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Original Article

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Objective and subjective effects of surgical treatment of nasal obstructions in patients with asthma

Halil Erdem ÖZEL[1], Özer Erdem GÜR[1], Serpil ARIKAN[2], Cafer ÖZDEM[1]

Aim: There is a lot of evidence indicating an association between upper and lower airway diseases. The objective of this study was to investigate the objective and subjective effects of surgical treatment of pathologies causing nasal obstruction in relation with asthma.

Materials and methods: In this study, 17 patients with asthma were divided into 2 groups. Nine patients with septal and/or disorders of turbinate constituted group 1, and 8 patients with nasal polyposis or concomitant septal deviation constituted group 2. Nasal endoscopic examination was performed and paranasal sinus computed tomography was obtained for each patient. Subjects with nasal polyposis, refractory to systemic steroid treatment, were included in the study. Nasal obstruction was treated surgically in all patients. Preoperatively and 3 months postoperatively patients were evaluated in terms of sinonasal symptoms, severity of asthma, and pulmonary function tests.

Results: The mean FEV1 (forced expiratory volume in the first second) and FEF25-75 (forced midexpiratory flow rate) rates were improved in both groups postoperatively, but this difference was not statistically significant ($P > 0.05$). Severity of asthma and dosage of asthma medications were reduced in all patients and in half of the patients, respectively. Nasal obstruction, headache, and postnasal drip were the most frequent symptoms in both groups. These symptoms improved markedly after the surgery.

Conclusion: Sinonasal symptoms and severity of asthma reduce with the surgical treatment of nasal obstructions, which increase the quality of life of patients significantly.

Key words: Nasal obstruction, nasal polyps, asthma, endoscopy, treatment outcome

Astımı olan hastalarda nazal obstrüksiyonların cerrahi tedavisinin objektif ve subjektif etkileri

Amaç: Üst ve alt solunum yolları hastalıkları arasında bir ilişki olduğuna dair birçok kanıt mevcuttur. Bu çalışmanın amacı, nazal obstrüksiyona yol açan patolojilerin cerrahi tedavisinin astım üzerine objektif ve subjektif etkilerini incelemektir.

Yöntem ve gereç: Bu çalışmada astımı olan 17 olgu iki gruba bölünmüştür. Septum ve/veya konka hastalıklarına sahip 9 hasta grup 1'i oluşturmuştur. Nazal polipozis veya beraberinde septum deviyasyonuna da sahip 8 hasta grup 2'yi oluşturmuştur. Tüm hastaların nazal endoskopik muayeneleri yapılmıştır ve paranazal sinüs bilgisayarlı tomografileri çekilmiştir. Sistemik steroid tedavisinden fayda görmeyen nazal polipozis olguları çalışmaya dahil edilmiştir. Tüm hastaların nazal obstrüksiyonları cerrahi olarak tedavi edilmiştir. Hastalar preoperatif olarak ve postoperatif üçüncü ayda sinonazal semptomları yönünden sorgulanmıştır, astım şiddeti belirlenmiştir ve solunum fonksiyon testleri yapılmıştır.

Bulgular: Her iki grupta da postoperatif FEV1 (birinci saniyesindeki zorlu ekspiratuvar hacim) ve FEF 25-75 (zorlu ekspirasyon ortasındaki akım hızı) ortalama değerlerinde düzelme olmasına rağmen istatiksel olarak anlamlı

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[1] Department of ENT, Ankara Numune Research and Education Hospital, Ankara - TURKEY
[2] Department Chest Diseases, Ankara Numune Research and Education Hospital, Ankara - TURKEY
Correspondence: *Halil Erdem ÖZEL, Fakülteler Mahallesi, Keskin Sokak, 1/6 Cebeci, Ankara - TURKEY*
E-mail: heozel@yahoo.com

bulunmamıştır (P > 0,05). Tüm hastaların astım şiddetinde ve yaklaşık yarısında astım nedeniyle kullandığı ilaç dozlarında azalma olmuştur. Her iki grupta da burun tıkanıklığı, baş ağrısı ve postnazal akıntı en sık rastlanan semptomlardır. Cerrahi tedavi sonrası bu semptomlarda belirgin iyileşme sağlanmıştır.

Sonuç: Nazal obstrüksiyonların cerrahi tedavisi ile sinonazal semptomlar ve astım şiddeti azalmaktadır. Bu etkiler hastaların yaşam kalitesini belirgin olarak arttırmaktadır.

Anahtar sözcükler: Nazal obstrüksiyon, nazal polip, astım, endoskopi, tedavi sonuçları

Introduction

Upper and lower airway diseases are currently considered to be associated; however, there is no consensus regarding the mechanism of this relationship. Upper airway diseases might trigger or exacerbate inflammatory lower airway diseases including asthma (1-3). Asthma is a chronic inflammatory disease of the lungs. Nasal polyposis (NP), however, is a chronic inflammatory disease of the nose and paranasal sinuses. NP in many cases accompanies asthma. The incidence of NP among asthma patients above 40 years old ranges between 10% and 15%. Asthma is seen in 30%-70% of patients with NP (4).

There are many studies suggesting that treatment of NP has favorable effects on asthma; however, studies on the effect of septal and turbinate diseases on asthma are scarce (5-8). Yet, it could be anticipated that surgical treatment of non-inflammatory but obstructive disorders of the upper airways including septal deviation, turbinate hypertrophy, and concha bullosa can influence asthma positively.

The objective of this study was to investigate the objective and subjective effects of surgical treatment of inflammatory and/or obstructive diseases causing nasal obstruction in relation with asthma.

Materials and methods

Patients who had been treated for asthma for a minimum of 1 year in our institution between October 2006 and August 2007 and who required surgical treatment for one or more of the pathologies including NP, septal deviation, turbinate hypertrophy, and concha bullosa were included in this study. The study protocol was approved by the institutional ethics committee of our hospital and written informed consent was obtained from each patient prior to the study. Detailed history was obtained from each patient. Nasal endoscopic examination was performed and paranasal computed tomography (CT) examination was obtained with coronal cross-section. The diagnoses of asthma and disease severity were established by the Chest Diseases Department using 'Global Initiative for Asthma (GINA)' criteria from daytime symptoms, medication need, and rescue medication as mild intermittent, mild persistent, moderate, and severe. Pulmonary function tests (PFTs) were performed with the spirometry device preoperatively and 3 months postoperatively. FEV1 (forced expiratory volume in the first second) and FEF 25-75 (forced midexpiratory flow rate) measurements were used in the study. Smokers, and those who had any systemic diseases, aspirin hypersensitivity (Samter syndrome), previous history of nasal operation, and upper airway infection in the last month were excluded from the study.

Oral prednisolone (1 mg/kg), local nasal steroid and levofloxacin (500 mg) were initiated in patients with NP. Daily prednisolone was divided into 3 equal dosages; the dosage was decreased 10 mg every other day and administered concomitantly with anti-acid treatment. Antibiotic treatment was administered once a day for a total of 3 weeks. Functional endoscopic sinus surgery (FESS) was performed under general anesthesia in patients whose nasal polyps proved refractory in control paranasal CT obtained 2 months after medical treatment. Patients with septal deviation, turbinate hypertrophy, and concha bullosa were operated under local anesthesia. Septoplasty was performed in patients with septal deviation. Radiofrequency thermal ablation at 350 J (Gyrus-ENT TC RF) was administered bilaterally to the anterior, middle, and posterior portions of inferior turbinate in patients with turbinate

hypertrophy. Lateral bony and mucosal portions of the middle turbinate were resected in patients with concha bullosa. Treatment of asthma was maintained postoperatively the same as it had been arranged preoperatively by the Chest Diseases Department.

Septal and turbinate diseases were examined in group 1 and patients with NP or concomitant septal deviation were examined separately in group 2. Wilcoxon's test was applied to the preoperative and postoperative FEV1 and FEF 25-75 measurements in both groups. $P < 0.05$ was considered statistically significant. Severity of asthma was determined 3 months after the operation according to GINA criteria. Subjective variables were measured preoperatively including nasal obstruction, postnasal drip, headache, epistaxis, and hyposmia. Patients were asked to classify these complaints as marked improvement, partial improvement, and no difference at 3 months postoperatively.

Results

A total of 17 patients were included in the study. Nine patients with septal and/or turbinate diseases were included in group 1 and 8 patients with NP or accompanying septal deviation were included in group 2. Postoperatively, patients were followed up for 5 to 9 months in group 1 (7 months on average), and 6 to 9 months in group 2 (8 months on average). No complications developed and no recurrences were observed in the follow up period.

Group 1

This group included 9 patients with one or more of the pathologies including septal deviation, turbinate hypertrophy, and concha bullosa. Three of the patients were male and 6 were female. Mean age was 37.4 years, with an age range between 22 and 54. Mean duration of asthma was 6.8 years. Demographic and clinical data as well as PFT variables are presented in Table 1.

Table 1. Distribution of sex, age, current diseases, duration of asthma, preoperative and postoperative PFT results, and severity of asthma in patients in group 1.

					Preoperative			Postoperative (at 3 months)		
No.	Sex	Age	Disease	Duration of asthma (years)	FEV 1 (%)	FEF 25-75 (%)	Severity of asthma	FEV1 (%)	FEF 25-75 (%)	Severity of asthma
1	M	41	SD+TH	10	77	106	Severe	89	78	Moderate
2	F	54	TH	10	98	72	MP	106	74	MI
3	M	30	SD+TH	6	82	58	Moderate	111	59	MP
4	F	36	SD+TH	8	106	70	MP	93	89	MI
5	F	30	SD+CB	5	90	67	Severe	112	86	MP
6	F	41	SD	2	91	56	Moderate	80	63	MP
7	M	22	SD+TH	1	115	107	MI	90	88	MI
8	F	46	TH	4	62	27	Severe	103	53	Moderate
9	F	37	SD+TH	15	97	92	MI	108	85	MI

F: Female; M: Male; SD: Septal deviation; TH: Turbinate hypertrophy;
CB: Concha bullosa; MI: Mild intermittent; MP: Mild persistent

Mean FEV1 and FEF 25-75 values were 90.88% and 72.77%, respectively in the preoperative period and 99.11% and 75%, respectively, at 3 months postoperatively. There was 9.06% (P = 0.343) and 3.06% (P = 0.634) increase between the preoperative and postoperative FEV1 and FEF25-75 measurements, respectively. However, there was no statistically significant difference between the preoperative and postoperative FEV1 and FEF25-75 values (P < 0.05). These data are presented in Figure 1.

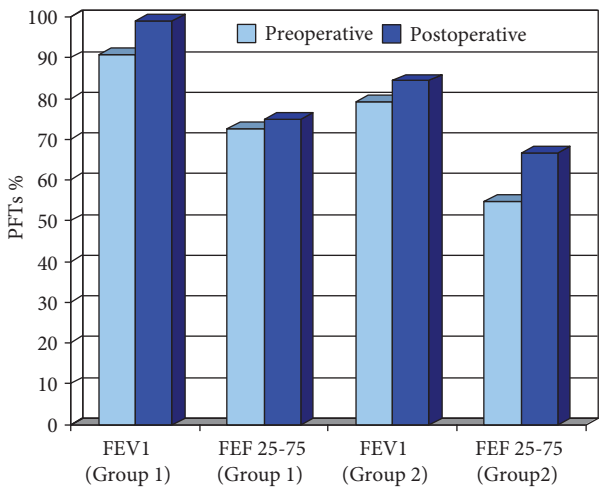

Figure 1. Results of preoperative and postoperative pulmonary function tests in groups 1 and 2.

Postoperatively, severity of asthma was reduced in 7 out of 9 patients and no change was noted in the remaining 2 patients. These 2 patients were already diagnosed with mild intermittent asthma preoperatively. Five out of 9 patients reported a reduction in their dosages of asthma medications. However, the dosage remained unchanged in 4 patients (Figure 2). The data regarding the symptoms of the patients are presented in Figure 3.

Group 2

This group included 8 patients with NP or accompanying septal deviation. Three of the patients were male and 5 were female. Mean age was 41.6 years, with an age range between 24 and 68. Mean duration of asthma was 4.9 years. Demographic and clinical data as well as PFT variables are presented in Table 2.

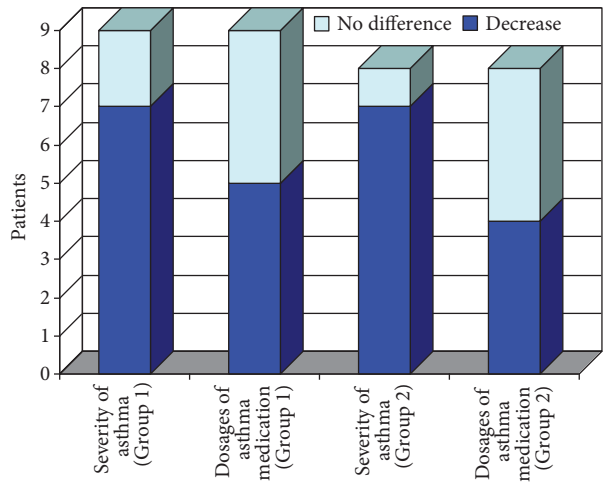

Figure 2. Rates of reduction in severity of asthma and dosage of asthma medication in the postoperative period in groups 1 and 2.

Mean FEV1 and FEF 25-75 values were 79.375% and 54.75%, respectively, in the preoperative period, and 84.375% and 66.75%, respectively, at 3 months postoperatively. There was 6.3% (P = 0.484) and 21.9% (P = 0.080) increase between the preoperative and postoperative FEV1 and FEF25-75 measurements, respectively. However, there was no statistically significant difference between the preoperative and postoperative FEV1 and FEF25-75 values (P < 0.05). These data are presented in Figure 1.

Postoperatively, severity of asthma was reduced in 7 out of 8 patients and no change was noted in the remaining 1 patient. This patient was the one already diagnosed with mild intermittent asthma, preoperatively. Four out of 8 patients reported a reduction in their dosages of asthma medications. However, the dosage remained unchanged in 4 patients (Figure 2). The data regarding the symptoms of the patients are presented in Figure 3.

Discussion

Similar histopathological and immunological features of upper and lower airways, including ciliated columnar epithelium, disperse mucinous glands, vascularization, and innervation, suggest an association between these 2 anatomically neighboring areas. The incidence of NP might be

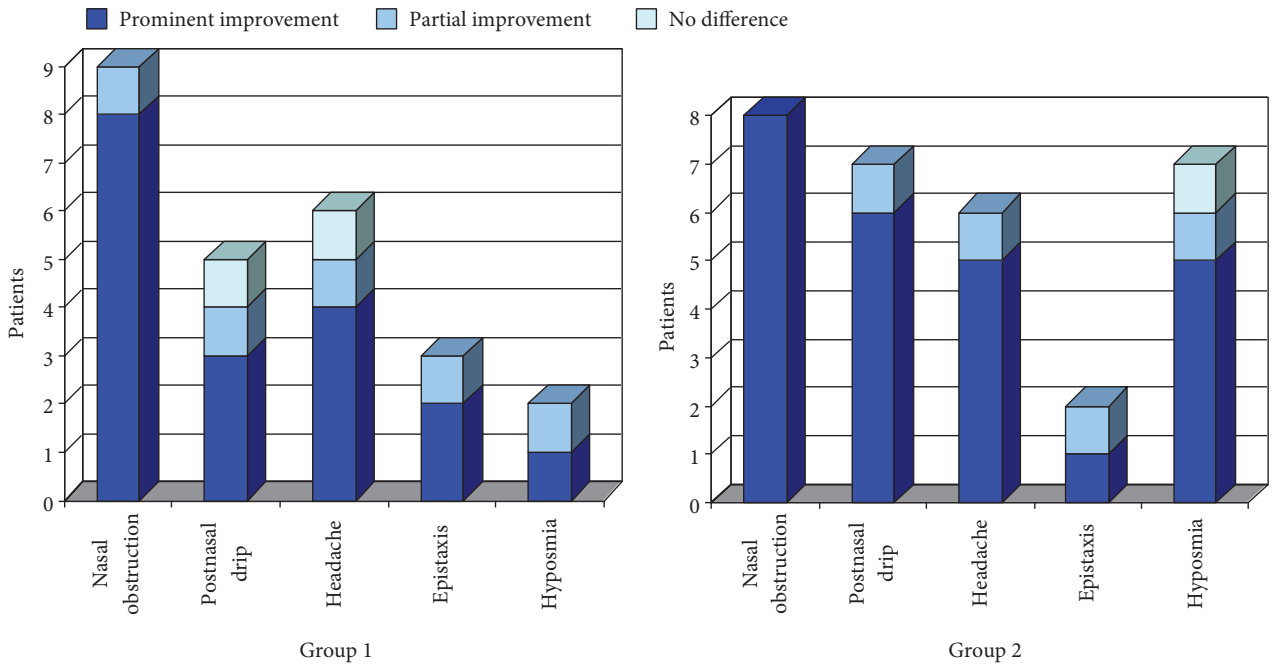

Figure 3. Preoperative frequency and postoperative improvement rates of sinonasal symptoms in patients in groups 1 and 2.

Table 2. Distribution of sex, age, current diseases, duration of asthma, preoperative and postoperative PFT results, and severity of asthma in patients in group 2.

				Preoperative				Postoperative (at 3 months)		
No.	Sex	Age	Disease	Duration of asthma (years)	FEV 1 (%)	FEF 25-75 (%)	Severity of asthma	FEV1 (%)	FEF 25-75 (%)	Severity of asthma
1	F	51	NP	6	32	22	Severe	42	25	Moderate
2	M	68	NP+SD	3	50	31	Moderate	77	43	MP
3	M	39	NP	3	96	110	MI	82	98	MI
4	F	38	NP	6	82	38	MP	89	76	MI
5	F	24	NP	4	49	31	Moderate	78	59	MP
6	M	26	NP+SD	3	105	75	Severe	99	66	Moderate
7	F	49	NP	4	104	48	MP	89	62	MI
8	F	38	NP	10	117	83	Severe	119	105	MI

F: Female; M: Male; NP: Nasal polyposis; SD: Septal deviation;
MI: Mild intermittent; MP: Mild persistent

as high as 36%-96% in asthma patients with aspirin sensitivity (9). NP is more severe and difficult to treat in patients with asthma. In addition, asthma severity is increased in patients with NP (10).

There is a limited number of studies in the literature on the effects of surgical treatment of turbinate pathologies in asthma. Ducroz et al. have performed inferior turbinate resection in 19 children with

allergic rhinitis and turbinate hypertrophy resistant to medical treatment. The authors concluded that there was significant improvement in the quality of life of patients (8). Major functions of the turbinates include warming, moisturizing, and filtering the air. Their malfunctioning might result in inspiration of cold, dry air rich in allergens, and irritant inducing bronchospasm. Shturman-Ellstein et al. demonstrated that lower airway hyperreactivity was more common in asthmatic children performing oral respiration predominantly rather than nasal respiration (11). Proper nasal functioning is particularly important in patients with asthma. Therefore, treatment modalities with lowest risk of turbinate damage should be preferred in this group of patients. The most important advantage of radiofrequency thermal ablation, which treats nasal obstruction by reducing the tissue volume in inferior turbinate hypertrophies, is that it preserves mucociliary functioning (12,13). There were 2 patients in our study in whom radiofrequency thermal ablation was performed for turbinate hypertrophy alone. Severity of asthma was reduced in these 2 patients at 3 months postoperatively. In another 5 patients, septal deviation accompanied turbinate hypertrophy. Septoplasty plus radiofrequency thermal ablation to inferior turbinate was performed in these 5 patients and asthma severity was seen to decrease.

Studies have shown that septal deviation disturbs mucociliary clearance, which returns to normal after septoplasty (14-16). Removal of mucous, debris, and infectious and irritant materials rely on mucociliary clearance. Otherwise, accumulation of these harmful substances in the upper airways might trigger adverse consequences in the lower airways via both local and systemic mechanisms. Septal deviation and concha bullosa might cause recurrent episodes of sinusitis through these mechanisms. Treatment of these diseases prevents transport of inflammatory mediators and infectious materials to lower airways via postnasal drip. In addition, it also prevents bronchospasm through nasobronchial reflex mechanism that might result from increased vagal stimulation secondary to infection and obstruction (17). In our study the reduction in the severity of asthma and dosages of asthma medications following surgical treatment of septal and turbinate pathologies might be explained by the above mechanisms.

There are many studies demonstrating the favorable effects of FESS on asthma in patients with chronic inflammatory sinonasal disease (1,18-20). The study by Batra et al. involved 17 patients with NP and asthma, including 9 with aspirin sensitivity, revealed favorable objective and subjective effects of FESS in patients with no aspirin sensitivity (5). Senior et al. reported a reduction in the severity of asthma and steroid need in 1.1 years post-FESS in 30 bronchial asthma patients with chronic sinonasal disease including 12 cases of nasal polyposis (21). Park et al. also reported a similar improvement after FESS in 80% of 56 asthma patients, 73% of whom had been diagnosed with nasal polyposis (7). Dejima et al. reported an improvement in PFTs and subjective complaints of 75% of asthma patients after the performance of FESS (6). Dufour et al. compared 3 groups of patients including patients with nasal polyposis alone, asthma plus nasal polyposis, and Samter syndrome. Four-year follow up demonstrated improvement in sinonasal symptoms; however, the difference was not statistically significant among the 3 groups. Marked improvement in the clinical picture and reduction in the dosage of asthma medication was reported in 24 of 31 asthma patients (22). There are few studies in the literature defending the contrary. In their study, Uri et al. concluded that FESS does not improve asthma, but it does influence quality of life positively (23). Goldstein et al. performed a similar study on 13 cases and concluded that no statistically significant improvement occurred in terms of PFTs (24). FEV1 and FEF25-75 were improved in our study; however, this was not statistically significant. Severity of asthma was reduced in all and medication dosages were reduced in half of the patients (Figure 2). These changes increase the quality of life of patients significantly and are important in decreasing side effects of steroids including osteoporosis, cataracts, hypertension, and weight gain as well as psychological side effects.

This study and numerous other studies indicate nasal obstruction, headache, postnasal drip, and hyposmia as the most frequent symptoms in sinonasal disease (18,20,22-24). Our study also shows that symptoms are more intense in group 2, which is composed of patients with nasal polyposis. Nasal obstruction is the most frequently seen and postoperatively most frequently improved symptom

in both groups. Marked improvement was obtained in 16 out of 17 patients with nasal obstruction and partial improvement was obtained in the remaining 1 patient. Phillips et al. concluded that FESS caused a marked improvement in headache due to sinuses (25). This study also showed that headache is a frequent and postoperatively curable symptom.

Surgical treatment of pathologies that cause nasal obstruction and/or inflammation has both objective and subjective favorable effects on sinonasal symptoms and asthma. These effects increase the quality of life markedly. Statistically significant results may be obtained in future studies with greater number of subjects and longer follow up periods.

References

1. Senior BA, Kennedy DW. Management of sinusitis in the asthmatic patient. Ann Allergy Asthma Immunol 1996; 77: 6-15.
2. Corren J, Kachru R. Relationship between nonallergic upper airway disease and asthma. Clin Allergy Immunol 2007; 19: 101-114.
3. Corren J. Allergic rhinitis and asthma: how important is the link? J Allergy Clin Immunol 1997; 99: S781-786.
4. Settipane GA. Epidemiology of nasal polyps. Allergy Asthma Proc 1996; 17: 231-236.
5. Batra PS, Kern RC, Tripathi A, Conley DB, Ditto AM, Haines GK 3rd et al. Outcome analysis of endoscopic sinus surgery in patients with nasal polyps and asthma. Laryngoscope 2003; 113: 1703-1706.
6. Dejima K, Hama T, Miyazaki M, Yasuda S, Fukushima K, Oshima A et al. A clinical study of endoscopic sinus surgery for sinusitis in patients with bronchial asthma. Int Arch Allergy Immunol 2005; 138: 97-104.
7. Park AH, Lau J, Stankiewicz J, Chow J. The role of functional endoscopic sinus surgery in asthmatic patients. J Otolaryngol 1998; 27: 275-280.
8. Ducroz V, Girschig H, Roger G, Grimfeld A, Garabedian EN. Inferior turbinectomy in asthmatic children. Ann Otolaryngol Chir Cervicofac 1997; 114: 36-40.
9. Larsen K. The clinical relationship of nasal polyps to asthma. Allergy Asthma Proc 1996; 17: 243-249.
10. Ceylan E, Gencer M, San I. Nasal polyps and the severity of asthma. Respirology 2007; 12: 272-276.
11. Shturman-Ellstein R, Zeballos RJ, Buckley JM, Souhrada JF. The beneficial effect of nasal breathing on exercise-induced bronchoconstriction. Am Rev Respir Dis 1978; 118: 65-73.
12. Harsten G. How we do it: radiofrequency-turbinectomy for nasal obstruction symptoms. Clin Otolaryngol 2005; 30: 64-66.
13. Sapci T, Sahin B, Karavus A, Akbulut UG. Comparison of the effects of radiofrequency tissue ablation, CO2 laser ablation, and partial turbinectomy applications on nasal mucociliary functions. Laryngoscope 2003; 113: 514-519.
14. Ulusoy B, Arbag H, Sari O, Yondemli F. Evaluation of the effects of nasal septal deviation and its surgery on nasal mucociliary clearance in both nasal cavities. Am J Rhinol 2007; 21: 180-183.
15. Uslu H, Uslu C, Varoglu E, Demirci M, Seven B. Effects of septoplasty and septal deviation on nasal mucociliary clearance. Int J Clin Pract 2004; 58: 1108-1111.
16. Jang YJ, Myong NH, Park KH, Koo TW, Kim HG. Mucociliary transport and histologic characteristics of the mucosa of deviated nasal septum. Arch Otolaryngol Head Neck Surg 2002; 128: 421-424.
17. Ferguson B, Powell-Davis A. The link between upper and lower respiratory disease. Curr Opin Otolaryngol Head Neck Surg 2003; 11: 192-195.
18. Dhong HJ, Jung YS, Chung SK, Choi DC. Effect of endoscopic sinus surgery on asthmatic patients with chronic rhinosinusitis. Otolaryngol Head Neck Surg 2001; 124: 99-104.
19. Nishioka GJ, Cook PR, Davis WE, McKinsey JP. Functional endoscopic sinus surgery in patients with chronic sinusitis and asthma. Otolaryngol Head Neck Surg 1994; 110: 494-500.
20. Bayız Ü, Dursun E, Bayız H, Ceylan K, Özeri C. Results of endoscopic sinus surgery in asthmatic patients with chronic ınflammatory sinonasal disease. Kulak Burun Boğaz ve Baş Boyun Cerrahisi Dergisi 2003; 11: 55-63.
21. Senior BA, Kennedy DW, Tanabodee J, Kroger H, Hassab M, Lanza DC. Long-term impact of functional endoscopic sinus surgery on asthma. Otolaryngol Head Neck Surg 1999; 121: 66-68.
22. Dufour X, Bedier A, Ferrie JC, Gohler C, Klossek JM. Diffuse nasal polyposis and endonasal endoscopic surgery: long-term results, a 65-case study. Laryngoscope 2004; 114: 1982-1987.
23. Uri N, Cohen-Kerem R, Barzilai G, Greenberg E, Doweck I, Weiler-Ravell D. Functional endoscopic sinus surgery in the treatment of massive polyposis in asthmatic patients. J Laryngol Otol 2002; 116: 185-189.
24. Goldstein MF, Grundfast SK, Dunsky EH, Dvorin DJ, Lesser R. Effect of functional endoscopic sinus surgery on bronchial asthma outcomes. Arch Otolaryngol Head Neck Surg 1999; 125: 314-319.
25. Phillips JS, Vowler SL, Salam MA. Endoscopic sinus surgery for 'sinus headache'. Rhinology 2007; 45: 14-19.