

Changes in Nasal Resistance and Quality of Life After Endoscopic Microdebrider-Assisted Inferior Turbinoplasty in Patients With Perennial Allergic Rhinitis

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Objective: To assess objective and subjective outcomes in patients with perennial allergic rhinitis who had undergone endoscopic microdebrider-assisted inferior turbinoplasty.

Design: Prospective study.

Setting: Tertiary referral center.

Patients: Fifty patients with perennial allergic rhinitis who had substantial mucosal hypertrophy of the inferior turbinates and who underwent endoscopic microdebrider-assisted inferior turbinoplasty with follow-up 1 year after surgery.

Intervention: A newly designed microdebrider blade incorporated with an elevator was used to perform this procedure in the clinical setting with the patient under local anesthesia and with 30° endoscopic guidance.

Main Outcome Measures: Both objective outcome

evaluated by total nasal resistance at anterior rhinomanometry and subjective outcome assessed with the Rhinoconjunctivitis Quality of Life Questionnaire were analyzed before and 1 year after surgery.

Results: The median total nasal resistance in 50 patients decreased from 0.45 Pa/cm³ per second preoperatively to 0.28 Pa/cm³ per second 1 year postoperatively, a statistically significant difference ($P < .001$). Compared with preoperative scores, the postoperative scores of these patients significantly improved in both 7 separate domain scores and overall Rhinoconjunctivitis Quality of Life Questionnaire scores ($P < .005$).

Conclusion: Our results suggest that endoscopic microdebrider-assisted inferior turbinoplasty is effective for decreasing nasal resistance and improving quality of life in patients with perennial allergic rhinitis who have substantial nasal congestion.

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NASAL OBSTRUCTION, ALthough not life threatening, can interfere with quality of life. Enlargement of the inferior turbinates is a common cause of obstruction of the nasal airway, in addition to deviation of the septum. Turbinate surgery is an effective treatment for chronic nasal obstruction induced by perennial allergic rhinitis.¹ Many techniques of turbinate reduction have been performed, including partial or total turbinate resection, cauterization, cryotherapy, laser therapy, and radiofrequency ablation.²⁻⁶ Disadvantages of these traditional techniques include bleeding, crusting, synechia formation, osteitis, inadequate volume reduction, and atrophic rhinitis. Furthermore, the multiplicity of techniques indicates the lack of consensus on the "gold standard" for inferior turbinate reduction.

Because the respiratory mucosa is essential to proper physiologic functioning

of the turbinates, such as warming and humidification of inspired air and mucociliary clearance, the ideal turbinate surgery would effectively reduce the volume of the submucosal stromal tissue while preserving the overlying respiratory epithelium and averting complications. It has been reported that submucosal turbinectomy is an excellent procedure for reducing not only nasal congestion but also sneezing and rhinorrhea in patients with perennial allergic rhinitis.^{7,8} However, microdebrider-assisted powered reduction of the inferior turbinate has not proved effective in these patients, although it provides a method for achieving volume reduction with mucosal preservation and minimal risk for complications.

The microdebrider, which has been widely used in nasal surgery for the past decade, is supposed to provide real-time suction with the ability of precise tissue resection.⁹ Although several studies proposed the feasibility of using the micro-

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debrider in inferior turbinate surgery, the postoperative changes in nasal resistance and quality of life remained unexplored. With the advent of a newly designed small (2.0-mm) microdebrider blade incorporated with an elevator, we have performed endoscopic submucosal turbinate reduction with this instrument in the clinical setting with the patient under local anesthesia. The purpose of this study was to evaluate the objective and subjective outcomes in patients with perennial allergic rhinitis who had substantial mucosal hypertrophy of the inferior turbinates and who underwent endoscopic microdebrider-assisted inferior turbinoplasty.

METHODS

INCLUSION CRITERIA AND OBJECTIVE EVALUATION

Fifty patients (28 men and 22 women; age range, 8-61 years; mean age, 31.2 years) with perennial allergic rhinitis underwent endoscopic microdebrider-assisted inferior turbinoplasty between May 1, 2004, and July 31, 2004. All patients were recruited based on the following 2 criteria: a documented clinical history of perennial allergic rhinitis and a high titer of anti-*Dermatophagoides farinae*-specific and anti-*Dermatophagoides pteronyssinus*-specific IgE antibodies.

Patients underwent a complete workup including a thorough history of medical therapy, rhinoscopic examination, and anterior rhinomanometry (standard Rhino KOC-8900; Chest MI Inc, Tokyo, Japan). The anterior rhinometry procedure included the placement of a pressure sensor in one nostril and detected the flow of air in the other nostril. Hence, the resistance of each nasal cavity and total nasal resistance could be calculated separately. We excluded those patients who had sinusitis or nasal polyps or who had previously undergone nasal surgery. The effect of topical decongestion on nasal resistance was also evaluated. A less than 35% decrease in unilateral nasal resistance at rhinomanometry indicated structural abnormality such as septal deformity, conchal hypertrophy, and conchal bullosa, and patients with these conditions were excluded from the study.¹⁰ Patients with nasal valve collapse detected at rhinomanometry with the typical finding of an asymmetric nasal pressure-flow curve were also excluded. Surgery was performed in the patients with substantial mucosal hypertrophy of the inferior turbinates that was unresponsive to medical therapy. Patients did not receive any medical treatment for allergic rhinitis within 4 weeks of the preoperative and 1-year postoperative examinations. Rhinomanometry was repeated 1 year postoperatively, and the objective outcome was evaluated as total nasal resistance rather than unilateral nasal resistance.

SUBJECTIVE EVALUATION

Quality of life was investigated in patients before and 1 year after surgery using the Rhinoconjunctivitis Quality of Life Questionnaire (RQLQ) developed by Juniper et al.¹¹ The RQLQ contains 28 questions in 7 domains: activities (questions 1-3; maximum score, 18), sleep (questions 4-6; maximum score, 18), non-hay fever symptoms (questions 7-13; maximum score, 42), practical problems (questions 14-16; maximum score, 18), nasal symptoms (questions 17-20; maximum score, 24), eye symptoms (questions 21-24; maximum score, 24), and emotions (questions 25-28; maximum score, 24). Patients rated each item on a scale of 0 (not bothersome) to 6 (extremely bothersome). The scores of the

domains were expressed as the mean score for each item. The overall RQLQ score was the average of the scores of the 7 separate domain scores. Consistent with previous analysis, a change in score greater than 0.5 on an RQLQ domain or overall score may be considered clinically important.^{11,12}

STATISTICAL ANALYSIS

We used SPSS software (SPSS Inc, Chicago, Ill) for statistical analysis. The values of the median and interquartile ranges were used for descriptive statistics of rhinomanometric results. The value of the mean \pm SD was used for the RQLQ scores (overall and each domain). Comparative analysis of these results was conducted by Wilcoxon signed rank test. $P < .05$ indicated a significant difference.

SURGICAL TECHNIQUE

All operations were performed in the outpatient clinic with the patient under local anesthesia. The inferior turbinates were injected with lidocaine hydrochloride (10 mg/mL) in epinephrine acid tartrate (1:100 000) in a submucosal plane under 30° endoscopic guidance after intranasal decongestion with cotton sticks moistened with lidocaine hydrochloride (40 mg/mL) and epinephrine (1:5000). A vertical incision was made with a No. 11 blade in the anterior aspect of the inferior turbinate and a submucosal pocket was created with sharp dissection on the medial surface of the bony turbinate. A straight microdebrider blade (2.0 mm) incorporated with an elevator (Medtronic Xomed Inc, Jacksonville, Fla) was inserted through the incision into the submucosal pocket, which was further dissected with the elevator. Debridement of submucosal tissue from the inferior turbinate was performed with the blade positioned mediolaterally from the submucosal plane at a speed of up to 3000 rpm. The incision was not closed, and hemostasis was achieved by nasal packing with 1 piece of petroleum jelly-saturated (Vaseline) gauze and cotton balls for 24 hours. Complications included bleeding, mucosal tears, synechia, crusting, and foul odor.

RESULTS

Before surgery, the minimum, maximum, and median total nasal resistance at rhinomanometry calculated at 150 Pa of pressure in 50 patients was 0.22, 3.06, and 0.45 Pa/cm³ per second, respectively, compared with 0.18, 0.53, and 0.28 Pa/cm³ per second 1 year postoperatively ($P < .001$; **Table 1**).

After the operation, patients demonstrated substantial improvement in both the 7 separate domain scores and overall RQLQ scores compared with those obtained before the operation ($P < .005$; **Table 2**). These differences were also beyond the proposed threshold of clinical relevance (> 0.50).

The preoperative subscale scores of nasal symptoms (questions 17-20) including nasal obstruction, rhinorrhea, sneezing, and postnasal drip were 4.22 ± 1.30 , 3.56 ± 1.36 , 3.44 ± 1.50 , and 3.02 ± 1.85 , respectively, in contrast to those after surgery, which were 1.98 ± 1.12 , 1.92 ± 1.19 , 1.88 ± 1.15 , and 1.78 ± 1.23 , respectively ($P < .001$). Among them, nasal obstruction demonstrated the most significant change in the subscale score.

No patient had any postoperative bleeding after removal of the nasal packing after 24 hours. Five patients

Table 1. Comparison of Preoperative and Postoperative Rhinomanometric Findings

Rhinomanometry	No. of Patients	Total Nasal Resistance, Pa/cm ³ per Second			
		Minimum	Maximum	Median	Interquartile Range
Preoperative	50	0.22	3.06	0.45*	0.30
Postoperative	50	0.18	0.53	0.28*	0.10

* $P < .001$, Wilcoxon signed rank test.

Table 2. Preoperative and Postoperative Subscale Scores of the RQLQ*

RQLQ Subscale	Preoperative Score†	Postoperative Score†	Change in Score	P Value
Activities	3.27 ± 1.33	2.60 ± 1.13	-0.67 ± 1.25	<.005
Sleep	2.63 ± 1.39	1.87 ± 0.93	-0.77 ± 1.42	<.005
Non-hay fever symptoms	2.52 ± 1.30	1.84 ± 1.16	-0.68 ± 1.19	<.005
Practical problem	3.67 ± 1.37	2.65 ± 0.81	-1.01 ± 1.38	<.001
Nasal symptoms	3.59 ± 1.25	1.89 ± 0.96	-1.70 ± 1.59	<.001
Eye symptoms	2.02 ± 1.44	0.92 ± 0.74	-1.11 ± 1.42	<.001
Emotions	2.84 ± 1.38	2.02 ± 1.01	-0.83 ± 1.50	<.005
Overall score	2.89 ± 1.02	1.92 ± 0.66	-0.96 ± 1.00	<.001

Abbreviation: RQLQ, Rhinoconjunctivitis Quality of Life Questionnaire.

*Data are given as mean ± SD unless otherwise indicated.

†Wilcoxon signed rank test.

(10%) had mucosal tears, but there was no loss of mucosa. We did not observe any crusting, synechia, foul odor, or atrophic change.

COMMENT

Common anatomical abnormalities that cause nasal obstruction include nasal septal deviation, nasal valve collapse, and mucosal or bony hypertrophy of the turbinates. Patients with nasal septal deviation and nasal valve collapse were excluded from this study because other concomitant operations would limit the ability to attribute the relief of nasal symptoms and the improvement in quality of life only to reduction of the inferior turbinates. Ideal turbinate surgery, in which there is an attempt to reduce submucosal tissue with minimal violation of the mucosa, could be achieved with an endoscopy-guided microdebrider-assisted technique. However, patients with bony hypertrophy covered with a thin layer of mucosa are not good candidates for microdebrider turbino-plasty because the thick, calcified bony turbinates make their debridement difficult and might predispose the turbinates to mucosal loss. Thus, in this study, we enrolled only patients with mucosal hypertrophy of the inferior turbinates to undergo microdebrider-assisted inferior turbino-plasty.

Total nasal resistance is less variable than unilateral nasal resistance because it incorporates both nasal airways and, thus, is not affected by the nasal cycle. Consequently, it is a better predictor of the presence of nasal obstruction. Our results revealed that the median total nasal resistance was 0.28 Pa/cm³ per second postoperatively compared with 0.45 Pa/cm³ per second preopera-

tively. The rhinomanometric change corresponded to the patients' subjective improvement in the relief of nasal obstruction.

Our results indicate that not only nasal obstruction but also rhinorrhea, sneezing, and postnasal drip were significantly improved postoperatively. One may question why all symptoms of allergy improved in patients undergoing the mucosa-preserving surgery, because a large proportion of nasal allergic reactions occur in the superficial layer of the inferior turbinate. It has been reported that submucosal turbinectomy is effective in reducing not only nasal congestion but also sneezing and rhinorrhea in patients with perennial allergic rhinitis via reduction in the number of various inflammatory or allergy-affected cells in the turbinates.^{7,8} In addition, submucosal turbinectomy also damages the branch of the postnasal nerve, which has a role in causing sneezing and hypersecretion.⁸ Because microdebrider-assisted inferior turbino-plasty can achieve similar effects as submucosal turbinectomy, that is, decreasing allergy-affected cells and destroying the nerve, the improvement in nasal allergic symptoms can be anticipated.

Quality-of-life questionnaires were introduced in the clinical evaluation of respiratory allergies by Juniper et al¹²⁻¹⁴ to quantify the effects of symptoms under real-life conditions, and subsequently they were used to evaluate the efficacy of treatments of allergic disease. We selected and based our study on the RQLQ because it is a standardized and validated method. It has been demonstrated that the RQLQ can be used with confidence to measure quality of life in epidemiological surveys, clinical trials, and patient monitoring. It has proved evidence of strong discriminative and evaluative measure-

ment properties.¹²⁻¹⁴ Our study patients demonstrated not only a decrease in total nasal resistance but also substantial improvement in quality of life for all 7 domains of the RQLQ 1 year after surgery. One possible explanation is that the patients felt so much better insofar as the most bothersome symptom of nasal congestion that it led to a subjective feeling of improvement in all other domains. These results might suggest that endoscopic microdebrider-assisted inferior turbinoplasty can be useful in patients with allergic rhinitis who have substantial nasal congestion.

Compared with the microdebrider blades (3.5 or 4.0 mm) used in the past, in this study, we used a newly designed, much smaller blade (2.0 mm) incorporated with an elevator, causing less complications such as mucosal tears, bleeding, and synechia.^{15,16} Additional benefits of our procedure are that this surgery can be performed as an outpatient procedure with the patient under local anesthesia, with shorter duration of nasal packing and better visualization with 30° endoscopic guidance. However, lengthier studies must be performed to conclude that the effects of this surgery can last longer than 1 year.

CONCLUSIONS

Results of this prospective study show favorable outcomes of rhinomanometry and RQLQ in patients with perennial allergic rhinitis undergoing endoscopic microdebrider-assisted inferior turbinoplasty. We believe that this procedure offers effective volume reduction and preservation of physiologic functioning of the turbinates, and averts complications.

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