Septoplasty and Turbinate Surgery

When a patient requesting rhinoplasty also complains of nasal obstruction, it is critical to accurately diagnose the cause. The author reviews diagnostic procedures, including anterior rhinoscopy, nasal endoscopy, and coronal-sinus computed tomography scan. He discusses technical aspects of septoplasty and turbinate surgery, which address common causes of nasal obstruction, emphasizing traditional and endoscopic septoplasty, septoplasty techniques to address the caudal septum, and a graduated stepwise approach to the inferior turbinates. (*Aesthetic Surg J* 2003;23:393-403.)

I t is not unusual to see patients with concerns about both nasal appearance and function. Therefore the surgeon must have intimate knowledge of both external and intranasal anatomy. The differential diagnosis of conditions causing nasal obstruction is extensive (Table 1). Although patients with these conditions are frequently seen in practices that specialize in nasal function, some also present for treatment in rhinoplasty practices. It is critical that nasal obstruction be correctly diagnosed. Just as aesthetic analysis leads to an appropriate rhinoplasty plan, good functional nasal analysis dictates appropriate medical or surgical treatment.

In my practice, problems causing nasal obstruction in patients seeking rhinoplasty have included deviated septum, chronic sinusitis, sinus polyps, antrochoanal polyp, rhinitis medicamentosa, turbinate hypertrophy, adenoid hypertrophy, tumor (rhinoplasty was deferred in this patient), concha bullosa, choanal stenosis, and internal and external valve collapse.

A detailed history is critical in evaluating and treating patients presenting with nasal complaints or requesting nasal surgery. In the history, consider nasal obstruction, chronic or recurrent sinusitis, postnasal drip and cough, facial pressure or pain, ear pressure or pain, hearing loss, loss of sense of smell or taste, halitosis, and other pertinent findings (Table 2).[1–3] Be sure to ask about environmental allergies and to further evaluate these when appropriate.[4] A history of topical nasal-decongestant abuse may cause rhinitis medicamentosa. Note whether there is a history of sinus surgery, rhinoplasty, or other nasal surgery.

Perform anterior rhinoscopy before and after topicalization with a vasoconstricting agent. You may not detect any abnormalities on anterior rhinoscopy, or an anatomic abnormality may be observed but not fully appreciated. Perform a nasal endoscopic examination when indicated by patient history or by anterior rhinoscopy findings. Abnormalities and physical findings not apparent on rhinoscopy may appear when careful endoscopy is performed by a skilled endoscopist.[1,5–7]

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With the extensive differential diagnosis of nasal obstruction in mind, I will focus here on technical aspects of 2 commonly performed surgical procedures to address nasal obstruction: septoplasty and turbinate surgery.
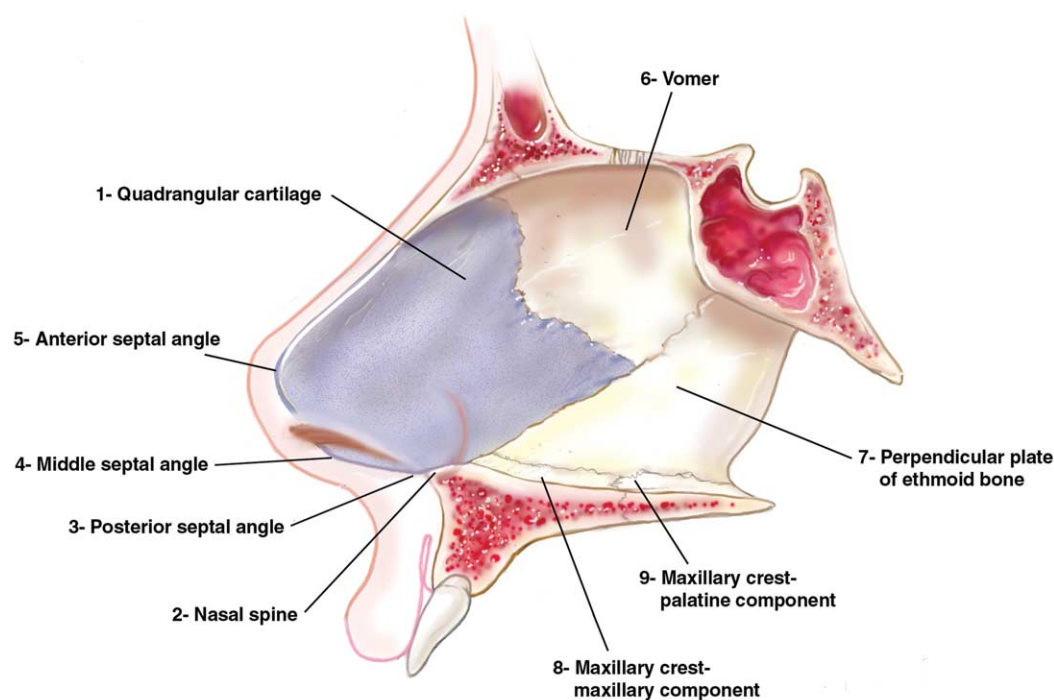
Technical Considerations in Septoplasty

The anatomy of the septum is well recognized by nasal surgeons (Figure 1).[8-11] In this section, we will consider traditional septoplasty, endoscopic septoplasty, and septoplasty techniques to address the caudal septum. I prefer the traditional septoplasty approach (as opposed to endoscopic septoplasty) for broad deviations and for primary septoplasty. Endoscopic approaches are less invasive and advantageous for focal deflections and spurs, as well as for revision septoplasty. Caudal septal deflections require special attention.

To perform a traditional septoplasty, I retract the columella with a small nasal speculum, but a columellar retractor, large 2-prong hook, or other suitable instrument may also be used. The purpose is to expose the caudal margin of the septum and to protect the columella from injury. Next I make a hemitransfixion incision extending from the anterior septal angle to the posterior septal angle along the caudal border of the cartilaginous septum with a 15 blade or 15-C blade. I use a modified Killian incision if less exposure is necessary. However, if I need access to the caudal septum or need to separate the

Illustrations by William M. Winn, Atlanta, GA.

Figure 1. Anatomy of the septum.

Table 1. Differential diagnosis of nasal obstruction

Cause	Example
Allergic	Allergic rhinitis
Congenital	Encephalocele (iatrogenic or posttraumatic), glioma, teratoma
Chronic rhinosinusitis	
Endocrine	Pregnancy, hypothyroidism, adrenal insufficiency, menstruation
Iatrogenic	Atrophic rhinitis, overresection, overnarrowing after osteotomies
Infection	Acute and chronic rhinosinusitis, septal abscess
Inflammatory polyposis	
Mechanical	Deviated septum, nasal valve collapse, synechiae, nasal polyps, inferior turbinate hypertrophy, middle turbinate hypertrophy (including concha bullosa), adenoid hypertrophy, choanal atresia, septal hematoma
Medicinal	Rhinitis medicamentosa
Neoplastic	Benign and malignant nasal tumors
Foreign body	
Nasal cycle	
Other	

upper lateral cartilages from the dorsal septum to place spreader grafts, or if I simply feel that I require the widest possible exposure, I will use a hemitransfixion incision.

The classic Killian incision extends posterior-inferiorly. Frequently, as dissection proceeds posteriorly, a tear occurs along the inferior aspect. When the cartilage is incised to allow submucoperichondrial dissection on the opposite side, at this location, the mucoperichondrium is at risk for tearing directly opposite the Killian incision. This puts the patient at high risk for a septal perforation. At this location, septal perforations are frequently symptomatic. The modified Killian incision avoids the risks of
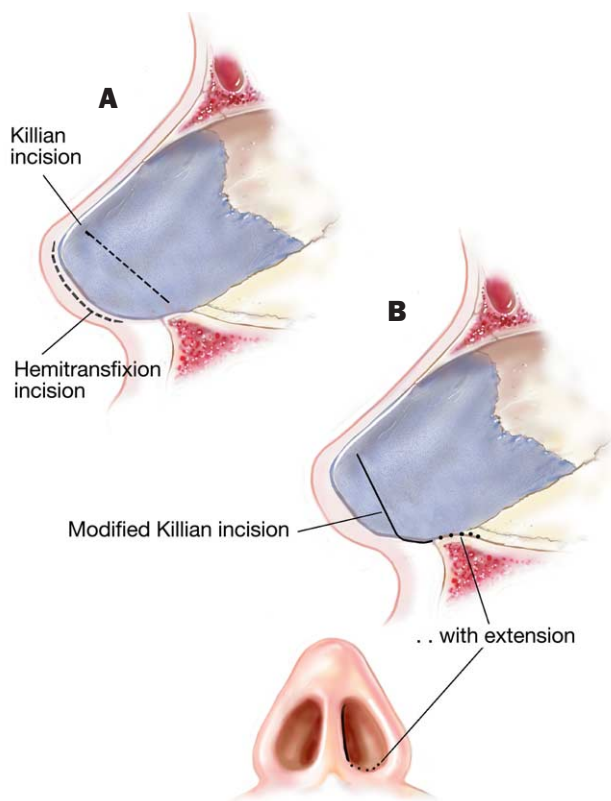
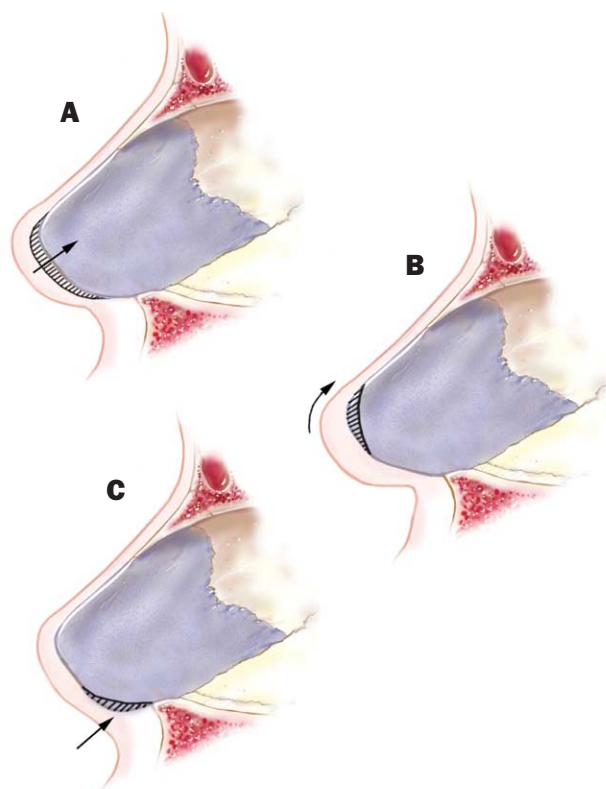Figure 2. Septoplasty incisions.

Figure 3. Modifications of the caudal septum.

the classic Killian incision while bypassing the caudal septum (Figure 2). This incision placement also permits extension along the floor, which is useful if a floor tunnel becomes necessary (eg, when the patient has a severe spur along the maxillary crest).

Using a 15 blade, small sharp pointed scissors, or other suitable instrument, I then incise the perichondrium of the septum adjacent to the caudal septum on one side. I perform a submucoperichondrial dissection along the lower half of the septum to allow harvest of septal cartilage, if needed. If I plan to place a spreader graft by way of an endonasal approach, I am careful not to extend this dissection too high, so that later in the dissection I can make a precise tunnel for the spreader graft.

Next I elevate the mucoperichondrial flap on the opposite side. If I have used a hemitransfixion incision, I begin at the caudal septum. If I have used a modified Killian incision, I gain access to the opposite side by incising the cartilage just anterior to the offending (deviated) portion, taking great care to preserve a generous L-strut of at least 15 mm for continued nasal support.

If the septum needs shortening, this may be a good time to perform selective excision of the caudal aspect of the septum (Figure 3). If rotation of the nasal tip is necessary, a superiorly based triangle of caudal septum can be
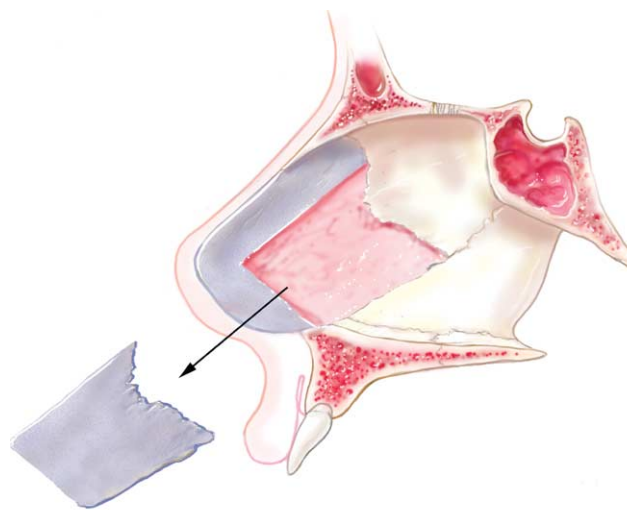

Figure 4. Maintain a generous L-strut.

excised. For an obtuse nasolabial angle, the posterior septal angle can be trimmed. For a tension nose deformity[12] or hanging columella deformity, the entire caudal septum may need to be trimmed. In place of resection, an overly long midline caudal septum can be sutured between the medial crura to provide support, increase projection, and set tip rotation and alar-columellar relationship.
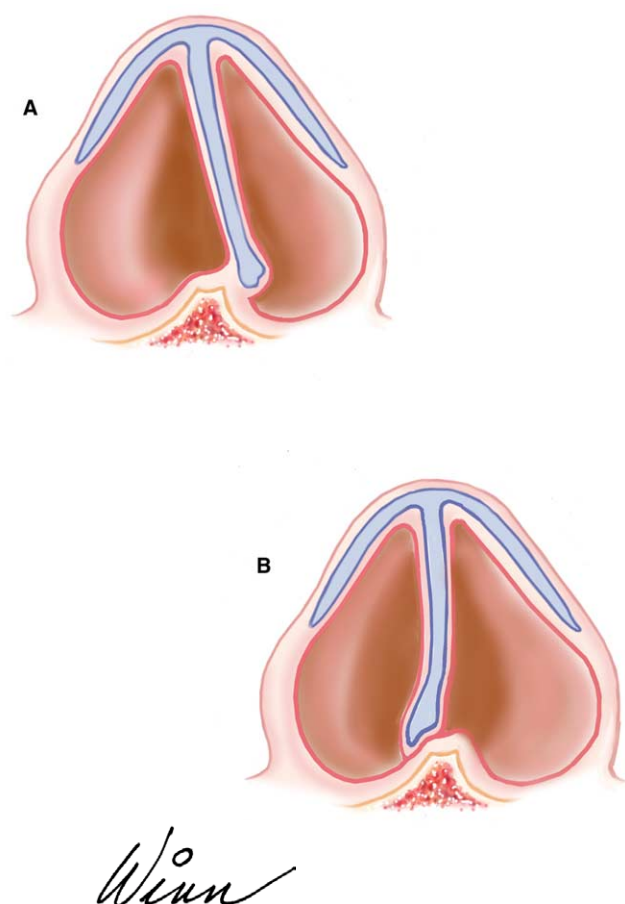
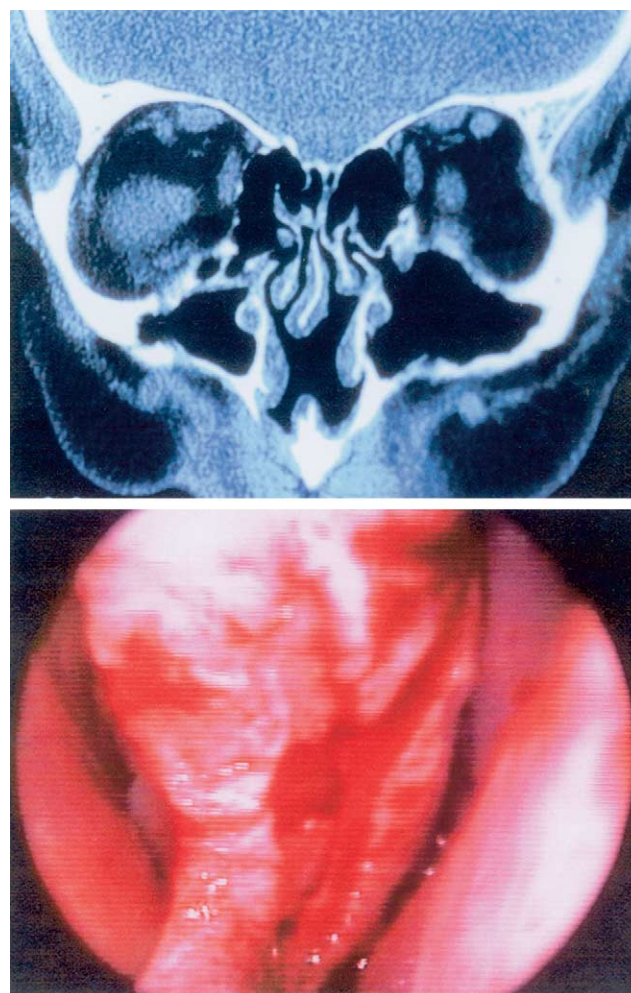Figure 5. The "doorstop" technique described by Pastorek and Becker.[13]

Figure 6. Endoscopic septoplasty was performed in this case to address a persistent septal deviation behind a large iatrogenic septal perforation.

Septal Surgery with Harvest of Cartilage

At times it is necessary to resect significant amounts of septal cartilage and bone, either to correct a deviation or to use for grafts in rhinoplasty. To achieve this, I disarticulate the cartilaginous septum from its bony attachment, leaving an ample attachment superiorly (dorsally) at the "keystone" region. I incise the cartilage dorsally and caudally, preserving at least 15 mm anteriorly to support the nasal tip and making sure that at least 15 mm will remain dorsally after hump removal (Figure 4).

Caudal Septal Deflection

There are specific challenges in treating a deviated caudal septum. Caudal septal deflection can cause persisting nasal obstruction and may require complex reconstruction.[13,14] Several maneuvers are available with which to treat caudal septal deviation, including scoring the septal cartilage on the concave side, thereby relaxing the "spring" of the cartilage.[13] This may be performed as a solitary maneuver or in conjunction with a "swinging-door maneuver." Excise a wedge of cartilage along the maxillary crest to release the caudal septal attachments and allow the septum to "swing" to the midline. Secure the midline position with an absorbable suture attached to the periosteum adjacent to the opposite side of the nasal spine. Ethmoid-bone splinting grafts or sandwich grafts may also be beneficial.[13,15] Harvest a straight piece of bone, and use a large straight Keith needle as a hand-held drill to make holes in the bone graft. Address the deviated portion of cartilaginous septum by scoring on the concave side, and use the bone graft or grafts to splint the septum in a straighter orientation. Note that using the ethmoid-bone graft in this location thickens the caudal septum and can contribute to nasal obstruction. The ethmoid-bone sandwich grafts may be used to address a deviation of the dorsal septum where the additional septal thickness caused by this graft is well tolerated.
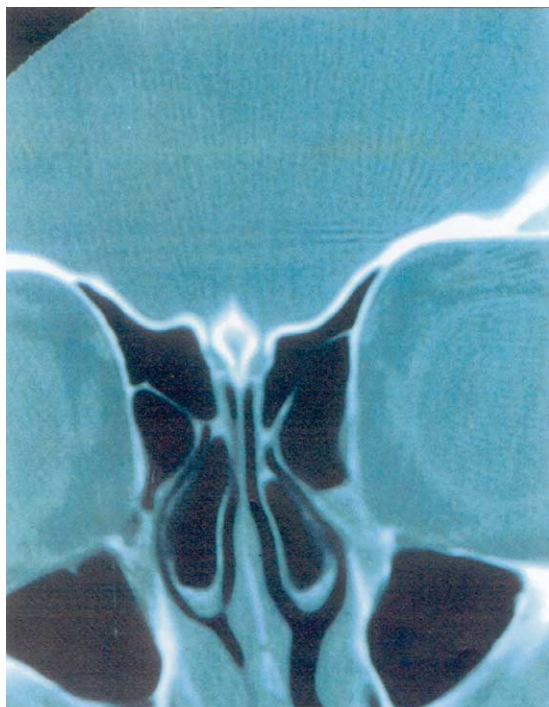
Figure 7. This CT scan demonstrates a straight septum. Large, bilateral concha bullosa, or aerated middle turbinates, are causing the patient's nasal obstruction.

Figure 8. In a patient with a deviated septum, return of the septum to midline by means of septoplasty may actually diminish the airway on the side of a hypertrophied middle turbinate. Partial middle turbinectomy may be indicated in this situation.

Table 2. Common nasal and sinus symptoms

Recurrent or chronic nasal/sinus infections
Nasal stuffiness or congestion
Headache
Facial fullness, pressure, or pain
Facial swelling
Postnasal drainage
Discolored nasal drainage
Nasal bleeding
Altered sense of taste/smell
Fever
Fatigue
Ear fullness/clicking
Halitosis
Worsening asthma

In patients with a severely deviated caudal and dorsal septum, the offending portion may be excised and replaced with a straight piece of cartilage, typically harvested from the septum more posteriorly.[3] Suture fixation to a stable segment of cartilage attached at the osseocartilaginous junction and nasal spine will allow reconstruction of an intact L-strut to support the lower third of the nose. The reconstructed caudal segments can be sutured between the medial crura to set nasal length, projection, rotation, and alar-columellar relationship.

Pastorek and Becker described a modified swinging-door technique for treatment of the caudal septum.[13] The septal cartilage along the maxillary crest is dissected free but not excised. Instead, the caudal septum is flipped over the nasal spine, which acts as a "doorstop" and secures the caudal septum in a straighter position (Figure 5).

Endoscopic Septoplasty

Endoscopically guided septoplasty (Figure 6) is useful in difficult revision nasal surgeries in which obstructing septal deviation persists. Indications for endoscopic septoplasty include an isolated septal deformity, or a posterior septal deformity in a patient with densely adherent septal mucosal flaps, typically found in cases of revision septoplasty.

If septal deviation persists posteriorly after a septo-plasty, persisting nasal obstruction may require revision septoplasty. Because the mucosal flaps are often densely adherent after a septoplasty, revision septoplasty involving a traditional approach may present technical difficulty, including significant risk of septal perforation. Endoscopic septoplasty is a relatively recent and important technique.[15–21]

The endoscopic approach may be a useful adjunct in difficult revision cases in which complete elevation of a mucoperichondrial flap presents difficulties, such as a persistent posterior septal obstruction after prior septoplasty or after septal injury (such as hematoma or abscess) with loss of cartilaginous septum. In these cases, typical surgical dissection planes are obliterated and complete elevation of a mucoperichondrial or mucoperiosteal flap may be difficult. The ability to address a persisting deviation, elevating the mucosal flap directly over the
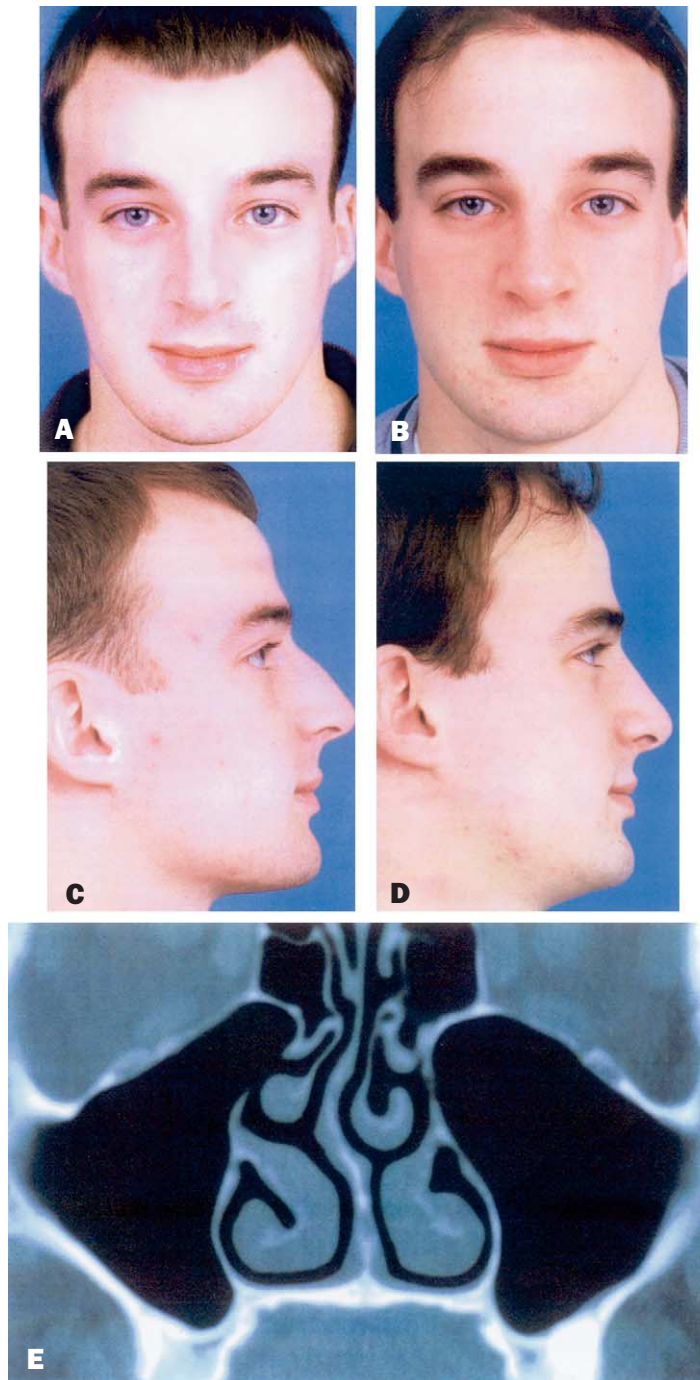
Figure 9. A, C, Preoperative views of a 20-year-old man with allergic rhinitis. **B, D,** Postoperative views after septoplasty, cosmetic rhinoplasty, and radiofrequency reduction of the inferior turbinates. **E,** The CT scan demonstrates hypertrophic inferior turbinates treated with radiofrequency reduction.

offending deviation using endoscopic techniques greatly facilitates treatment.

Becker and Kallman reported an experience with endoscopic septoplasty.[20] For this report, I reviewed my database from January 1998 to July 1999 for cases of isolated septoplasty, septoplasty with functional endoscopic sinus surgery, septorhinoplasty with functional

endoscopic sinus surgery, and functional septorhinoplasty. Six endoscopic septoplasties were undertaken in a group of 190 patients. Since then, I have found that I use the endoscopic approach with increased frequency in primary septoplasty for isolated septal deformities.
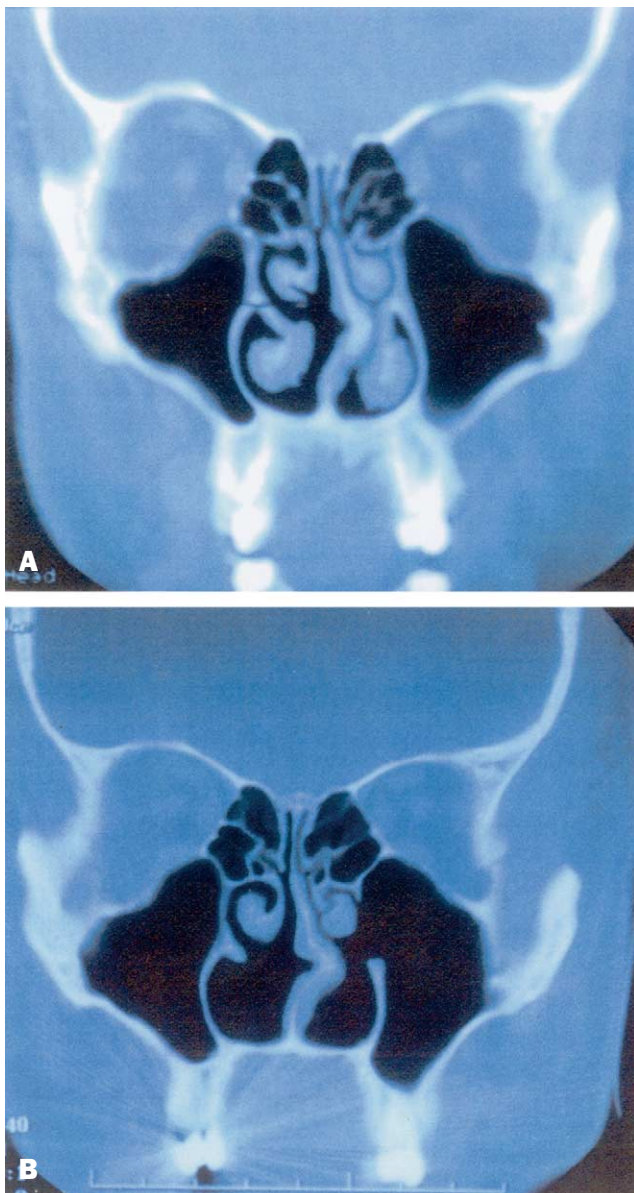
Turbinates

Figure 10. A, Preoperative CT scan of a 62-year-old man who presented for treatment of left-sided nasal obstruction. The patient underwent bilateral inferior turbinectomy. He subsequently sought a second opinion because he was experiencing severe bilateral nasal obstruction, worse than his preoperative condition, and nasal dryness. Intranasal examination revealed the absence of inferior turbinates, a widely patent nasal airway, and dry nasal mucosa. Saline-solution irrigation only slightly mitigated his symptoms. **B,** A postoperative CT scan is illustrative of a persistent left deviated septum and absent inferior turbinates consistent with his diagnosis of atrophic rhinitis.

Figure 11. This 32-year-old man presented with nasal obstruction and had been given the diagnosis of a deviated septum elsewhere. He was also interested in rhinoplasty to address the deviated nasal tip and tip asymmetries. An examination including endoscopy revealed that it was impossible to pass an endoscope; a CT scan revealed an ossifying fibroma extending to the skull base and posteriorly approaching the optic nerve. A postoperative CT scan is shown.

Treatment of the inferior turbinates is a matter of some controversy.[22–27] Some authors advocate inferior turbinate sacrifice as an almost routine treatment of nasal obstruction; others categorically advise against surgical reduction because of the risk of atrophic rhinitis. In my view, there should be a balanced approach. A thorough search to determine the cause of nasal obstruction is essential, and *that cause* should be addressed. The proper treatment of nasal obstruction is *not* simply turbinectomy. By the same token, it is unlikely that the inferior turbinates are immune from pathologic conditions; turbinate hypertrophy must be recognized. A graduated stepwise approach to the inferior turbinates is prudent.[2,23–27] It is clear that atrophic rhinitis develops in
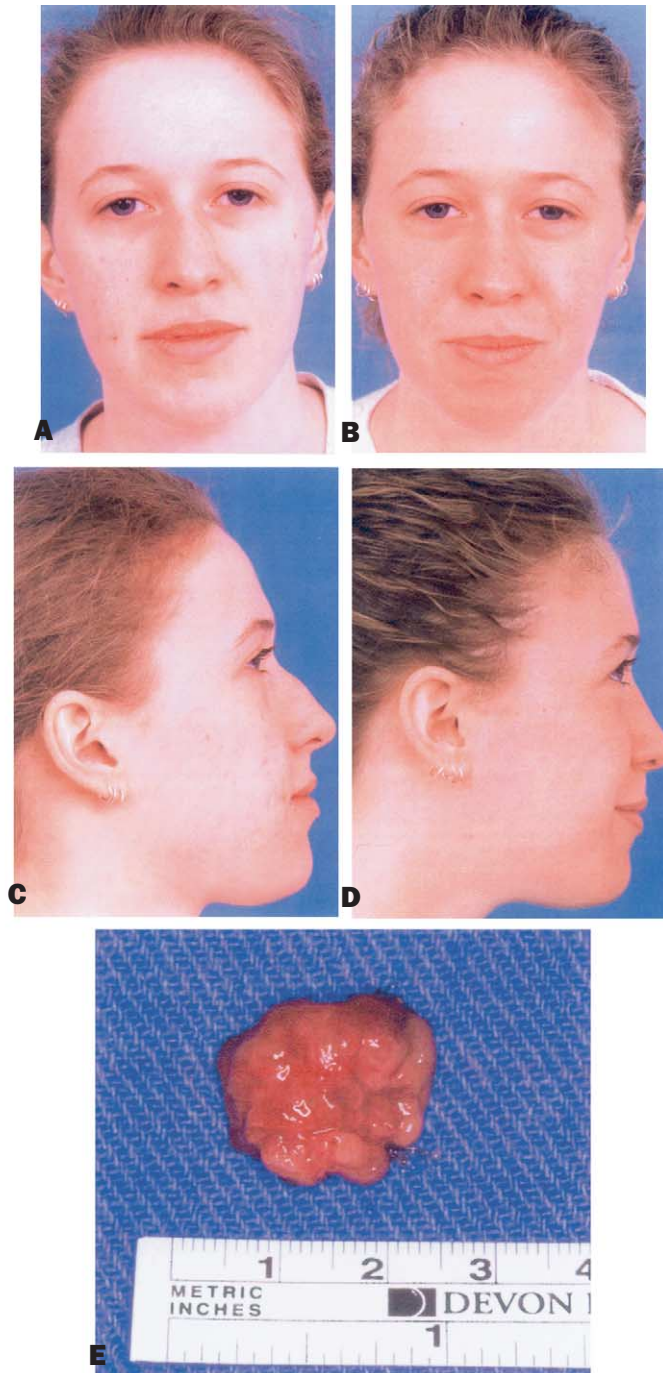
Figure 12. A, C, Preoperative views of a 16-year-old patient who requested improvement in the appearance of her nose and in her nasal breathing. She had a moderately deviated septum, but endoscopic examination also revealed obstructing adenoids. **B, D,** Postoperative views after septorhinoplasty. **E,** Adenoids (shown here) were removed at the time of septorhinoplasty.

some patients after inferior turbinectomy, so undertake this procedure with great caution.

Do not ignore the middle turbinate, for it may be a cause of nasal obstruction (Figure 7). In patients with a deviated septum, return of the septum to midline by way of septoplasty may actually diminish the airway on the side of a hypertrophied middle turbinate (Figure 8). Partial sac-

rifice of an enlarged turbinate, in this situation, may significantly contribute to improvement in nasal breathing.[22]

The inferior turbinates can be hypertrophic, especially in a patient with allergic rhinitis. Medication can frequently be used to address this abnormality, but nasal obstruction resulting from inferior turbinate hypertrophy may persist.
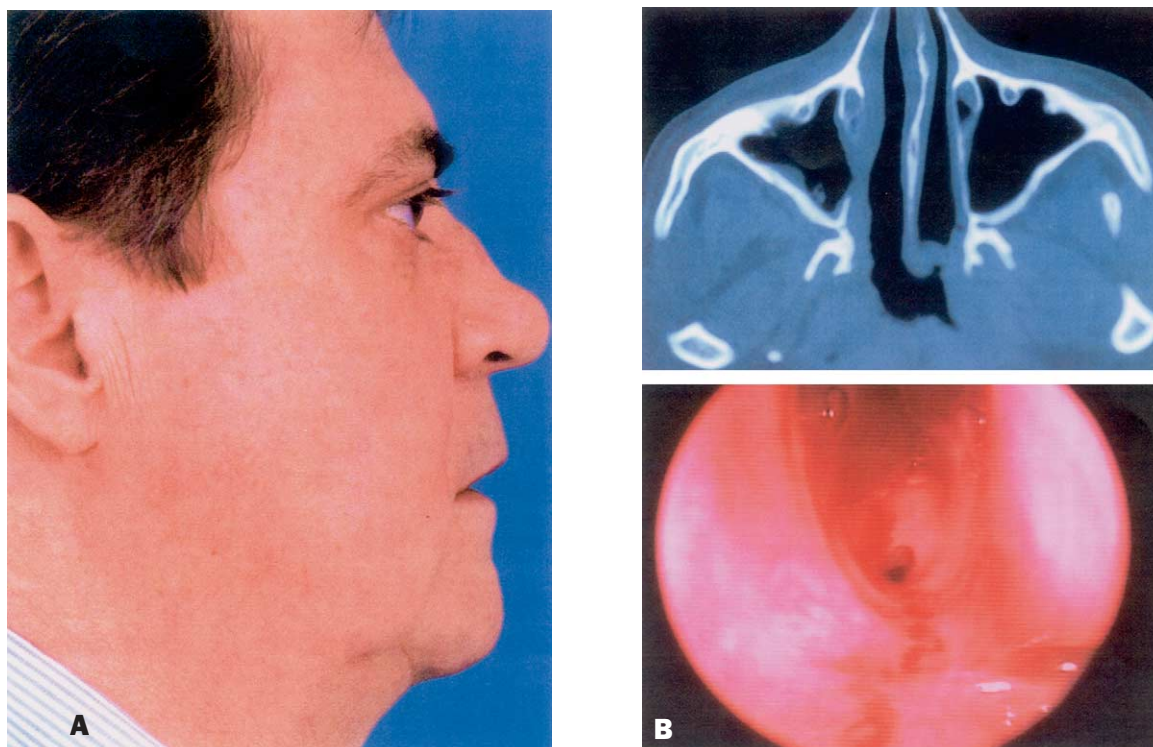
Figure 13. A, This 52-year-old man complained of posttraumatic nasal obstruction, the left side worse than the right. **B,** Although nasal obstruction in patients with saddle-nose deformity commonly results from problems with the nasal valve, endoscopic examination in this patient revealed an additional cause: traumatic choanal stenosis, also seen here on CT.

The advent of radiofrequency devices (Somnus Medical Technologies Inc., Sunnyvale, CA; Coblation Corp., California) to reduce the size of the inferior turbinates has been a significant advance providing a conservative procedure that may be performed with the patient under local anesthesia as an alternative to more aggressive approaches (Figure 9).[23–27] When more aggressive treatment of the inferior turbinates is warranted, a submucosal elevation of the turbinate with resection of the bulky bone of the inferior concha is preferred. Partial sacrifice of the inferior turbinate, such as resection or crushing, has never seemed appropriate or physiologic even when successful. After submucosal resection, the turbinate may be reattached with absorbable sutures and now occupies considerably less space than its original bulk, even as its physiological functions of warming, lubricating, and air-conditioning are preserved.[2]

Lee and associates[26] describe 3 mucosa-sparing techniques for the surgical management of inferior turbinate hypertrophy. I subscribe to all these techniques. Radiofrequency (RF) volumetric tissue reduction uses radiofrequency heating to induce submucosal tissue destruction, leading to reduction of tissue volumes. The RF generator (Somnus Medical Technologies) is connect-
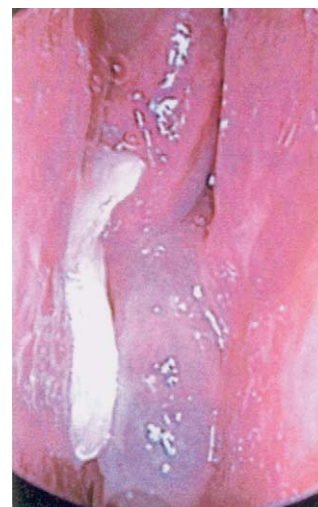

Figure 14. Nasal polyps may cause nasal obstruction. This endoscopic photograph demonstrates nasal polyps emanating from the middle meatus into the nasal cavity.

ed to a specialized single-use delivery tip and handpiece. The tip is a 22-gauge electrode, 4 cm long; the active portion is 1 cm, and the remaining 3 cm is insulated. Two thermocouples allow constant temperature feedback at the location of treatment and in the surrounding tissue,

thereby limiting mucosal injury. Topical and infiltrative anesthesia is used. To avoid tissue shrinkage, some surgeons prefer not to use vasoconstrictive agents, which could increase the risk of mucosal injury. Under direct vision, place the RF electrode in the anterior-inferior portion of the turbinate, with several millimeters of the inactive portion in contact with the mucosa to avoid mucosal injury. Deliver the RF energy at a specified energy setting. Measure the temperature at the delivery site constantly, and modulate the rate of energy delivery to ensure a maximal temperature of less than 75°C. This allows the procedure to be performed with the patient under local anesthesia, without pain. Time and experience have shown that the recommended energy levels create a submucosal injury that causes favorable tissue shrinkage. Often a second lesion immediately posterior to the first is both safe and effective. Lee and associates feel that it is reasonable to expect 70% to 80% subjective improvement in patients treated with this technique.

The use of powered instrumentation has become widespread in functional nasal surgery, particularly in endoscopic sinus surgery.[28–32] Microdebrider-assisted turbinate reduction excises erectile soft tissue of the inferior turbinate under endoscopic visualization while preserving the overlying mucosa.

In this approach, make a stab incision at the anterolateral surface of the inferior turbinate. Perform a supraperiosteal elevation of soft tissue over the turbinate bone. A suction elevator is helpful in clearing blood from the surgical plane. Carry the dissection posteriorly and also superolaterally along the lateral nasal wall.

Use a pediatric noncutting microdebrider blade to minimize the risk of perforating the overlying mucosa. Position the active face of the microdebrider outward, toward the mucosal surface. Then perform soft-tissue resection under endoscopic visualization. Outfracture, or resection of a portion of the inferior turbinate bone, may be easily accomplished at the same time, when indicated.

Overresection of intranasal soft tissue can result in atrophic rhinitis, such as that seen after resection of major intranasal tumors and after inferior turbinectomy. Despite having widely patent nasal cavities, these patients complain of nasal obstruction and nasal dryness (Figure 10).

In relatively mild cases of atrophic rhinitis, saline nasal spray may relieve symptoms.

Discussion

Levine[33] reported that in 39% of patients who visited a rhinology practice with complaints of nasal obstruc-tion, endoscopy revealed findings that were not identified with traditional rhinoscopy. Many of Levine's patients had seen other physicians for treatment of nasal obstruction and had not received adequate treatment. I have also found that several causes of nasal obstruction can only be diagnosed with nasal endoscopy or computed tomography (CT) (Figures 11–14).

For a patient with nasal obstruction without a clear diagnosis, perform nasal endoscopy and also consider coronal-sinus CT. CT may demonstrate or better define the cause of nasal obstruction, which may be overlooked without careful endoscopic examination supplemented, at times, by CT.

Endoscopy is an office procedure that takes minutes and causes minimal discomfort. It provides potentially significant useful information that may alter the approach to surgical therapy in a way that improves functional outcome. In patients with a functional nasal problem, office endoscopy is reimbursed in the United States by most insurance companies. In light of all of this, I recommend that patients presenting for rhinoplasty who complain of nasal obstruction should undergo anterior rhinoscopy, and if complete visualization of the intranasal anatomy is not possible, anterior rhinoscopy should be followed by nasal endoscopy. In a significant number of patients, nasal endoscopy allows identification of clinically significant pathologic findings and thereby may cause an alteration in the approach to surgical therapy. ∎

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