

Impact of Nasal Septal Surgery on Sleep Quality and Attention-Deficit/Hyperactivity Disorder

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Objective: To evaluate the effect of nasal septal surgery on quality of life.

Methods: A total of 49 patients who underwent septoplasty and/or inferior turbinate radiofrequency operations for nasal septal deviation and inferior turbinate hypertrophy were prospectively enrolled in the study. All patients completed the adult attention-deficit/hyperactivity disorder scale (ADHD scale) and Pittsburgh sleep quality index (PSQI) before and after septoplasty. Acoustic rhinometric measurements were also recorded.

Results: Acoustic rhinometric measurements and PSQI showed statistically significant improvement after nasal surgery ($P < 0.05$), but no statistically significant difference was present between pre- and postoperative ADHD scores ($P > 0.05$).

Conclusion: Besides the functional improvement of septoplasty, a long-lasting improvement in the quality of life is observed in patients with that undergo this surgery.

Key Words: Acoustic rhinometry, septoplasty, sleep quality

Septum deviation is the most common cause of nasal obstruction in the adult population. One-third of the world's population is referred to an otolaryngologist for septal deviation, and a quarter of them undergoes septoplasty.¹ The main objective of this operation is to eliminate the symptoms of the patient and to improve the quality of life (QOL). Therefore, the studies investigating the effects of septoplasty on QOL have received significant attention in recent years.

Sleep is a physiologic, psychologic, and social notion of the basic and indispensable daily life activity that affect the QOL and health of individuals. The importance of sleep on health and QOL is essential at all ages. Although nasal obstruction is not a life-threatening disorder, its negative impacts on sleep and life quality have been demonstrated in the previous studies.²

Attention-deficit/hyperactivity disorder (ADHD) is one of the most common neurobehavioral disorder seen in the people referring to the children-adult psychiatric clinics.³ The higher incidence of nasal obstruction in children with ADHD suggests that the relation of nasal obstruction and septoplasty with ADHD should be investigated in the adult population.

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In the literature, there are limited number of studies showing the effect of septoplasty on attention deficit and hyperactivity. In this prospective study, we aimed to put forward the effect of nasal septal surgery and inferior turbinate radiofrequency on adult ADHD and sleep quality.

To the best of our knowledge, our study is the only study that objectively correlates operative success with the subjective findings of ADHD and sleep quality by using an acoustic rhinometry before and after nasal septal operation in the adult population.

METHODS

Study Population

A total of 49 patients (39 males, 10 females) with a mean age of 36.8 (± 9.95) who underwent septoplasty and/or inferior turbinate radiofrequency operations for the treatment of nasal septal deviation and inferior turbinate hypertrophy at Umraniye Education and Research Hospital were enrolled in the study. The study was approved by the local ethical committee and all patients signed the agreement to participate in the study.

Inclusion criteria were as follows: adults between 18 and 60 years old, the nasal septal deviation with a nasal obstruction symptom at least for 3 months. The patients who had a history of nasal surgery, allergic rhinitis, adenoid hypertrophy, or systemic disorders such as diabetes mellitus, cardiovascular disorders, and diagnosed psychiatric disorders were excluded from the study.

Acoustic Rhinometry

In this study, we used a Rhinometrics SRE 2000 device (Rhinometrics A/S, Lyngø, Denmark) for acoustic rhinometric measurements. During the measurements, the patients sat erect in the chair and kept their head perpendicular to the horizontal plane in a soundless room. Measurements were taken 1 day before the operation and at least 3 months after the operation. They were instructed to hold their breath during the measurement. The test was repeated 3 times for each nostril, and 2 minimum cross-sectional areas and 2 nasal cavity volumes were calculated from the mean of the 3 sets of 5 measurements. The outermost minimum cross-sectional area (MCA1, cm²) and the innermost minimum cross-sectional area (MCA2, cm²) were recorded separately. In addition, the nasal cavity volume segments of 2 and 5 cm distance from the nostril measured.

Surgical Procedure

Patients underwent septoplasty under general anesthesia. The operation technique includes a hemi-transfixion incision followed by creating subperichondrial and subperiosteal tunnels via a closed approach and correction of the deviated segment with minimal excisions, trying to reshape and mold the most deviated parts.

The turbinoplasty treatment was conducted using the radiofrequency method. The electrode of Curis Radiofrequency (Sutter Medizintechnik GmbH, Freiburg, Germany) device placed into the anterior-inferior portion of the hypertrophic inferior turbinate.

After the surgery, the nasal cavity was packed with silicone Doyle nasal splints (Boston Medical Products, Shrewsbury, MA).

Pittsburgh Sleep Quality Index

Pittsburgh sleep quality index (PSQI)⁴ is a self-rated questionnaire of the sleep quality, disturbance, and intensity during the previous month. The questionnaire consists of 19 questions of self-assessment and 5 questions rated by the bed partner or roommate. The 19 items are divided into 7 components and the sum of the scores of these components gives the total score. The total score varies 0 to 21. The Turkish adaptation was made by Agargun et al in 1996.⁵

TABLE 1. Mean and Standard Deviations of Pre- and Postoperative MCA2 and VOL2 Values for Right and Left Sides

	Group			
	Right Side N:49		Left Side N:49	
	Mean	Standard Deviation	Mean	Standard Deviation
Preoperative MCA2	0.50	0.42	0.58	0.49
Postoperative MCA2	0.66	0.52	0.74	0.43
Preoperative VOL2	4.59	3.05	4.84	3.13
Postoperative VOL2	5.79	3.37	6.23	4.24

MCA, minimum cross-sectional area.

Adult Attention-Deficit/Hyperactivity Disorder Scale

The Turkish version of adult attention-deficit disorder (ADD)/ADHD scale was developed by Turgay in 1995, and the validity and reliability of Turkish version of the ADHD scale have been performed by Günay et al in 2006.⁶ The scale is a 5-point Likert-type rating, with 3 subscales: attention deficit, hyperactivity/impulsivity, and ADHD-related features and problems. The first section is based on the criteria of the attention-deficit symptoms of DSM-IV (Diagnostic and Statistical Manual of Mental Disorders, 4th ed, 1991). The second part comprises of the hyperactivity symptoms of DSM-IV. These 2 sections consist of 9 items. The third section is composed of 30 items according to clinical observations and experiences. Individuals with total value 36 or higher are considered highly likely to have ADHD.

Statistical Analysis

Statistical analysis was performed by SPSS 20.0 (IBM Corporation, Armonk, NY) program. In addition to definitive statistical methods (mean, standard deviation), normal distribution of group data was measured with Kolmogorov-Smirnov Test. Paired *t*-test was used in the comparison of normally distributional dependent variables. *P* < 0.05 was considered statistically significant.

RESULTS

Acoustic Rhinometry

Acoustic rhinometry measurements performed in the preoperative period showed the following results: right MCA2: 0.59 (±0.42); right VOL2: 4.59 (±3.05); left MCA2: 0.58 (±0.49); left VOL2: 4.84 (±3.13). Postoperative results: right MCA2: 0.66 (±0.52); right VOL2: 5.66 (±3.49); left MCA2: 0.66 (±0.45); left VOL2: 6.23 (±4.24). The comparison of preoperative and postoperative values demonstrated that there was a statistically significant increase in postoperative levels (*P* < 0.05) (Tables 1 and 2).

Pittsburg Sleep Quality Index

The mean score of the preoperative PSQI was 6.29 (±3.28), whereas postoperative mean score was 5.43 (±2.18). There was a statistically significant improvement after the operation (*P* < 0.05) (Table 3).

Adult Attention-Deficit/Hyperactivity Scale

The mean preoperative scores obtained from the attention deficit, hyperactivity/impulsivity, and ADHD-related features and problems were 7.59 (±5.09), 6.59 (±5.04), and 20.41 (±13.43), respectively. After the operation, these values were

TABLE 2. The Comparison of Pre-and Postoperative MCA2 and VOL2 Parameters

	Mean	Std Deviation	Minimum	Maximum	<i>P</i> Value
Preoperative MCA2	0.54	0.46	0.00	2.19	0.002*
Postoperative MCA2	0.70	0.48	0.00	2.62	
Preoperative VOL2	4.72	3.08	0.00	13.89	0.003*
Postoperative VOL2	6.01	3.82	0.08	24.09	

Paired *t*-test.
MCA, minimum cross-sectional area.
**P* < 0.05.

changed to 7.18 (±5.47), 6.73 (±5.63), and 18.8 (±15), respectively. There was no statistically significant difference between the preoperative and postoperative values (*P* > 0.05) (Table 3).

DISCUSSION

In the otolaryngology practice, septoplasty is one of the most frequently performed operations. The indisputable prognostic value of the septoplasty in the treatment of nasal obstruction has been demonstrated in many studies. In recent years, health-related QOL has become a popular subject and has been studied frequently. However, the number of studies showing emotional changes such as sleep quality, depression, and hyperactivity in the postoperative period is very limited. In this study, we have studied the efficacy of nasal septal surgery on sleep quality and ADHD.

Acoustic rhinometry is a useful, non-invasive device used in measuring the size of the nasal cavity using the reflection of a sound wave.^{7,8} The MCA1 corresponds to the level of nasal valve, whereas MCA2 corresponds to the anterior half of inferior turbinate. In our study, for the objective demonstration of nasal septal surgery success on nasal obstruction, acoustic rhinometric measurements were used. Comparison of pre- and postoperative acoustic rhinometric measurements revealed a statistically significant improvement in MCA2, and VOL2 as a reflection of the surgical success. The demonstration of a significant improvement in nasal cavity volume increases the reliability of pre- and postoperative surveys of the QOL questionnaires.

Schwentner et al emphasized the positive effect of subjectively assessed septal surgery on QOL by 2 standardized questionnaires; “Health-Related Quality of Life Questionnaire Rhino Surgery” survey and the “Glasgow Benefit Inventory” retrospectively.⁹ Especially postoperative improvement in disease-specific subgroups overall medical state, practical problems, sleep, and nasal symptoms were shown. In our prospective study, surgical success was assessed objectively by acoustic rhinometry and to assess the QOL comprehensive, multi-item PSQI, and ADHD scales were used. In our study, when we inquired the detailed questionnaires, only the improvement in sleep quality was detected.

In another study, Alakärppä et al questioned patients before and after functional endoscopic sinus surgery and septoplasty operation,¹⁰ and they compared the findings with the healthy control group. They used the “Sino-Nasal Outcome Test-22” and RAND 36-Item Health Survey to measure the QOL in chronic rhinosinusitis patients and to measure the overall QOL, respectively. In this study, although there was an increase in postoperative QOL scores, the rise was not statistically significant.

Ertugay et al used nose obstruction symptom evaluation scale, Epworth sleepiness scale, and snore symptom inventory before and after septoplasty in another study.² They presented the efficacy of septoplasty on the subjective parameters of nasal obstruction in habitual snorers. In our study, sleep quality was evaluated

TABLE 3. Pre- and Postoperative Values of PSQI and ADHD Scale

	Groups				
	Preoperative N:49		Postoperative N:49		P Value
	Mean	Standard Deviation	Mean	Standard Deviation	
Attention deficit	7.59	5.09	7.18	5.47	0.638
Hyperactivity/impulsivity	6.59	5.04	6.73	5.63	0.862
ADHD-related problems	20.41	13.43	18.88	15.00	0.502
PSQI	6.29	3.28	5.18	2.93	0.047*

Paired t-test.

ADHD, attention-deficit/hyperactivity disorder; PSQI, Pittsburgh sleep quality index.

*P < 0.05.

separately from the overall QOL questionnaire which may suggest a more specific consequent. Evaluation of sleep quality with PSQI questionnaire revealed an improvement in the quality of sleep after the nasal septal surgery with or without inferior turbinate radio-frequency as indicated by other surveys in the literature.^{9,10}

The ADHD which is a common childhood illness may be also seen in adulthood. The prevalence is much lower in adulthood than in childhood.³ Sleep is very important in cognitive function, learning, and memory consolidation. Therefore, sleep disturbances may affect cognitive, emotional, and physical function, which may rise to, or exacerbate ADHD symptoms.¹¹ Children with primary snoring have more sleepiness, attention deficit, and hyperactivity than healthy controls. On the contrary, children with ADHD have more habitual snoring, increased apnea-hypopnea index compared to healthy controls.^{12,13}

The beneficial effect of adenotonsillectomy on the improvement of the ADHD symptoms in children with adenotonsillar hypertrophy has been extensively researched and has been put forward in many studies.^{14–16} Additionally, children with ADHD are more likely to have allergic rhinitis than the healthy children.¹⁷ This result could be explained by nasal obstruction and other allergic symptoms.¹⁸ Toward these studies, due to increased incidence of sleep disorders in childhood patients with ADHD, also sleep disorders have been studied in adult patients with ADHD. In adult patients with ADHD, in a small number of studies, subjective sleep problems such as poor sleep quality, restless sleep, and daytime sleepiness were reported.^{19,20} About 25% to 50% of children and more than 50% of adults with ADHD suffer from sleep problems.¹²

Besides from the above-mentioned topic, we investigated the effect of nasal septal surgery on sleep quality and ADHD in our study. Despite the positive effect of the nasal septal surgery on sleep quality, we did not find any significant change in attention status.

CONCLUSION

Septal surgery is a frequently performed procedure and done to improve the QOL of patients in otorhinolaryngology. In this study, we have shown that nasal septal surgery has a positive effect, particularly on sleep quality. Although there is no significant difference in attention status, adults with both ADHD syndrome and septal deviation may show dissimilar results. Therefore, in the future, the effect of nasal septal surgery on symptoms of ADHD syndrome should be studied.

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