Contemporary Techniques in Inferior Turbinate Reduction: Survey Results of the American Society for Aesthetic Plastic Surgery

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Abstract

Background: Nasal airway obstruction is a frequently-encountered problem, often secondary to inferior turbinate hypertrophy. Medical treatment can be beneficial but is inadequate for many individuals. For these refractory cases, surgical intervention plays a key role in management.

Objective: The authors evaluate the current trends in surgical management of inferior turbinate hypertrophy and review the senior author’s (SS) preferred technique.

Methods: A questionnaire was devised and sent to members of the American Society for Aesthetic Plastic Surgery (ASAPS) to determine their preferred methods for assessment and treatment of inferior turbinate hypertrophy.

Results: One hundred and twenty-seven physicians responded to the survey, with 85% of surveys completed fully. Of the responses, 117 (92%) respondents were trained solely in plastic surgery and 108 (86.4%) were in private practice. Roughly 81.6% of respondents employ a clinical exam alone to evaluate for airway issues. The most commonly-preferred techniques to treat inferior turbinate hypertrophy were a limited turbinate excision (61.9%) and turbinate outfracture (35.2%).

Conclusions: Based on the results of this study, it appears that limited turbinate excision and turbinate outfracture are the most commonly-used techniques in private practice by plastic surgeons. Newer techniques such as radiofrequency coblation have yet to become prevalent in terms of application, despite their current prevalence within the medical literature. The optimal method of management for inferior turbinate reduction should take into consideration the surgeon’s skill and preference, access to surgical instruments, mode of anesthesia, and the current literature.

Keywords

inferior turbinate reduction, airway obstruction, turbinate hypertrophy, nasal airway resistance

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Nasal airway obstruction secondary to inferior turbinate hypertrophy is both a common and complicated problem. Many nonsurgical interventions can help to alleviate this condition; however, medical therapy is not always effective. For the cases that are refractory to medical therapy, surgery becomes an essential method of treatment.

The ideal treatment method is currently undetermined. In the first half of the 20th century, there were at least 13 basic surgical techniques described, including submucosal resection, electrocautery, turbinate outfracture, and turbinectomy, among others.1 More recent advances in technology (coblation, microdebrider, etc.) have given surgeons even more choices for the treatment of this common condition. All of these techniques vary in their ability to effectively reduce turbinate volume, provide a relatively asymptomatic recovery period, and minimize the risk of complications. Because they each have distinct advantages and disadvantages, there is no single primary intervention that is considered to be the “best practice” treatment.

In 2007, Batra et al1 performed a literature review of the surgical management of inferior turbinate hypertrophy and found that of the 96 studies published since 1970 (which met minimal quality requirements), only one had level 1 evidence (a randomized controlled trial) to support it, and only two had level 2 evidence (a prospective cohort study).
study or low-quality randomized trial) for support. The vast majority of studies (75 of 96, or 78%) supplied only level 4 (a case series or retrospective chart review) or level 5 evidence (expert opinion). This lack of high-quality data is understandable to some degree because of the difficulty associated with planning and conducting trials that provide high levels of evidence for this particular condition, but this also means that the broad body of literature must be interpreted “with a grain of salt,” so to speak. Physicians must view all of these studies within the context of their own clinical practice, their clinical skill, and their experience.

The primary purpose of this article is to quantify practicing surgeons’ preferences for the assessment and management of inferior turbinate hypertrophy, so that physicians may compare their own experiences to those of their colleagues.

METHODS

To gain perspective regarding current trends in inferior turbinate hypertrophy management, a survey was designed and offered online at surveymonkey.com. The survey collected baseline data regarding physician training background, type of practice, and number of rhinoplasty procedures performed in the past year. In addition, specific questions that pertained to inferior turbinate hypertrophy and management were asked, which included (among others) the following:

1. How do you evaluate for airway problems?
2. What method do you prefer in performing a turbinectomy? (multiple answers allowed)
3. What percentage of time are you performing an inferior turbinectomy concomitantly with aesthetic rhinoplasty?

The Web site link was emailed to 1550 members of the American Society for Aesthetic Plastic Surgery (ASAPS) in March 2009. Data were subsequently collected through the same Web site and analyzed with proportional measurements.

RESULTS

Of the 1550 members of ASAPS who received the link for the online survey, 127 (8.2%) physicians responded to the survey, with 85% of those surveys completed fully. Of the respondents, 117 of 126 who answered the question (92%) were trained solely in plastic surgery and nine (7.9%) had some form of training in both otolaryngology (ear, nose, and throat [ENT]) and plastic surgery (Table 1). Additionally, 108 of 125 (86.4%) respondents who answered the question were active in private practice, 12 (9.6%) respondents were active in academic medicine, and four (3.2%) were active in both private practice and academic medicine (Table 2). The median number of rhinoplasty cases performed by respondents in the past year was between 11 and 20 (Table 3).

There were 125 responses to the question, “How do you evaluate for airway problems?” The largest percentage of respondents (102, or 81.6%) employed clinical exam alone to evaluate for airway problems. Twenty-two respondents (17.6%) employed clinical exam in conjunction with nasendoscopy, computed tomography (CT) examination, or an ENT consultation. Among respondents without ENT training (n = 118), 11 (9.3%) utilized ENT consultations to evaluate the nasal airway. The complete results for this question are listed in Table 4.

Next, 107 respondents answered the question regarding their preferred turbinectomy technique (for which multiple answers were allowed), with 65 (61.9%) individuals preferring the limited turbinectomy excision, 37 (35.2%) preferring the turbinate outfracture technique, nine (8.6%) preferring radiofrequency, and six (5.7%) preferring cautery. The complete results for this question can be found in Table 5.

Finally, the majority of respondents infrequently perform inferior turbinectomies concomitantly with aesthetic rhinoplasty. Of the 106 surgeons who responded to this final question, 73 (68.9%) execute concomitant procedures less than 25% of the time, 25 (23.6%) between 25% and 50% of the time, five (4.7%) between 50% and 75% of the time, and three (2.8%) greater than 75% of the time. These results can also be found in Table 6.

DISCUSSION

The purpose of this article is to assess current trends in the surgical management of inferior turbinate hypertrophy. The literature in recent decades has demonstrated that the spotlight of investigation has trended from techniques that completely remove the internal nasal...
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structure to techniques that decrease the volume of the turbinate but preserve the mucosa and mucociliary functions. Thus, the literature focus has shifted from turbinectomy procedures to submucosal resection and finally to radiofrequency technology.2 The results of our study, however, demonstrate that radiofrequency technology has yet to become adopted in a significant way by the plastic surgical community. Of 105 respondents to the question regarding preferred surgical management strategies for inferior turbinate hypertrophy, 65 (61.9%) individuals prefer a limited turbinate excision (turbinoplasty or submucosal resection), whereas only nine (8.6%) prefer radiofrequency technology. Based on these results, there appears to be a significant disparity between current practices and the most-published method of treatment over the past seven years. This is not unexpected, as gaps in clinical practice and the literature have been present historically,3 yet it is important to note that these gaps can be problematic and lead to “expensive, ineffective, or even harmful decision making.”3 An appropriate understanding of the ideal surgical management of inferior turbinate hypertrophy involves discussion of the pertinent anatomy, methods of assessment, and various treatment methods for this condition.

### Anatomy and Function

The inferior turbinate plays a key role in the nasal airway. The structure consists of a bony core (conchal bone) with a soft tissue cover that consists of a fibroelastic stroma, submucosal glands, and cavernous sinusoids.5,5 The soft tissue portion of the inferior turbinate can be further broken down into medial and lateral portions that are separated by the internal conchal bone.5 Blood flow through the cavernous sinusoids is regulated by the autonomic nervous system and leads to subsequent enlargement or reduction in size of the inferior turbinate.

The soft tissue is subsequently lined externally by pseudostratified, ciliated, columnar epithelium. This unique structure of the inferior turbinate allows it to play an important role in the filtration, humidification, and warming of inspired air, so as to protect the fragile alveolar epithelium of the lung from subsequent damage.6

### Table 3. Practice Volume

<table>
<thead>
<tr>
<th>Answer Options</th>
<th>Response Percent</th>
<th>Response Count</th>
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<tbody>
<tr>
<td>0-10</td>
<td>38.1</td>
<td>48</td>
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<tr>
<td>11-20</td>
<td>30.2</td>
<td>38</td>
</tr>
<tr>
<td>21-30</td>
<td>11.9</td>
<td>15</td>
</tr>
<tr>
<td>31-40</td>
<td>7.1</td>
<td>9</td>
</tr>
<tr>
<td>41-50</td>
<td>3.2</td>
<td>4</td>
</tr>
<tr>
<td>&gt; 50</td>
<td>9.5</td>
<td>12</td>
</tr>
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</table>

Respondents who answered question 126
Respondents who skipped question 1

### Table 4. Airway Evaluation

<table>
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<tr>
<th>Answer Options</th>
<th>Response Percent</th>
<th>Response Count</th>
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<tbody>
<tr>
<td>Clinical evaluation (CE)</td>
<td>81.6</td>
<td>102</td>
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<td>CE + otolaryngology consult (ear, nose, and throat [ENT])</td>
<td>8.0</td>
<td>10</td>
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<tr>
<td>CE and computed tomography (CT) imaging</td>
<td>4.8</td>
<td>6</td>
</tr>
<tr>
<td>CE + nasoendoscopy (NE)</td>
<td>3.2</td>
<td>4</td>
</tr>
<tr>
<td>CE + rhinomanometry</td>
<td>0.8</td>
<td>1</td>
</tr>
<tr>
<td>CE + NE + nasometry</td>
<td>0.8</td>
<td>1</td>
</tr>
<tr>
<td>ENT</td>
<td>0.8</td>
<td>1</td>
</tr>
</tbody>
</table>

Respondents who answered question 125
Respondents who skipped question 2

### Table 5. Preferred Methods

What method do you prefer in performing a turbinectomy? (multiple answers allowed)

<table>
<thead>
<tr>
<th>Answer Options</th>
<th>Response Percent</th>
<th>Response Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Limited turbinate excision</td>
<td>61.9</td>
<td>65</td>
</tr>
<tr>
<td>Outfracture</td>
<td>35.2</td>
<td>37</td>
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<tr>
<td>Radiofrequency ablation</td>
<td>8.6</td>
<td>9</td>
</tr>
<tr>
<td>Cautery</td>
<td>5.7</td>
<td>6</td>
</tr>
<tr>
<td>Combination of methods</td>
<td>5.7</td>
<td>6</td>
</tr>
<tr>
<td>No preferred method</td>
<td>1.9</td>
<td>2</td>
</tr>
<tr>
<td>Laser therapy</td>
<td>0.0</td>
<td>0</td>
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</tbody>
</table>

Respondents who answered question 105
Respondents who skipped question 22

### Table 6. Concomitant Procedures

What percentage of the time are you performing inferior turbinectomy concomitantly with aesthetic rhinoplasty?

<table>
<thead>
<tr>
<th>Answer Options</th>
<th>Response Percent</th>
<th>Response Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 25% of the time</td>
<td>68.9</td>
<td>73</td>
</tr>
<tr>
<td>Between 25% and 50% of the time</td>
<td>23.6</td>
<td>25</td>
</tr>
<tr>
<td>Between 51% and 75% of the time</td>
<td>4.7</td>
<td>5</td>
</tr>
<tr>
<td>Between 76% and 100% of the time</td>
<td>2.8</td>
<td>3</td>
</tr>
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</table>

Respondents who answered question 106
Respondents who skipped question 21
Inferior Turbinate Hypertrophy

Inferior turbinate hypertrophy can be caused by allergies, vasomotor rhinitis, dust, tobacco, nasal inflammatory disorders, and other pathologies. The common underlying origin in most cases is a chronic inflammation, which subsequently causes changes to the mucosa, soft tissue, and bony parts of the nasal structure.4 Mucosal changes involve both the epithelium and cilia, as scanning electron microscope observations have shown severe metaplasia, stratification, hyperplasia, and degeneration of epithelial cells, as well as loss of cilia and disruption of intercellular connections.7 An increase in size of the mucosal layer is caused by a combination of inflammatory infiltrates, glandular hyperplasia, venous sinusoid engorgement, and collagen deposition.5,7 Although the majority of the increase in soft tissue volume of the inferior turbinate is secondary to hypertrophy of the medial mucosal layer, a significant contribution is made by the lateral mucosal layer as well. Additionally, bony enlargement of the conchal bone can be seen, contributing to the overall picture of inferior turbinate hypertrophy.5

Assessment and Treatment Overview

The appropriate management of inferior turbinate hypertrophy requires proper assessment and consequent treatment. Regarding assessment, many methods exist for determining the etiology and severity of the nasal airway disturbance. Clinical assessment plays a major role in the evaluation and consists of history taking and a physical examination, which involves both a visual and functional examination of the integrity of the nasal airway, septum, nasal valves, and turbinates. Plastic surgeons overwhelmingly rely on this alone to preoperatively assess individuals with an obstructive airway; 81% of respondents to this article’s survey indicated as much. Many surgeons will supplement the treatment of this condition with ancillary tests such as nasoendoscopy, CT examination, acoustic rhinometry, rhinomanometry, ENT consultation, and allergen testing, among others. For plastic surgeons without ENT training, consulting ENT colleagues plays a significant role in assessing the problem; 9.3% of these respondents require ENT consults prior to a surgical intervention. The correct and proper method of assessment should ultimately be patient and clinician specific.

Regarding treatment, many surgical procedures have been described to treat nasal airway obstruction secondary to inferior turbinate hypertrophy. These procedures, in general, seek to reduce the bony and soft tissue volume of the inferior nasal turbinate while preserving the inherent function of the nasal structure and resulting in a relatively asymptomatic postoperative course with minimal complications. The number of procedures that have been described to achieve these goals is significant, yet each option has its own distinct advantages and disadvantages. The optimal intervention is not singular; rather, the solution is personal and must rely on each surgeon’s skill level, scope of clinical practice, and costs. The following techniques currently play or have played a prominent role in the operative management of inferior turbinate hypertrophy. The background, operative technique, efficacy, and advantages and disadvantages of each technique will be discussed.

Submucosal Resection

Submucosal techniques were introduced as a response to the ever-growing recognition of the value of nasal mucosal preservation to maintain functionality of the nasal airway. The technique comes in many forms but, in general, is performed under general anesthesia and consists of initially making an incision on the anterior portion of the inferior turbinate, subsequently dissecting and elevating the medial and inferior mucosa, resecting turbinate bone and parenchyma using Hartmann forceps, and finally closing the nasal mucosa primarily.

In a large, prospective, randomized clinical trial with a six-year follow-up comparing the efficacy of six common treatment methods, the submucosal resection method combined with outfracture led to the best long-term outcomes with the least complications.8 However, the study only compared submucosal resection with or without outfracture to somewhat antiquated techniques (turbinectomy, laser cautery, electrocautery, and cryotherapy) and did not include promising treatment modalities such as radiofrequency technology or powered instrumentation. These newer procedures can be performed under local anesthesia and have been shown in certain studies to produce equal results in terms of subjective and objective outcomes after surgery.9,10 Moreover, submucosal resection has a significant risk of postoperative bleeding, requires postoperative nasal packing, and needs a considerable amount of skill to perform, especially in young children with smaller nasal passages. Despite these disadvantages, submucosal resection continues to play a significant role in the management of inferior turbinate hypertrophy, as 61.9% of respondents in this study designated it as a preferred method of inferior turbinate reduction.

Turbinate Outfracture

Turbinate outfracture (infracture or lateralization) involves fracture of the conchal bone’s attachment to the lateral nasal wall and subsequent displacement. The procedure has been described with a variety of surgical instruments, including the Ruben, the Goldman displacer, and an ostetome, among others. After insertion of the instrument into the nasal cavity, a careful, gradual spreading action fractures the inferior turbinate and compresses it inferolaterally toward the lateral nasal floor.

This technique to displace the turbinate’s structural support can often be performed with zero complications11; however, the procedure is highly variable in its efficacy and, moreover, does nothing to address the hypertrophic soft tissues that are a major source of the problem. One study found that at nine-month follow-up, the amount of lateralization achieved was highly variable, with changes ranging from 5% to 50%.11 A separate study noted that the
treatment (when combined with a posterior partial turbinatectomy) was effective in leading to a subjective improvement in nasal airway obstruction in only half of the patients treated. This variable efficacy has been one of the major criticisms of isolated turbinate outfracture; however, the technique has proven useful as an adjunct to other inferior turbinate reduction procedures, leading to improved outcomes without increased morbidity. Our study showed that this simple procedure, despite its disadvantages, is prevalent in clinical practice, as 35.2% of survey respondents consider this a preferred method, most likely as an adjuvant technique.

**Radiofrequency Ablation**

Technologies have been developed that capitalize on the ability of radiofrequency waves to disperse enough energy to melt the molecular bonds of tissues at relatively low temperatures (below 90°C), thereby limiting damage to adjacent tissues. The technology is employed to cause destruction of soft tissue and cavernous sinusoids, with subsequent fibrosis and contraction leading to reduction of inferior turbinate size as the mucosa and soft tissue become adherent to the conchal bone.

Radiofrequency energy can be delivered in a monopolar fashion or with a bipolar instrument that delivers the energy through a conductive fluid medium (“coblation”). The procedure is generally performed by inserting the probe submucosally in the anteroinferior portion of the turbinate and subsequently passing the instrument longitudinally through the inferior turbinate. The number of passes made with the probe is often based on the amount of inferior turbinate hypertrophy.

There are significant advantages and disadvantages to radiofrequency technology. The procedure can be performed under local anesthesia and has been shown to consistently preserve mucociliary function. When compared with laser therapy, radiofrequency therapy had similar efficacy but a slightly increased risk of minor complications.

The major issue with radiofrequency therapy is the long-term efficacy of this technique. Studies examining radiofrequency technology versus microdebridement have shown that radiofrequency therapy may only be an effective short-term procedure, as subjective and objective outcomes as well as satisfaction rates decrease after about one year or more. In the study by Lee and Lee, satisfaction rates after one year were significantly lower than for procedures performed with microdebridement technology (60% vs 80%). Additionally, when compared with submucosal resection at a short-term follow-up (seven days and two months), Salzano et al. found that radiofrequency therapy was less effective in achieving positive subjective and objective outcomes. The problems with its short-term and long-term effectiveness may be related to the general difficulty in assessing the degree of soft tissue destruction, a feature common to all submucosal procedures.

Reported complications of the procedure have been bleeding, crusting, and nasal synechiae; however, the risk of postoperative bleeding is significantly less than with microdebrider turbinate reduction, and complaints largely diminish within two days. It appears that these disadvantages play a significant role in respondents’ decision to utilize this technology, though, as only 8.6% of respondents consider this a preferred method. Again, this is in stark contrast to the overwhelming presence of radiofrequency technology as a topic of investigation.

**Electrocautery**

Electrocautery has been employed for centuries to reduce the size of the inferior turbinates. The procedure involves the administration of electric current to cauterize the turbinate tissue and can be applied to either the surface of the inferior turbinate or in a submucosal fashion similar to methods described above. Scientific exploration into this topic has tended to be of low quality and, additionally, has become increasingly sparse over recent decades. Passalci et al. performed the highest quality study involving surface electrocautery and found that this method was the least effective in improving nasal airway resistance and volume and also was associated with high rates of postoperative crusting and nasal synechiae. When performed submucosally, this technique carries with it the same concern as other submucosal techniques, in that the amount of tissue destruction is hard to gauge. Additionally, this technology has the substantial risk of surrounding tissue destruction, as the temperatures generated tend to be in the hundreds of degrees Celsius. As histopathological studies have shown, although there is a slight reduction in mucous and collagen production, surface cilia do not regenerate, and the respiratory epithelium actually degenerates into a flattened, stratified layer. With the combination of inefficacy, damage to surface mucosa, and difficulty gauging amount of tissue loss with submucosal techniques, it was surprising to see that roughly 5.7% of respondents consider this technology as a preferred method.

**Laser Therapy**

During the latter half of the 1990s, laser therapy for the treatment of inferior turbinate reduction was a popular source of investigation, as it represented a new and innovative method for treating inferior turbinate hypertrophy. Although at one point a significant number of papers were being published, there were essentially no studies with high levels of evidence. Additionally, since the many case series varied in the type and technique of laser therapy, appropriate analysis of the literature had been (and continues to be) difficult. Treatment methods can vary greatly, including in the type of laser, laser parameters, and application modalities (contact, noncontact, interstitial, or superficial).

Regarding the type of laser, in vitro studies have shown that the different lasers provide different amounts of tissue destruction to the turbinate surface and the submucosal tissues, which subsequently results in varying degrees of functional epithelium, soft tissue bulk, and hemostasis postoperatively. Janda et al. found that of five common laser systems, Argon-ion, ND:YAG, and diode lasers appear to have the most beneficial tissue interactions for inferior
turbinate hypertrophy when comparing the treatment effects with a scanning electron microscope.

The laser procedure is performed by applying the beam along the entire turbinate, in parallel stripes, and/or with spots on the turbinate head. The degree of surface area that is vaporized must balance the negative effects on the functional epithelium with the positive effects of soft tissue volume reduction. The procedure is useful in that it can be performed as an outpatient procedure under local anesthesia with minimal postoperative bleeding (secondary to the technology’s hemostatic properties) and without postoperative nasal packing. It is generally well tolerated, as more than 80% of individuals would undergo the procedure again or recommend it to a friend.5,23

On the other hand, it is important to realize that although several low-level evidence studies have demonstrated the effectiveness of laser therapy to improve patient symptomatology,16 other treatment methods such as submucosal resection with or without turbinate outfracture and microdebridement seem to have better long-term effectiveness.3,22 This may be partially due to the limited depth of submucous reduction. The study by Janda et al9 showed that of the multiple lasers compared, the maximum depth of tissue destruction was 1.15 mm, whereas studies have shown that the average width of the medial mucosal layer alone is 2.53 mm.5 Moreover, the laser therapy does nothing to address the lateral mucosal layer or bony hypertrophy. Additionally, factors such as excess mucociliary damage16 and the cost of equipment are important disadvantages to consider. Because of these significant drawbacks, laser therapy has become almost completely antiquated, and no respondents mentioned preference toward this technique.

**Powered Instrumentation**

Powered instrumentation (microdebriders) for submucosal turbinate resection has recently gained a significant amount of attention. The microdebrider is an electric-powered, handheld shaver that operates under suction. It has been employed for the removal of acoustic neuromas and also for arthroscopic surgery.23,24 The procedure, generally performed under local anesthesia with an endoscope for visualization, begins with an anterior incision in the inferior turbinate. Next, a submucosal pocket is dissected medial to the bony turbinate and the microdebrider is then inserted into this pocket, where it can be used to remove hypertrophic submucosal soft tissue and bone.

Inferior turbinate reduction utilizing the powered microdebrider fares well when compared to other submucosal reduction techniques that can be performed under local anesthesia. In 2009, Liu et al19 examined long-term results of microdebrider versus radiofrequency inferior turbinate reduction and found that microdebridement was superior in achieving long-term subjective and objective results, as well as improvements in mucociliary function. Postoperative bleeding has been a concern with this procedure but is generally reported to occur less than 7% of the time.9,17,19,25 Moreover, steps are being made toward combining bipolar cautery with microdebridement to improve hemostasis and outcomes.23 The disadvantages of this procedure are the weight of the handheld microdebriders, the small amount of tactile feedback, and the costs associated with the system and the associated disposable blades. This technique has significant advantages and disadvantages to consider. It is worth noting that none of the respondents designated this as a preferred technology to treat inferior turbinate hypertrophy, despite the promising literature.

**The Senior Author’s Preferred Technique: The Stal ‘Microfracture’ Technique**

The search for the ideal treatment method that improves nasal airway resistance, has an asymptomatic recovery period, and minimizes complications is still ongoing. Over the past 20 years of practice, the senior author (SS) has performed most of the above-mentioned techniques, including complete resection, partial resection, and outfracture and cauterization; however, well-documented complications have led him to abandon the complete excision and outfracture techniques, which demonstrate a high recurrence of nasal obstruction after bony healing. In the author’s experience, limited resection, cauterization/ablation, and microfracture yield similar results and recurrence/reoperation rates. However, resection and ablation techniques have a more symptomatic recovery (rhinorrhea, malodorous drainage, and intranasal crusting), leading to higher patient complaints and dissatisfaction.

The author’s microfracture technique involves injection of copious local anesthetic with epinephrine, followed by application of a Ruben “butterknife” to grossly outfracture bony turbinate (Figure 1A). A small incision is subsequently made on the anterior surface of the turbinate (Figure 1B), after which elevation of the mucosa from the bony turbinate is performed with a Cottle elevator. Then, a greenstick fracture is made with the elevator to comminute the bony turbinate (Figures 1C,D). Bony excision is performed if needed, followed by removal of any exposed bone. Limited excision of anterior and inferior stroma occurs as needed. Primary mucosal closure follows, and a splint is placed.

Although most cases can be performed without resection, the authors are not zealots regarding this fact, as this technique remains flexible and for limited mucosal resection (with primary closure rather than cauterization) if deemed necessary after completing the microfracture. Therefore, the author’s microfracture technique limits trauma and cauterization/scabbing to the mucosa and eliminates exposed bone and its resultant, malodorous sequestrum, allowing for a rapid, well-tolerated recovery. Additionally, by comminuting the bony turbinate, chances of organized healing into an obstructive structure are minimized. A video of the author’s procedure can be seen at www.aestheticsurgeryjournal.com.

**Study Limitations**

The results of this survey have some important limitations. First, the study results mostly represent the current practice methods of plastic surgery–trained, private practitioners,
as 92% of respondents were trained solely in plastic surgery and 86.4% were in private practice. Second, responses to the question regarding the preferred method of performing turbinate reduction procedures is hard to interpret fully, as multiple responses were allowed. In cases of multiple response, it is unclear how often individuals perform each of the selected techniques. Third, when considering the outfracture method as a preferred technique, it is unclear whether respondents meant that they employ this method as the sole technique to improve nasal airway resistance or in conjunction with other techniques. Fourth, it is unclear what role age or duration of training plays in respondents’ answers, as differences in generational training may have biased survey results. Finally, it is unclear whether the results of this survey are applicable to the population of individuals who practice inferior turbinate reduction procedures, as demographics of the community were not available.

**CONCLUSIONS**

This study provides a framework from which plastic surgeons may evaluate their own methods of inferior turbinate reduction with the most common practices of their colleagues. Whatever the method of choice, efficacy depends on airway patency and residual postoperative turbinate function, which are of the utmost importance. Additionally, postoperative recovery course and patient satisfaction are a consideration.

The senior author’s (SS) microfracture technique combines the benefits of minimal tissue disruption and...
limited excision while avoiding the pitfalls of the mucosal cauterezation/scabbing and exposed bone that plague the submucous resection. For these reasons, our team now utilizes this technique exclusively, and it has yielded excellent, lasting results without patient complaints. Overall, multiple techniques remain popular and, like many topics in our field, more prospective analysis with objective data analysis is warranted.

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REFERENCES


