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Relationship between nasal polyps and inflammatory markers

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Abstract

In this study, we investigated the relationship between nasal polyps (NP) and NP density using the systemic inflammatory index (SII), systemic inflammatory response index (SIRI), eosinophil-lymphocyte ratio (ELR), neutrophil-lymphocyte ratio (NLR), and platelet-lymphocyte ratio (PLR). Of the 132 patients included in this study, 67 had NP, and 65 were included in the control group. The mean age of the study group was 44.58 ± 14.15 years, and that of the control group was 42.46 ± 13.59 years. An endoscopic staging method was used to determine NP density. The SII, SIRI, ELR, NLR, and PLR values in the NP and control groups were calculated and statistically compared. The study group was stratified according to endoscopic NP density. The mean NLR and ELR values were significantly higher in the study group. The mean NLR and ELR values in the study group were 1.72 ± 0.66 and 1.46 ± 0.50, respectively, and in the control group, they were 1.46 ± 0.50 and 0.13 ± 0.06 (p=0.007, p=0.0001). The higher mean PLR, SII, and SIRI values in the study group were not statistically significant (p>0.05). The leukocyte count was significantly higher in the stage 3 patient group. No statistically significant relationship was found between staging and mean NLR, ELR, PLR, SII, and SIRI values (p>0.05). NLR and ELR values derived from hemogram data can serve as markers of nasal polyps.

Keywords: Blood cell count, inflammation, nasal polyps

Introduction

Nasal polyps (NPs) are mucosal lesions that protrude into the nasal cavities. They have a pedunculated, smooth surface, involve mucosal inflammation, and have multiple etiologies. They are the most common cause of nasal masses [1]. The incidence of NPs is 1–4%, and is 2–4 times more common in males [2,3]. NPs are more commonly observed in the fifth decade of life and may be associated with cystic fibrosis if found in the pediatric age group. Its etiopathogenesis is not fully elucidated, and various inflammatory processes contribute to it [3].

NP is an inflammatory disease with a high mortality rate. Studies have found that T helper 1, T helper 2, and chemokines are elevated in the nasal secretions of patients with NP [4]. The systemic inflammatory index (SII), systemic inflammatory response index (SIRI), eosinophil lymphocyte ratio (ELR), neutrophil lymphocyte ratio (NLR) and platelet lymphocyte ratio (PLR) are inflammation markers that have recently gained significance. These values are used as predictive and prognostic factors in many inflammatory and malignant diseases. These values can be easily calculated from hemogram data [5,6].

In this study, the relationship between both NP and NP density and SII, SIRI, ELR, NLR, and PLR values was investigated.

Material and Methods

Data from the Ear, Nose, and Throat (ENT) Clinic of Malatya Training and Research Hospital were retrospectively reviewed between July 2023 and December 2024. A total of 132 participants were included in the study. 67 patients who underwent surgery with a diagnosis of NP and whose pathology results reported NP, and 65 healthy individuals were included in the study. The control group comprised patients without NP who underwent septoplasty or tympanoplasty at the ENT clinic. Patients with diseases causing unilateral nasal masses, such

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as inverted papilloma, antrochoanal polyps, active infection, connective tissue disease in the active phase, vasculitis, uncontrolled chronic systemic disease, acute ischemic heart disease, and inflammatory bowel disease, were excluded from the study.

Our study was retrospective, and routine complete blood count values obtained from patients before surgery were examined. Blood samples obtained from the peripheral veins of patients were analyzed using a Sysmex WE-2100 (Sysmex Corporation, Kobe, Kansai, Japan). Hemoglobin, erythrocyte, leukocyte, neutrophil, lymphocyte, and platelet counts were determined. SIRI (neutrophil × monocyte/lymphocyte), SII (neutrophil × platelet/lymphocyte), NLR, PLR, and ELR were calculated from the hemogram data.

The leukocyte, neutrophil, lymphocyte, eosinophil, platelet, SII, SIRI, ELR, NLR, and PLR values of both groups were compared. The study group was staged according to endoscopic appearance. Stage 0: no polyp; Stage I: polyp under the middle turbinate that can be seen with the use of an endoscope; Stage II: polyp protruding under the middle turbinate that can be seen without the use of an endoscope; Stage III: massive polyposis [1]. Stage 0 disease was not observed in the study. Patients in stages 1 and 2 were assigned to group 1, and those in stage 3 were assigned to group 2. The leukocyte, neutrophil, lymphocyte, eosinophil, platelet, SII, SIRI, ELR, NLR, and PLR values of both groups were evaluated statistically separately.

Ethics committee approval for this study was obtained from the Malatya Turgut Ozal University Non-interventional Clinical Research Ethics Committee on February 19, 2025. The ethics committee protocol number was 2025/46.

Statistical Analyses

SPSS (version 22.0; IBM, Armonk, NY, USA) was used to enter and analyze the data. Ratios for qualitative variables and mean, standard deviation, median, minimum, and maximum values for quantitative variables were calculated. Pearson's chi-square test was used to compare qualitative variables. According to the Shapiro–Wilk test statistic ($p<0.05$), since the variables were not normally distributed, the Mann–Whitney U statistic was used from the nonparametric tests, and according to the Shapiro–Wilk test statistic ($p>0.05$), since the variables were normally distributed, the parametric test statistic was used. Independent samples between the two groups were used.

Results

This study included 67 patients and 65 healthy controls who underwent surgery. The patient group included 45 men and 22 women, with a mean age of 44.5 ± 14.1 years (range, 20–75 years). The control group included 37 men and 28 women, with a mean age of 42.4 ± 13.5 years (range, 20–73 years). The groups were comparable in terms of age and sex. ($p=0.46$, $p=0.225$). A comparison of the blood parameters and inflammatory markers between the study and control groups is presented in Tables 1 and 2. There were statistically significant differences between the study and control groups in leukocyte, neutrophil, and eosinophil values from complete blood count results ($p<0.05$; Table 1). When the NLR and ELR values were compared between the study and control groups, a statistically significant difference was observed ($p<0.05$, Table 2). The high mean PLR, SII, and SIRI values in the study group were not statistically significant ($p>0.05$).

Table 1. Comparison of the blood parameters of the study and control groups

Groups	Leukocyte	Neutrophil	Lymphocyte	Monocyte	Eosinophil	Platelet
Patient group Mean ± SD (n=67)	8.22 ± 2.21	4.49 ± 1.59	2.73 ± 0.76	0.59 ± 0.23	0.36 ± 0.23	276.38 ± 62.12
Control group Mean ± SD (n=65)	7.19 ± 1.40	3.75 ± 1.09	2.65 ± 0.58	0.53 ± 0,18	0.22 ± 0.18	268.53 ± 64.52
p	0.003	0.003	0.56	0.131	0.0001	0.34

*Significant difference at $p<0.05$ level according to Mann-Whitney U test, SD: standard deviation

Table 2. Comparison of NLR, PLR, ELR, SII, and SIRI means according to Mann-Whitney U Test

Groups	NLR	PLR	ELR	SII	SIRI
Patient group Mean ± SD (n=67)	1.72 ± 0.66	110.47 ± 31.18	0.13 ± 0.06	481.03 ± 232.51	1.06 ± 0.77
Control group Mean ± SD (n=65)	1.46 ± 0.50	105.17 ± 31.18	0.09 ± 0.08	455.41 ± 156.26	0.89 ± 0.42
p	0.007	0.98	0.0001	0.87	0.422

$p<0.05$ is significant ELR: eosinophil lymphocyte ratio, NLR: neutrophil lymphocyte ratio, PLR: platelet lymphocyte ratio, SII: systemic inflammatory index, SIRI: systemic inflammatory response index

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The NP group was staged according to endoscopic appearance. Endoscopic staging was performed between 0 and 3 years. According to this staging system, the number of patients was 0, 17, 14, and 36. Patients with NP were divided into two groups based on endoscopic staging: the first group included those in stages 1 and 2, and the second group included those in stage 3. When these two groups were compared, a statistically significant difference was detected only in the mean leukocyte count ($p<0.05$, Table 3). The mean leukocyte value for group 1 was 7.75 ± 2.01, while it was 8.64 ± 2.32 in group 2.

Table 3. Comparison of hematological parameters according to endoscopic staging

Parameters	Group 1 Mean ± SD (n=31)	Group 2 Mean ± SD (n=36)	*p*
Leukocyte	7.75 ± 2.01	8.64 ± 2.32	0.04
Neutrophil	4.19 ± 1.32	4.75 ± 1.76	0.169
Lymphocyte	2.63 ± 0.81	2.82 ± 0.70	0.31
Monocyte	0.56 ± 0.22	0.62 ± 0.24	0.168
Eosinophil	0.32 ± 0.175	0.40 ± 0.26	0.21
Platelet	284.16 ± 66.66	269.69 ± 58.04	0.34
NLR	1.68 ± 0.67	1.75 ± 0.65	0.52
PLR	116.73 ± 44.22	105.09 ± 52.60	0.09
ELR	0.12 ± 0.07	0.13 ± 0.06	0.53
SII	474.29 ± 208.75	486.84 ± 253.99	0.77
SIRI	0.95 ± 0.56	1.15 ± 0.91	0.32

*Significant difference at $p<0.05$ level according to Mann-Whitney U test

Discussion

NP is an inflammatory disease affecting the paranasal sinuses and nose, with unclear etiopathogenesis; however, factors such as allergies and inflammation have been implicated. This disease affects approximately 11% of the population [7,8].

Neutrophils, lymphocytes, and platelets participate in inflammatory processes. Aktaş et al. examined leukocyte and platelet values in patients with NP, but no significant changes were observed [9]. We found a statistically significant increase in leukocyte, neutrophil, and eosinophil counts in patients with NP.

NLR, PLR, ELR, SII, and SIRI values calculated from hemogram data have recently been used as markers of chronic inflammation [11,13,14,16-18]. They are cheaper and easier to obtain than other markers.

Numerous studies have used NLR as an inflammatory marker to evaluate its value in patients with NP. A relationship between nasal polyps and NLR has been reported in many studies [8,10]. Studies have found that NLR levels are high in patients with recurrent nasal polyps [11]. Atan D et al. found the NLR value to be statistically significantly higher in the NP group compared to the control group [10]. We also found that NLR was elevated in patients with nasal polyps; however, the increase with endoscopic staging was not statistically significant.

Similar to NLR, PLR is used as a marker for various diseases. In this study, although the mean PLR was high in patients with nasal polyps, the difference was not statistically significant. Similar to our study, Atan et al. found no relationship between PLR and nasal polyps. Another study found no association between recurrent nasal polyposis and PLR [12].

Eosinophilia in sinus tissue is associated with polyp growth, disease severity, and recurrence. The prevalence of allergic diseases is higher in patients with NP than in healthy individuals [5]. We found that eosinophil and ELR values were significantly higher in patients with NP than in those without. However, the increase in endoscopic staging was not significant. Several studies have suggested that ELR may be associated with recurrent nasal polyposis [5,11,12].

The SII value, an important inflammatory marker, is an important prognostic indicator in many cancers [13,14]. Few studies have correlated NP with SII. Sivrice et al. used SII to predict nasal polyp subtypes in their study [15]. Yang et al. identified SII as a marker of recurrent NP [6]. In this study, we found higher SII values in patients with NP and higher polyp density; however, this difference was not statistically significant. Another inflammatory marker, SIRI, is also prognostic and diagnostic and has been used in many studies [16-18]. Chao et al. showed that SIRI is an objective and reliable marker of survival in patients with cervical cancer after radical surgery [18]. Yıldız et al. found elevated SIRI values in patients with proximal pulmonary embolism [16]. Another study by Yıldız et al. found that SIRI could be a complication marker in patients with acute appendicitis [17]. We found only one study in the literature on the use of SIRI in nasal polyps. Yang et al. found that SIRI was a predictive marker for the recurrence of chronic sinusitis with nasal polyps [6]. In this study, we found higher mean SII values in patients with NP and high NP density; however, this difference was not statistically significant.

Study Limitations

One of the main limitations of this study was that the control group consisted of patients who underwent both septoplasty and tympanoplasty.

Conclusion

Therefore, NLR and ELR values can be used as markers in patients with nasal polyps. However, these markers were not associated with NP density. Studies on recurrence and intraoperative bleeding density can be conducted using these markers. There was also a relationship between nasal polyp density and leukocyte count. In our study, we evaluated NP density using endoscopic staging. NP density can be evaluated using tomographic scoring. The SII and SIRI values were elevated in patients with NP and NP density; however, this increase was not statistically significant.

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Ethical Approval
The study protocol was approved by the Malatya Turgut Ozal University Non-interventional Clinical Research Ethics Committee (No: 2025/46; Date: 19 February 2025).

Patient Consent
Due to the retrospective design of the study, informed consent was waived by the ethics committee.

Conflict of Interest
The authors declare no conflict of interest.

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