

Assessment of neutrophil-to-lymphocyte ratio, platelet-to-lymphocyte ratio and mean platelet volume in patients with tinnitus

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Abstract

Objective: The aim of this retrospective, case-control study was to investigate the association of neutrophil-to-lymphocyte ratio (NLR), platelet-to-lymphocyte ratio (PLR) and mean platelet volume (MPV) with tinnitus.

Methods: A total of 51 patients with tinnitus and 42 healthy, age- and sex-matched subjects were recruited for the present study. Audiometric data including pure-tone average (PTA) values, the side of the head in which tinnitus was experienced, duration of tinnitus, tinnitus reaction questionnaire (TRQ), tinnitus handicap questionnaire (THQ), complete blood count (CBC) and biochemical data were assessed from patient records. The mean values of NLR, PLR and MPV were compared between patients with tinnitus and healthy controls.

Results: The difference was not significant for mean serum NLR, PLR and MPV values between patients with tinnitus and healthy controls.

Conclusion: Serum NLR, PLR and MPV levels may not be useful parameters for routine clinical evaluation of tinnitus.

Keywords: Tinnitus, neutrophils, lymphocytes, mean platelet volume.

Özet: Tinnitus hastalarında nötrofil/lenfosit oranı, platelet/lenfosit oranı ve ortalama trombosit hacminin değerlendirilmesi

Amaç: Bu retrospektif, olgu-kontrol çalışmasının amacı, nötrofil/lenfosit oranı, platelet/lenfosit oranı ve ortalama trombosit hacmi ile tinnitus arasındaki ilişkiyi araştırmaktır.

Yöntem: Çalışmaya 51 tinnitus hastası ile 42 yaş ve cinsiyet uyumlu sağlıklı kontrol hastası alındı. Hastaların medikal kayıtlarından saf ses ortalamasını da içeren odyometrik bilgileri, tinnitusun yönü, ne kadar süredir var olduğu, tinnitus reaksiyon anketi, tinnitus handicap anketi, tam kan sayımı ve biyokimya değerleri kaydedildi. Ortalama nötrofil/lenfosit oranı, platelet/lenfosit oranı ve ortalama trombosit hacmi tinnitus hastaları ve sağlıklı kontroller arasında karşılaştırıldı.

Bulgular: Ortalama kan nötrofil/lenfosit oranı, platelet/lenfosit oranı ve ortalama trombosit hacmi tinnitus hastalarının rutin klinik değerlendirmesinde yararlı parametreler olmayabilir.

Sonuç: Kan nötrofil/lenfosit oranı, platelet/lenfosit oranı ve ortalama trombosit hacmi tinnitus hastalarının rutin klinik değerlendirmesinde yararlı parametreler olmayabilir.

Anahtar sözcükler: Tinnitus, nötrofiller, lenfositler, ortalama trombosit hacmi.

Tinnitus is a condition of the ear in which the person perceives sounds without an external source. The estimated prevalence of tinnitus ranges from 5 to 15%, and it becomes more prevalent with older age.^[1] Despite the high prevalence of tinnitus, the underlying pathophysiological mechanisms have not been fully clarified. The neutrophil-to-lymphocyte ratio (NLR) and platelet-to-lymphocyte ratio (PLR) have been defined as novel markers of inflammation and thrombotic events which can be easily measured from the com-

plete blood cell count (CBC).^[2] Sudden sensorineural hearing loss, Bell's palsy and vestibular neuritis are certain pathological conditions that have been found to be related to NLR and PLR in otolaryngological practice.^[3-5] Mean platelet volume (MPV) is a blood marker related to function and activation of platelets.^[6]

In the present study, we aimed to investigate the association of NLR, PLR and MPV with tinnitus.

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Materials and Methods

A retrospective, case-control study was conducted in the Department of Otorhinolaryngology Head and Neck Surgery of the Kayseri Training and Research Hospital. The study group consisted of patients who were admitted to our hospital with the complaint of tinnitus for at least one month. After a detailed evaluation of the patients' medical records, subjects who had acute inflammation or infection, diabetes mellitus, systemic hypertension, hyperlipidemia, coronary artery disease, chronic liver disease, acute or chronic renal failure, chronic obstructive pulmonary disease, connective tissue disease, inflammatory bowel disease, current smoking, moderate or severe hearing loss, history of acoustic trauma, family history of hearing loss or any otologic disease such as chronic otitis media, noise induced hearing loss, otosclerosis or Meniere's disease were excluded from the study. A total of 51 patients were ultimately recruited to the SG and patients were recalled to the hospital if there was any missing data in their medical records. The control group was composed of 42 healthy, age- and sex-matched subjects.

Audiometric data including pure-tone average (PTA) values calculated from the mean of the four frequencies (0.5, 1, 2 and 4 kHz), the side of the head in which tinnitus was experienced, duration of tinnitus, tinnitus reaction questionnaire (TRQ),^[7] tinnitus handicap questionnaire (THQ),^[8] CBC and biochemical data were assessed from patient records. Absolute neutrophil, platelet and lymphocyte counts, and MPV values were derived from the CBC measurements. NLR and PLR were calculated as follows: $NLR = \text{Absolute neutrophil count} / \text{absolute lymphocyte count}$ and $PLR = \text{Absolute platelet count} / \text{absolute lymphocyte count}$. CBC measurements were performed with an automated blood cell counter (Sysmex XE-2100; Sysmex, Kobe, Japan). All samples were run in duplicate, and the mean values of absolute neutrophil, platelet count, and lymphocyte count, MPV, NLR and PLR were compared between the study group and the control group.

Statistical analysis was conducted using Statistical Package for the Social Sciences (v. 15; SPSS Inc., Chicago, IL, USA). A two-tailed unpaired Student's t test was used to compare parametric conditions and Mann-Whitney U test was carried out for nonparametric conditions. Chi-square test was used for categorical variables. A p value less than 0.05 was considered significant for all comparisons.

Results

The study group consisted of 25 women and 26 men, and the mean age was 43.47 ± 13.74 years in this group. The

control group consisted of 18 women and 24 men, and the mean age was 45.19 ± 9.71 years in this group. There was statistically no significant difference between the two groups with regard to age and sex ($p > 0.05$).

The side of the head in which tinnitus was experienced, the duration of tinnitus, the mean value of PTA of each ear and the mean scores of TRQ and THQ in the study group are shown in Table 1. The difference was not significant for the mean absolute neutrophil, platelet count, and lymphocyte counts, NLR, PLR and MPV values between the study group and the control group (Table 2).

Discussion

Tinnitus is a disturbing disorder with worldwide impact for which the pathogenesis and optimum management are still unclear. Tinnitus can become chronic and diminish the quality of life in about 5–15% of the population.^[9] The correlation between tinnitus and emotional stress, anxiety and depression is a well-known phenomenon.^[3,10,11] Emotional distress may accompany over 70% of all tinnitus patients.^[12] Chronic psychosocial distress often accom-

Table 1. Clinical data of patients with tinnitus in the study group.

Study group (n=51)		
Tinnitus side	Right	16 (31.3%)
	Left	18 (35.2%)
	Bilateral	17 (33.3%)
Tinnitus duration (month)		27.02±34.99
Pure-tone average (dB)	Right	14.44±8.97
	Left	14.94±10.03
Tinnitus reaction questionnaire		28.22±19.28
Tinnitus handicap questionnaire		845.18±565.994

dB: decibel.

Table 2. Complete blood cell count values in the study and control groups.

	Study group (n=51)	Control group (n=42)	p value
Absolute neutrophil count	4.19±1.05	3.82±0.81	0.07
Absolute platelet count	261.96±53.38	248.31±46.95	0.199
Absolute lymphocyte count	2.15±0.47	2.01±0.52	0.195
Neutrophil to lymphocyte ratio	2.04±0.66	2±0.65	0.818
Platelet to lymphocyte ratio	126.65±51.12	130.45±40.26	0.69
Mean platelet volume	10.2±1.12	9.85±1.13	0.092

panies elevated inflammation.^[13] CBC is a widely used blood test that provides useful information about patient general health and inflammatory status. High neutrophil and platelet counts reflect inflammation, whereas a low lymphocyte count reflects general stress and poor health.^[14] NLR is a practical, cost-effective and valuable marker of inflammatory state that can easily be calculated from CBC tests. It has been found to be a valuable predictor of poor prognosis and long-term mortality in oncological patients,^[15,16] in coronary artery disease,^[17] end-stage renal disease^[18] and inflammatory diseases such as ulcerative colitis^[19] and appendicitis.^[20] In otolaryngological practice, high NLR was found to be related to various pathological conditions, including vestibular neuritis,^[3] Bell's palsy,^[4] idiopathic sudden sensorineural hearing loss^[5] and head and neck squamous cell carcinoma.^[21] Recently, Ozbay et al.^[22] reported significantly higher NLR values in patients with severe tinnitus than control subjects and they concluded that NLR should be considered as a potential clinical marker of tinnitus.

Platelet-to-lymphocyte ratio is a novel potential marker that reflects chronic inflammation. Chung et al.^[3] found that PLR levels were significantly higher in patients with vestibular neuritis than in healthy controls. In patients with Bell's palsy, PLR was reported to be higher than control subjects.^[23] In a study of Atan et al.,^[24] there was statistically no significant difference in terms of mean PLR values between patients with nasal polyposis and healthy individuals. PLR was found to be superior to NLR as an inflammation marker in some studies. Turkmen et al.^[25] reported that PLR can predict inflammation better than NLR in patients with end-stage renal disease. PLR was found to be superior to NLR in predicting clinical outcome in patients with soft tissue carcinomas.^[26] However, in a detailed review of the literature we could not find any studies concerning PLR values in patients with tinnitus.

Mean platelet volume has emerged as a marker of inflammation that is routinely examined in CBC tests. A high level of MPV is indicative of increased platelet activity, which causes more intense inflammation.^[27] An increased level of MPV was found to be related to various pathological conditions, including cardiovascular^[28] and cerebrovascular^[29] disorders, and deep venous thrombosis.^[30] MPV was also investigated in some studies related to otolaryngological pathologies. Poorey et al.^[31] reported an increased level of MPV due to chronic nasal obstruction in patients with deviated nasal septum. Karli et al.^[6] stated that MPV is not a predictive parameter in the diagnosis of sudden sensorineural hearing loss. Ozbay et al.^[22] found no

significant difference in terms of MPV levels between patients with severe tinnitus and control subjects.

In the present study, we hypothesized that if tinnitus has a close relationship with chronic emotional distress, inflammatory markers including NLR, PLR and MPV may be affected due to the stress-related inflammation. However, statistically no significant difference was found in terms of serum NLR, PLR and MPV levels between the study group and the control group. This result contradicts the study of Ozbay et al.^[22] who investigated NLR in patients with severe tinnitus. They found that the NLR was significantly higher among patients with severe tinnitus, but this study did not include patients with slight or mild tinnitus. In the present study, the study group was heterogeneous and we preferred not to distinguish patients in terms of the degree of tinnitus. Therefore the contradiction between the two studies may be due to patient selection criteria. On the other hand, the small sample size constitutes a major limitation of our study. However, this is the first study investigating NLR, PLR and MPV levels in a heterogeneous group of patients with tinnitus and no relationship was detected between these parameters and tinnitus.

In conclusion, the present study showed no association between NLR, PLR and MPV levels, and the presence of tinnitus. Therefore, we concluded that the serum NLR, PLR and MPV levels may not be useful parameters for routine clinical evaluation of tinnitus.

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