Evidence-Based Medicine: Current Practices in Rhinoplasty

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Learning Objectives: After studying this article, the participant should be able to: 1. Perform aesthetic and functional nasal analysis to guide septorhinoplasty. 2. Recognize common complications associated with rhinoplasty. 3. Select appropriate septorhinoplasty techniques to refine nasal aesthetics and treat nasal airway obstruction. 4. Identify factors leading to poor patient satisfaction following rhinoplasty.

Summary: Septorhinoplasty is among the most technically challenging procedures in the realm of plastic and reconstructive surgery. Moreover, it is a constantly evolving topic with extensive background literature. Surgeons must be comfortable with the traditional knowledge base and the current practices in the field. This article reviews the latest thinking on patient selection, functional indications, aesthetic analysis, and operative techniques in septorhinoplasty, with an emphasis on key cartilage grafting and tip suture techniques. (*Plast. Reconstr. Surg.* 141: 137e, 2018.)

Rhinoplasty remains one of the most technically and artistically challenging procedures in the purview of plastic surgery. According to the American Society of Plastic Surgeons, rhinoplasty was the fifth most popular cosmetic surgical procedure in 2015, with 217,979 rhinoplasty procedures performed.[1–3] Innovations in aesthetic and functional analysis of the nose, surgical approaches to rhinoplasty, and management of complications continue to be a point of interest among plastic surgeons.[4,5] This CME article reviews the current state of rhinoplasty.

PREOPERATIVE EVALUATION AND NASAL ANALYSIS

Preoperative evaluation of rhinoplasty patients should include psychological, functional, and aesthetic components. Patients should be assessed for the ability to set achievable goals before undergoing rhinoplasty. A study of patients seeking rhinoplasty demonstrated an association with body dysmorphic disorder symptoms.[6] A systematic review of the literature suggested that young age, male sex, high use of cosmetic surgery, unrealistic expectations, and personality disorders portend poor patient satisfaction.[7]

Septorhinoplasty is indicated for nasal airway obstruction, which can lead to obstructive sleep apnea, snoring, altered sensations of smell and taste, and chronic rhinosinusitis. The external and internal nasal valves, which are formed by the septum and lateral cartilages, are critical bottlenecks for nasal airflow. We previously described the role of septorhinoplasty and turbinectomy in the management of obstructive sleep apnea.[8] Reconstructive rhinoplasty is also considered the standard of care in select instances of craniofacial trauma and congenital craniofacial syndromes.[9–11]

Aesthetic considerations for the nose are complex because of its central position and

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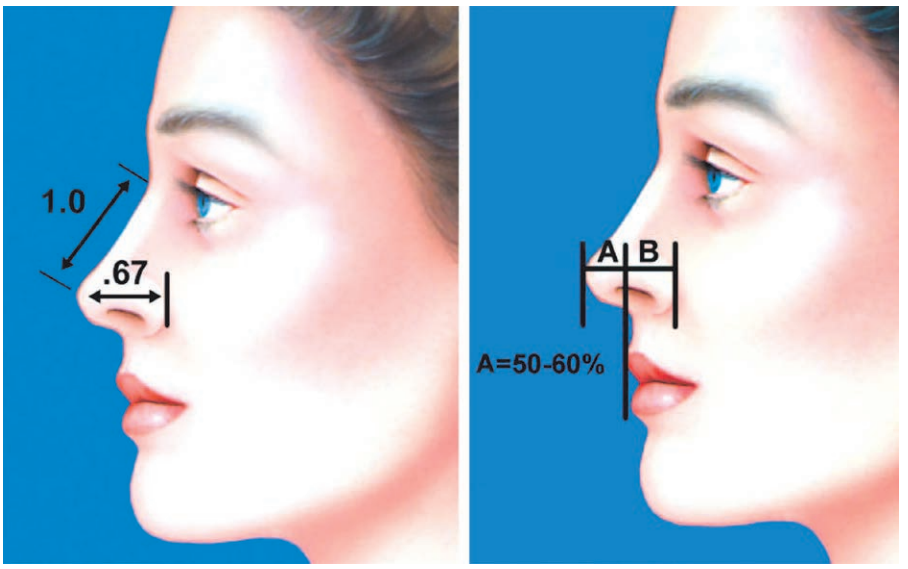


Fig. 1. Surgical management of the nasal tip requires accurate assessment of nasal tip projection. (Reprinted with permission from Gunter JP, Hackney FL. Clinical assessment and facial analysis. In: Gunter JP, Rohrich RJ, Adams WP Jr, eds. *Dallas Rhinoplasty: Nasal Surgery by the Masters*. 2nd ed. St. Louis: Quality Medical; 2007:105–123.)

topographic prominence on the face. Evaluation should be approached systematically from four different views, namely, the frontal, lateral, basal, and internal views.[12]

The frontal view assesses the nose in the context of facial proportions, which has been described and refined extensively in the plastic surgery literature.[13–18] Generally, the nasal length should be equivalent to the height of the forehead and lower face. Nasal width from ala to ala should be roughly equivalent to the width of the eyes, intercanthal width, and one-quarter of facial width. However, significant variation exists within and between racial groups, and nasofacial harmony remains a challenging trait to define quantitatively.

The nasal bones and septum, which define the dorsal aesthetic lines of the nose, should be symmetrical. C- or S-shaped curvature suggests deviation of the septum. The ideal dorsal aesthetic lines represent a pair of soft curves that narrow at the radix and widen toward the tip and alae. In women, a slight supratip break is aesthetically pleasing. Assessment of the nasal tip should identify boxy, bulbous, pinched, and drooping deformities.[19] An exaggerated infratip lobule should also be noted.[19,20]

The upper lip visually counterbalances the nose and should be evaluated for excessive or insufficient length. Activation of the depressor septi nasi muscle, which originates in the upper lip and inserts on the septum and alae, can also distort the nasal tip, columella, and ala.[21,22]

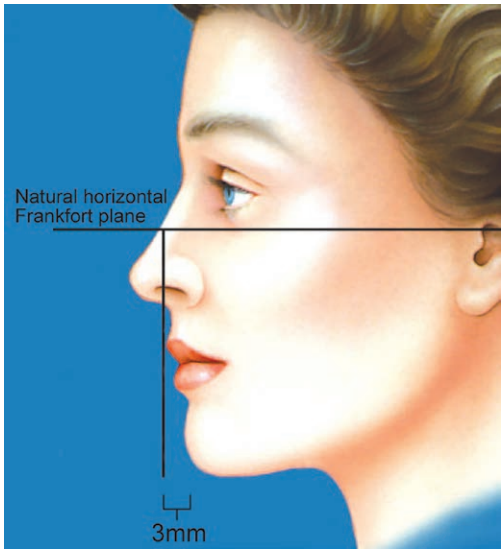


Fig. 2. Chin projection serves as a counterpoint to nasal projection, and retrognathia or micrognathia can lead to the illusion of an overprojected nose. (Reprinted with permission from Gunter JP, Hackney FL. Clinical assessment and facial analysis. In: Gunter JP, Rohrich RJ, Adams WP Jr, eds. *Dallas Rhinoplasty: Nasal Surgery by the Masters*. 2nd ed. St. Louis: Quality Medical; 2007:105–123.)

The lateral view is ideal for examination of the nasal profile. The nasofrontal angle should be evaluated. In Caucasians, the radix tends to be prominent or high, whereas in patients of Asian and African ancestry, the radix may be low.[23] The ideal dorsum in feminine and prepubescent faces is smooth and linear. In masculinized faces, a

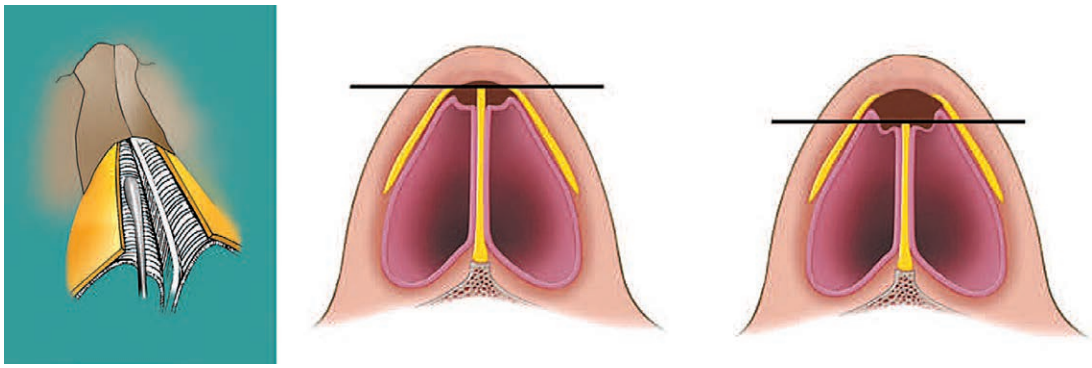


Fig. 3. Component dorsal hump reduction allows for individual modifications of the septum and the upper lateral cartilages. (Reprinted with permission from Rohrich RJ, Muzaffar AR, Janis JE. Component dorsal hump reduction: The importance of maintaining dorsal aesthetic lines in rhinoplasty. *Plast Reconstr Surg*. 2004;114:1298–1308.)

Video 1. Supplemental Digital Content 1 displays component dorsal hump reduction, which allows for the selective reduction of the septum proper and modification of the upper lateral cartilages as needed. This video is available in the "Related Videos" section of the full-text article on PRSJournal.com or at ***http://links.lww.com/PRS/C531***.

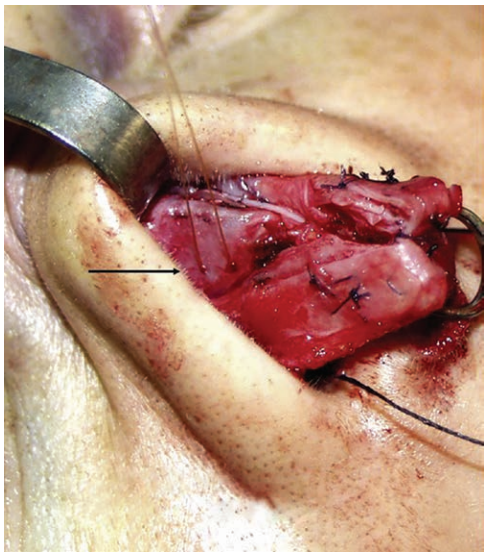


Fig. 4. Upper lateral cartilage tension spanning sutures can be used to improve the nasal valve. (Reprinted with permission from Teichgraeber JF, Gruber RP, Tanna N. Surgical management of nasal airway obstruction. *Clin Plast Surg*. 2016;43:41–46.)

modest dorsal hump may be acceptable or desirable. The presence of a "scooped out" or "saddle nose" deformity may indicate disruption of the bony and cartilaginous support of the nasal vault in previous nasal surgery or the collapse of the nasal vault from trauma, vascular compromise, neoplasms, or systemic abnormality.[24,25]

Evaluation of the tip includes assessment of tip projection and rotation.[26] Adequate projection can be quantified as 50 to 60 percent of nasal projection anterior to the upper lip or nasal projection equal to two-thirds of nasal length (Fig. 1). Dorsal prominence in the supratip region depresses the tip and decreases tip rotation, leading to a "Polly beak" deformity.[19,27] Additional causes of this deformity include scar tissue in the supratip, adequate dorsal septal height but lack of tip support leading to derotation of the tip, and soft-tissue excess, particularly in the thick-skinned patient.

The columellar-labial angle also affect tip projection and rotation. The ideal nasolabial angle is approximately 95 to 100 degrees in men and 100 to 110 degrees in women.[28] The alae should lie at approximately the level of the columella, with roughly 2 to 4 mm of columellar show.[24] Retraction, notching, or collapse of the alae should be noted.[19] Notably, chin projection serves as a counterpoint to nasal projection, and retrognathia or micrognathia can lead to the illusion of an overprojected nose (Fig. 2).[26,29]

The basal and internal views of the nose allow for assessment of the columella, external and internal

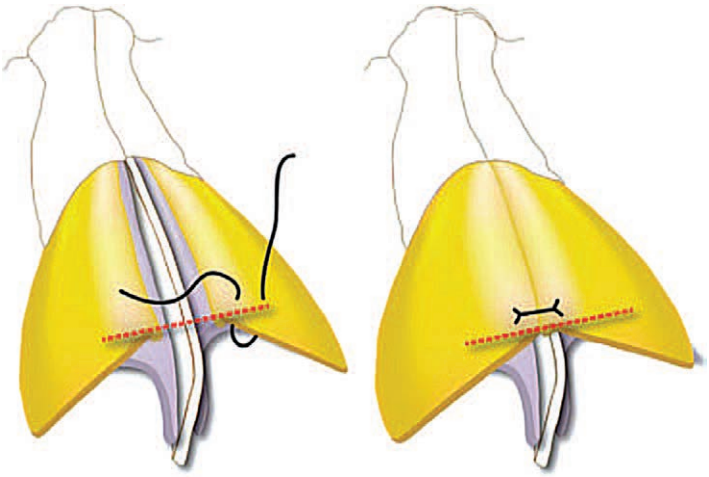


Fig. 5. Autospreader flaps can be used to improve the internal nasal valve. (Reprinted with permission from Roostaeian J, Unger JG, Lee MR, Geissler P, Rohrich RJ. Reconstitution of the nasal dorsum following component dorsal reduction in primary rhinoplasty. *Plast Reconstr Surg*. 2014;133:509–518.)

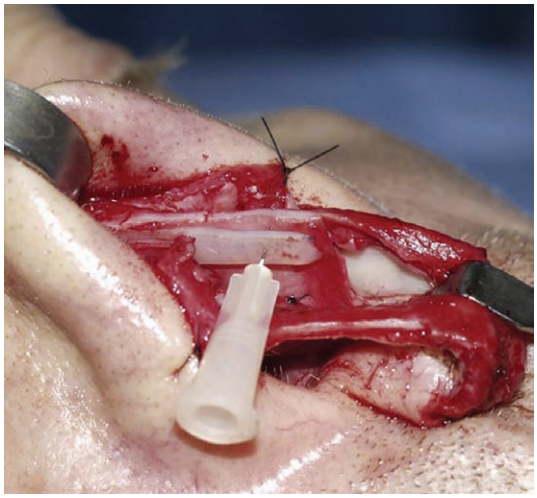


Fig. 6. Spreader grafts are used to reconstruct a narrowed midvault, correct the deviated nose, or treat internal nasal valve dysfunction. (Reprinted with permission from Teichgraeber JF, Gruber RP, Tanna N. Surgical management of nasal airway obstruction. *Clin Plast Surg*. 2016;43:41–46.)

Video 2. Supplemental Digital Content 2 displays spreader flaps, performed to stabilize the middle nasal vault. This video is available in the "Related Videos" section of the full-text article on PRSJournal.com or at ***http://links.lww.com/PRS/C532***.

valve, turbinates, and septum. Columella length and rigidity affect tip projection. Nostril asymmetry is associated with deformities of the columella, lower lateral cartilages, and alae.[19] Inferior turbinate hypertrophy, septal deviation, and collapsed valves are associated with airway obstruction.[8]

SURGICAL MANAGEMENT

Dorsum

Creation of smooth and regular dorsal aesthetic lines is of requisite importance when examining the patient on frontal view. In addition, the nasal profile on lateral view should also be smooth and continuous.

Dorsal hump reduction can be performed as either a composite or a component reduction.[30–34] The latter technique allows for the selective reduction of the septum proper and modification of the upper lateral cartilages as needed (Fig. 3). (**See Video, Supplemental Digital Content 1**, which displays component dorsal hump reduction, which allows for the selective reduction of the septum proper and modification of the upper lateral cartilages as needed. This video is available in the "Related Videos" section of the full-text article on PRSJournal.com or at ***http://links.lww.com/PRS/***

Video 3. Supplemental Digital Content 3 displays spreader grafts placed to restore the internal nasal valve. This video is available in the "Related Videos" section of the full-text article on PRSJournal.com or at ***http://links.lww.com/PRS/C533***.

Video 4. Supplemental Digital Content 4 displays diced cartilage fascia grafts, used for dorsal augmentation. This video is available in the "Related Videos" section of the full-text article on PRSJournal.com or at ***http://links.lww.com/PRS/C534***.

C531.) This technique may prevent inverted-V deformity, internal nasal valve dysfunction, and irregular dorsal aesthetic lines.

Reconstitution of the septum can be performed with upper lateral cartilage tension spanning sutures,[31] autospreader flaps,[35–38] or spreader grafts (Figs. 4 through 6).[39–41] (**See Video, Supplemental Digital Content 2**, which displays spreader flaps, performed to stabilize the middle nasal vault. This video is available in the "Related Videos" section of the full-text article on PRSJournal.com or available at ***http://links.lww.com/PRS/C532***. **See Video, Supplemental Digital Content 3**, which displays spreader grafts placed to restore the internal nasal valve. This video is available in the "Related Videos" section of the full-text article on PRSJournal.com or available at ***http://links.lww.com/PRS/C533***.)

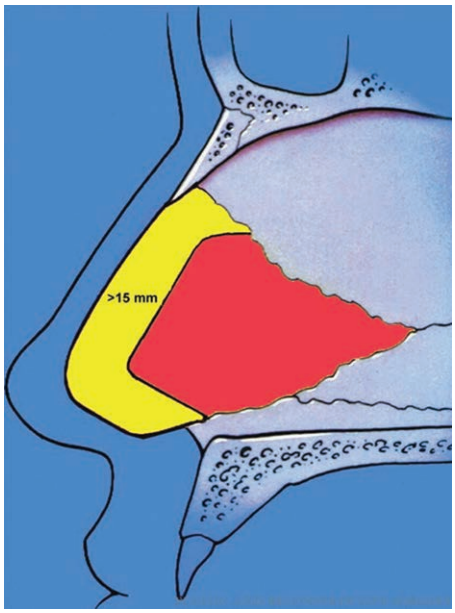


Fig. 7. When performing septoplasty, a 15-mm-wide dorsal and caudal L-strut should be preserved. (Reprinted with permission from Constantine FC, Ahmad J, Geissler P, Rohrich RJ. Simplifying the management of caudal septal deviation in rhinoplasty. *Plast Reconstr Surg*. 2014;134:379e–388e.)

Autospreader flaps or spreader grafts are best used to reconstruct a narrowed midvault, correct the deviated nose, or treat internal nasal valve dysfunction. They can widen the dorsum on frontal view. To minimize this, they should be slightly recessed, posterior to the junction of the upper lateral cartilages and the dorsal septum.

Dorsal augmentation can be performed with various autografts or allografts. Diced cartilage fascia grafts are commonly used as an autologous technique. (**See Video, Supplemental Digital Content 4**, which displays diced cartilage fascia grafts, used for dorsal augmentation. This video is available in the "Related Videos" section of the full-text article on PRSJournal.com or at ***http://links.lww.com/PRS/C534***.)

Septum

Septal deviation can result in nasal obstruction and/or external nasal deviation.[42–48] Deviation includes a septal tilt, anteroposterior deviation, craniocaudal deviation, or septal spurs.[42] Septoplasty can be used to correct the deviation. Alternatively, in patients without septal deviation, septoplasty can be performed to harvest cartilage to be used for grafting. Finally, in patients with severe deviation, extracorporeal septoplasty may be required.

Mucoperichondrial and mucoperiosteal flaps are elevated during standard septoplasty. The

deviated or deformed intervening cartilage and bone are removed or repositioned to the midline. When removing cartilage, the surgeon should preserve a 15-mm-wide dorsal and caudal L-strut (Fig. 7).[49] This can be a challenge in caudal septal deviations.

Management of the caudal septum is difficult. Caudal septal deviation contributes to nasal pyramid deviation and can be a source of nasal obstruction. The caudal septum, along with lower lateral cartilage, alar rim, and nostril sill contribute to the external nasal valve.[50]

Turbinates

The turbinates condition air by warming and moisturizing it as it flows through the nose.[8] The inferior turbinates can block nasal airflow when

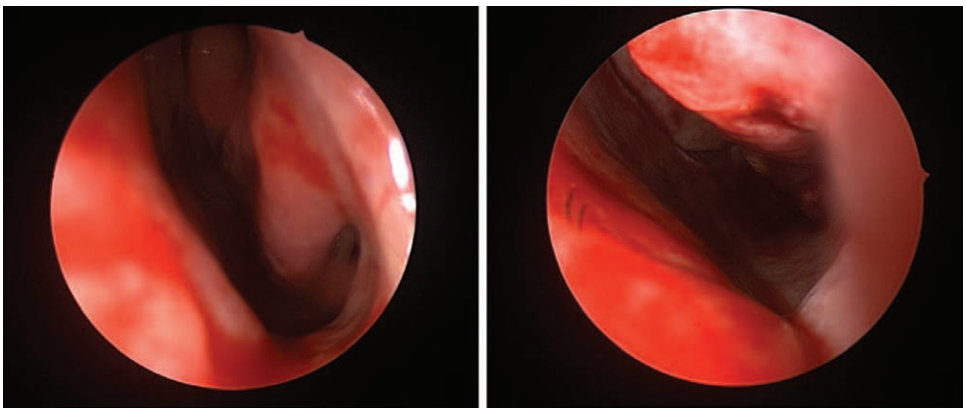


Fig. 8. The left inferior turbinate is demonstrated on endoscopic examination before (*left*) and after (*right*) inferior turbinoplasty. (Reprinted with permission from Tanna N, Smith BD, Zapanta PE, et al. Surgical management of obstructive sleep apnea. *Plast Reconstr Surg*. 2016;137:1263–1272.)

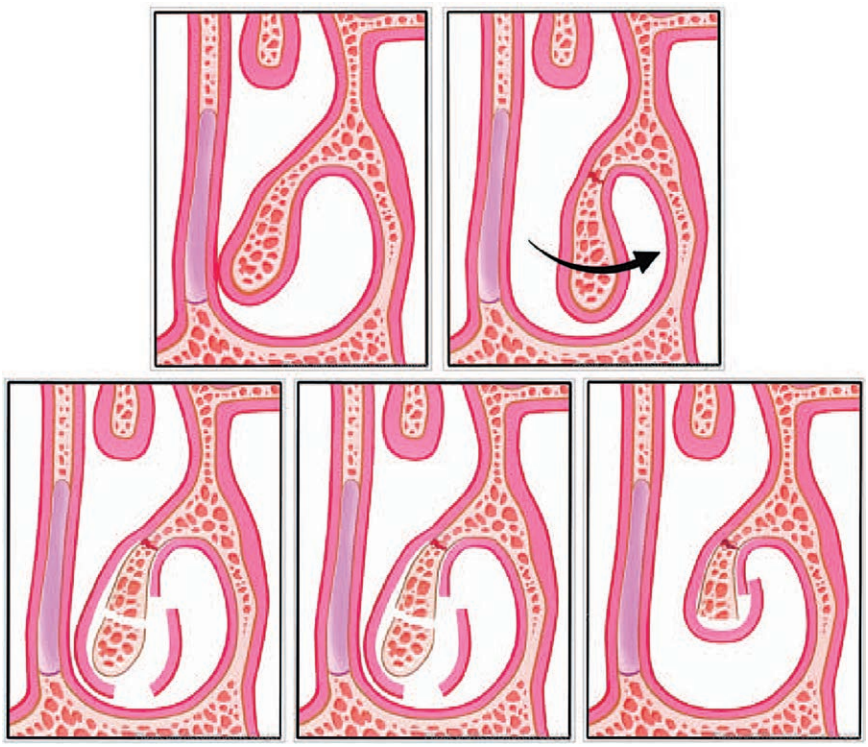


Fig. 9. Submucous resection is advocated for turbinate reduction. (Reprinted with permission from Rohrich RJ, Krueger JK, Adams WP Jr, Marple BF. Rationale for submucous resection of hypertrophied inferior turbinates in rhinoplasty: An evolution. *Plast Reconstr Surg*. 2001;108:536–544; discussion 545–546.)

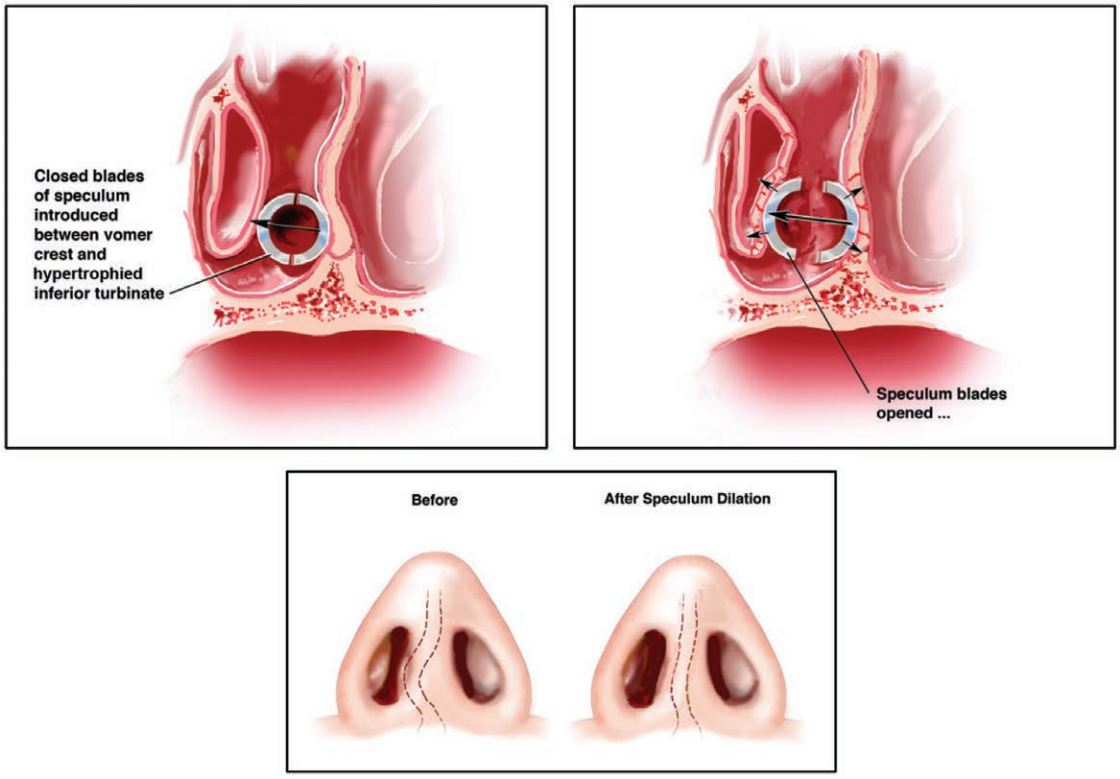


Fig. 10. Schematic of basic procedure. (*Above*, *left*) The speculum is inserted into the vestibule. (*Above*, *right*) On opening the speculum, the turbinate is compressed and the bony septum is centralized. (*Below*) The result is an expanded airway. (Reprinted with permission from Tanna N, Lesavoy MA, Abou-Sayed HA, Gruber RP. Septoturbinotomy. *Aesthet Surg J*. 2013;33:1199–1205.)

Video 5. Supplemental Digital Content 5 displays septoturbinotomy, which easily outfractures the turbinates and also centralizes the bony septum. This video is available in the "Related Videos" section of the full-text article on PRSJournal.com or at ***http://links.lww.com/PRS/C535***.

they are enlarged (Fig. 8).[51–54] Anatomically, the turbinate is a thin semicircular conchal bone surrounded by highly vascular mucoperiosteum. The inferior turbinates sit along the floor of the lateral

Table 1. Invisible/Nonpalpable Techniques That Influence Tip Refinement and Projection*

Length, width, and strength of the lower lateral cartilages
Length and stability of the medial crura
Suspensory ligament that spans the crura over the anterior septal angle of the upper and lower lateral cartilages
Fibrous connections between the upper and lower lateral cartilages
Abutment with the pyriform aperture
Anterior septal angle
Skin and soft-tissue thickness and availability

*Reprinted with permission from Ghavami A, Janis JE, Acikel C, Rohrich RJ. Tip shaping in primary rhinoplasty: An algorithmic approach. *Plast Reconstr Surg*. 2008;122:1229–1241.

nasal cavity. They can be a source of nasal airway obstruction.[50,55–58]

Submucous resection is advocated for turbinate reduction (Fig. 9).[54] More aggressive means, such as turbinectomy, can lead to crusting, bleeding, ciliary dysfunction, or atrophic rhinitis.[8] Turbinate outfracture will increase the cross-sectional area of the nasal airway.[5] It has minimal morbidity and is easy to perform (Fig. 9).[59–61] The septoturbinotomy is a simple technique whereby a long speculum is inserted into the nasal cavity. When

Table 2. Invisible/Nonpalpable Techniques That Influence Tip Refinement and Projection

Technique	Tip Refinement	Tip Projection
Cephalic trim	+	Decreased
Columellar strut	+	Increased
Septal extension graft	+	Increased
Medial crura suture	+	Increased/decreased
Transdomal suture	+	Increased
Interdomal suture	+/−	Increased/decreased
Medial crura septal suture	+	Increased/decreased
Alar base resection neutral		Decreased

Table 3. Improving Tip Refinement and Projection Key Points

1. Adequate tip projection is defined as when 50–60% of the tip lies anterior to the most projecting point of the upper lip.
2. The open approach allows for more direct and accurate assessment and execution of invisible and nonpalpable tip suturing and grafting techniques when more than minimal tip refinement and projection are required.
3. The skin and soft-tissue envelope should be dissected as close as possible to the cartilaginous framework and debulking of the tip should be avoided. This will lessen postoperative edema and potential vascular embarrassment.
4. In a patient with thick, sebaceous skin, alterations to the cartilaginous framework should be more aggressive to produce adequate tip definition and projection.
5. One should expect to lose some tip projection intraoperatively through detachment of tip-supporting structures, but when properly applied invisible/nonpalpable techniques are used, this can be counteracted.
6. Great care should be taken to preserve the existing anatomical integrity of the tip-supporting structures. Unnecessary excisions of cartilage and soft tissue should be avoided and are rarely indicated in primary rhinoplasty.
7. Overreduction of the nasal dorsum to give the illusion of improved tip projection is a misguided approach and can lead to a worsening nasal deformity that will require more complex corrective techniques.
8. Columellar struts are the mainstay in providing a stable and strong nasal base that will allow for more liberal use of other tip-suturing techniques.
9. Suturing techniques should be incremental, starting with the medial crural suture to secure and stabilize the columellar strut. Transdomal sutures are commonly required and are a powerful tool in simultaneously controlling tip projection and definition. Medial crural septal sutures may be placed to affect tip rotation and drooping.
10. The skin envelope should be redraped after each suture is placed to assess for modifications needed in position or degree of tightness.
11. Nostril-to-tip imbalances must be assessed preoperatively and reassessed intraoperatively because a preexisting disproportion may be exaggerated by augmenting the tip and failing to address the nostril proper.
12. If the desired tip projection and refinement are not achieved using available invisible/nonpalpable tip-suturing and grafting techniques, more visible/palpable cartilage grafts may be used. These include an assortment of tip grafts that can be fashioned from cephalic trim, septal, or conchal cartilage remnants.

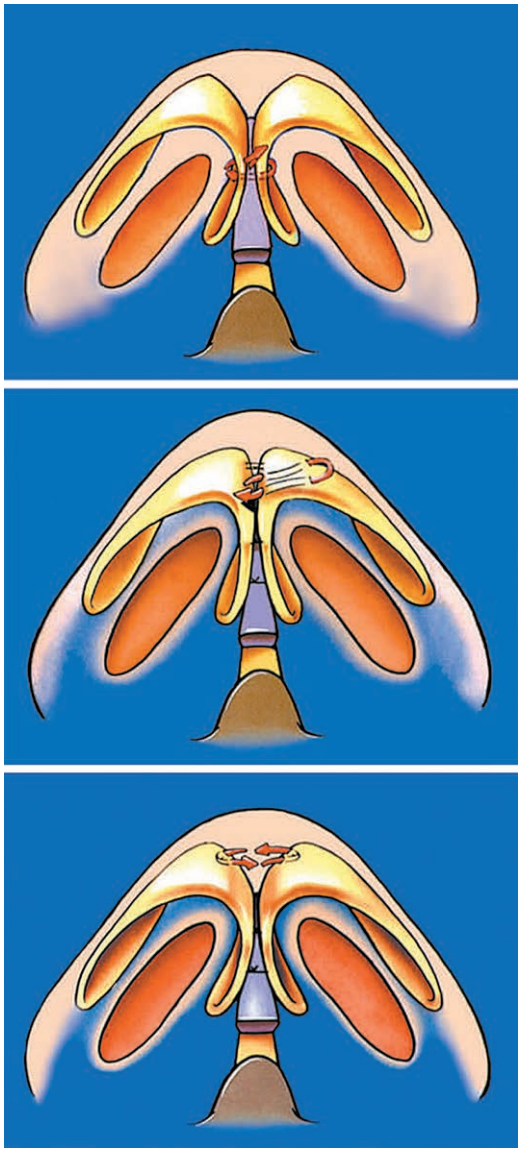


Fig. 11. (*Above*) Medial crural suture. (*Center*) Transdomal suture. (*Below*) Interdomal suture. (Reprinted with permission from Rohrich RJ, Muzaffar AR. Rhinoplasty in the African-American patient. *Plast Reconstr Surg*. 2003;111:1322–1339; discussion 1340–1341.)

the handles are compressed, the technique outfractures the turbinates and also centralizes the bony septum (Fig. 10).[59] (**See Video, Supplemental Digital Content 5**, which displays septoturbinotomy, which easily outfractures the turbinates and also centralizes the bony septum. This video is available in the "Related Videos" section of the full-text article on PRSJournal.com or at ***http://links.lww.com/PRS/C535***.)

Tip

The nasal tip represents a complex nasal tripod.[62,63] Tip refinement begins with assessment of tip rotation

and projection. Alteration of projection and rotation can be performed with cephalic trim, tip-suturing, or cartilage grafting (Tables 1 through 3).[64–94]

Cephalic Trim

Cephalic trim decreases vertical height of the lateral crura. The lower lateral cartilage is separated from the upper lateral cartilage at the scroll area. The amount of cartilage preserved is critical, as 8 to 10 mm medially and 5 to 7 mm laterally should remain.[63–65] The lateral third of the lateral crus should not be trimmed, as it may cause lateral wall collapse.

Cephalic trim decreases supratip fullness. The supratip break represents a subtle shadow in the supratip area, as the more posteriorly positioned dorsum transitions to the anteriorly located tip.[64,65] In many unoperated noses, the supratip break is higher than ideal or absent. With cephalic trim, the vertical height of the domes is reduced. This repositions the supratip break more inferiorly, thereby refining the nasal tip.[63]

It is important to note that dome sutures or trimming the anterior septal angle (as it approaches the level of the domes) are powerful techniques to decrease supratip fullness. Conversely, lack of tip projection can result in poor supratip definition, as the height between the domal peak and dorsum is lessened.[62–65]

Excessive cephalic trim will weaken the lateral crus, resulting in alar deformities (retraction or notching) or external nasal valve dysfunction. It is important to recognize that cephalic trim decreases tip projection by disrupting attachments of the upper and lower lateral cartilages.

Tip Suturing

Three commonly used techniques include the medial crural, transdomal, and interdomal sutures (Fig. 11). Medial crural sutures can increase tip projection, correct columellar asymmetries, control columellar width, and reduce flaring. The sutures are placed in the middle third of the medial crura, often fixated to a columellar strut graft. The sutures increase tip strength and projection by elevating the medial crura toward the anterior septal angle.

Transdomal sutures can increase tip projection and provide tip refinement. In addition, domal asymmetries can be addressed with these sutures.[64–90] These are placed after the nasal base has been stabilized. The suture is placed as a horizontal mattress one through the lateral and medial aspects of the dome. The further the suture is placed from the domal apex, the greater the lateral crural concavity and tip projection that result.

The interdomal suture is a powerful technique with various indications. It is a horizontal mattress suture placed between the domal segments of the middle crura of the lower lateral cartilages. The sutures can increase tip projection, decrease the angle of domal divergence, narrow the tip-defining points, and refine the infratip lobule.[64–90]

Tip suturing has to be performed with precision and caution. Aggressively placed sutures can narrow the domal angle (created between the medial and lateral crura). This interrupts the

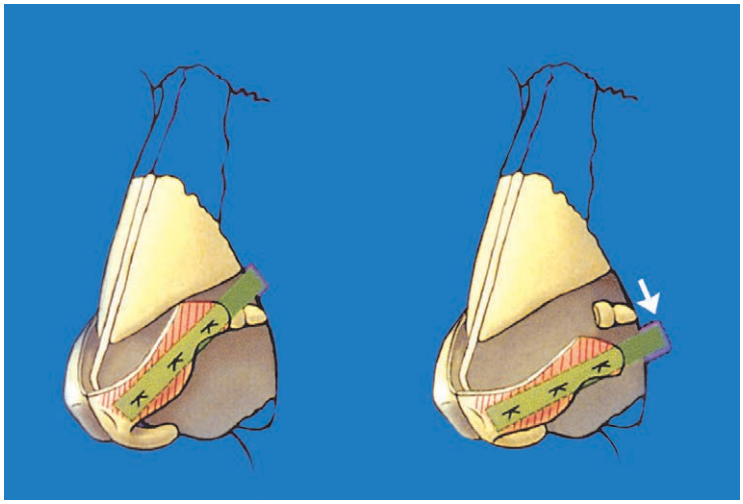


Fig. 12. The lateral crural strut graft can be used to strengthen weak lateral crura and/or to reposition lateral crura caudally. (Reprinted with permission from Ghavami A, Janis JE, Acikel C, Rohrich RJ. Tip shaping in primary rhinoplasty: An algorithmic approach. *Plast Reconstr Surg*. 2008;122:1229–1241.)

Video 6. Supplemental Digital Content 6 displays lateral crural strut grafts, which can reorient the cephalically malpositioned lateral crus. This video is available in the "Related Videos" section of the full-text article on PRSJournal.com or at ***http://links.lww.com/PRS/C536***.

smooth transition between the tip and alar lobule, resulting in a pinched tip.

Strong lateral cartilages must be present before using transdomal or interdomal suture techniques. These sutures will medialize the lateral crura and produce a relative concavity. If performed in the setting of weak lateral crura, alar notching or retraction may ensue.

Cartilage Grafting

Various sources of cartilage grafting exist, including the nasal septum, rib, and ear. Risks with cartilage grafting include displacement, absorption, warping, and visibility. Common grafts used in rhinoplasty include the columellar strut, lateral crural strut, alar rim, and spreader graft.[62]

Before working on the tip lobule, the nasal base should be stabilized. The columellar strut graft is used to maintain or increase tip projection. In

Fig. 13. Alar rim grafts correct external nasal valve deficiency. An improvement in concavity of the alar rim is seen before (*left*) and after (*right*) surgery.

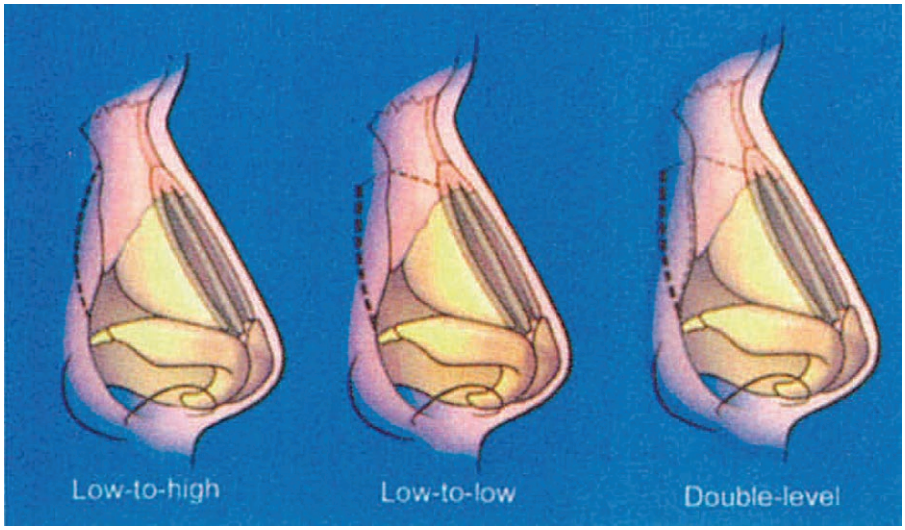


Fig. 14. Patterns of osteotomy (Reprinted with permission from Rohrich RJ, Krueger JK, Adams WP Jr, Hollier LH Jr. Achieving consistency in the lateral nasal osteotomy during rhinoplasty: An external perforated technique. *Plast Reconstr Surg*. 2001;108:2122–2130; discussion 2131–2132.)

Fig. 15. Frontal view photographs are shown before (*above*, *left*) and 1 year after septoplasty, dorsal hump reduction, columellar strut, lateral crural strut, interdomal suturing, and spreader graft placement (*above*, *right*). Lateral view photographs before (*below*, *left*) and after (*below*, *right*) surgery demonstrate a smooth dorsum, supratip break, and appropriate nasolabial angle.

addition, it can be used to maintain the shape of the medial crura, alter the degree of columellar show, and refine the infratip lobule–columellar relationship. It is placed in a pocket dissected between the medial crura of the lower lateral cartilage.[66–80]

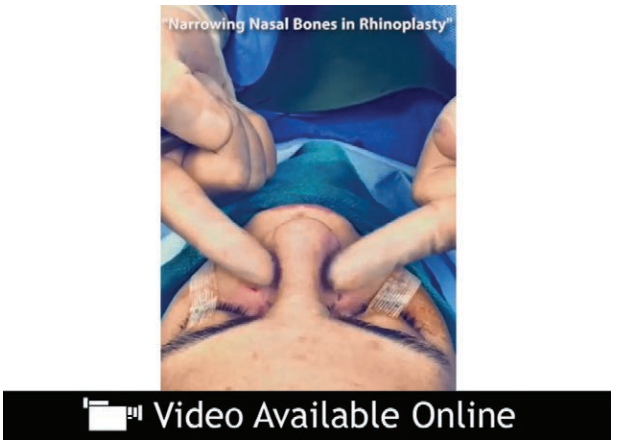
The lateral crus should be straight in anteroposterior direction. Its caudal edge should be in the same horizontal plane as the cranial margin. When the caudal margin is well below the cephalic margin, the tip can appear pinched, with poor transition between the tip and alar lobules.

Cephalically oriented lateral crus gives supratip fullness and a "parenthesis" appearance on frontal view.[63] Lateral crural strut grafts can be used to reposition the lateral crura. The vestibular skin is dissected free from the undersurface of the lateral crura. A cartilage graft is sutured to the undersurface. The distal aspect of the graft is then placed into a caudally positioned pocket within the alar rim. This allows for the lateral crura to be repositioned caudally (Fig. 12). (**See Video, Supplemental Digital Content 6**, which displays lateral crural strut grafts, which can reorient the cephalically malpositioned lateral crus. This video is available in the "Related Videos" section of the full-text article on PRSJournal.com or at ***http://links.lww.com/PRS/C536***.)

Alar notching or retraction can manifest from lateral crus dysfunction. Functional implications include external nasal valve dysfunction. Techniques to alter the lateral crus include lateral crural horizontal mattress sutures, lower lateral crural turnover flaps, alar batten grafts, alar rim grafts, or lateral crural strut grafts. Alar rim grafts are thin (2 to 3 mm wide) and long (12 to 15 mm long). They are placed along the alar margin, in a pocket along the marginal incision (Fig. 13).[62–70]

Osteotomies

Nasal osteotomies are indicated to close an open roof deformity, decrease the nasal bony width, and straighten the deviated nasal



Video 7. Supplemental Digital Content 7 displays nasal osteotomies, which can be used to narrow the nasal pyramid width. This video is available in the "Related Videos" section of the full-text article on PRSJournal.com or at ***http://links.lww.com/PRS/C537***.

Video 9. Supplemental Digital Content 9 displays cadaveric dissection and demonstrates various tip-refinement techniques. This video is available in the "Related Videos" section of the full-text article on PRSJournal.com or at ***http://links.lww.com/PRS/C539***.

Video 8. Supplemental Digital Content 8 displays cadaveric dissection, demonstrating the medial oblique and lateral low-to-low osteotomies. This video is available in the "Related Videos" section of the full-text article on PRSJournal.com or at ***http://links.lww.com/PRS/C538***.

Video 10. Supplemental Digital Content 10 displays the subdomal graft, which is used to prevent iatrogenic pinch deformity or dome misalignment. This video is available in the "Related Videos" section of the full-text article on PRSJournal.com or at ***http://links.lww.com/PRS/C540***.

pyramid.[94–107] Osteotomies can be classified by approach (external or internal), type (lateral, medial, transverse, or a combination), and level (low-to-high, low-to-low, or double-level) (Figs. 14 and 15). (**See Video, Supplemental Digital Content 7**, which displays nasal osteotomies, which can be used to narrow the nasal pyramid width. This video is available in the "Related Videos" section of the full-text article on PRSJournal.com or at ***http://links.lww.com/PRS/C537***. **See Video, Supplemental Digital Content 8**, which displays cadaveric dissection, demonstrating the medial oblique and lateral low-to-low osteotomies. This video is available in the "Related Videos" section of the full-text article on PRSJournal.com or at ***http://links.lww.com/PRS/C538***. **See Video, Supplemental Digital Content 9**, which displays cadaveric dissection and demonstrates various tip-refinement techniques. This video is available in the "Related Videos" section of the full-text article on PRSJournal.com or at ***http://links.lww.com/PRS/C539***.)

COMPLICATIONS

Complications of rhinoplasty include patient dissatisfaction with cosmetic appearance, iatrogenic deformity of the nose, airway obstruction, epistaxis, and rarely, complications of the soft tissue, such as fibrosis, necrosis, infection,

mucosal inclusion cysts, and subcutaneous granulomas from foreign materials. Autologous grafts to the nose are commonly at risk for displacement, warping, or resorption. Alloplastic implants pose additional risk of extrusion and infection.

Residual and new airway obstruction is one of the most common complications following rhinoplasty. Sixty to 74 percent of patients undergoing revision rhinoplasty complain of airway obstruction.[108] Objective findings correlate highly with patient complaints of obstruction.[108]

Patient dissatisfaction with cosmetic appearance following primary rhinoplasty may be a result of iatrogenic deformity or poor patient selection and management of expectations. Iatrogenic deformities include asymmetry, deviation, and a constellation of other structural problems. Commonly recognized deformities of the nasal dorsum and middle vault include saddle nose, scooped out, and Polly beak deformities. Issues involving the lower third of the nose include pinched tip, underrotated and overrotated tip, alar retraction, and collapse of the external valves. The subdomal graft is used to prevent iatrogenic pinch deformity or dome misalignment.[109] (**See Video, Supplemental Digital Content 10**, which displays the subdomal graft, which is used to prevent iatrogenic pinch deformity or dome misalignment. This video is available in the "Related Videos" section of the full-text article on PRSJournal.com or at ***http://links.lww.com/PRS/C540***.) More specifically, the subdomal graft controls the interdomal distance and medial genu angle.

CONCLUSIONS

Rhinoplasty remains an iconic topic in plastic surgery. The sheer volume of current literature can be attributed to the enigmatic qualities of nasal aesthetic and the complexity and diversity of approaches put forth to achieve this ideal. Advances in computer-assisted facial analysis and intraoperative planning, autologous fat grafting, and injectable fillers will ensure that plastic surgeons will continue to have an ever-expanding array of knowledge and techniques with which to refine the form and function of the nose.

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PATIENT CONSENT

Authors provided signed statements confirming appropriate patient releases and written informed consent for patients granting use of their likeness.

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