

The effect of adult tonsillectomy in chronic tonsillitis on Neutrophil / Lymphocyte ratio (NLR), Platelet / Lymphocyte ratio (PLR) and Mean Platelet Volume (MPV)

Adult tonsillectomy

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Abstract

Aim: The aim of this study is to investigate whether the preoperative and postoperative Neutrophil / Lymphocyte ratio (NLR), Platelet / Lymphocyte ratio (PLR) and Mean Platelet Volume (MPV) changes in patients operated for chronic tonsillitis and tonsil hypertrophy. **Material and Method:** The study included 90 individuals divided into 3 groups. The first group consisted of 30 adult patients who underwent tonsillectomy for chronic tonsillitis. The second group consisted of 30 adult patients who underwent tonsillectomy for tonsil hypertrophy. The third group is was a control group. NLR, PLR, and MPV were calculated from the blood samples before operation of the first group and the second group at least 6 months after the operation and these values were compared with the values before surgery. **Results:** Preoperative NLR and PLR values were not significantly different from the control group in Group 1 and Group 2 ($p>0,05$). MPV values were significantly increased postoperatively in the chronic tonsillitis group, but no significant change was observed in the tonsil hypertrophy group after the operation ($p <0,05$, $p > 0,05$ respectively). **Discussion:** The NLR and PLR were not significant between obstruction and chronic tonsillitis group before and after tonsillectomy. Otherwise, MPV can be used to determine the disease stage in the chronic tonsillitis clinic in adults and to determine the operation indication.

Keywords

Neutrophil / Lymphocyte Ratio; Platelet / Lymphocyte Ratio; Mean Platelet Volume; Chronic Tonsillitis

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Introduction

Chronic tonsillitis is a disease characterized by recurrent severe throat pain, swallowing difficulty, high fever episodes and impaired quality of life [1]. According to Burton, tonsillitis appearing twice a year is considered to be recurrent acute tonsillitis, whereas tonsillitis which appears four times a year is considered as chronic tonsillitis [2]. Local and systemic inflammatory responses play an important role in the development of chronic tonsillitis [3]. There are many systemic and local cytokines released in response to local bacterial and viral agents in the pathogenesis of chronic tonsillitis. Although there are studies of local cytokine release and local response, their practical use is difficult [4]. Thus, the use of some components of the systemic inflammatory response is more common.

Recently, NLR, PLR, and MPV have been frequently used as a part of the systemic inflammatory response in chronic diseases [5]. The NLR was obtained by dividing the neutrophil count by the lymphocyte count, the PLR is obtained by dividing the platelet count by the lymphocyte count. Recent studies have shown that NLR and PLR increase in inflammatory events and malignancies [6,7]. Platelet counts and structure are linked to events such as thrombosis and inflammation. MPV has been shown to increase in obstructive diseases such as OSAS and in atherosclerotic conditions [8,9].

Although there are studies evaluating the relationship between NLR, PLR and MPV and various malignancies and chronic diseases in the literature, there is no study on how tonsillectomy in adults affect these parameters.

In this study, we aimed to investigate how these values change in adult patients with tonsillectomy due to chronic tonsillitis and patients who have undergone tonsillectomy for obstructive causes.

Material and Method

In this cross-sectional study, we reviewed the medical records of 60 adult tonsillectomized patients and 30 control subjects who have been investigated in our clinic between January 2010 to December 2016 in Tokat State Hospital. The approval for this retrospective study was obtained from the ethics committee of Gaziosmanpaşa University Medical Faculty; Approval number:17-KAEK-151. Patients were divided into 3 groups. Group 1 consisted of patients who underwent tonsillectomy due to chronic tonsillitis (CT), Group 2 consisted of patients who underwent tonsillectomy for obstructive causes (Tonsil Hypertrophy-TH). Group 3 (Control) consisted of healthy individuals who had the desired hemogram values due to the job application and had normal results without any chronic diseases. The patients who constitute the CT group consist of patients who had tonsillitis more than 4 times a year and who had tonsillectomy with symptoms such as a sore throat, swallowing difficulty, high fever and physical examination with hyperemic and cryptic tonsils in their medical records. Tonsil hypertrophy group consists of patients with at least grade 3 tonsil hypertrophy which is detected by physical examination and has symptoms such as breathing difficulty, sleeping with mouth open and snoring and underwent tonsillectomy for these reasons.

Patients in Groups 1 and 2 were recorded with hemogram tests for preparation before surgery and hemograms for routine ex-

aminations between 6 months and 1 year after the surgery. Individuals with diabetes mellitus, chronic hypertension, liver disease, or any chronic disease were excluded from the study. The complete blood count was measured by a fully automatic blood cell counter (BC-6800, Mindray). Neutrophil counts, lymphocyte counts, platelet counts, MPV values, neutrophil/lymphocyte counts and platelet/lymphocyte ratios of all patients were analyzed. Values before and after surgery were compared within themselves and between groups.

Statistical Analyses

Data analysis was performed using Medcalc software, version 14.8.1 (MedCalc, Mariakerke, Belgium). The Kolmogorov-Smirnov test was used to test the normality of distribution of the continuous variables. Numerical variables with normal distribution are expressed as sample size and mean values with Standard deviation and if there is no normal distribution, median with interquartile range. The comparison of the mean of quantitative variable with normal distribution was compared to a paired-samples t-test. If there is no normal distribution, then Wilcoxon test was used. The p-value < 0.05 was considered statistically significant. If normal distribution has been seen, Analysis of variance (ANOVA) was used to compare means between preoperative groups and control group followed by Bonferroni correction. If normal distribution hasn't seen Kruskal-Wallis test was used to compare medians between preoperative groups and control group followed by Mann-Whitney U test. Differences were considered significant only when p-values were < 0.05. Data are reported as the mean Standard deviation (SD) and median with interquartile range.

Results

This study consists of a total of 90 individuals divided into the following three groups: chronic tonsillitis group (Group 1), tonsil hypertrophy (Group 2) and control group. There was no statistical difference in age between groups ($p > 0,05$) (Table 1).

The neutrophil count was not statistically significant in Group 1, although it decreased after the surgery ($p > 0,05$) (Table 2). The neutrophil count was not statistically significant in the Tonsil Hypertrophy group, although it decreased after the surgery ($p > 0,05$) (Table 2). Compared with the neutrophil count control group, there was no statistical significance in values before the surgery ($p > 0,05$) (Table 2).

Thrombocyte counts in Group 1 and Group 2 did not show a statistically significant difference after the surgery. No statistically significant differences were observed between Group 1 and Group 2 platelet counts before the surgery compared to the control group ($p > 0,05$) (Table 2). In Group 1 and Group 2, postoperative NLR values were lower than preoperative values, but statistically, this difference was not significant. There was no statistical difference when NLR values are compared with the control group ($p > 0,05$) (Table 2).

PLR values decreased after the surgery in Groups 1 and 2. However, no statistical difference was observed. There was no statistical difference between Group 1, Group 2 and control group when PLR values were compared with the control group ($p > 0,05$) (Table 2).

MPV values increased postoperatively in Group 1 (Figure 1).

This value was statistically significant ($p < 0,05$). Although MPV increased postoperatively in Group 2, there was no statistical difference ($p > 0,05$).

Table 1. Demographic Characteristics

Groups	Group 1	Group 2	Group 3	p
Patients	Chronic Tonsillitis (CT)	Tonsil Hypertrophy (AH)	Control	
n	n=30	n=30	n=30	0,992
Age (yr)	32,4	32,2667	32,6	

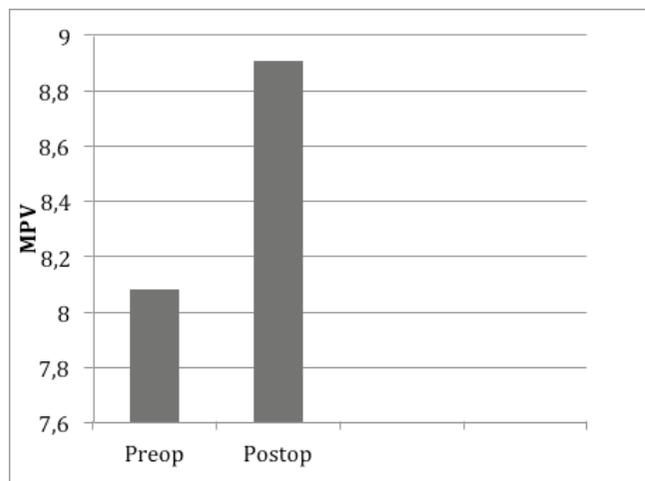


Figure 1. Change of MPV according to the before operation in chronic tonsillitis group. The groups were shown as mean \pm 2 Standard Deviation. The significance level was accepted as $p < 0,05$. MPV=Mean Platelet Volume.

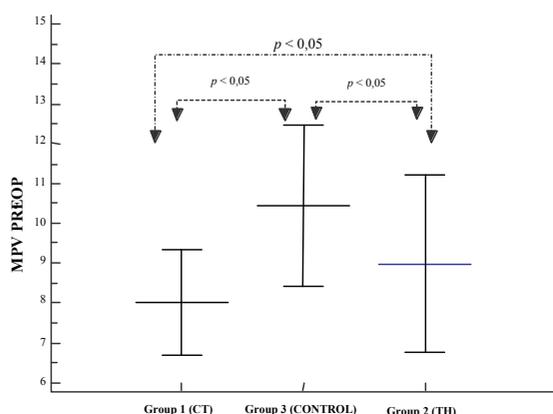


Figure 2. Comparison of preoperative MPV values of CT and AH groups with control group. The groups were shown as mean \pm 2 SD. The significance level was accepted as $p < 0,05$.CT: Chronic Tonsillitis, TH: Tonsil Hypertrophy.

When compared between Group 1, Group2 and Group 3, preoperative MPV values were statistically higher than in the control group. ($p < 0,05$) (Table 2, Figure 2).

Discussion

In our study, no statistical difference was observed between all groups in terms of NLR and PLR values. However, in the chronic tonsillitis group, the preoperative NLR and PLR values and the total amount of neutrophils and platelets were higher than in the other groups. But there is no statistical significance. There was no statistically significant difference between the groups in terms of neutrophil count, which is a sign of acute inflammation, in Chronic Tonsillitis and Tonsil Hypertrophy groups, although preoperative results were higher than postoperative and control group. Similarly, preoperative neutrophil count and NLR were found to be higher in children undergoing tonsillectomy due to chronic tonsillitis in the study of Yenigün et al. [10]. Many biomarkers have been identified as indicators of chronic inflammation. Many studies have shown that antioxidants increase in the body in response to chronic inflammation in children who undergo tonsillectomy due to chronic tonsillitis and obstruction, and antioxidant levels decrease in the postoperative period. In the study by Cho et al., the levels of 8-hydroxy-2-deoxyguanosine and F2-isoprostane decreased significantly after adenotonsillectomy [11]. In the study by Koç et al., paraoxanase and arylesterase levels decreased after adenotonsillectomy in children [12]. Malondialdehyde and SOD values decreased after adenotonsillectomy in the study by Kaygusuz et al. [13]. These results indicate that the oxidative response increases in response to chronic inflammation in the body. However, it is not practical to use these values as a routine test before tonsillectomy. Therefore, the use of NLR and PLR as a cheaper test for routine use can be used as a more practical approach.

NLR is a parameter that has been shown to increase in chronic inflammatory events in many studies in recent years. For example, increased levels of NLR and PLR have been shown in psoriasis and psoriatic arthritis [14]. In another study, it was shown that NLR is significantly higher in chronic otitis media with effusion than in the control group [15]. In our study, preop-NLR and PLR values of chronic tonsillitis group were higher than in adenoid and in control group. This suggests that neutrophils are higher in patients with chronic tonsillitis than in those without disease. However, this rising was not statisti-

Table 2. Change of NLR, TLR and MPV between groups.

	GROUP 1			GROUP 2			GROUP 3			COMPARISON OF THREE GROUPS			
	CT (n=30)			TH (n=30)			CONTROL (n=30)			p	1&2	1&3	2&3
	Mean \pm SD	Mean \pm SD	Mean \pm SD	Pre-op	Post-op	p	Pre-op	Post-op	p				
NLR	1,88 \pm 0,57	1,74 \pm 0,58	0,3468*	1,76 \pm 0,58	1,67 \pm 1,45	0,5304**	1,73 \pm 0,25	0,508##	NS	NS	NS		
PLR	135,4 \pm 51.9	127,5 \pm 55.6	0,6583**	109,7 \pm 26.7	105,8 \pm 37.2	0,5714*	109,66 \pm 27	0,012#	NS	NS	NS		
MPV	8,018 \pm 0,66	8,98 \pm 0,95	<0,0001*	8,97 \pm 1,11	9,49 \pm 1,14	0,3756*	10,4 \pm 1	0,001#	S	S	S		
Neutrophil 10 ³ /U	4,142 \pm 1	3,92 \pm 1.20	0,2684*	4,06 \pm 1.01	3,824 \pm 1.3	0,1315*	4,098 \pm 0.72	0,943#	NS	NS	NS		
Platelet 10 ³ /U	278 \pm 69.5	265,4 \pm 64.8	0,2684*	256,7 \pm 39,6	246,1 \pm 36.28	0,0519**	255,4 \pm 52.1	0,341##	NS	NS	NS		
Lymphocyte 10 ³ /U	2,162 \pm 0,68	2,201 \pm 0,55	0,7698*	2,396 \pm 2.4	2,46 \pm 0.74	0,6123*	2,4 \pm 0.46	0,193#	NS	NS	NS		

*Paired Test, **Wilcoxon Test, # One way Anova Test, ## Kruskal-Wallis Test, NS: Non significant, S: Significant ($p < 0,05$), CT: Chronic Tonsillitis, TH: Tonsil Hypertrophy, Pre-op: Preoperative, Post-op: Postoperative, NLR: Neutrophil-lymphocyte ratio, PLR: Platelet- lymphocyte ratio, MPV: Mean Platelet Volume.

cally significant in our study, although it was higher than in the control group. This suggests that the inflammatory response is reduced by the resolution of the infection.

MPV is a parameter showing platelet volume and function, which is also used as an indicator in inflammatory events, and recent studies showed that it can be used as an inflammatory parameter in rheumatoid arthritis, familial Mediterranean fever and ankylosing spondylitis [16-19]. In our study, preoperative MPV values of the CT group were significantly lower than of the control group and the preoperative TH group ($p < 0.0001$).

There have been many studies on MPV levels in recent years in different clinical situations. In a study by Önder and colleagues, the change in MPV after adenoidectomy was investigated and an increase in MPV but no significant increase was observed [21]. Cevik et al. found that children who underwent tonsillectomy and adenoidectomy had a significantly lower MPV value in the preoperative period [22]. Increased and decreased levels of MPV have been associated with inflammatory events. It has been shown that MPV increases in cases such as cerebrovascular diseases and myocardial infarction, and decreases in some inflammatory events [16,20]. The decline was attributed to the production of the platelets by the cytokines produced in response to inflammation [16]. In our study, the MPV values in the tonsillectomy group were significantly higher than before the surgery ($p < 0.0001$). There was no statistically significant difference between preop and postop MPV values in the adenoidectomy group ($p > 0,05$). At the same time, there is no study showing the effect of tonsillectomy and adenoidectomy on MPV in adults.

As a result, parameters such as NLR, PLR, and MPV can be used to determine the disease stage in the chronic tonsillitis clinic in adults and to determine the operation indication. In the future, further research is needed on this issue involving more volunteers.

Scientific Responsibility Statement

The authors declare that they are responsible for the article's scientific content including study design, data collection, analysis and interpretation, writing, some of the main line, or all of the preparation and scientific review of the contents and approval of the final version of the article.

Animal and human rights statement

All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. No animal or human studies were carried out by the authors for this article.

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Conflict of interest

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