

Results

There were 99 patients in the study group, and 64 of them (64.6%) were male and 35 (35.4%) were female. The youngest patient was 20 years old and the oldest wad 86 years old. The mean age of the study group was 44.41±13.74 years, where it was 45.87±14.49 years for male patients and 41.74±11.98 years for female patients.

The control group consisted of 150 subjects, and 81 of them (54%) were male and 69 (46%) of them were female. The mean age of male subjects in the control group was 41.81±14.01 years, and the mean age of female subjects in the control group was 42.34±17.34 years.

Age and sex ratios were not significantly different between the study group and the control group ($p>0.005$); and WBC, RBC, Hb, Hct, PLT, and MPV levels were not significantly different either ($p>0.005$). The PDW level for the study group was 14.35±2.04, while it was 13.73±2.01 for the control group. This difference was significant ($p<0.05$; Table 1)

According to the correlation test in the study group, we found a weak, positive, directional, and meaningful relationship (r=3) between PDW and MPV variables and this means that the high PDW level patients also have high MPV levels ($p<0.05$; Fig. 1).

The mean PDW level of the 99 patients in the study group was 14.49, and the mean PDW level of the 150 patients in the control group was 13.76.

Discussion

This study was the first of its kind in the literature conducted in patients with nasal polyposis. We compared the venous blood PDW levels of patients with nasal polyposis and those of normal individuals. We found that the mean PDW values of the study group were significantly higher than the control group.

The pathophysiology of nasal polyps is not fully understood, but it is believed that it is a multifactorial disease.[15] Moreover, on the nasal polyp tissue, several inflammatory molecules are shown. Many studies in the literature report that the inflammation occurring in the nasal polyp tissue depends on eosinophils and inflammatory products.[16] Among these, PDW and MPV are more reliable because they are not affected by some medications and pathological situations in the period between drawing the blood sample and investigating it. However, some new parameters, like PDW for example, have rarely been investigated, while MPV is frequently studied.[17,18] MPV and PDW are the parameters used for platelet size and the degree of differences in the size of platelets.[19] Our studies showed that there is a rise in biochemical mediators and free radicals in patients who have nasal polyps. In several studies, it was shown that the biochemical mediators and free radicals increased in patients with nasal polyposis.[20–22]

In recent studies, PDW has been found to be associated with several clinical conditions. In a study by Celikbilek et al., the platelet count, MPV, and PDW levels of 45 patients with benign paroxysmal positional vertigo (BPPV) were compared with a control group and all parameters were found statistically high in the BPPV group ($p<0.05$).[23]

In a study by Mirkavili et al., the PDW levels of 108 patients with sudden sensorineural hearing loss were investigated in a case-controlled prospective study and compared with a healthy control group; no statistically significant difference was found between the patient group and the control group, but a relationship between the rise in PDW levels and the severity of hearing loss was established.[24] In a study by Kurt et al., 98 OSAS patients were divided into 4 groups from mild to severe according to their apnea/hypopnea index; the PDW levels of the severe OSAS patients were found statistically higher than those of the other three groups, and it was thought that PDW could be an indicator of the severity of the disease.[25]

Jindal et al. designed a study of 75 diabetic patients, 50 of which had one or more than one microvascular complications; this study group was compared with a control group including 50 sex- and age-matched healthy individuals and the PDW levels were different from the control group. In the diabetic group, the PDW levels were higher in patients with microvascular complications.[26]

Table 1. Study parameters in patients with nasal polyposis.

	Study group (n=99) mean	Control group (n= 150) mean	p value*
Age (years)	44.41±13.74	42.06±15.58	0.077
Sex, F/M, n (%)	35 (35.4%) / 64 (64.6%)	69 (46.0%) / 81(54.0%)	0.096
WBC (/µL)	8.46±4.52	7.60±2.27	0.081
RBC (10^6/µL)	4.85±0.63	4.78±0.52	0.157
Hb (g/dL)	13.33±1.92	13.09±2.03	0.272
Hct (%)	41.25±5.62	40.95±4.91	0.383
PLT (K/mm^3)	242.95±54.86	238.14±64.99	0.295
MPV (fL)	8.03±0.68	8.10±1.05	0.903
PDW (fL)	14.49±2.08	13.76±2.14	0.022

COME: chronic otitis media with effusion; **F:** female; **Hb:** hemoglobin; **Hct:** hematocrit; **M:** male; **MPV:** mean platelet volume; **PLT:** platelets; **PDW:** platelet distribution width; **RBC:** red blood cell count; **WBC:** white blood cell count. ±: Standard deviation. *Statistical analysis was performed with the Mann-Whitney U test.

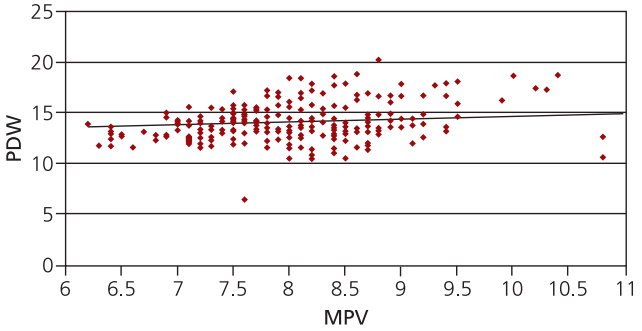

Fig. 1. The correlation between the MPV and PDW variables in the study group.

In a study by Topal et al.[27] conducted on 128 preschool patients with allergic eczema, their PDW levels were lower than those in the control group, but the MPV levels were higher. In a study by Chandrashekar et al.[28] carried out with 45 patients with chronic urticaria, both the MPV and PDW levels were significantly higher in the study group than they were in the control group and there was a correlation between the increase in disease severity and the increase in MPV and PDW levels. Patients with high PDW value in our study group also had high MPV values ($p<0.05$). The results of these studies are in agreement with our results.

Conclusions

The contribution of mediators released from the platelets to allergic inflammations is well known. In our study, the PDW as a parameter which indicates an increase in the number of metabolic and inflammatory active young platelets in circulation was significantly higher in patients with nasal polyps than in the control group. The measurement of PDW is very easy and practical for several minutes in CBC parameters of auto analyzer result. Thus, the rise of platelet PDW levels in patients with nasal polyposis may be used for its diagnostic value, and additional controlled studies are required to explain the role of PDW in the severity of nasal polyposis.

Conflict of Interest: No conflicts declared.

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