ORIGINAL CONTRIBUTION

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A randomized clinical study: outcome of submucous resection of compensatory inferior turbinate during septoplasty*

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SUMMARY

Background: *Septoplasty and/or turbinate surgery are commonly used surgical techniques for the treatment of mechanical nasal obstruction. The aim of this study was to define the effectiveness of submucous resection of a hypertrophied turbinate together with simultaneous septoplasty for the treatment of nasal obstruction.*

Methods: *Forty-two patients with septum deviation and compensatory contralateral inferior turbinate hypertrophy were recruited in this study. The inferior turbinate hypertrophy was diagnosed based on examination. The patients were randomly divided into two groups. In group A, a submucous resection was performed to treat a hypertrophied inferior turbinate, together with a septoplasty. In group B, only a septoplasty was performed. Acoustic rhinometry and rhinomanometry tests were conducted for an objective evaluation of nasal patency. A visual analog scale (VAS) was applied to the patients for the subjective evaluation of nasal obstruction complaints.*

Results: *The application of submucous resection intended to reduce a hypertrophied inferior turbinate led to a distinctive increase in cross-sectional area of nasal patency; however, when the two groups were compared, it was statistically significant only at the post-operative sixth month. There was no difference between the results of rhinomanometry. The subjective symptom scores were better in group A than in group B between the post-operative first to sixth month.*

Conclusion: *Submucous resection of a hypertrophied inferior turbinate is necessary for the treatment of nasal obstruction.*

Key words: septoplasty, inferior turbinate hypertrophy, submucous resection, acoustic rhinometry, rhinomanometry

INTRODUCTION

The most common reason for anatomic nasal stuffiness is septum deviation (SD). While anatomic SD narrows one of the nasal passages, compensatory inferior turbinate hypertrophy (TH) in the wider passage results in a decrease in the cross-sectional area of nasal patency [1]. The clinical result of this change, which is intended to ensure nasal passage turbulence, is referred to as inferior TH [2,3]. Accordingly, the presence of inferior TH is established by a subjective evaluation method (anterior rhinoscopy) [3].

Correction of a nasal deformity alone or its application together with turbinate surgery on patients with complaints of nasal obstruction is still under discussion and relies on empirical criteria [2,4]. There are studies which support the benefits of surgery on the turbinate together with a septoplasty; however, there are studies which state this surgical procedure yields no contribution to ensure nasal patency. Fairbanks and Klainer [5] claimed that compensatory inferior TH does not spontaneously regress; rather, the nasal passage with a hypertrophied inferior turbinate gets narrower when the septum is brought to the midline. Relying on the results, they claimed that it was necessary to correct a hypertrophied inferior turbinate together with septum surgery. In the non-randomized study of Hilberg [6], a septoplasty alone was compared with an inferior turbinoplasty and concluded that a contralateral turbinoplasty and septoplasty were successful in ensuring nasal patency in 2/3 of the patients. On the contrary, Nunez and Bradley [3] reported that surgery involving compensatory contralateral inferior TH had no contribution in avoiding unilateral SD.

The purpose of the current study was to define the effectiveness of turbinate submucous resection on nasal obstruction

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treatment that is applied for septoplasty and compensatory contralateral inferior TH treatment through objective measurements, as well as subjective evaluations.

PATIENTS AND METHODS

Patients

The study was initiated after written approval (publication date / number: 06.04.2006/78) was obtained from the Board of Clinical and Laboratory Research Ethics of the Faculty of Medicine at Dokuz Eylul University.

A total of 108 patients who presented with nasal obstruction with a hypertrophied inferior turbinate on the contralateral side of the SD were recruited for the study. The diagnosis was performed on the basis of anterior rhinoscopy and 0° rigid endoscope findings. Forty one patients who had previous nasal surgery, history of previous nasal medication, a history of allergic rhinitis, or patients with nasal polyposis and/or neoplasia, which might cause nasal obstruction, were not included. The patients who were selected, had not received any medical treatment during the last four week before the surgery. They neither received any medical treatment after the surgery.

Patients were randomly divided into two groups. In group A (n = 34), patients underwent septoplasty with concomitant submucous resection of the contralateral hypertrophied inferior turbinate. In group B (n = 33), a septoplasty alone was performed. All the surgeries were performed under remifentanyl-propofol-based total intravenous anesthesia. The nasal mucosal decongestion was provided by topical application of 0.1% xylometazoline before the induction of anesthesia. Eleven patients from Group A and 12 from group B were excluded due to the changes in the addresses, noncompliance for tests and noncompliance to the test schedules during the postoperative follow up period. In addition; 2 patients from Group A were excluded due to the occurrence of septal perforation.

Surgical technique

Each inferior turbinate on both sides was prepared for submucosal reduction with a 10 ml submucasal injection of 1/200,000 adrenaline/1% lidocaine solution. Subsequent to the mucosal vertical cut on the caudal end of the inferior turbinate, decolation of the mucoperiosteum at both the medial and lateral surfaces was accomplished. The submucosal resection was performed with an Inferior Turbinate Blade (2.9 mm; Medtronic Xomed Inc., Phıledelphia, PA, USA) by using a Xomed Power System 3000 microdebrider (Medtronic Xomed Inc.). The submucosal resection with the microdebrider targeted the bony turbinate and the submucosal sinusoids as well. In group B, the septoplasty was the only surgical intervention.

The same surgical technique was used by one surgeon (NOD) for all patients. Starting with a standard hemitransfixation incision for the septoplasty, a submucoperichondrial flap was elevated and the cartilage causing the curvature and the bone parts were corrected. The suturation of the hemitransfixation incision was followed by anterior packing. The packs in each nasal airway were removed after 48 hours.

Objective nasal measurements

The patients were asked to rest in a sitting position in a silent, air conditioned room. For an objective evaluation of nasal patency, the nasal cavity minimal cross-sectional area (MCA) and nasal airflow volumes (NAVs) were defined by applying Rhinometrics SRE 2000 (Assens, Denmark), acoustic rhinometry (AR), and rhinoanometry (RM) tests to the patients in the pre-operative period. The same tests were repeated at the end of the 1^{st}, 3^{rd}, and 6^{th} post-operative months.

Visual analog scale

A visual analog scale (VAS) was applied to the patients in the pre-operative period for the subjective evaluation of nasal obstruction complaints. Patients were asked to score between 10 (total obstruction) and 0 (no obstruction). The post-operative long-term effect of the surgery on the subjective complaints was evaluated by repeating the VAS in the post-operative 1^{st}, 3^{rd}, and 6^{th} months.

Statistical analysis

Non-parametric techniques (Wilcoxon test with two dependent variables and the Mann-Whitney U test and one way-ANOVA with two independent variables) were chosen for the statistical analyses. All of the test results were transferred to SPSS, version 11.0 (SPSS, Inc., Chicago, IL, USA) program for statistical analyses of the data.

RESULTS

In group A, there were 15 male and 6 female patients, with

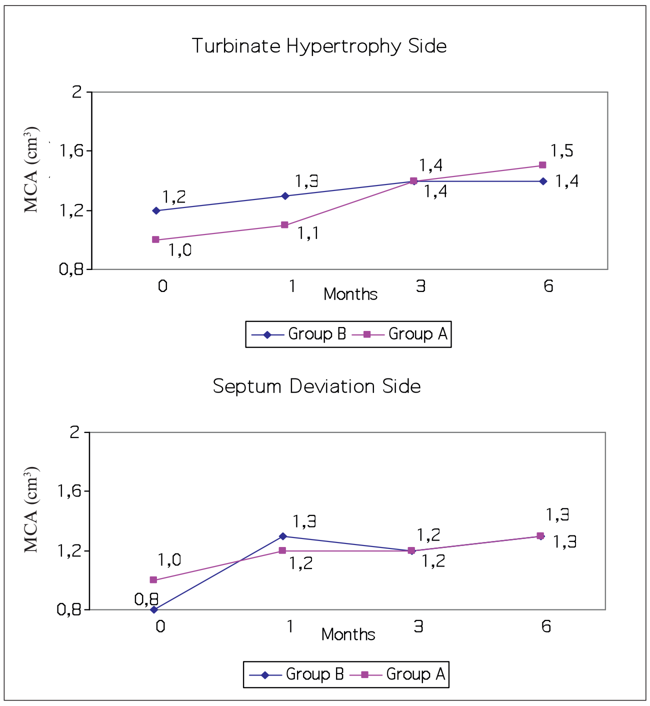

Figure 1. MCA values corresponding to both nasal passages in groups A and B. (group A: septoplasty + submucous resection of the contralateral hypertrophied inferior turbinate; group B: septoplasty).

a mean age of 34.5 ± 2.4 years (range, 18-60 years). These patients had been treated with septoplasty and concomitant submucosal resection of the contralateral hypertrophic inferior turbinate. In group B, there were 17 male and 4 female patients with a mean age of 27.3 ± 1.7 years (range, 19-47 years) who were treated with septoplasty alone.

Assessment of the objective nasal airway

In group A, there was an increase in the mean MCA value of the side with TH compared to the pre-operative value. The difference was not statistically significant at the 1st month ($p = 0.113$), whereas the difference at the 3rd ($p = 0.008$) and 6th month ($p = 0.001$) was statistically significant. On the side of SD, a statistically significant increase was achieved in every value at the post-operative 1st ($p = 0.008$), 3rd ($p = 0.014$), and 6th months ($p = 0.001$).

In group B, never a significant difference between any pre-operative and post-operative values of the side with the TH was observed. On the side with the SD; however, a statistically significant increase was achieved in every value obtained at the 1st ($p = 0.008$), 3rd ($p = 0.014$), and 6th ($p = 0.001$) post-operative months (Figure 1).

Figure 2 demonstrates that the mean NAV post-operative values, obtained in both nasal passages at each interval, did not show any statistically significant difference from the pre-operative values for the two groups ($p > 0.05$).

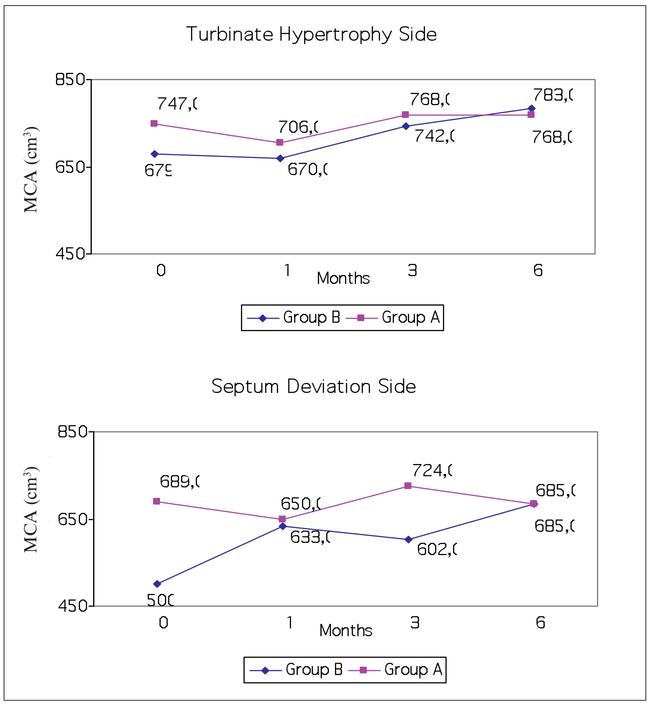

Figure 2. NAV values corresponding to both nasal passages in groups A and B. (group A: septoplasty + submucous resection of the contralateral hypertrophied inferior turbinate; group B: septoplasty).

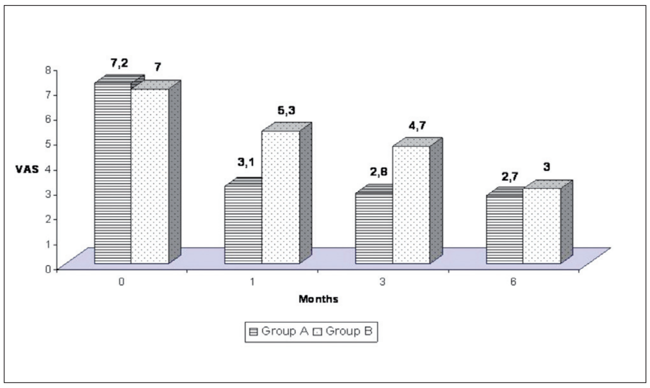

Figure 3. Mean visual analog scale (VAS) scores obtained before surgery and at the 1st, 3rd, and 6th post-operative months for groups A and B. (group A: septoplasty + submucous resection of the contralateral hypertrophied inferior turbinate; group B: septoplasty).

The changes in MCA values of group A corresponding to the side of the TH were statistically significantly different from group B at the end of the 6th post-operative month ($p = 0.005$). When the airway volumes of the two groups were compared, no statistically significant difference was found with respect to the pre-operative values in either nasal passage at any time of inspection ($p > 0.05$).

Assessment of data from the VAS

In group A, a marked amelioration of subjective symptoms was noted at the end of the 1st post-operative month in comparison to the pre-operative VAS scores ($p < 0.001$). While it was found that this amelioration extended to the 6th post-operative month, a comparison of mean VAS scores showed that the change between the 3rd ($p = 0.643$) and 6th ($p = 0.737$) months was not statistically significant different. In comparison to the pre-operative records, an advancing amelioration of subjective symptoms was detected at the end of the 1st, 3rd, and 6th post-operative months; although in group B no significant difference was observed between the 1st ($p = 0.088$) and 3rd ($p = 0.156$) months, the amelioration at the end of the 6th post-operative month was statistically significant ($p < 0.001$, Figure 3).

DISCUSSION

The most common and prominent constitutional etiology of nasal congestion are mechanical obstructions due to SD and hypertrophy of the contralateral inferior turbinate. The most commonly applied surgical interventions against these two forms of mechanical obstruction are septoplasty and surgery involving the inferior turbinate [2,3,9,10].

Nasal obstruction due to SD requires surgical correction for patient relief. Hypertrophy of the inferior turbinate is assessed by subjective evaluation. Although septoplasty means correcting the SD, the aim should target a proper and efficient nasal airway. The assessment of a wider and efficient nasal air way should contain objective measurements. AR and RM are the most commonly utilized objective nasal airway tests for evaluating patients suffering from nasal obstruction.

In this study, the objective assessment of the nasal airway on both sides (TH and SD) was provided by AR. On the side with SD, there was a significant increase in both groups. The septum surgery resulted in an increase in nasal MCA values for the SD sides. In group A, the statistically significant increase was detected at the 3rd and 6th month; however, in group B there was no difference at the 1st, 3rd, and 6th month. The difference between group A and B was statistically significant for every measurement. The NAV did not reveal any difference between and within the groups. The AR revealed a significant increase in the SD side for both groups and the TH side for group A. However, the increase in NAV was not statistically significant. In light of these findings, application of submucous resection to the turbinate was concluded to be effective in reducing the MCA.

There are studies which support the efficacy of surgical interventions to the inferior turbinate accompanying septoplasty, as well as others which assert that this practice does not improve the nasal airway [2,3,6]. Pirila and Tikanto studied 117 subjects for effects of septoplasty on the unilateral and bilateral nasal airways. Using AR, RM, and subjective evaluations, they reported a suggestive increase in post-operative MCA and NAV values of the side of deviation, but a decrease in those of the opposite side, which suggested them conclude that septoplasty might affect the opposite nasal valve negatively. When subjective symptoms were evaluated; however, the patients were found to have substantial relief from nasal obstruction [19].
Similarly, in the present study, despite the increase in post-operative MCA values on the side of the SD, that such an increase was not observed on the opposite side in the group that underwent septoplasty only may have stemmed from the negative change in the nasal valve zone. This is supported further by the observation that for the group which received turbinate surgery along with septoplasty, the MCA values corresponding to the side opposite to the SD exhibited an increase. This condition depends on the constricting operation applied to the inferior turbinate on the side opposite to the SD, because, as it is known, the turbinate caudal tip is the most important component of the nasal valve zone, and although septoplasty may exhibit a negative effect on the nasal valve zone of the other side, this effect may be remedied by adding an appropriate turbinate surgery to the septoplasty.

In a non-randomized clinical study on patients with SD, Nunez and Bradley [3] provided a comparison of their results for two groups, one of which was treated with turbinectomy for contralateral compensatory inferior TH and the other group which did not undergo any surgical procedure on the hypertrophic inferior turbinate, and concluded that in the case of unilateral SD, a correction of contralateral compensatory inferior TH did not provide additional short- or long-term improvement of nasal obstruction. In their study [3], the objective tests were conducted during the 6th and 12th post-operative weeks. Since similar monitoring time intervals yielded similar results in the present study, it can be concluded that these monitoring times might have failed to reveal the success of surgery. Some non-randomized clinical studies have displayed the reoccurrence of nasal blockage in a dissimilar way in patients who did not undergo contralateral turbinectomy surgery on their inferior turbinates during septal surgery [19,20]. Some studies have reported a pronounced correlation between subjective symptoms and nasal obstruction parameters obtained using AR or RM, while there are others which disclaim such a relationship [2,4,8,12-18].

In accordance with our findings, the VAS scores for nasal obstruction were consistent with the mean MCA values for both groups in the present study. This significance was present at the 6th post-operative month for group B, whereas it was significant at the 1st, 3rd, and 6th months for group A. This subjective evaluation is in agreement with the AR results. The VAS revealed that the submucous resection of the inferior turbinate resulted in a decrease in nasal obstruction.
Decrease in the VAS score differences between group A and B through out the 6th month might be due to spontaneous recovery of compensatory turbinate hypertrophy. On the other hand turbinate surgery would be necessary to satisfy patients in the short turn after surgery.
In a similar study, in which septoplasty alone was compared with septoplasty accompanied with turbinate surgery, no difference was found between the two methods from the point of subjective symptoms [2]. Grymer et al. [4] also demonstrated a similar relationship between MCA values and subjective symptoms. Contrary to these observations, it was reported by Hilberg et al. [6] that post-operative total MCA values obtained by AR did not match the patients' subjective values of nasal air flow. It was also reported that a patient's sense of nasal air flow might not solely depend on the dimensions of the airway, and that while evaluating the results of surgery, the patient's sense of nasal air flow was the most important parameter [6].

CONCLUSIONS

The submucous resection of a contralateral hypertrophic inferior turbinate in SD surgery increased the nasal valve area based on endoscopic measurements and increased the MCA values during the 6 months of follow-up. The increase in NAV was not statistically significant, but the subjective evaluation of the patient supports the beneficial effect of turbinate surgery. The submucous reduction in compensatory hypertrophy of the inferior turbinate as an adjunct to septal correction improves the short- and long-term results in improving airway patency.

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