The Effect of Nasal Septal Deviation on Serum Lipid Levels

Duran Karataş, Adnan Ekinci, Abdurrahman Yetiş, Müge Özcan

Department of Otorhinolaryngology, Hitit University School of Medicine, Çorum, Turkey

Abstract

Objective: The aim of the study was to determine the effect of nasal septal deviation on serum lipids.

Material and Methods: Thirty-two patients aged 18-53 with nasal septal deviation and nasal obstruction were included into this study. Serum lipid levels were determined before and after septoplasty.

Results: There was no statistically significant difference in serum lipid levels before and after septoplasty (p=0.248, p=0.135, p=0.862, p=0.829). There was a statistically significant difference in the serum low-density lipoprotein cholesterol level between the patient and control group (p=0.024).

Conclusion: This study showed that nasal septal deviations had no effect on serum lipids, except on low-density lipoprotein cholesterol. Septoplasty can reduce the speed of atherosclerosis progression in patients with both atherosclerosis and nasal septal deviation.

Keywords: Cholesterol, lipids, nasal septal deviation, NOSE score, septoplasty

INTRODUCTION

The nose is the main airway of the respiratory system. It also allows the air to be moistened, heated, and cleaned from the particles. The nose is involved in reflex arcs related to the respiratory and circulatory system functions (1). Although there are many factors that cause nasal obstruction, nasal septum deviation (NSD) is at the forefront (1, 2). Nasal obstruction leads to a decrease in the airflow. As a result, hypoxia and hypercapnia develop and are thought to cause cardiac arrhythmias due to autonomic dysfunction (3).

Hypercholesterolemia initiates a systemic vascular proinflammatory response that results in the development of atherosclerotic plaques and increases the risk of cardiovascular diseases (4). Hypercholesterolemia is associated with impaired adaptive immune system mediated by other diseases such as asthma and related disorders (5). Does NSD lead to an increase in the risk of asthma or symptom severity of asthma (6)? The upper-airway resistance is also increasing in NSD. This leads to the desaturation of the oxyhemoglobin in the blood. NSD leads to chronic hypoxia, and increased hypoxia causes increased oxyhemoglobin levels. An increase in oxyhemoglobin and hypoxia may result in elevated cholesterol levels (7). NSD leads to an increase in hypoxia, hypercapnia, and upper-airway resistance. These results led to the discussion of whether or not NSD had an effect on serum lipid levels. NSD is one of the common complaints encountered in otolaryngology clinics, and septoplasty is the only solution to NSD-related nasal obstruction.

The aim of this study was to compare the serum lipids of healthy subjects with those of NSD subjects and to determine the change in serum lipids of the septoplasty surgeon.

MATERIAL AND METHODS

Between August 1, 2016, and January 31, 2017, the patients who were admitted to the ear nose and throat clinic due to nasal obstruction and who had nasal septal deviation were included in this study. The study was planned prospectively. Patients who had previously undergone septoplasty, those who underwent endoscopic sinus surgery, those with allergic rhinitis, those with septal perforations, and those with significant concha hypertrophy were excluded from the study. In addition, patients with cardiac insufficiency, arrhythmia, coronary artery disease, statin users, and hypercholesterolemia causes (diabetes mellitus, obesity, hypothyroidism, alcohol use, and liver disease) were not included in the study. The age and gender of the patients were recorded. The type of NSD was determined according to the Mladina (8) classification. The number of patients who underwent septoplasty was determined. The Nasal Obstruction Symptom Evaluation (NOSE) scores were assessed preoperatively and 3 weeks postoperatively, and an

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Address for Correspondence: Duran Karataş

E-mail: drkaratasbugra@hotmail.com

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assessment of nasal obstruction was performed. The septal surgery method, nasal buffer type, time to take the buffer, postoperative complications (infection, synechia, perforation, hematoma) were recorded. Amoxicillin/clavulanic acid was given orally twice a day for 10 days postoperatively. A control group was established from those who did not have the NSD and did not have the exclusion criteria. This study was accepted by Hitit University Ethics Committee. The date was 10/02/2017, and the decision number was 2017-31. The written approval form was obtained from all the subjects who participated in our work. Informed consent was taken from the patients and control group.

Biochemical Analysis

After at least 12 hours of fasting, venous serum samples from all subjects were analyzed for total cholesterol (CHOL), low-density lipoprotein cholesterol (LDL-C), high-density lipoprotein cholesterol (HDL-C), very low-density lipoprotein cholesterol, and triglyceride (TG) levels. Before septoplasty and 3 weeks after surgery, blood samples were collected in serum separator tubes containing silica and a gel pellet (Becton, Dickinson and company). After that, it was centrifuged and analyzed within 2 hours. Analyzes were performed in a Cobas Integra 400 (Roche, Basel, Switzerland) instrument at the local laboratory.

Statistical Analysis

Statistical analyzes were performed using the Statistical Package for Social Sciences version 22.0 (IBM Corp.; Armonk, NY, USA) program. The distribution of normality was using the Kolmogorov-Smirnov and Shapiro-Wilk test. Descriptive statistics were presented as mean±standard deviation, median (min-max), and number and percentage for categorical data, based on distributional assumptions for continuous variables. In the analysis of continuous variables, two independent t-tests (independent-samples t-test) were used in the mean comparison of two independent samples showing normal distribution. The Mann-Whitney U test was used for independent groups with no normal distribution. Statistical significance level was accepted as $p<0.05$.

RESULTS

Thirty-two of 50 patients with NSD were included into this study. Eighteen patients were excluded from the study due to the exclusion criteria. The study group consisted of 14 women (43.8%) and 18 men (56.2%). The mean age was 29.66±10.930 (range 18-53). The control group included 39 people. The mean age of the control group was 33.13±13.293. In the study group, Type 2 deviation was found (18.8%) in 6 patients, Type 3 deviation (18.8%) in 6 patients, Type 4 deviation (6.3%) in 2 patients, Type 5 deviation (28.1%) in 9 patients, 3 patients had Type 6 deviation (9.4%), and 6 patients had Type 7 deviation (18.8%).

Septoplasty was performed by three different surgeons. After septoplasty, a Doyle nasal splint or Merocel nasal pack was applied. The nasal pack was applied at 48 or 72 hours postoperatively. A septal perforation in 2 patients, synechia in 4 patients, and hematoma in 1 patient were detected. No postoperative infection was observed in any patient.

There was no statistically significant difference between the study and control groups in serum lipid levels before and after septoplasty (p=0.02, p=0.137, p=0.389, p=0.355, respectively) (Table 1). There was no statistically difference between before septoplasty and control group (Table 2). However, when the serum lipid values after septoplasty were compared with the control group, the LDL-c level was found to be significantly lower (p=0.027), and the cholesterol level was found to be very close to the significance level (p=0.055) (Table 3).

Table 1. Comparison of the mean serum lipid values and NOSE score before and after septoplasty

		Mean	n	Std. Deviation	p
Pair 1	CHOLpre	177.59	32	34,977	0.248
	CHOLpost	175.28	32	35.670	
Pair 2	LDL-c pre	103.81	32	34.193	0.135
	LDL-c post	102.03	32	29.097	
Pair 3	HDL-c pre	47.38	32	11.039	0.862
	HDL-c post	47.34	32	10.721	
Pair 4	TG pre	134.66	32	94.884	0.829
	TG post	125.94	32	73.374	
Pair 5	NOSE score pre	67.50	32	17.598	*<0.001
	NOSE score post	14.56	32	12.037	

pre: before septoplasty; post: after septoplasty; CHOL: cholesterol; LDL-c: low-density lipoprotein; HDL: high-density lipoprotein; TG: triglyceride

Table 2. Comparison of mean serum lipid values before septoplasty of patients and control group

	Group	n	Mean	Std. Deviation	p
CHOL	Preoperation	32	177.59	34.977	0.092
	Control	39	192.92	39.674	
LDL-c	Preoperation	32	103.81	34.193	0.137
	Control	39	115.18	29.510	
HDL-c	Preoperation	32	47.38	11.039	0.389
	Control	39	50.97	13.857	
TG	Preoperation	32	134.66	94.884	0.355
	Control	39	134.13	57.116	

CHOL: cholesterol; LDL: low-density lipoprotein; HDL: high-density lipoprotein; TG: triglyceride

Table 3. Comparison of mean serum lipid values between post operation patients and control group

	Groups	n	Mean	Std. Deviation	p
CHOL	Postoperation	32	175.28	35.670	0.055
	Control	39	192.92	39.674	
LDL-c	Postoperation	32	102.03	29.097	*0.027
	Control	39	115.18	29.510	
HDL-c	Postoperation	32	47.34	10.721	0.309
	Control	39	50.97	13.857	
TG	Postoperation	32	125.94	73.374	0.265
	Control	39	134.13	57.116	

pCHOL: cholesterol; LDL: low-density lipoprotein; HDL: high-density lipoprotein; TG, triglyceride

*statistically significant

The mean NOSE score before and after the operation was 67.50±17.598 and 14.56±12.037, respectively. There was a statistically significant difference in the NOSE score before and after septoplasty ($p<0.001$).

DISCUSSION

The most important finding in this study is that the decrease of cholesterol levels is not significant when the levels of cholesterol before and after surgery are compared. As the main finding, we found no difference between the serum cholesterol levels of patients with NSD and the serum cholesterol levels of the control subjects.

Cholesterol is essential for the integrity of cellular membranes and membrane functions, including signal transduction and the maintenance of membrane fluidity. Although cholesterol is essential for cellular integrity and cell metabolism, it is known that cholesterol-induced cytotoxic and inflammatory responses are involved in atherosclerosis and other disorders. In atherosclerosis, LDL-c plays an important role, especially during the initial stages of the foam cell formation, lipid accumulation, and induction of inflammation (9). Atherosclerosis also triggers other cardiac disorders, especially coronary artery disease. There are studies investigating the effect of NSD on cardiac disorders (10, 11). In a study conducted in children with adenoid and tonsil hypertrophy, the HDL-c level was low and inversely correlated with the adenoid and tonsil size (12). There are studies investigating the relationship of serum lipids to some cancer studies. In a study of patients with breast cancer, low preoperative serum TG and HDL-c levels were found to be a risk factor for breast cancer (13). In a study published in 2016, it was observed that lower levels of serum lipids were effective in the development and progression of oral squamous cell cancer (14). However, to the best of our knowledge, there are no studies investigating the effect of NSD and septoplasty on serum lipids.

Nasal septum deviation causes hypoxia by obstructing the upper airway, while also contributing to hypoxia by inhibiting the nasopharyngeal reflex. The upper-airway resistance is increasing in NSD (10). This leads to desaturation of oxyhemoglobin in the blood. An increase in oxyhemoglobin and hypoxia may result in elevated levels of cholesterol (7). When this information is evaluated, it may be expected that serum lipids are high in NSD patients, but in our study, there was no significant difference between NSD patients and control group for serum lipid values. In addition, no significant difference was found in preoperative and postoperative serum lipid values of patients who had septoplasty. A significant decrease in serum LDL-c levels after septoplasty was observed compared to the control group. There is a strong association between coronary heart disease and LDL (15). The authors believe that the post-septoplasty reduction of the lipid serum level, which increases the formation of atherosclerosis, may have an effect in reducing coronary heart disease in patients.

In patients with obstructive sleep apnea (OSA), intermittent hypoxia can be observed, which can lead to dyslipidemia. Although the exact mechanism is unknown in animal experimental studies, intermittent hypoxia has been found to increase CHOL, HDL-c, LDL-c, and TG levels (16). CPAP is one of the most successful methods in OSAS I treatment. In a study that included OSA patients treated with CPAP therapy, serum CHOL and LDL-c levels decreased, but HDL-c levels increased (17). In a study investigating the effect of airway surgery on serum lipids for OSAS treatment, the effect of uvulopalatopharyngoplasty on lipid profiles was found to be better than the nasal surgery, especially for cholesterol (16).

The nasal obstruction is one of the common complaints. The NOSE is a useful test to evaluate the quality of life of nasal obstruction. The NOSE is a suitable tool for evaluating septal surgery (18). In our study, the NOSE test was performed preoperatively and postoperatively, and a statistically significant result was obtained ($p<0.05$).

According to the authors, this study has some disadvantages. The number of subjects may be wider, and thus more meaningful and precise results may be obtained. There are many different parameters and factors that can affect serum lipids, so there may be minimal deviations in serum lipid values. Multiparameter prospective studies are needed.

As a result, NST had no effect on serum lipids, but there was a significant decrease in the serum LDL-c level after septoplasty. In addition, the level of CHOL was found to be very close to the level of significance. These results show that septoplasty surgery has a positive effect on atherosclerosis. But there is a need to conduct studies that involve a large number of subjects, a long follow-up period after the operation, and more data analysis.

CONCLUSION

This study showed that NSD had no effect on serum lipids, but there was a significant decrease in the serum LDL-c level after septoplasty. The authors believe that septoplasty may have a positive effect on reducing the serum LDL-c level. Thus, it may be considered that septoplasty can make a positive contribution to the reduction of atherosclerosis progression in patients with both atherosclerosis and septum deviation.

Ethics Committee Approval: Ethics committee approval was received for this study from the Ethics Committee of Hitit University (2017-31).

Informed Consent: Written informed consent was obtained from the patients and control group who participated in this study.

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