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The Impact of Adenotonsillectomy on Mean Platelet Volume in Adenotonsillar Hypertrophy

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Abstract

Background: Chronic adenotonsillar hypertrophy which causes airway obstruction and obstructive sleep apnea is the most common indication for adenotonsillectomy in children. Obstructive sleep apnea is almost always associated with adenotonsillar hypertrophy in this age group. Mean platelet volume (MPV) is an indicator of the platelet size. Platelet size reflects the platelet function and activation. Larger platelets have denser granules and higher thrombosis potential. So higher MPV levels are correlated with higher platelet activity and inflammation intensity. Increased platelet activity has a great role in atherosclerosis, ischemic heart disease and cardiovascular morbidity and mortality.

Purpose: The aim of this study is to evaluate the MPV level in patients who underwent adenotonsillectomy.

Methods: In this longitudinal study, 37 patients with chronic adentonsillar hypertrophy who underwent adenotonsillectomy were enrolled. MPV levels before and 3 weeks after surgery were recorded and compared with paired comparison analysis. The significance level was less than 0.05.

Results: MPV levels were 8.7 ±0.9 and 8.2±1.2 fL, before and after adenotonsillectomy, respectively. A statistically significant decrease was noted in MPV levels following surgery (P=0.022).

Conclusion: MPV levels of the patients with adenotonsillar hypertrophy significantly decreased postoperatively. These results demonstrate that MPV level changes can be reversed and treated by adenotonsillectomy.

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INTRODUCTION

Chronic adenotonsillar hypertrophy causes airway obstruction and obstructive sleep apnea (OSA), which is almost always associated with adenotonsillar hypertrophy in children. Obstructive sleep apnea is the most common indication for adenotonsillectomy in this age group. Moreover, oxygen desaturation episodes following apnea impose stress on the cardiovascular system (1). The mean platelet volume (MPV) indicates the average platelets' size, which is decreased in circulation over aging. MPV shows the platelets' turnover and is therefore higher in patients with rapid platelet turnover because of the larger size of the newly produced platelets (2). Moreover, increased

platelet production such as peripheral platelet consumption (e.g., immune thrombocytopenia) and myeloproliferative diseases can cause the higher level of MPV, while it is lower in cases with impaired production such as bone marrow aplasia. Platelets' volume increases when platelets become activated. Larger platelets have denser granules and higher thrombotic potential (3). It is already known that increased platelet activity has an important role in the development of atherosclerosis (4). According to previous studies, the MPV is elevated in hypertension, myocardial infarction, severe obstructive sleep apnea and stroke (5-8). It has been shown that in patients with an increased MPV, the risk of death due to ischemic heart disease is higher (9).The aim of this study was to evaluate the effect of adenotonsillectomy on MPV levels in patients with adenotonsillar hypertrophy.

PATIENTS and METHODS

In this longitudinal study, 37 patients who underwent adenotonsillectomy in the Otolaryngology department of Khatamolanbia Hospital, Zahedan, Iran between March 2013 to 2014 were enrolled using convenience sampling method. Patients with any type of disease which could affect the MPV level, such as hematologic diseases, renal, hepatic or thyroid dysfunction, cardiovascular diseases, bronchial asthma or any other chronic or systemic inflammatory disease, hypertension, hypercholesterolemia, diabetes mellitus or obesity were excluded from the study. An informed consent was obtained from the parent/guardian of each child prior to study. The study protocol was approved by the local Ethics Committee of Zahedan University of Medical Sciences (Code of Medical Ethics: IR.ZAUMS.REC.1392.886). A 5 mL venous blood sample was collected from each patient before the operation; follow up samples were taken 3 weeks following surgery. The blood samples were collected into EDTA containing tubes. SYSMEX KX-21 N was used for total blood count analysis. The collected data was analyzed by the Statistical Package for Social Sciences, version 13.0 (SPSS 13.0, SPSS Inc.; Chicago, IL, USA). The paired comparison analysis was applied to compare MPV levels with considering significance level of less than 0.05.

RESULTS

A total of 37 children, 19 males(51.3%) and 18 females(48.7%), with a mean age of 6.9 ±2.6 years was evaluated. MPV levels were 8.7±0.9 and 8.2± 1.2 fL, before and after adenotonsillectomy respectively; indicating a statistically significant decrease following surgery (P=0.022). Regarding the patients' gender, the decrease in MPV levels after surgery was statistically significant among females (P=0.001) whereas no such difference was observed among males (P=0.77; Table 1).

Table 1. MPV (Mean Platelet Volume) levels before and after surgery based on Gender

Variable	MPV		P- value
	Before surgery	After surgery	
Male	8.6 ±0.9	8.5±1.0	0.770
Female	8.9 ±0.9	7.7 ±1.3	0.001

DISCUSSION

Airway obstruction and obstructive sleep apnea(OSA) is almost always associated with chronic adenotonsillar hypertrophy in the children. OSA is the most common indication for adenotonsillectomy in children. Oxygen desaturation episodes following apnea impose stress on the cardiovascular system (1). Mean platelet volume is an indicator of the platelets' size. Platelet size reflects the platelet's function and activation. Larger platelets have denser granules and higher thrombosis potential. So, MPV level has a positive relationship with platelet activity and inflammation intensity (3). Changes in MPV value have been studied in many chronic inflammatory diseases such as inflammatory bowel disease, rheumatoid arthritis, ankylosing spondylitis and chronic obstructive pulmonary diseases (COPD) (10). A significant association has been observed between MPV and hypertension, hypercholesterolemia, obesity, diabetes mellitus, statins and other antihypertensive drugs usage, metabolic syndromes and atrial fibrillation (11). MPV is a predictive factor of stroke, acute myocardial infarction and restenosis in coronary angioplasty. Endler et al. showed that raised MPV levels in patients with pre-existing coronary artery disease increase the risk of myocardial infarction (12). Furthermore, Makay et al. noted that during the acute attack in familial Mediterranean fever (FMF), MPV values were higher than healthy controls (13). A hypercoagulable state has been shown in OSA and this might be the reason why patients with OSA have an increased risk of cerebrovascular and coronary artery diseases. The activation of the sympathetic nervous system due to repeated nocturnal hypoxemia and arousal from sleep may cause the pathophysiologic basis of this association (14). Another proposed mechanism is that chronic intermittent hypoxia can lead to platelet activation directly. Chronic hypoxia can cause inflammation, endothelial dysfunction and consequently platelet activation (11). Varole et al. reported that MPV levels were significantly higher in patients with severe OSA compared to the control group. They found that this increase can be reversed by 6-months of CPAP therapy (16).Sagit et al. showed a significantly higher MPV level in patients with marked nasal septal deviation compared to controls. They also noted that this septoplasty (15). A study by Cengiz et al. demonstrated that MPV values were significantly lower in children with upper respiratory tract obstruction (adenotonsillar hypertrophy) that underwent adenotonsillectomy, compared to healthy children (17). Contrary to Cengiz et al. results (17), in our study, the MPV levels of patients with adenotonsillar hypertrophy were significantly reduced postoperatively. Similar to our study, Sagit and Varole reported that restoration of hypoxia via septoplasty in patients with marked nasal septal deviation or via continuous positive airway pressure in obstructive sleep apnea, can decrease platelet activation and MPV level; it could also result in reduced cardiovascular morbidity and mortality (11,15). Nevertheless, the main limitation of the current study was the small sample size and therefore stronger studies are highly recommended to obtain enough evidence in this subject.

CONCLUSION

Our findings demonstrated that MPV level changes can be reversed and treated by adenotonsillectomy. Previous studies have reported that reduced MPV can result in decreased cardiovascular morbidity and mortality. However, in order to prove that adenotonsillectomy can also give similar outcomes, further and larger studies are still required, mainly due to the various factors which playing role in cardiovascular related morbidity and mortality.

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CONFLICT of INTEREST

The authors have no conflict of interest to declare.

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