



Surgical options for the allergic rhinitis patient

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Purpose of review

Allergic rhinitis is a very common disorder that affects millions of patients annually and the hallmark complaint of nasal obstruction significantly impacts the quality of life. Many surgical options exist for the treatment of allergic rhinitis, directed primarily at the underlying nasal obstructive component. The purpose of this review is to highlight and discuss the various surgical modalities and their historical efficacy.

Recent findings

Much of the literature has focused on reduction of the inferior turbinate for symptomatic improvement in patients afflicted with allergic rhinitis. Endoscopic sinus surgery and septoplasty play little role in the management of allergic rhinitis, unless when seen in conjunction with other conditions such as rhinosinusitis.

Summary

Although no single modality has evolved as the gold standard for the treatment of allergic rhinitis, the mainstay of surgical intervention targets the inferior turbinate. It is very important for the otolaryngologist to be familiar with an armamentarium of surgical techniques.

Keywords

allergic rhinitis, inferior turbinate hypertrophy, nasal obstruction, turbinoplasty

INTRODUCTION

Allergic rhinitis is the most prevalent atopic disorder, with more than 600 million patients afflicted worldwide, and the incidence is steadily increasing [1–3]. The central complaint of nasal obstruction accounts for one of the most common reasons for outpatient otolaryngologic visits. Indeed, many interventions exist for the treatment of allergic rhinitis, which has been referred to as the ‘total rhinologic disease’ [4,5]. The most common surgical interventions are aimed at alleviating nasal obstruction to better reduce static obstruction while improving compliance of the nasal passages.

INFERIOR TURBINATE REDUCTION IN ALLERGIC RHINITIS

The inferior turbinate is of central importance in allergic rhinitis patients. Turbinoplasty induces scar tissue and fibrosis within the submucosal layer, while destroying glandular and vascular structures [6–8]. The reduced turbinate volume augments nasal patency and, subsequently, the nasal cavity can better accommodate edema during the allergic response. Complications such as atrophic rhinitis or empty nose syndrome (ENS) have driven practitioners away from radical turbinectomy [7].

LATERALIZATION OUTFRACTURE

Outfracture targets the anterior and inferior portions of the lower turbinate, which are the main determinants of nasal airway resistance, and has been one of the most historic treatments for nasal obstruction.

Outfracture is associated with minimal risks and was first described by Killian in 1904 as an alternative to radical turbinectomy [8]. Critics argue the effects are short lived, as the turbinate may medialize over time [9,10]. The appropriate method is displacement of the inferior turbinate in a lateral, then superior, and then inferior fashion until a crunching sound is heard (Fig. 1).

A study evaluating the inferior turbinate outfracture demonstrated statistically significant

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KEY POINTS

- Allergic rhinitis is a widespread condition, and surgical intervention is aimed at reducing the nasal obstructive component.
- The inferior turbinate plays a central role in allergic rhinitis, and reduction of the lower turbinate is a primary means of enhancing nasal patency.
- Septoplasty and endoscopic sinus surgery alone have little role in the treatment of allergic rhinitis, but may be useful adjuncts when fixed anatomic deformities, chronic rhinosinusitis, or sinonasal polyposis are present.
- Many forms of turbinoplasty exist, but no single modality has evolved as the gold standard for the treatment of allergic rhinitis.

reductions between the nasal sidewall and the area lateral to the inferior turbinate according to computed tomography (CT) scans [8[•]]. This technique is simple and generally well tolerated, with few adverse complications. Still, further studies with large patient populations would be helpful to evaluate the long-term efficacy of outfracture.

LASER VAPORIZATION

Laser therapy functions by ablating vascular channels while inducing submucosal fibrosis and reducing tissue bulk [11]. Vaporization of the entire turbinate has been reported, but more commonly the laser is applied in a linear fashion, anterior-to-posterior striping, or along only a portion of the turbinate [12,13]. Authors have demonstrated histologic changes from CO₂ laser turbinoplasty, including disorganized seromucinous acini and an overall reduction in the number of active nasal glands, likely accounting for less nasal rhinorrhea [14,15,16[•]]. Following treatment, potassium-titanyl-phosphate (KTP) laser may also have a beneficial effect on eosinophilic inflow across mucosal surfaces in response to allergens [17[•]].

Objective rhinomanometry and subjective scores for nasal obstruction, rhinorrhea, sneezing, and nasal pruritus showed statistically significant improvement in a study of patients who underwent diode laser turbinoplasty [18]. Relief of nasal obstruction was most pronounced and was initially higher in perennial patients but was more sustained in the seasonal rhinitis population. This is an important consideration in the treatment of allergic rhinitis. Many laser systems exist, but diode lasers have gained increasing popularity for their ease of use in the office setting [18]. The most common

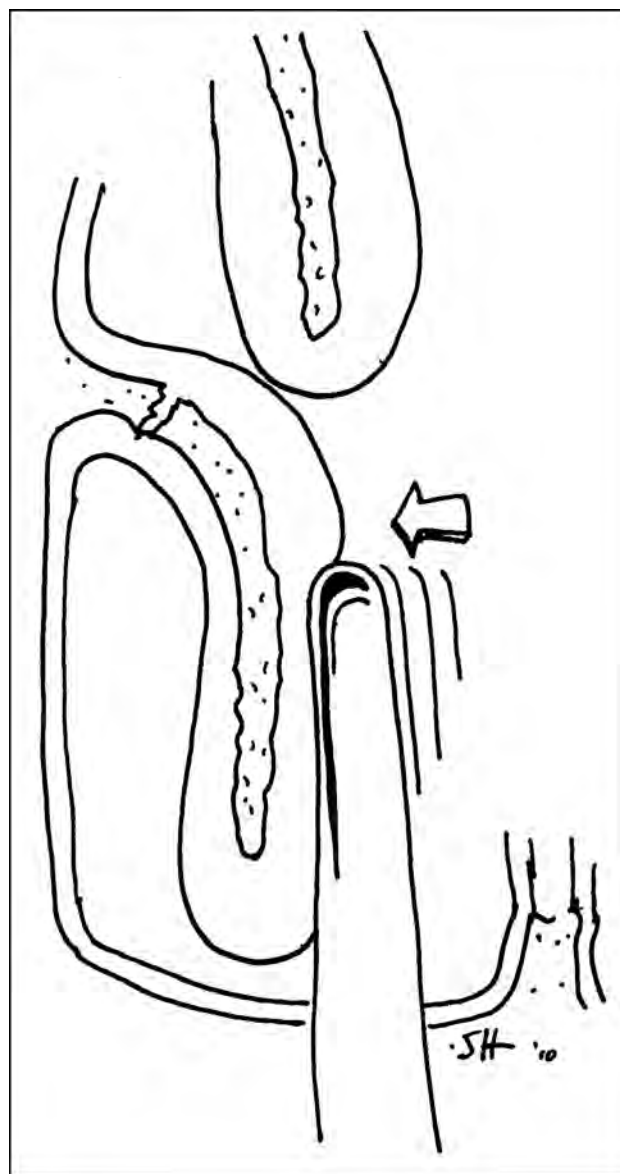


FIGURE 1. Lateralization outfracture of the right inferior turbinate. Reproduced with permission [19].

diode wavelengths range from 800 to 1000 nm, but higher settings may reduce the operative time, while providing equal tissue reduction and symptomatic improvement [20[•]].

Complications of laser treatment are not widespread, but include crusting, synechiae formation, and bony exposure of nasal structures. Additionally, the equipment may be bulky, expensive, and not readily available in many medical centers.

RADIOFREQUENCY ABLATION AND COBLATION

Radiofrequency ablation (RFA) utilizes a probe that is inserted directly into the inferior turbinate and is

used to deliver a low-frequency ionic energy [13]. This thermal effect results in postoperative wound contracture and fibrosis, while preserving the surface epithelium and ciliary function [13,21]. Statistically significant reductions in turbinate volume have been shown with the objective aid of CT imaging [22].

RFA has shown a statistically significant effect on symptoms and nasal patency with fewer side-effects than other methods of turbinate reduction, although microdebrider-assisted surgery demonstrated superior results in improving nasal volume and blockage [21,23,24,25[■]]. Only one study has been placebo-controlled and double-blinded, however [26].

Lin *et al.* [6[■]] published on 101 patients undergoing RFA reduction for allergic rhinitis, the first long-term study of its kind. Six-month and 5-year response rates were 77.3 and 60.5%, respectively, and statistically significant improvement was noted. Garzaro *et al.* [27[■]] studied 40 patients with both allergic and nonallergic rhinitis and, although no correlation between allergy and the improvement of olfactory function was found, the authors did demonstrate statistically significant improvements in nasal resistance and net improvement in odor thresholds, discrimination, and identification.

Coblation is a technology that exists within the umbrella of RFA and exploits molecular ionization to achieve low-temperature, focused disintegration of tissues [28]. This technique is especially popular in the pediatric population because of less postoperative pain [29].

Overall, RFA and coblation are well tolerated with minimal adverse effects and coblation in particular heralds less pain, which may have expanded implications for the pediatric population. The main drawback is a lack of large, double-blind, placebo-controlled randomized trials to better elucidate causal relationships [21]. Additionally, longer patient follow-up, additional objective assessment, and side-by-side cost are needed.

SUBMUCOSAL RESECTION

The goal of submucous resection is to reduce bulky inflammatory tissue, while maximally preserving the overlying mucosa, thereby maintaining ciliary function. Radical turbinectomy has largely fallen out of favor because of significant adverse outcomes, such as those described by Passali *et al.* [9]. ENS is a rare iatrogenic disorder resulting from the excessive loss of turbinate tissue [30]. Although ENS is somewhat controversial, it can be a devastating complication and the incidence is greatly reduced through mucosal-sparing operations

[7,30]. Aggressive cauterization should be limited as thermal injury can render the mucosa nonfunctional, and ENS symptoms may result.

Classically, submucous resection involves an incision and a mucosal flap elevation on the medial side of the lower turbinate, followed by forceps resection of the bone (Fig. 2). The lateral mucosa overlying the inferior meatus was often removed as well, whereas the conserved mucosa on the medial aspect was then re-draped over the resected bone. The term 'submucous resection' is now used to reference a variety of techniques, including thermal ablation of cavernous submucosal tissue, laser techniques, and powered instrumentation. This has led to confusion in the literature and we therefore advise the judicious use of the term 'submucous resection' and instead recommend naming and specifically describing the technique used.

A study of 60 patients with severe perennial allergic rhinitis who underwent submucous turbinectomy revealed statistically significant effects on the reduction of nasal discharge, stiffness, and sneezing [31]. The numbers of eosinophils and infiltrating IgE cells were also reduced in turbinate tissue. Authors have hypothesized that submucous resection may injure autonomic and sensory nerve fibers that travel submucosally to the inferior turbinate, thereby producing even greater relief to allergic rhinitis patients, although the pathophysiology is unclear [31].

Microdebrider-assisted turbinate reduction relies on real-time suction with tissue removal through a small stab or pocket-type submucosal incision,

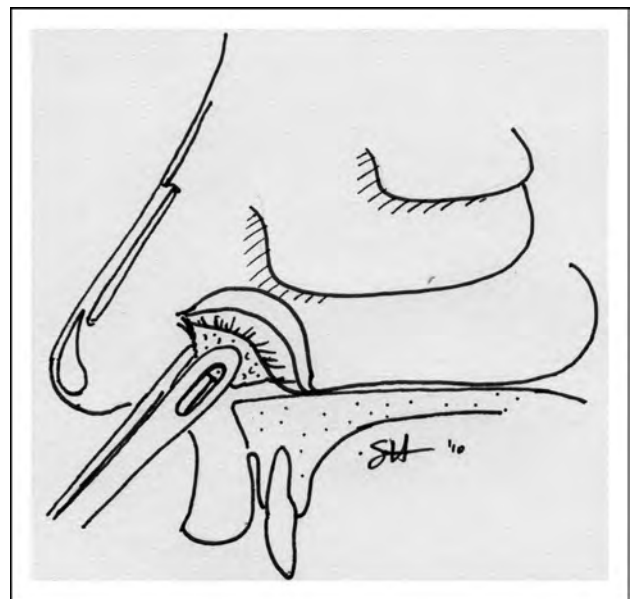


FIGURE 2. The classic submucous resection technique. Reproduced with permission [19].

followed by resection of the cavernous tissue surrounding the bony turbinate (Fig. 3). In a series by Chen *et al.* [32] of 160 patients with allergic rhinitis, the microdebrider technique is at least as effective as submucous resection in reducing subjective complaints, improving nasal airflow, and mucociliary clearance. Also, operative time and blood loss are significantly less with powered turbinate reduction as compared with submucous resection, although crusting may still develop with either technique [33].

In summary, submucous resection and powered turbinate reduction provide beneficial effects to allergic rhinitis patients with few long-term side-effects. The basic principle is to augment the nasal airway through reduction of lower turbinate tissue, and respect and preservation of the superficial mucosal layer, coupled with conservative resection technique, are vital to maximizing benefit to allergic rhinitis patients.

SEPTOPLASTY

There is little literature investigating septoplasty alone as a treatment for allergic rhinitis, but it does appear to have a role in reducing nasal obstructive complaints. The inferior turbinate has a much more central role in symptomatology in allergic rhinitis, and the septum does not undergo the dynamic extent of engorgement, mucosal edema, and glandular hyperplasia experienced by the lower turbinate during the allergen response. Septal tissue is also thought to have a smaller role in allergen deposition and mucociliary clearance. Some authors have even cited allergic rhinitis as a relative contraindication to septal surgery [34,35]. Anatomic deformities of the nasal septum, such as bony spurs or cartilaginous deviation, may affect laminar airflow and worsen subjective nasal obstruction in

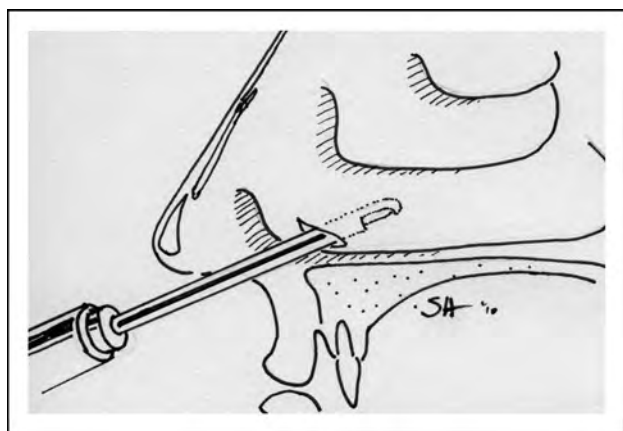


FIGURE 3. Microdebrider-assisted turbinate reduction. Reproduced with permission [19].

allergic rhinitis patients. Septoplasty is commonly combined with turbinate reduction or endoscopic sinus surgery, especially when obvious anatomic deformity or obstruction exists [36].

A large series of 478 patients compared septoplasty with submucous resection [35]. In this study, 72 patients suffered from allergic rhinitis, and improvements in nasal patency and air passage were comparable between the allergic rhinitis and non-allergic patients, though rhinorrhea remained unchanged. Furthermore, patients with allergic rhinitis were significantly less satisfied than their nonallergic counterparts. The authors concluded that patients with allergic rhinitis may undergo septal surgery on general lines, but that allergic rhinitis alone should not be an indication for septoplasty. Interestingly, a 2009 study confirmed these findings [37]. Comparison using both anterior rhinomanometry and subjective questionnaires was made in 176 patients undergoing septoplasty. The groups consisted of allergic rhinitis with nasal septal deviation and nasal septal deviation alone (nonallergic rhinitis). Following septoplasty, subjective improvement in breathing was significantly higher in patients without allergic rhinitis and this was confirmed with anterior rhinomanometry. These studies indicate that a cautious approach to the management of nasal septal deviation in allergic rhinitis is warranted, as these patients are less likely to be satisfied following surgical intervention [37].

A 2010 study investigated the well-known iatrogenic risk of septal perforation in allergic rhinitis patients [38]. It has been hypothesized that allergic rhinitis patients may be at increased risk for septal perforation because of the loss of epithelial integrity, chronic use of intranasal steroids, and increased mucosal fragility from chronic inflammation [38]. Topal and colleagues performed septoplasty in 352 patients using the classic technique as described by Cottle and Loring [39], with 70 of these patients carrying the diagnosis of allergic rhinitis [38]. No concomitant turbinate or endoscopic procedures were performed in the study group. There was a 0.7% rate of nasoseptal perforations in the allergic group compared with 1.4% in the nonallergic group, and this difference was not statistically significant. According to this study, allergic rhinitis patients are not at higher risk for perforations of the nasal septum.

The role of septoplasty in the treatment of allergic rhinitis as a sole surgical modality is not convincing. Septoplasty may be a useful adjunct when combined with other procedures, such as turbinate reduction or endoscopic surgery, especially when there is an obvious and contributing obstructive component of the nasal septum. Additionally, the

literature has shown that postoperative patient satisfaction in allergic rhinitis may not be as substantial as in nonallergic patients, and this is an important consideration for the surgeon.

ENDOSCOPIC SINUS SURGERY

Nasal endoscopy helps to localize the contact points and focal areas of edema of the inferior and middle turbinates, and may actually be predictive of allergic rhinitis in the pediatric population [40]. Although the endoscope proves an excellent diagnostic tool, it has limited applications as a direct surgical treatment for allergic rhinitis patients. Endoscopic sinus surgery is primarily of indirect benefit in allergic rhinitis patients who present with concomitant rhinosinusitis, sinonasal polyposis, or allergic fungal sinusitis. The goal of endoscopic surgery is to maximize the nasal patency and to alleviate the effects of edematous ostia. Surgical reduction of polyposis and maximal opening of air cells and ostia will assist with medical and topical therapies, while reducing recurrent bouts of sinusitis [41]. This is of utmost importance in allergic rhinitis patients to enhance the quality of life. Endoscopic interventions may also be combined with turbinoplasty to provide benefit in more difficult or advanced cases of allergic rhinitis, in which turbinate reduction alone may be inadequate.

VIDIAN NEURECTOMY

Vidian neurectomy is of historical importance and is briefly mentioned here for completeness. This procedure was originally described by Golding-Wood in 1961 and involves the transection of the efferent pathway of the parasympathetic reflex [42,43]. The vidian nerve receives contributions from the superficial and greater petrosal nerves and the pericarotid sympathetic plexus before joining the sphenopalatine ganglion. Injury to these sensory nerve fibers reduces the hyperreactivity of the nasal reflex, which alleviates sneezing and nasal hypersecretion [42].

Much like radical turbinectomy, vidian neurectomy has largely fallen out of favor because of adverse outcomes. The most frequent and long-term side-effect is loss of lacrimation, or keratoconjunctivitis sicca, which mandates the use of artificial tear substitution [42]. This condition can be severely debilitating and bothersome, especially in extremely warm or cold climates. More severe complications include abducens palsy, eye muscle disorders, and postoperative hemorrhaging or hematoma [44]. Advances in both medical and surgical therapy have largely replaced this procedure, and

currently vidian neurectomy is very seldom a treatment for allergic rhinitis. It may be reserved as a last resort only after other surgical interventions have failed and the patient is adequately apprised of potential side-effects. Research into alternatives, such as selective ganglion ligation or endoscopic antegrade neurectomy, is underway, but further studies are needed to confirm their long-term efficacy [12,42,45[■]].

CONCLUSION

Allergic rhinitis is a very common condition, and the surgical objective is to augment the nasal airway by primarily reducing turbinate tissue, thereby alleviating the most common complaint of nasal obstruction. Anatomic obstruction, such as septal spurs or polyposis, may also require surgical correction when seen concomitantly with allergic rhinitis. The inferior turbinate has proven to be the most important contributor to nasal obstruction and dynamic compliance of the nasal cavity in allergic rhinitis patients. Various technologies and many surgical procedures exist for addressing the inferior turbinate, but no single modality has evolved as the gold standard. Therefore, it is very important for the surgeon to be familiar and facile with a number of approaches. An understanding of the underlying pathophysiology of allergic rhinitis is also central to directing surgical therapy. In order to reduce the adverse outcomes while improving the quality of life for allergic rhinitis patients, the surgeon should employ meticulous operative technique, respect the superficial mucosal layers, and use conservative reduction of lower turbinate tissue.

Acknowledgements

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Conflicts of interest

There are no conflicts of interest.

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- of special interest
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