

Full Length Research Paper

Effects of septoplasty on nasal and oropharyngeal microbial flora

Tayfun Apuhan^{1*}, Esra Koçoğlu², Yavuz Selim Yıldırım³, Tuğçe Şimşek¹,
Hasan Kazaz¹ and Üzeyir Gök¹

¹Department of Ear, Nose and Throat (ENT), Faculty of Medicine, Abant İzzet Baysal University, Bolu, Turkey.

²Department of Microbiology and Clinical Microbiology, Faculty of Medicine, Abant İzzet Baysal University, Bolu, Turkey.

³Department of Otorhinolaryngology and Head and Neck Surgery, Elbistan State Hospital, Kahramanmaraş, Turkey.

Accepted 23 August, 2011

We characterized the changes in oropharyngeal and nasal flora of the patients with a deviated nasal septum before and after septoplasty. Patients who underwent septoplasty for nasal septal deviation were included in this study. Nasal and oropharyngeal cultures were taken with a sterile cotton swab preoperatively and one month after septoplasty. Antimicrobial susceptibility testing was performed using the disc method. Fifty-nine patients with a deviated nasal septum were included in the study: 29 women and 30 men, whose ages ranged from 18 to 40 years. There was no significant difference between the preoperative and postoperative (one month after surgery) isolated bacteria of the nasal and oropharyngeal regions. Septoplasty did not change the nasal and oropharyngeal microbial flora in patients who underwent septoplasty for nasal septal deviation.

Key words: Septoplasty, nasal microbial flora and oropharyngeal microbial flora.

INTRODUCTION

Nasal septal deviation (NSD) is a nasal septal deformity, and septoplasty is a common procedure in otorhinolaryngology. Surgical correction of a deviated septum is the definitive treatment for NSD (Ketcham et al., 2010). Nasal and oropharyngeal flora consist of numerous strains of aerobic bacteria that maintain a balance through strategies of antagonism and coexistence. Many practitioners presume that failing to maintain this balance is one of the factors contributing to infectious diseases.

The middle meatus plays an important role in the onset and persistence of infections in the nasal cavity and sinuses (Eviatar et al., 2006; Klossek et al., 1996) and variations in the microbial flora in the middle meatus and oropharynx may predispose people to acute or chronic infection (Le et al., 2007). The location, severity and complexity of NSD influence airflow dynamics in the

nasal cavity. Post septoplasty operation the airflow in the nasal cavity is changed. This condition may affect the all respiratory tract. To our knowledge, there are no articles in the literature investigating the effects of septoplasty on the both nasal and oropharyngeal microbial flora for this reason. In our study, we aimed to investigate the effects of septoplasty on nasal and oropharyngeal microbial flora in patients who underwent septoplasty for NSD.

MATERIALS AND METHODS

The study was conducted with the approval of the Ethics Committee of the İzzet Baysal Medical Faculty at the University of Abant İzzet Baysal, Bolu, Turkey. Informed consent was obtained from all of the patients recruited for the study. Fifty-nine patients with a deviated nasal septum were included in this study, all of whom had difficulty breathing through the nose and underwent nasal septoplasty at the Abant İzzet Baysal University Medical Center. Exclusion criteria included nasal polyposis, presence of any immunocompromised state, allergic rhinitis, chronic rhinosinusitis, upper respiratory tract infection, nasal pathologies other than NSD, previous nasal surgery, history of systemic antimicrobial treatment within one month of the operation, use of topical decongestants or

*Corresponding author. E-mail: tayfunent@yahoo.com. Tel: +9 0505 809 75 80. Fax: 0 374 2534506.

Table 1. Comparison of oropharyngeal microbial flora before and after septoplasty.

Name of cultured bacteria {Oropharyngeal microbial flora (n = 59)}	Number of culture (n)	Before septoplasty (%)	After septoplasty (%)	p. value
Coagulase negative staphylococcus (CNS)	13	13 (21.6)	12 (20)	p= 0.693
<i>S. aureus</i> (MSSA)	1	1 (1.6)	1 (1.6)	P = 1
<i>E. coli</i>	1	1 (1.6)	0 (0)	P = 1
Alpha-hemolytic streptococci	13	13 (21.6)	14 (23.3)	p = 0.722
<i>M. catarrhalis</i>	2	2 (3.3)	1 (1.6)	p= 0.992
<i>Micrococcus</i> spp.	2	2 (3.3)	3 (5)	p= 0.313
<i>Enterococcus</i> spp.	2	2 (3.3)	3 (5)	p= 0.313
<i>Neisseria</i> spp.	1	1 (1.6)	1 (1.6)	p = 1
No growth	29	29 (48.3)	28 (46.6)	p= 0.891

antiallergic drugs such as steroid nasal spray, and NSD without symptoms of nasal airway obstruction.

Nasal and oropharyngeal cultures were taken with a sterile cotton swab preoperatively and one month after septoplasty. At the beginning of the operation, to avoid contamination by oral flora, oropharyngeal samples were taken under direct light and depression of the tongue. Sterile cotton swabs were taken by firmly rubbing the posterior oropharynx wall and tonsillar surfaces. Tonsillar surfaces were sampled by firmly swabbing the mucosa of both tonsils with the same cotton swab. If the tonsils had been removed, the mucosa of the tonsillar fossae was sampled in a similar manner. Nasal cultures were taken from both sides of the anteroinferiorly to the middle meatus with sterile cotton swabs, using a headlight; to prevent contamination of the cotton swabs in the vestibule, a Killian nasal speculum with long leaves was used by the same person. In patients with a severe obstructing septal deviation, the cultures were taken through the nonobstructed nostril.

Septoplasty was performed under general anesthesia using 2% lidocaine with 1:100,000 adrenaline for local anesthesia. A Killian incision was made in the septal mucosa. The mucoperichondrial flap was elevated from the septal cartilage, the deviated cartilage was resected, and the cartilage was then reshaped and the non-deviated cartilage sutured back in between the mucoperichondrial layers. At the end of the operation, a Merocel tampon concealed completely with a thin layer of tetracycline ointment was inserted into each nostril for 24 h.

The patients were prescribed amoxicillin/clavulanate two times daily for 10 days and instructed to use a sterile saline spray three times daily for two weeks postoperatively. At the followup visit one month after the operation, nasal and oropharyngeal cultures were again obtained.

Microbiology

To isolate microorganisms, the swab specimens were immediately inoculated onto blood agar, chocolate agar, mannitol salt agar, and eosin methylene blue agar, then incubated at 37°C for 24 and 48 h. Antimicrobial susceptibility testing was performed using the disc method. The bacteria were identified by methods described previously (Murray et al., 1993).

Statistical analysis

The data were evaluated using MedCalc statistical software v11.5.1. The Wilcoxon signed-rank test was used to compare repeated measures variables, and the Mann-Whitney U-test and

independent samples t-test were used to test between-group differences. The data are expressed as the mean ± standard deviation; $p < 0.05$ was considered as statistically significant.

RESULTS

Fifty-nine patients with a deviated nasal septum were included in the study: 29 women and 30 men, whose ages ranged from 18 to 40 years. In all of our subjects, preoperative and postoperative (one month after surgery) eight bacterial species [*Coagulase negative staphylococcus* (CNS), *Staphylococcus aureus* (MSSA), *E. coli*, *Alpha-hemolytic streptococci*, *Moraxella catarrhalis*, *Micrococcus* spp., *Enterococcus* spp., *Neisseria* spp] were isolated in the oropharyngeal cultures. Five bacterial species CNS, MSSA, *Alpha-hemolytic streptococci*, *M. catarrhalis*, *Enterococcus* spp. were isolated in the nasal cavity cultures. There was no significant difference between male and female patients ($P > 0.05$). CNS was the most frequently isolated pathogen from the nasal and oropharynx. In the oropharyngeal group, it was present before septoplasty in 13 (21.6%) subjects and in 12 (20%) subjects one month after septoplasty. In the nasal group, it was found in 18 (30.5%) subjects before septoplasty and 17 (28.8%) subjects after septoplasty. There were 23 negative cultures (38.9% before septoplasty and 40.6% after septoplasty) in the nasal group and also 29 (48.3% before septoplasty and 46.6% after septoplasty) in the oropharyngeal group (Tables 1 and 2). There was statistically not significant difference between the preoperative and postoperative (one month after surgery) isolated bacteria of the nasal and oropharyngeal regions ($p > 0.05$) (Figures 1 and 2).

DISCUSSION

The upper respiratory mucosa conditions inhaled air and protects the respiratory tract. NSD is known as the most important cause of obstruction of the nasal airway

Table 2. Comparison of nasal microbial flora before and after septoplasty.

Name of cultured bacteria {Oropharyngeal microbial flora (n = 59)}	Number of culture (n)	Before septoplasty (%)	After septoplasty (%)	p value
Coagulase negative staphylococcus (CNS)	18	18 (30.5)	17 (28.8)	p = 0.794
<i>S. aureus</i> (MSSA)	7	7 (11.8)	6 (10.1)	p= 0.429
Alpha-hemolytic streptococci	8	8 (13.5)	9 (15.2)	p= 0.567
<i>M. catarrhalis</i>	5	5 (8.4)	6 (10.1)	p= 0.344
<i>Enterococcus</i> spp.	6	6 (10.1)	5 (8.4)	p= 0.344
No growth	23	23 (38.9)	24 (40.6)	p = 0.857

Oropharyngeal microbial flora

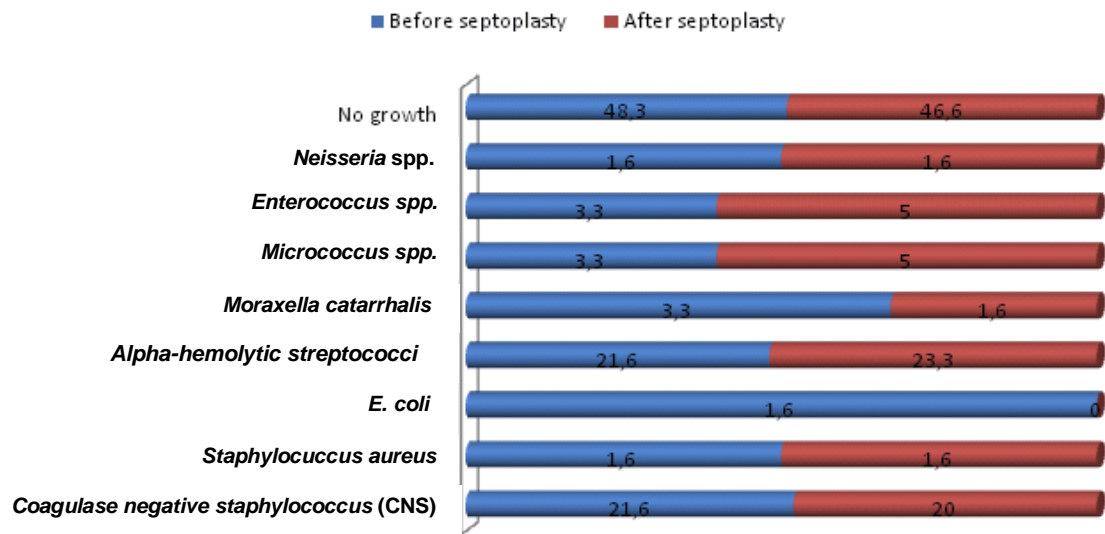


Figure 1. Oropharyngeal microbial flora before and after septoplasty.

Nasal microbial flora

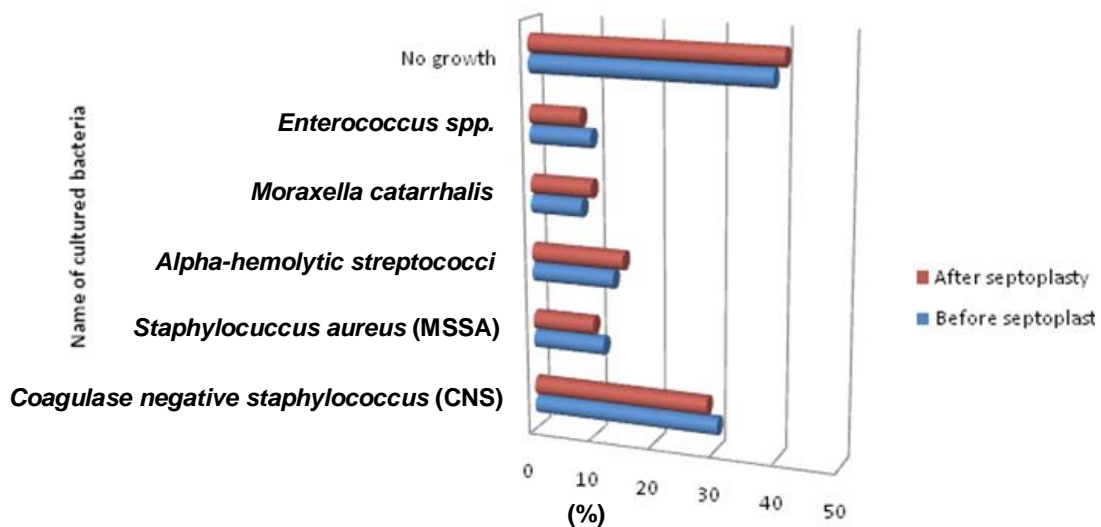


Figure 2. Nasal microbial flora before and after septoplasty.

(Ketcham et al., 2010). It is well known that the upper respiratory epithelial cell layer presents a physical barrier and prevents invasion by microorganisms. Mucociliary clearance protects the mucosa against foreign particles, prevents bacterial infection, and moisturizes the epithelial cell layer. Functional changes in the physiologic conditions of the nasal cavity influence the nasal and oropharyngeal region (Bulcun et al., 2010). It is well known that septal deviation is associated with an increased prevalence of rhinosinusitis.

On the basis of the literature, adenoidectomy seems to have a beneficial effect on the presence of nasopharyngeal bacterial flora. Le showed that in children undergoing adenotonsillectomy for mild to moderate symptoms of throat infections or adenotonsillar hypertrophy, surgery is associated with a reduction in the carriage of potential respiratory pathogens in the oropharynx (Le et al., 2007). The middle meatus plays a key role in the onset and persistence of infections in the nasal sinuses. To identify novel bacteria, we compared nasal flora from anteroinferiorly to the middle meatus of patients with symptomatic NSD, swabbing both before and one month after septoplasty. *Staphylococcus epidermidis* and *Corynebacteria* were the most frequent isolates from the nasal cavities of healthy subjects (Su et al., 1983). Savolainen isolated 79% *S. epidermidis*, 41% *Corynebacteria*, and 34% *S. aureus* (Savolainen et al., 1986). They isolated 72% *S. epidermidis*, 44% *Corynebacterium*, and 38% *S. aureus* from healthy young men (Ylikoski et al., 1989). Douglas took endoscopically guided cultures from the middle meatus in normal subjects and found 64% positive culture (Douglas et al., 1999). In another study, the researchers described the normal nasal flora as comprising certain bacterial species, including *S. aureus*, *alpha* and *gamma streptococci*, *S. epidermidis*, *Propionibacterium acnes*, and *aerobic diptheroides*. (Jousimies-Somer et al., 1989; Brook et al., 1999).

Haemophilus is usually not found in the nose (Eviatar et al., 2006), and it was reported that this bacterium was cultured from the nasopharynx of healthy young men in 27% of cases (Ylikoski et al., 1989). CNS belongs to the normal nasal flora and is cultured from the nasal cavity in widely varied percentages (12 to 81%) (Brook et al., 1999; Eviatar et al., 2006; Jousimies-Somer et al., 1989). In all of our subjects, CNS was the pathogen most frequently isolated from the nasal cavity both before and one month after surgery ($p < 0.05$). For secondary pathogens, patients were prescribed only 10 day amoxicillin/clavulanate two times daily and instructed to use a sterile saline spray three times daily for two weeks postoperatively. Other isolated nasal and oropharyngeal bacteria did not show any statistically significant change before or after surgery.

It is well known that the upper respiratory mucosa conditions affect all the respiratory tract. The physiologic conditions of the nasal cavity, such as humidity, mucociliary clearance, temperature are influenced

normally by the airstream and disrupted owing to the decreasing airstream. Changes in the cultures in the septoplasty patient at the 1st postoperative month might indicate that the procedure caused mucosal changes, stasis, secretions, crusting, and packing postoperatively (Eviatar et al., 2006).

We concluded that the favourable effects of septoplasty influence airflow decrease the chronic postnasal secretion of the upper airways and may influence microbial flora. Thus, we aimed to examine the effects of septoplasty on nasal and oropharyngeal aerobic microbial flora of such patients. In our study, the pre- and postoperative dominance of CNS was the most frequently isolated pathogen implies that the balance among the nasal bacteria is not completely disrupted by septoplasty surgery. *E. coli*, *Micrococcus* spp., *Neisseria* spp was not isolated in the oropharyngeal cultures. An isolated aerobic microorganisms in the nasal and oropharyngeal region was not statistically changed by septoplasty surgery during one month. This results might suggest that the value of culturing the nasal cavity and oropharyngeal region at 6 months postoperatively during the healing process. But, In our knowledge, there are no articles in the literature and we don't know about anaerobic microbial flora in this regions after septoplasty procedure.

The limitations of the current prospective study include a relatively short followup period and lack of anaerobic microbial flora. Our findings indicate that a larger group of patients with a longer followup period is required to better determine the possibility of change of anaerobic oropharyngeal microbial flora after septoplasty.

Conclusion

This pilot study shows for the first time that septoplasty does not change the presence of nasal and oropharyngeal aerobic microbial flora.

REFERENCES

- Brook I, Gober AE (1999). Bacterial interference in the nasopharynx and nasal cavity of sinusitis prone and non-sinusitis prone children, *Acta Otolaryngol.*, 119: 832-836.
- Bulcun E, Kazkayasi M, Ekici MA, Tahran FD, Ekici M (2010). Effects of septoplasty on pulmonary function tests in patients with nasal septal deviation. *J. Otolaryngol. Head Neck Surg.*, 39: 196-202.
- Douglas M, Nadel DM, Lanza DC, Kennedy DW (1999). Endoscopically guided sinus cultures in normal subjects. *Am. J. Rhinol.*, 13: 87-90.
- Eviatar E, Kessler A, Segal S, Vaiman M, Kalmovich LM (2006). Effects of septoplasty on the nasal flora. *Am. J. Rhinol.*, 20: 40-42.
- Jousimies-Somer HR, Savolainen S, Ylikoski JS (1989). Comparison of the nasal bacterial floras in two groups of healthy subjects and in patients with acute maxillary sinusitis. *Clin. Microbiol.*, 27: 2736-2743.
- Ketcham AS, Han JK (2010). Complications and management of septoplasty. *Otolaryngol. Clin. North Am.*, 43: 897-904.
- Klossek JM, Dubreuil L, Pharm D (1996). Bacteriology of the adult middle meatus. *J. Laryngol. Otol.*, 110: 847-849.
- Le TM, Rovers MM, van Staaij BK, van den Akker EH, Hoes AW,

- Schilder AG (2007). Alterations of the oropharyngeal microbial flora after adenotonsillectomy in children: a randomized controlled trial. *Arch. Otolaryngol. Head Neck Surg.*, 133: 969-972.
- Murray PR, Baron EJ, Pfaller MA, Tenover PC, Tenover RH (1993). *Manual of Clinical Microbiology*, 5th ed, Washington DC, American Society for Microbiology., pp. 133-134.
- Savolainen S, Ylikoski J, Jousimies-Somer H (1986). The bacterial flora of the nasal cavity in healthy young men. *Rhinology*, 24: 249-255.
- Su WY, Liu C, Hung SY, Tsai WF (1983). Bacteriological study in chronic maxillary sinusitis. *Laryngoscope*, 93: 931-934.
- Ylikoski J, Savolainen S, Jousimies-Somer H (1989). Bacterial flora in the nasopharynx and nasal cavity of healthy young men. *Otorhinolaryngology*, 51: 50-55.