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After obstructive sleep apnea syndrome surgery, preoperative, postoperative early and late change of neutrophil / lymphocyte ratio, platelet / lymphocyte ratio and mean platelet volume

Obstruktif uyku apne sendromu cerrahisinden sonra nötrofil/lenfosit oranı, ortalama tombosit hacmi ve trombosit/ lenfosit oranlarının preoperatif ve postoperatif erken ve geç dönemdeki değişimi

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Abstract

Aim: The aim of this study was to investigate the relationship between the severity of obstructive sleep apnea syndrome (OSAS), neutrophil lymphocyte ratio (NLR), platelet lymphocyte ratio (PLR) and mean platelet volume (MPV), preoperative and postoperative early and late levels of these patients surgery related changes were investigated.

Methods: A total of 148 patients (22 women, 14.9% and 126 men, 85.1%) who underwent OSA diagnosis and surgical treatment were included in the study: patients with mild to moderate OSAS [86 (58.1%)], and severe OSAS [62 (41.9%)] patients with apnea hypoapnea index. (AHI: 5-15 mild OSAS, AHI: 15-30 moderate OSAS and AHI >30 severe OSAS). Patients were divided into two groups. Retrospectively, the blood results of these patients were investigated and preoperative, postoperative early and late full blood results were examined.

Results: Weight and BMI values were found to be high in the heavy OSAS group. There was no significant difference between mild-moderate OSAS and severe OSAS groups, preoperative, early and late postoperative periods, and between NLR, PLR and MPV values. Intra-group comparison showed an increase in NLR and PLR in the early postoperative period in both groups. There was no difference between the other values. In late postoperative period, NLR levels decreased to preoperative values while PLR levels were higher than preoperative values.

Conclusion: The similarity of NLR, PLR, and MPV values between the mild-moderate and severe OSAS groups as a marker of systemic inflammation and the fact that airway obstruction was remained unchanged suggests that oxidative stress and systemic inflammation in this disease are due to a variety of factors besides airway obstruction.

Keywords: Obstructive sleep apnea syndrome, Neutrophil lymphocyte ratio, Platelet lymphocyte ratio, Mean platelet volume

Öz

Amaç: Bu çalışmada Obstrüktif uyku apne sendromu (OUAS) şiddeti ile Nötrofil Lenfosit oranı (NLO), Trombosit Lenfosit oranı (TLO) ve Ortalama Trombosit Hacmi (OTH) arasındaki ilişki ve bu hastaların preoperatif ve postoperatif erken ve geç dönemdeki düzeyleri, cerrahiye bağlı değişimleri araştırıldı.

Yöntemler: OUAS tanısı konmuş ve tedavi amacıyla cerrahi operasyon yapılmış toplam 148 hasta (22 kadın %14.9 ve 126 erkek %85.1) çalışmaya alındı. Hastalar apne hipoapne indeksine (AHİ) göre hafif-orta OUAS'lı hastalar (86 (%58.1)), (AHİ:5-15 Hafif OUAS, AHİ:15-30 Orta OUAS) ve Ağır OUAS'lı (62 (%41.9)) hastalar olarak iki gruba ayrıldı. Retrospektif olarak hastaların kan sonuçları tarandı ve preoperatif, postopertif erken ve geç dönem tam kan sonuçları incelendi.

Bulgular: Kilo ve BMI değerleri Ağır OUAS grubunda yüksek saptandı. Hafif-Orta OUAS ile Ağır OUAS grupları, NLO, TLO ve OTH değerleri preoperatif, erken ve geç postoperatif dönemler, gruplar arası karşılaştırıldığında anlamlı fark bulunmadı. Grup içi karşılaştırmada ise her iki grupta da NLO'da ve TLO'da postoperatif erken dönemde artış saptandı. OTH değerler arasında fark bulunmadı. Postoperatif geç dönemde NLO düzeyleri preoperatif değerlere düşerken, TLO düzeyleri preoperatif değerlere göre yükseklik devam etmekte idi.

Sonuç: Sistemik inflamasyonun belirteci olarak kullanılan NLO, TLO ve OTH değerlerinin Hafif-Orta ve Ağır OUAS grupları arasında benzer olması ve hava yolu tıkanıklığının giderilmesine rağmen değişmeyişi bu hastalıktaki oksidatif stres ve sistemik inflamasyonun hava yolu tıkanıklığının yanı sıra çok çeşitli faktörlere bağlı olduğunu düşündürmektedir.

Anahtar kelimeler: Obstruktif uyku apne sendromu, Nötrofil lenfosit oranı, Trombosit lenfosit oranı, Ortalama trombosit hacmi

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Introduction

Obstructive sleep apnea syndrome (OSAS) is a disease with recurrent obstructions of the upper airway during sleep. OSAS is seen in approximately 4% of adult males and 2% of females [1]. Oxidative stress and airway inflammation play an important role in the pathophysiology of OSAS [2]. Neutrophils and leukocytes play an important role in the development of inflammatory response. Numerous cytokine secretions and immune response and inflammatory reactions are initiated. In recent years, neutrophil lymphocyte ratio (NLR), thrombocyte lymphocyte ratio (PLR) and mean platelet volume (MPV) from hemogram data have been used as indicators of systemic inflammation.

The aim of this study is to demonstrate the association between OSAS severity and NLR, PLR, and MPV in patients undergoing surgery due to OSAS, and to reveal early and late changes in these parameters before and after operation.

Materials and methods

After approval of the ethics committee, a total of 222 patients with OSAS due to radio frequency application, uvulopalatopharyngoplasty, tongue root suspension surgery between January 2014 and March 2016 were investigated using the hospital data system. A total of 148 patients (22 women, 14.9% and 126 men, 85.1%) were included in the study. Seventy-four patients who could not have postoperative early and late hemogram studies were excluded due to lack of data. Patients' age, weight, height, BMI and sex were taken from file records. Patients' polysomnography, preoperative, early and late postoperative hemogram results, neutrophil, lymphocyte, platelet and MPV values were obtained from file records. Patients were divided into two groups according to their apnea hypoapnea index (AHI) values: mild to moderate OSAS group (AHI 5-30) and severe OSAS (AHI 30>) group

Statistical analysis

Descriptive statistics are presented with frequency, percent, mean, standard deviation (SD) and median (median), minimum (min), max (max) values. Fisher's Exact Test or Pearson Chi-square test was used to analyze the relationships between categorical variables.

In the normality test, the Shapiro Wilks test was used when the number of samples in the group was less than 50, and the Kolmogorov-Smirnov test was used when it was large. The Mann-Whitney U test was used when the difference between the two groups was not in normal distribution, and the Student t test was used when there was difference between the 2 groups. For each group, the Wilcoxon test was used when the measurements did not fit the normal distribution, and the Paired Samples t test was used for the normal distribution. Repeated Measure ANOVA was used when the parametric assumptions were provided for the comparison between the measurement change differences of the groups. In the other case, the difference between the measurements was compared with the Mann-Whitney U test between the two groups. Friedman test and Wilcoxon signed ranks test were used for preoperative, postoperatively early and late full blood results

Analyzes were done with SPSS 23.0 package program. P values less than 0.05 were considered statistically significant.

Results

When the two groups were compared, the weight and BMI values were significantly higher in the severe OSAS group (Table 1, $p<0.05$). There was no difference between age and height ($p>0.05$). Male gender was higher than female sex in intra-group comparison (Table 1, $p<0.05$). When the AHI score was compared between the groups, it was found as 53±2.3 in the 14±0.7 severe group in the mild-to-moderate group and statistically higher in the severe OSAS group (Table 1, $p<0.05$).

Table 1: Demographic and AHI values of OSAS Groups

	Mild - Moderate OSAS	Severe OSAS
Age	48.4±1	47.4±1.2
Height (cm)	169.8±1.6	172±1.0
Weight	84.7±1.3*	92.8±1.7*
BMI	28.9±0.4	31.1±0.4
Number of women	18 (% 81.8)	4 (%18.2)
Number of males	68 (%54.0)*	58 (%46.0)*
Total patient	86 (%58.1)	62 (%41.9)
AHI	14±0.7*	53±2.3*

OSAS: Obstructive sleep apnea syndrome, BMI: Body mass index, AHI: Apnea hypoapnea index, Mean ± Standard deviation in comparison between groups, *p<0.05

Robotic surgery In 20 patients (23.3%) in the mild-moderate OSAS group, 35 patients (56.5%) in the severe OSAS group were treated. The rate of tongue root suspension and robotic surgery was higher in the severe OSAS group ($p<0.05$). There was no significant difference between the groups in other surgical procedures (pulse radio frequency application, uvulopalatopharyngoplasty, tongue root suspension, robotic surgery) ($p>0.05$) (Table 2).

Table 2: Surgical Procedures of OSAS Groups

Groups	Radio frequency application	Uvulopalato-pharyngoplasty	Tongue root suspension	Robotic surgery
Mild - Moderate OSAS	37 (%43.0)	74 (%86.0)	26 (% 30.2)*	20 (%23.3)*
Severe OSAS	20 (%32.3)	49 (79.0)	39 (% 62.9)*	35 (%56.5)*
Total	57 (%100)	123 (% 100)	65 (% 100)	55 (% 100)

There was no significant difference between mild-moderate OSAS and severe OSAS groups, NLR, PLR, and MPV values preoperatively, early and late postoperatively, and between groups (Table 3, $p<0.05$). Intra-group comparison showed an increase in early postoperative period in NLR in both groups ($p<0.05$). In the late postoperative period, NLR values were found to decrease preoperatively (Table 3, $p>0.05$).

Table 3: Comparison of preoperative (NLR1), postoperative early (NLR2), and late (NLR3) values of Neutrophil Lymphocyte Ratios of OSAS groups

Groups	NLR1	NLR2	NLR3
Mild - Moderate OSAS	1.92±0.83	6.86±4.44*	1.89±0.56
Severe OSAS	1.90±0.85	8.64±4.87*	2.18±1.63

NLR: Neutrophil lymphocyte ratio, Mean scores ± standard deviation, *p<0.05

When the mild-moderate OSAS and severe OSAS PLR values were compared within the group, an increase in preoperative values was detected in the early postoperative period (Table 4, $p<0.05$). There was no significant difference between groups in preoperative and postoperative early and late periods (Table 5, $p>0.05$).

Table 4: Comparison of preoperative (PLR1), postoperative early (PLR2), and late (PLR3) values of platelet lymphocyte ratios of OSAS groups

Groups	PLR1	PLR2	PLR3
Mild - Moderate OSAS	101.3±29	161.4±72*	128.8±42
Severe OSAS	96.4±59	179±66*	135.5±52

PLR: Platelet lymphocyte ratio, Mean scores ± standard deviation,*p<0.05

Table 5: Comparison of preoperative (MPV1), postoperative early (MPV 2), and late (MPV3) values of mean platelet volume ratios of OSAS groups

Groups	MPV1	MPV2	MPV3
Mild - Moderate OSAS	7.62±0.93	7.73±0.89	7.59±1.16
Severe OSAS	7.39±0.99	7.30±0.90	7.34±1.02

MPV: Mean platelet volume, Mean scores ± standard deviation. *p<0.05

Discussion

The aim of this study was to investigate the role of oxidative stress and systemic inflammation in the pathogenesis of OSAS. We found that 1) there was no difference between the severity of the disease and the markers of inflammation, and 2) no evidence of systemic inflammation markers by elimination of airway obstruction.

OSAS is associated with pro-inflammatory and prothrombotic agents [3-5]. Components of leukocytes, such as neutrophils and lymphocytes, play an important role in inflammatory processes. NLR has been proposed as a new marker for systemic inflammatory response in various diseases [6-9]. Various peripheral artery diseases, coronary artery disease, and some gynecologic and hepatobiliary malignancies have high PLR values and are associated with poor prognosis. NLR increases in systemic inflammation, in some gynecologic and gastrointestinal cancers, and in some cardiovascular diseases [10-12]. The platelet size measured as mean platelet volume (MPV) is a good indication of platelet-specific activities such as platelet aggregation, thromboxane A2, platelet factor 4 and thromboglobulin release [10,13]. Mean platelet volume increases in diabetes mellitus [14,15], myocardial infarction [16-18], smoking [19] and renal artery stenosis [20]. Platelet activation plays a role in inflammatory process upregulation by interacting with leukocytes as well as endothelial adhesion and aggregation [21]

Inflammatory markers related to the severity of the disease

In our study, NLR PLR and MPV were found to be comparable between the mild and moderate OSAS patients' group and the severe patients' group. It has been reported that NLR can give an idea about the presence and severity of OSAS [22]. In a study conducted by Sünbül et al. [22] 130 OSAS patients and 65 healthy subjects were compared and NLR was found significantly higher than healthy subjects. In addition, it was stated that AHI score and NLR values showed a significant correlation. In another study, NLR was found to be higher in the OSAS group compared to 171 OSAS patients and 118 control groups [23]. Song et al. [24] 290 patients were divided into four groups according to their AHI value, and compared PLR with OSAS severity (as reflected by AHI) was significantly associated with the study. In our study, there was no relationship between the severity of the disease and PLR. Platelet sizes are given as MPV and are indirectly related to their activity. It has been reported that MPV decreases during particularly active periods during the disease course [10]. Varol et al. [25] reported that OSAS levels were also higher in the MPV. Another study reported a correlation between MPV and AHI in OSAS patients [26]. In a study conducted by Kurt et al. [27] 98 OSAS patients were grouped according to their AHI values, and there was no difference between the AHI groups and the MPV values. We also found no difference between the mild-moderate OSAS group and the severe OSAS group between the groups and intra-group statistical evaluation. In our study, NLR, PLR and MPV did not change with the severity of the disease. This suggests that systemic inflammation and oxidative stress as well as other factors are more important in the pathogenesis of the disease.

Postoperative change of inflammatory markers

In our study, NLR and PLR values were significantly increased in the early postoperative period in both groups, but there was no difference in preoperative and late postoperative period. MPV was found to be similar in all three periods. In literature, no study comparing preoperative and postoperative NLR and PLR values was found in OSAS patients. In a study of 37 patients who received uvulupalatal flap surgery after having diagnosed OSAS, blood and polysomnographic analyzes of pre- and post-operative blood samples were found to have no correlation with polysomnographic parameters [28]. The increase in NLR and PLR in our postoperative, early postoperative period was thought to be associated with secondary inflammation of the operation. Findings of our study suggest that the inflammatory process involved in the pathogenesis of this disease does not affect the operation in the long term.

In conclusion, the fact that NLR, PLR and MPVvalues used as indicators of systemic inflammation are similar between the mild-moderate and severe OSAS groups and that airway obstruction is remained unchanged, suggests that oxidative stress and systemic inflammation in this disease are due to a variety of factors besides airway obstruction. There is a need for further studies to evaluate these.

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