Inferior Turbinoplasty During Cosmetic Rhinoplasty

Techniques and Trends

Neil Tanna, MD, MBA, Daniel D. Im, MD,† Hamdan Azhar, MS,‡ Jason Roostaeian, MD,† Malcolm A. Lesavoy, MD,† James P. Bradley, MD,† and Reza Jarrahy, MD†*

Background: The sheer number of accepted inferior turbinoplasty techniques emphasizes the fact that there is no general agreement on which approach yields optimal results, nor are there data available that describes prevalent techniques in turbinate surgery among plastic surgeons.

Objective: The aim of this study was to identify practice patterns among plastic surgeons who perform inferior turbinoplasty during rhinoplasty.

Methods: Members of the American Society of Plastic Surgeons were invited to participate in an anonymous, Internet-based survey containing questions related to personal preferences and outcomes in inferior turbinate surgery.

Results: A total of 534 members of the American Society of Plastic Surgeons participated in the survey. Most (71.7%) trained in an independent plastic surgery program with prerequisite training in general surgery. More than half (50.6%) had more than 20 years of operative experience; only 15.2% reported performing greater than 40 rhinoplasties per year. The 5 most preferred inferior turbinate reduction techniques were outfracture of the turbinates (49.1%), partial turbinectomy (33.3%), submucous reduction via electrocautery (25.3%), submucous resection (23.6%), and electrocautery (22.5%). Fewer than 10% of the respondents reported the use of newer techniques such as radiofrequency thermal ablation (5.6%), use of the microdebrider (2.2%), laser cautery (1.1%), or cryosurgery (0.6%). Mucosal crusting and desiccation were the most frequently reported complications.

Conclusions: The results of this survey provide insights into the current preferences in inferior turbinate reduction surgery. Plastic surgeons are performing more conventional methods of turbinate reduction rather than taking advantage of the many of the more novel technology-driven methods.

Key Words: inferior turbinate, rhinoplasty, turbinoplasty, nasal obstruction, septoplasty

(*Ann Plas Surg* 2014;72: 5–8)

There has been a longstanding debate among rhinoplasty surgeons surrounding the surgical management of nasal obstruction secondary to enlarged inferior turbinates.[1] When a patient who presents for rhinoplasty has a surgically correctable cause of inferior turbinate hypertrophy (eg, bony hypertrophy or redundant hyperplastic mucosa) and has failed medical management (ie, intranasal steroids, decongestants, or antihistamines), it is widely accepted that surgical treatment is then warranted.[2–5] The goals of surgery are to relieve nasal obstruction via a volumetric reduction of the turbinate that preserves nasal function and minimizes complications.[6,7] However, there is no general consensus on the most effective method of treating inferior turbinate hypertrophy. A multitude of destructive and nondestructive surgical techniques have been used to reduce enlarged turbinates.[8] The sheer number of accepted approaches belies the lack of agreement on which approach is the optimal one.

Accepted methods for surgical treatment of turbinate hypertrophy have ranged from total turbinectomy[9,10] to less radical procedures, including partial turbinectomy,[11] submucous resection,[12] and turbinate outfracture.[13,14] Over the past 2 decades, multiple minimally invasive approaches, such as radiofrequency ablation,[15–19] submucous diathermy,[11] laser cautery,[20–25] and cryosurgical reduction,[26] have been introduced and popularized, primarily in the otolaryngology literature.

Each of these techniques has well-described advantages, disadvantages, and complications. Yet among plastic surgeons, none has emerged as a clearly preferred method, nor are there any data that demonstrate the extent to which more novel techniques have been adopted by practitioners of our specialty. The goal of this study was to determine practice patterns and preferences among plastic surgeons in the surgical management of the patient undergoing rhinoplasty with inferior turbinate hypertrophy. We also sought to examine relationships between training and experience of surgeons and their preference for certain techniques and the incidence of complications as a function of preferred techniques and surgeon background. Furthermore, by surveying members of the American Society of Plastic Surgeons (ASPS), we hoped to assess the extent to which the plastic surgery community has embraced some of the more novel, less invasive methods used for inferior turbinate ablation.

MATERIALS AND METHODS

An anonymous, Web-based survey was generated containing questions regarding training and practice history, experience with rhinoplasty, approach to the evaluation and surgical management of inferior turbinate hypertrophy, and complications noted after turbinate surgery. An initial solicitation for participation in the survey was electronically distributed to 5,110 members of the ASPS. The original solicitation was followed by 4 follow-up requests, sent 1 month apart for 4 months.

Survey responses were tallied and analyzed using descriptive statistics (frequencies and percentages). We first sought to evaluate the relationship between surgeon background and preferred technique. For each of the 5 most commonly preferred techniques, a multiple binary logistic regression analysis was conducted to evaluate the relationship between preference for that technique and the following 3 independent variables: training program type, number of procedures performed annually, and number of years in practice. Results were considered significant at the $P < 0.05$ level.

A similar procedure was implemented to assess the relationship between complication incidence and surgeon background and preferred technique. The complication data were first dichotomized to indicate nonzero versus zero incidence for each of the 6 complication types. Multiple binary logistic regression was again implemented, separately for each complication type, with complication presence

Received January 24, 2012, and accepted for publication, after revision, April 4, 2012.

From the *Institute of Reconstructive Plastic Surgery, New York University, New York, NY; †Division of Plastic and Reconstructive Surgery, David Geffen School of Medicine, University of California, Los Angeles, CA; and ‡Department of Biostatistics, School of Public Health, University of Michigan, Ann Arbor, MI.

Presented at the 2011 American Society of Plastic Surgeons Annual Meeting, Denver, CO, September 25, 2011.

Conflicts of interest and sources of funding: none declared.

Reprints: Neil Tanna, MD, MBA, Institute of Reconstructive Plastic Surgery, New York University, 550 First Ave, New York, NY 10016. E-mail: ntanna@gmail.com.

ISSN: 0148-7043/14/7201-0005
DOI: 10.1097/SAP.0b013e3182590970

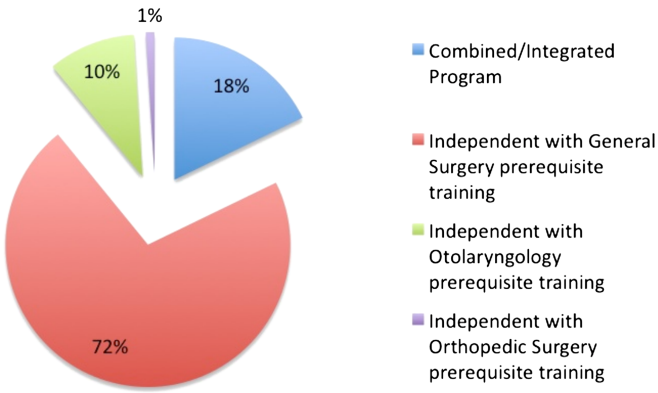

FIGURE 1. The type of plastic surgery residency training completed by the respondents.

as he dependent variable and independent variables including the 3 aforementioned measures of surgeon background and indicator variables representing expressed preference for the 5 most commonly selected techniques. An indicator variable reflecting expressed preference for any of 4 newer surgical techniques was also included as an independent variable in the analysis. Statistical analyses were conducted using SAS 9.2 (SAS Institute Inc, Cary, NC) software.

RESULTS

Response Rate and Demographics

A total of 534 (10.5%) usable responses were obtained from the 5,110 members of the American Society of Plastic Surgeons who were surveyed. Of these respondents, most (71.7%) trained in an independent plastic surgery program with prerequisite training in general surgery (Fig. 1). Only 10% of the respondents were dual training in plastic surgery and otolaryngology, with prerequisite training in otolaryngology. Half of the respondents (50.6%) had more than 20 years of experience (Fig. 2), and only a minority (15.2%) reported performing greater than 40 cosmetic rhinoplasties per year (Fig. 3).

Preoperative Evaluation

Nearly all ASPS member surgeons who responded to the survey routinely assess for symptoms of nasal airflow obstruction when taking the preoperative history (98.5%). Similarly, most do specifically evaluate the inferior turbinates for hypertrophy during the preoperative physical examination (90.5%). Nearly 70% of respondents forego obtaining *routine* diagnostic studies before rhinoplasty/turbinate surgery (eg, computed tomographic scan or rhinometry). However, 23.6% reported obtaining such studies if the patient reported a history of nasal airflow obstruction or if the preoperative physical examination revealed turbinate hypertrophy. Overall, 76.1% of the surgeons reported formulating a specific preoperative plan for the surgical management of the inferior turbinates during rhinoplasty.

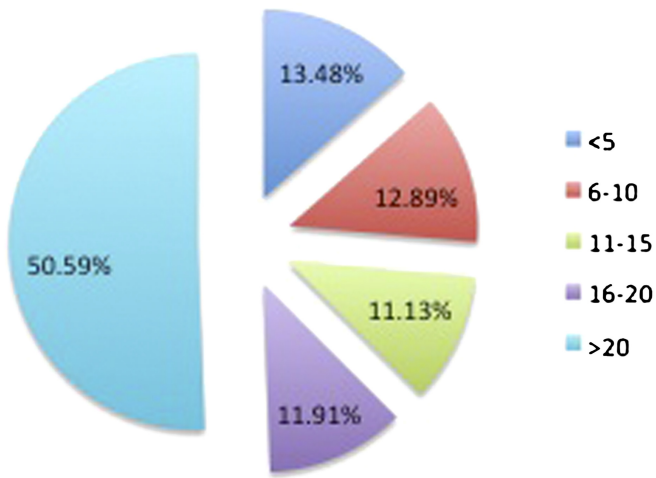

FIGURE 2. The length of practice of respondents expressed as the number of years in practice.

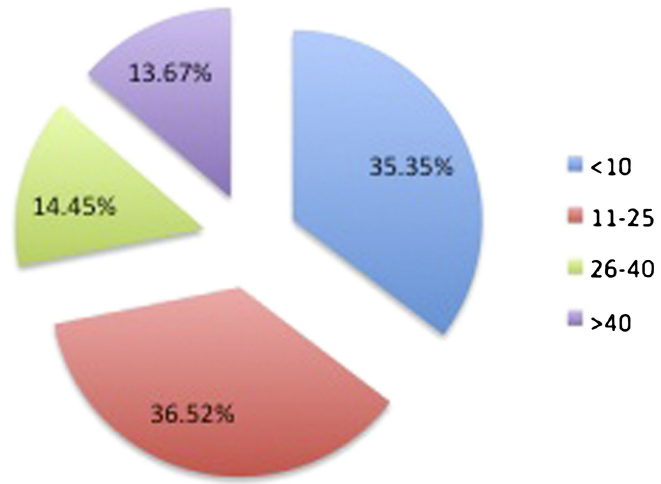

FIGURE 3. Rhinoplasty experience of respondents expressed as rhinoplasties performed per year.

Inferior Turbinoplasty Technique

Given the option to indicate 1 or more preferred techniques for the management of inferior turbinate hypertrophy during cosmetic rhinoplasty, 41.8% indicated only 1 choice as a preferred technique, 29.0% indicated 2 techniques, and 20.8% indicated 3 or more techniques. A minority of respondents (8.4%) failed to respond with a preferred technique and indicated only that they would refer patients to another specialist for turbinate management; these subjects were excluded from subsequent regression analyses as described below.

The 5 most preferred inferior turbinate reduction techniques were outfracture of the turbinates (49.1%), partial turbinectomy (33.3%), submucous reduction with electrocautery (25.3%), submucous resection (23.6%), and electrocautery (22.5%). Table 1 summarizes the reported preferences of inferior turbinoplasty among plastic surgeons. Because respondents were allowed to choose more than 1 technique, the total percentage is greater than 100%.

Newer surgical techniques such as laser cautery, cryosurgery, and submucous reduction (either with radiofrequency thermal ablation or microdebrider) were selected by only 47 (8.8%) respondents.

Surgeon Background and Preferred Technique

Multiple logistic regression analysis was used to determine the effects of surgeon training and experience on technique preferences for the 5 most commonly selected techniques. No significant effect of training program type was observed. The number of years in practice was significantly positively associated with preference for partial turbinectomy [odds ratio (OR), 1.42; 95% confidence interval (CI), 1.23–1.64; $P < 0.0001$] and electrocautery (OR, 1.20; 95% CI, 1.02–1.40; $P = 0.027$). Years in practice was negatively associated with preference for submucous resection (OR, 0.81; 95% CI, 0.70–0.93; $P = 0.003$). There was no significant additive effect of number of procedures performed annually once years in practice was controlled for except in the case of electrocautery (OR, 1.31; 95% CI, 1.06–1.61; $P = 0.011$).

TABLE 1. Preferred Technique for Inferior Turbinoplasty Among Respondents

Surgical Technique	Percentage, %	No.
None	1.7	9
Referral to another specialist for turbinate management	12.6	67
Total turbinectomy	3.8	20
Outfracture of the turbinates	49.1	262
Partial turbinectomy	33.3	168
Submucous resection	23.6	126
Submucous reduction with electrocautery	25.3	135
Submucous reduction with radiofrequency thermal ablation	5.6	30
Submucous reduction with microdebrider	2.3	12
Electrocautery	22.5	120
Laser cautery	1.1	6
Cryosurgery	0.6	3
Others	4.3	23

Because more than 1 technique could be selected, the summary of the percentage of respondents is greater than 100%.

Complications After Inferior Turbinoplasty

Nearly half of all respondents (49.9%) reported at least some incidence of mucosal crusting and desiccation among patients, followed by bleeding (49.5%) and persistent nasal obstruction (47.9%). Less frequently reported were malodorous nasal drainage (24.4%), atrophic rhinitis (19.3%), and chronic infection (9.2%).

Multiple logistic regression was implemented to evaluate the relationship between surgeon background and technique preferences on reported complications. None of the surgeon background variables were statistically significant for any of the complication types.

Significant effects of technique preference on complications included elevated incidence of mucosal crusting and desiccation (OR, 1.14; 95% CI, 1.05–1.23; $P = 0.002$), bleeding (OR, 1.09; 95% CI, 1.00–1.18; $P = 0.043$), malodorous nasal drainage (OR, 1.11; 95% CI, 1.02–1.22; $P = 0.019$), and persistent nasal obstruction (OR, 1.10; 95% CI, 1.01–1.19; $P = 0.024$) among patients of surgeons who expressed a preference for partial turbinectomy. Submucous reduction with electrocautery was also associated with increased incidence of complications, including mucosal crusting and desiccation (OR, 1.11; 95% CI, 1.04–1.18; $P = 0.001$), malodorous nasal drainage (OR, 1.08; 95% CI, 1.02–1.16; $P = 0.016$), and atrophic rhinitis (OR, 1.08; 95% CI, 1.00–1.16; $P = 0.047$). Lastly, preference for any of the 4 newer surgical techniques was associated with elevated incidence of atrophic rhinitis (OR, 2.42; 95% CI, 1.20–4.90; $P = 0.014$).

DISCUSSION

Surgical management of inferior turbinate hypertrophy has been a debated topic for more than a century.[1] More than a dozen of surgical techniques have been described over the past 130 years without any clear consensus on which is the optimal technique.[27] At the turn of the 20th century, most surgeons involved in the care of patients with nasal airway obstruction due to hypertrophy of the inferior turbinates advocated total turbinectomy.[1] However, aggressive turbinate resection procedures were criticized for the significant morbidities associated with them, such as bleeding, prolonged postoperative crusting, and reports of atrophic rhinitis.[1,28]

Because of reports of these complications, a less radical approach to the problem evolved, and partial turbinate reduction procedures were adopted.[8,11] In 1924, the submucous resection was described; it was further popularized in the 1950s.[1,12,29] During the subsequent several decades, submucous reduction and surgical turbinate reduction were widely practiced.[8] Beginning in the 1990s, however, there was a greater emphasis on research and development of new technologies for turbinate reduction, such as cryosurgery,[26] electrocautery,[11] radiofrequency ablation,[15–19] laser cautery,[20–25] and microdebridement of the turbinate mucosal tissues.[30]

This study demonstrates that most of the ASPS members polled include an evaluation of inferior turbinate hypertrophy as part of a comprehensive rhinoplasty consultation. Once the need for inferior turbinoplasty is established, however, about one tenth of respondents would refer the patient to another physician. A comprehensive rhinoplasty evaluation should include assessment of the airway, and a complete rhinoplasty should include nasal airway intervention when indicated.

Turbinate outfracture—arguably the simplest of the various described techniques—was the most popular surgical option in our survey. Nearly half of the respondents reported it as a preferred technique. Even when restricting analysis to those responses in which plastic surgeons only picked a single turbinoplasty technique, outfracture of the turbinates remained the most preferred option. Turbinate outfracture most commonly involves the use of a blunt instrument to crush the turbinate and lateralize its position within the nasal cavity. Relative to other destructive procedures, it is less morbid because of the preservation of the nasal epithelium and mucociliary function.[8] The popularity of this technique is undoubtedly associated with its ease of performance and low incidence of associated complications.[1,13,14] The widespread use of outfracture may suggest that it is among the most commonly taught turbinate procedures in plastic surgery residency training programs, although our questionnaire did not specifically address this issue.

Following turbinate outfracture, partial turbinectomy was the second most preferred technique. Mabry,[31] a strong proponent of the partial turbinectomy technique, holds that the technique is conservative and provides consistent results. Following outfracture and partial turbinectomy (33.3%), submucous electrocautery (25.3%), submucous resection (23.6%), and surface electrocautery (22.5%) are similarly prevalent within the surveyed ASPS community.

Multiple regression analysis had several important findings. Although the training pathway of the treating surgeon had no significant effect on the choice of turbinoplasty technique, the experience of the surgeon did. Surgeons in practice for a longer time were more likely to choose partial turbinectomy or electrocautery and less likely to use submucous resection. This was unexpected because many other authors have documented increasing safety and efficacy with submucous resection.[2,12,32,33]

In 2003, Passàli et al[33] performed a randomized clinical trial of 6 different turbinoplasty techniques. With 6 years of follow-up, the authors found that only submucosal resection with or without turbinate outfracture resulted in optimal long-term normalization of nasal patency and in restoration of mucociliary clearance and local secretory IgA production to a physiologic level with few postoperative complications ($P < 0.001$).

The closed septoturbinoplasty as advocated by Lesavoy and Gruber[3,34,35] is an example of a simple, quick, minimally invasive, and extremely cost-effective technique. In this technique, a speculum or similar blunt instrument is inserted into the nose, and the blades are spread. By doing such, the technique has been shown to centralize the bony septum and outfracture the inferior turbinates. Finally, another potential explanation is that these instruments and techniques are unlikely to be readily available or commonly taught in most plastic surgery residency training programs, whereas they are probably more commonplace in otolaryngology residencies.

The findings in this study are in agreement with those of a recently published survey study of the American Society for Aesthetic Plastic Surgery.[36] Feldman et al[36] found that limited turbinate

excision and turbinate outfracture were the most commonly used techniques in private practice by plastic surgeons. Newer techniques such as radiofrequency coblation were not prevalent in terms of application, despite their current prevalence within the medical literature. Although their study examined only members of the American Society for Aesthetic Plastic Surgery, the data presented here were those obtained after survey of all ASPS members. In addition, Feldman et al[36] reported on data from only 127 respondents, whereas this study reflects the opinions of 534 active ASPS members.

The study does have several limitations. The first is the 11% response rate. A possible explanation for the small fraction of ASPS members who responded to the survey relates to the number of surgeons performing cosmetic rhinoplasty. To that fact, the degree of members considering or performing inferior turbinoplasty during cosmetic rhinoplasty may be even smaller. The nonresponders may represent this cohort of surgeons. As such, the authors believed it best to open the survey to all ASPS members. This is the same rationale for electing not to survey a random sampling of ASPS members. Above all else, this study does reflect the attitudes and perceptions of 534 active ASPS members. Another weakness to the study is the methodology by which complications are assessed. By eliciting survey responses, the data can be subject to a recall bias. Finally, the study does not address quality or outcomes.

CONCLUSIONS

The results of this survey provide insights into current preferences and practices in inferior turbinate reduction surgery among the sampled population of board-certified plastic surgeons. Moreover, there is a need for more controlled, prospectively generated studies that compare various techniques of inferior turbinate reduction, including both traditional and newer techniques, to determine which procedures generate the best outcomes.

REFERENCES

1. Jackson LE, Koch JR. Controversies in the management of inferior turbinate hypertrophy: a comprehensive review. *Plast Reconstr Surg*. 1999;103:300–312.
2. Rohrich RJ, Krueger JK, Adams WP, et al. Rationale for submucous resection of hypertrophied inferior turbinates in rhinoplasty: an evolution. *Plast Reconstr Surg*. 2001;108:535–544.
3. Abou-Sayed HA, Lesavoy MA, Gruber RP. Enlargement of nasal vault diameter with closed septoturbinotomy. *Plast Reconstr Surg*. 2007;120:753–759.
4. Courtiss EH, Goldwyn RM. Resection of inferior turbinates: a 10-year follow-up. *Plast Reconstr Surg*. 1990;86:152–154.
5. Courtiss EH, Goldwyn RM. The effects of nasal surgery on airflow. *Plast Reconstr Surg*. 1983;72:9–21.
6. Chang CWD, Ries WR. Surgical treatment of the inferior turbainte: new techniques. *Curr Opin Otolaryngol Head Neck Surg*. 2004;12:53–57.
7. Bhandarkar ND, Smith TL. Outcomes of surgery for inferior turbinate hypertrophy. *Curr Opin Otolaryngol Head Neck Surg*. 2010;18:49–53.
8. Buyuklu F, Cakmak O, Hizal E, et al. Outfracture of the inferior turbinate: a computed tomography study. *Plast Reconstr Surg*. 2009;123:1704–1709.
9. Jones TC. Turbinotomy. *Lancet*. 1895;2:496.
10. Holmes CR. Hypertrophy of the turbinated bodies. *NY Med J*. 1900;72:529–534.
11. Meredith GM. Surgical reduction of hypertrophied inferior turbinates: a comparison of electrofulguration and partial resection. *Plast Reconstr Surg*. 1988;81:891–898.
12. Spielberg W. The treatment of nasal obstruction by submucous resection of the inferior turbinate bone. Report of cases. *Laryngoscope*. 1924;34:197–203.
13. Goode RL, Pribitkin E. *Diagnosis and Treatment of Turbinate Dysfunction*. 2nd ed. Alexandria: American Academy of Otolaryngology-Head and Neck Surgery Foundation, Inc.; 1995:1–73.
14. Muran AGD, Lund VJ. *Clinical Rhinology*. New York: Thieme Medical Publishers, Inc.; 1990:82–84.
15. Stuck BA, Maurer JT, Verse T, et al. Tongue based reduction with temperature-controlled radiofrequency volumetric tissue reduction for treatment of obstructive sleep apnea syndrome. *Acta Otolaryngol*. 2002;122:531–536.
16. Blumen MB, Dahan S, Fleury B, et al. Radiofrequency ablation for the treatment of mild to moderate obstructive sleep apnea. *Laryngoscope*. 2002;112:2086–2092.
17. Coste A, Yona L, Blumen M, et al. Radiofrequency is a safe and effective treatment of turbinate hypertrophy. *Laryngoscope*. 2001;111:894–899.
18. Rhee CS, Kim DY, Won TB, et al. Changes of nasal function after temperature-controlled radiofrequency tissue volume reduction for the turbinate. *Laryngoscope*. 2001;111:153–158.
19. Back LJ, Hytonen ML, Malmberg HO, et al. Submucosal bipolar radiofrequency thermal ablation of inferior turbinates: a long-term follow-up with subjective and objective assessment. *Laryngoscope*. 2002;112:1806–1812.
20. Fukutake T, Yamashita T, Tomda K, et al. Laser surgery for allergic rhinitis. *Arch Otolaryngol Head Neck Surg*. 1986;112:1280–1282.
21. Kawamura S, Fukutake T, Kubo N, et al. Subjective results of laser surgery for allergic rhinitis. *Acta Otolaryngol Suppl*. 1993;500:109–112.
22. Wolfson S, Wolfson LR, Kaplan I. CO_2 laser inferior turbinectomy: a new surgical approach. *J Clin Laser Med Surg*. 1996;13:81–83.
23. Englender M. Nasal laser mucotomy (L-mucotomy) of the inferior turbinate. *J Laryngol Otol*. 1995;109:296–299.
24. Takeno S, Osada R, Ishino T, et al. Laser surgery of the inferior turbinate for allergic rhinitis with seasonal exacerbation: an acoustic rhinometry study. *Ann Otol Rhinol Laryngol*. 2003;112:455–460.
25. Supiyaphun P, Aramwatanapong P, Kerekhanjanarong V, et al. KTP laser inferior turbinoplasty: an alternative procedure to treat the nasal obstruction. *Auris Nasus Larynx*. 2003;30:59–64.
26. Rakovar Y, Rosen G. A comparison of partial inferior turbinectomy and cryosurgery for hypertrophic inferior turbinates. *J Laryngol Otol*. 1996;110:732–735.
27. Leong SC, Eccles R. Inferior turbinate surgery and nasal airflow: evidence-based management. *Curr Opin Otolaryngol Head Neck Surg*. 2010;18:54–59.
28. Freer OT. The inferior turbinate: its longitudinal resection for chronic intumescence. *Laryngoscope*. 1911;21:1136–1144.
29. House HP. Submucous resection of the inferior turbinal bone. *Laryngoscope*. 1951;61:637–648.
30. Gupta A, Mercurio E, Bielamowicz S. Endoscopic inferior turbinate reduction: an outcomes analysis. *Laryngoscope*. 2001;111:1957–1959.
31. Mabry RL. Surgery of the inferior turbinates: how much and when? *Otolaryngol Head Neck Surg*. 1984;92:571–576.
32. Clement WA, White PS. Trends in turbinate surgery literature: a 35-year review. *Clin Otolaryngol Allied Sci*. 2001;26:124–128.
33. Passàli D, Passàli FM, Damiani V, et al. Treatment of inferior turbinate hypertrophy: a randomized clinical trial. *Ann Otol Rhinol Laryngol*. 2003;112:683–688.
34. Gruber R, Lesavoy M. Simple technique to correct the bony septum. *Plast Reconstr Surg*. 1998;102:244–245.
35. Gruber R, Lesavoy M. Closed septal osteotomy. *Ann Plast Surg*. 1998;40:283–286.
36. Feldman EM, Koshy JC, Chike-Obi CJ, et al. Contemporary techniques in inferior turbinate reduction: survey results of the American Society for Aesthetic Plastic Surgery. *Aesthet Surg J*. 2010;30:672–679.