

Reducing Complications in Rhinoplasty

Daniel G. Becker, MD, FACS^{a,b,*},
Samuel S. Becker, MD^b

^a*Division of Facial Plastic Surgery, Department of Otolaryngology,
University of Pennsylvania Medical Center, Philadelphia, PA*

^b*University of Virginia Medical Center, Charlottesville, VA*

The nose plays a functional role in nasal breathing and an esthetic role because it represents the most prominent and central facial feature. That the nose has enormous psychological, emotional, social, and symbolic importance is indisputable [1]. Studies suggest that most rhinoplasty patients benefit psychologically from the operation [1]. Although rhinoplasty can be a satisfying procedure for the patient and the surgeon, the literature reports an incidence of postoperative rhinoplasty complications ranging from 8% to 15%. The rhinoplasty surgeon must take great care to minimize the incidence of functional and cosmetic complications [2–10].

Ultimately, success in rhinoplasty is based on well-developed judgment, wisdom, and accumulated knowledge and experience. Similar to most surgeries, rhinoplasty is a science and an art. Skill comes from experience and wisdom, combined with a measure of talent. The surgeon must have a detailed understanding of the multiple anatomic variants encountered. The surgeon also must have accumulated the appropriate surgical techniques and experience. Specifically, the surgeon must acquire knowledge of the surgical alternatives, and how healing forces affect the result. This skill set is acquired by careful follow-up of operated patients over time.

There is no “standard” rhinoplasty. Each operation is unique in that it must be tailored to the specific anatomic components involved and the desires of the patient. By developing a consistent, meticulous routine in which the patient’s nose is analyzed with regard to its anatomic components and their complex interrelationships, the surgeon can best select the appropriate incisions, approaches, and techniques for the patient’s nose.

* Corresponding author. Becker Nose and Sinus Center, LLC 400 Medical Center Drive, Suite B, Sewell, NJ 08080.

E-mail address: drbecker@therhinoplastycenter.com (D.G. Becker).

The authors' philosophy of rhinoplasty focuses on achieving two essential goals. The first is to make the patient happy. Hand in hand is the second goal—for this to be their only cosmetic nasal surgery. With these goals in mind, this article presents the authors' personal philosophy and approach to reducing complications in rhinoplasty.

Cosmetic rhinoplasty patients: esthetic nasal examination

When the patient arrives at the office, he or she is greeted and are asked to fill out a detailed history form. The patient is taken to the photography room by a nurse assistant, who takes digital photographs and escorts the patient to the examination room. The nurse downloads the photographs into the network computer.

Next, the surgeon meets the patient. The surgeon asks what the patient does not like about his or her nose and what he or she would like the surgeon to fix. After the patient has explained his or her goals, the surgeon reviews any prior medical records. After a review of the medical history, the surgeon performs an examination.

Detailed anatomic analysis of the nose is an essential initial step in achieving a successful surgical outcome. The author's approach to rhinoplasty analysis in a primary rhinoplasty is well described [9]. Box 1 presents a partial list of specific considerations.

Rhinoplasty analysis

A thorough physical examination and accurate preoperative analysis are crucial to achieving the desired long-term postoperative rhinoplasty result. Some degree of mental organization assists in the execution of the physical examination. *Visual examination* and *finger palpation* are equally important in the nasal evaluation. Throughout the evaluation, a *mental image* of the potential outcome and surgical limitations inherent in every individual case should be visualized. In effect, the potential rhinoplasty operation is rehearsed even as the physical examination proceeds [9,11].

Study of the standard preoperative photographic images for rhinoplasty (frontal, base, lateral, oblique) allows a systematic, detailed anatomic analysis that complements the physical examination process. This section focuses on analysis of the four standard rhinoplasty photographic views (frontal, base, lateral, oblique). Emphasis is placed on anatomic descriptions of structures and their relationships to other structures.

Analysis begins by examining all four views and making an assessment of the overall stature of the patient, the facial skin quality, and the symmetry of the face. The quality of the skin—soft tissue envelope—its thickness, its quality, its integrity, and its mobility in relation to the underlying nasal structures—must be determined because it plays a crucial role in dictating the limitations of what can and cannot be accomplished with esthetic nasal surgery [9–12].

Box 1. Nasal analysis*General*

Skin quality: integrity, vascularity, mobility, skin thickness (thin, medium, or thick)

Identify primary concerns leading patient to seek rhinoplasty (eg, "big," "twisted," "large hump")

Frontal view

Twisted or straight: follow brow-tip esthetic lines

Width: narrow, wide, normal, "wide-narrow-wide"

Tip: deviated, bulbous, asymmetric, amorphous, other

Base view

Triangularity: good versus trapezoidal

Tip: deviated, wide, bulbous, bifid, asymmetric

Base: wide, narrow, or normal; inspect for caudal septal deflection

Columella: columellar-to-lobule ratio (normal is 2:1 ratio); status of medial crural footplates

Lateral view

Nasofrontal angle: shallow or deep

Nasal starting point: high or low

Dorsum: straight, concavity, or convexity—bony, bony-cartilaginous or cartilaginous (ie, is convexity primarily bony, cartilaginous, or both)

Nasal length: normal, short, long

Tip projection: normal, decreased, or increased

Alar-columellar relationship: normal or abnormal

Nasolabial angle: obtuse or acute

Oblique view

Does it add anything, or does it confirm the other views

There are many other points of analysis that can be made on each view, but these are some of the vital points of commentary.

After completing the general assessment, the most striking characteristics of the nose should be noted and highlighted. These are typically the characteristics that bring the patient for rhinoplasty, such as excessive size, deviation, or a dorsal hump. These primary patient concerns must be recognized, highlighted, and addressed above all else.

As the surgeon reviews each photographic image, the major esthetic and technical points are noted first. Next, subtleties in analysis are addressed. It is important to recognize the characteristics of greatest concern to the patient

and the more subtle findings. The patient may not notice these other subtle abnormalities if they are left unaddressed by the surgeon. Postoperatively, the scrutinizing patient may notice and point out these abnormalities. Stepwise, methodical analysis of the patient and the photographic views allows a well-trained surgeon to identify significant anatomic and esthetic points.

Frontal view

On frontal view, the observant surgeon first notes nasal width, any deviation from the midline, and characteristics of the nasal tip. Nasal width can be assessed in the upper, middle, and lower third of the nose. A saddle deformity of the bony or cartilaginous dorsum contributes to the appearance of an overwide dorsum on frontal view, whereas a hump gives the impression of a narrow dorsum. Similarly, a low bony dorsum creates an illusion of a relatively wide upper third of the nose and wide intercanthal distance or pseudohypertelorism [12]. This appearance can be improved significantly by augmenting the nasal dorsum. The width of the nasal base on frontal view should approximate the intercanthal distance.

The contour of the curved esthetic lines that follow the eyebrows, traverse the radix, and continue down along the lateral nasal dorsum to end at the tip-defining points (*brow-tip esthetic lines*) should be followed. Any asymmetries, twists, or deviations should be noted. These brow-tip esthetic lines should be smooth, unbroken, gently curved, and symmetric [9,11].

The nasal tip should be characterized on frontal view with regard to symmetry and definition. Concavity or other anatomic findings of the alar sidewall are noted. Vertical and horizontal aspects of bulbosity should be recognized when present. Bifidity of the nasal tip may be visible on this view (but is typically best appreciated on base view). The gentle “gull-in-flight” relationship of the nasal alae to the infratip lobule should be followed, and any asymmetry should be noted. Exaggeration of this curve suggests alar retraction or a dependent infratip lobule. If the columella is not visible (“hidden columella”) on frontal view, this also may indicate a retracted columella. The vertical position and symmetry of the alar insertions should be described on the frontal view.

Base view

On base view, special attention should be given to triangularity, symmetry, columella-to-lobule ratio, and width and insertion of the alar base. The nasal base should be configured as an isosceles triangle with a gently rounded apex at the nasal tip and subtle flaring of the alar sidewalls [13–15]. Poor triangularity or trapezoidal configuration with broad domal angles may suggest abnormal divergence of the intermediate crura. The presence of asymmetry of the tip may be appreciated best on this view. Often, one can visualize the outline of the lower lateral cartilages beneath the thin skin of the columella and alar rim, and asymmetries or buckling can be

noted. Overlong or short medial crura may be apparent; a wide columella and flaring of the medial crural footplate should be noted when present. One should look into the nasal vestibule to identify possible recurvature of the lateral aspect of the lower lateral cartilage (lateral crura), which occasionally contributes to nasal obstruction or correlates with an alar concavity seen on frontal view. This recurvature of the lateral crura can be accentuated with application of dome-binding sutures (eg, transdomal sutures) resulting in nasal airway obstruction. The caudal septum may be seen protruding into a nostril. Asymmetric nostrils or protruding medial crural footplates may be a clue of subtle caudal septal deviation or asymmetry. Asymmetric orientation of the nostril apices may indicate underlying abnormalities of the domal region of the lower lateral cartilages.

The width of the alar base should be noted, with normal width generally being within a vertical line dropped from the medial canthi. Variations in the appearance of width on the base view may be due to the variation in horizontal position of the alar insertions on the face or in the flare of the alar sidewalls. The alar sidewalls themselves are characterized with regard to thickness and flare. Alar base insertions are described by degree of recurvature, with straight insertions going directly into the face (ie, no nostril sill), and extremely recurved alae inserting directly into the columella [13–15].

Lateral view

The lateral view offers important information on tip projection; nasal length; dorsal profile or contour, including the tip-supratip relationship; and alar-columellar relationship. The nasal tip ideally should project strongly from the face and lead gracefully to the supratip dorsum, creating a modest supratip break. An identifiable, but not overly exaggerated, columellar double break typically marks the junction of the medial and intermediate crus. Nasal tip projection is assessed consistently using the method described by Goode [16,17]. If the length of a line drawn from the tip-defining point perpendicular to a tangent to the alar-facial junction is greater than 0.55 to 0.60 of the line drawn from the nasion to tip-defining point, the nose may be overprojected. When assessing tip projection, relationships between the nose and other esthetic facial features (eg, chin projection, forehead contour, ethnic background) must be considered.

Nasal length is complicated to define. The objective definition of nasal length is the vertical distance from the nasion to the tip-defining point, and this measurement is compared with the other horizontal thirds of the face and the overall stature of the patient to determine if the nose is of appropriate length. The factors contributing to the appearance of nasal length are significantly more complex, however. The nose can be considered to have three lengths, with nasion to tip being the central length and nasion to alar margin being the lateral lengths. A short or long lateral length may reflect a retracted or hooded ala, whereas a short or long central length

may reflect an obtuse or acute nasolabial (columellar-labial) angle. A deep nasofrontal angle contributes to the illusion of a short nose, and a shallow nasofrontal angle adds apparent length to the nose [18].

The nature of the columellar-labial confluence and columellar-lobular angle (double break) also must be assessed. Webbing or tenting of the columellar-labial confluence should be noted. An overly obtuse columellar-labial angle or an exaggerated double break makes the nose appear short, whereas the converse (acute columellar-labial angle or absent double break) adds apparent length. A posteriorly inclining lip or deficiency of the premaxilla may confound accurate measurement of the columellar-labial angle. Also, the relationship of the nose to other facial structures influences nasal length; a flat forehead gives the illusion of increased nasal length [18].

One should be familiar with the esthetic angles applied in facial analysis as general guidelines for standards of facial esthetics and facial harmony. The Powell and Humphries esthetic triangle (nasofacial, nasofrontal, nasomental, and mentocervical angles) and the nasolabial angle or confluence are a few of the more commonly cited measurements.

Assessment of the dorsal contour should identify any concavity, convexity, or irregularity. A high dorsum with a slight concavity at the rhinion generally is considered the esthetic ideal in the nose of a white woman. A high dorsum that is straight or with a small hump is ideal in a white man. Other notable components of the dorsum include the nasal starting point, which ideally is positioned at the level of the superior palpebral fold, and the tip-supratip relationship as previously mentioned.

The ala is analyzed in detail on the lateral view. Insertion of the ala on the face 2 to 3 mm above the columella in the horizontal plane as described by Crumley and Lanser [13] is judged to be normal. The contour of the alar rim in profile ideally approximates a “lazy S” shape—one should note if this is normal, exaggerated, or straight. The size of the alar lobule is classified as small, normal, or large. The alar-columellar relationship should be described precisely. The range of normal columellar show generally is considered to be 2 to 4 mm. The complexities of the alar-columellar relationship were categorized by Gunter et al [19], who identified abnormal positioning of the ala and the columella in relationship to a line drawn through the long axis of the nostril. All patients have a hanging, normal, or retracted ala and a hanging, normal, or retracted columella. The alar-columellar relationship comprises nine possible anatomic combinations.

On lateral view, the long axis of the nostril should rise at approximately 10° to 30° from a plane horizontal to the Frankfurt plane. This is a reliable determinant of the need for operative rotation of the nasal tip [12].

Oblique view

Although it offers the least amount of objective data, the oblique view is an important esthetic view because the nose is most often seen at oblique angles.

Several aspects of nasal contour are highlighted on this view and should be assessed. The brow-tip esthetic lines and the soft tissue facets are especially prominent and should be assessed carefully because irregularities may be highlighted on this view. Abnormalities of the lateral aspect of the nasal bones, nasal length, dorsal height, and tip projection also may be highlighted on the oblique view.

Functional nasal examination

Anterior rhinoscopy is undertaken and may identify abnormalities, such as deviated septum, inferior turbinate hypertrophy, synechiae or scar bands, septal perforation, and other abnormalities. Examination also includes nasal endoscopy when there is a complaint of nasal obstruction [20,21]. If indicated, a sinus CT scan also may be obtained.

Pownell et al [20] described diagnostic nasal endoscopy in the plastic surgical literature. They trace the historical development of nasal endoscopy, explain its rationale, review anatomic and diagnostic issues including the differential diagnosis of nasal obstruction, and describe the selection of equipment and correct application of technique, emphasizing the potential for advanced diagnostic potential.

Levine [21] reported that 39% of patients with a complaint of nasal obstruction had findings on endoscopic examination that were not identified with traditional rhinoscopy. Many of Levine's patients had seen other physicians for this problem and had not received appropriate treatment.

In patients seeking cosmetic nasal surgery who also had nasal obstruction, Becker et al [22,23] described how nasal endoscopy allowed the diagnosis of additional pathology not seen on anterior rhinoscopy, including obstructing adenoids, enlarged middle turbinates with concha bullosa, choanal stenosis, nasal polyps, and chronic sinusitis. In their series, additional surgical therapy was undertaken in 28 of 96 rhinoplasty patients as a result of findings on endoscopic examination. Thirteen patients had endoscopic sinus surgery. Nine patients had a concha bullosa requiring partial middle turbinectomy. Three patients—all revision surgeries—had persisting posterior septal deviation requiring endoscopic septoplasty. Two patients underwent adenoidectomy. One patient required repair of choanal stenosis. Static and dynamic nasal valve collapse occasionally is encountered in primary rhinoplasty patients [24]. In Becker et al's report [24], only 2 of 21 patients with nasal valve collapse reported no past history of rhinoplasty.

Discussion with patient

If, after careful examination, the patient's goals seem to be reasonable and realistic to this point, the surgeon tells the patient so. The surgeon explains technical details of the surgical plan to the patient. All rhinoplasty

surgeons have complications. The literature reports complication rates of 8% to 15% [2–9]. Complications can occur despite surgery that has been well performed technically. The risk of complications is explained forthrightly to the patient. It is explained that, should a complication occur, it is generally correctible to some degree. The patient is informed that occasionally no improvement is possible.

Computer imaging

As part of the office consultation, computer imaging can be done. In the senior author's practice, the office computer network provides for imaging in each examination room. The patient's photos are uploaded onto the computer screen in the examination room, and computer imaging is undertaken.

The senior author explains to the patient that computer imaging is just a "video game"—that it is a way to communicate a shared surgical goal. This is *not* an "after" picture, it is *not* a guarantee, and it should *not* be taken to offer the slightest implication of a guarantee. It is simply a way to communicate the shared surgical goal. The senior author does not provide the patient with printouts of the computer imaging. The senior author explains to the patient that the preoperative photo and shared surgical goal photo routinely are printed out and taped to the wall in the operating room during surgery so that the pictures can be referred to as surgery progresses.

Typically, the surgeon and patient are able to reach a shared surgical goal. If so, the surgeon should reiterate his or her impression that the goals are reasonable and realistic. Technical details are discussed further. The potential benefits and potential risks of surgery are reviewed. After the surgeon and patient have concluded their discussion, the patient should be introduced to the office manager to discuss logistical and financial details.

Patient education

In the senior author's experience, the rhinoplasty patient researches the subject exhaustively. Many rhinoplasty patients avail themselves of the tremendous amount of educational material on the Internet. They are interested in learning about the procedure in general and are interested in preoperative and postoperative photographic images by their potential surgeon.

The best patient is a well-informed patient. In an effort to provide detailed information to individuals researching this subject, the senior author created two websites, www.TheRhinoplastyCenter.com and www.RevisionRhinoplasty.com. In addition to the requisite logistical information, considerable effort has been placed in providing a detailed educational tutorial at these websites. Consequently, the senior author has found that the patients he sees in the office already know "what is wrong" with their nose and already are reasonably well versed in the author's approach and philosophy.

Technical overview of potential complications

The nationally reported revision rate for primary rhinoplasty ranges from 8% to 15% [2–9]. Sadly, there will likely never be a shortage of patients requiring revision rhinoplasty. Experienced surgeons consistently achieve a high level of satisfaction among their patients. Still, complications can occur despite technically well-performed surgery. All surgeons have complications (Box 2).

Having the opportunity in practice to examine numerous revision rhinoplasty patients from across the United States and around the world, the senior author has observed a wide range of problems. The senior author has selected problems encountered in revision practice that warrant highlighting because they are problems encountered frequently or because they illustrate specific surgical techniques that may be particularly useful in the surgeon's armamentarium.

Specific problems to avoid

Overresection of lateral crus

Overresection of the lateral crus is perhaps the most common problem seen in a revision rhinoplasty practice [6,10,24–27]. Overresection of the lateral crus leads to the predictable changes of alar retraction, pinching, bossae, and tip asymmetry (Fig. 1). Excision of vestibular mucosa in primary rhinoplasty also may contribute to scar contracture with alar retraction. A conservative approach to cephalic resection is warranted in rhinoplasty.

In many revision cases, the amount of lateral crus that remained seemed ample; that is, it fell within the “guideline” of 6 to 9 mm that typically is cited. In these cases, the scar contracture secondary to healing apparently overpowered the remnant cartilage. If the tip cartilages are soft and weak, and if the scar contracture is profound, undesirable changes can occur.

In some cases, this situation can be anticipated. An anatomic study of the alar base recognized that in a normal patient population, 20% of patients had a thin alar rim. This anatomic variation must be recognized, and cephalic resection probably should be avoided or minimized in these patients to minimize the risk of alar retraction or external nasal valve collapse [25]. These changes are not always predictable, however, and are not always avoidable.

Understanding that the healing forces are not completely predictable, it is important to take a conservative approach when undertaking cephalic resection. Risk cannot be eliminated, but can be reduced in this manner.

Alar batten grafts are the first-line treatment of alar retraction and nasal valve collapse (Fig. 2) [10,24,26]. Batten grafts have been well described in the literature. Alar retraction may be treated by cartilage batten grafts in less severe cases (1–2 mm) [9].

Auricular composite grafts commonly are used in more severe cases (Fig. 3) [27]. The skin and cartilage of the anterolateral surface, just inferior

Box 2. Complications of rhinoplasty*Bossae*

Bossae are caused by a knuckling of lower lateral cartilage at the nasal tip owing to contractural healing forces acting on weakened cartilages. Patients with thin skin, strong cartilages, and nasal tip bifidity are especially at risk. Excessive resection of lateral crus and failure to eliminate excessive interdomal width may play some role in bossae formation.

Pollybeak

Pollybeak refers to postoperative fullness of the supratip, with an abnormal tip-supratip relationship. It has several etiologies, including failure to maintain adequate tip support (postoperative loss of tip projection), inadequate cartilaginous hump (anterior septal angle) removal, or supratip dead space/scar formation.

Treatment depends on anatomic cause. If the cartilaginous hump was underresected, one should resect additional dorsal septum. Also, one must ensure adequate tip support. Maneuvers such as placement of a columellar strut may be beneficial. If the bony hump was overresected, one should consider a graft to augment the bony dorsum. If a pollybeak is from excessive scar formation, triamcinolone (Kenalog) injection or skin taping should be considered in the early postoperative period, before any consideration of surgical revision.

Inverted V deformity

Inadequate support of the upper lateral cartilages after dorsal hump removal can lead to inferomedial collapse of the upper lateral cartilages and an inverted V deformity. In this deformity, the caudal edge of the nasal bones is visible in broad relief, frequently owing to inadequate infracture of the nasal bones. When executing hump excision, it is helpful to preserve the underlying nasal mucoperichondrium (extramucosal dissection), which provides significant support to the upper lateral cartilages and helps decrease the risk of inferomedial collapse of the upper lateral cartilages after hump excision. When undertaking osteotomies after hump excision, appropriate infracture and narrowing of the bony vault must be achieved.

Rocker deformity

If osteotomies are taken too high, into the thick frontal bone, the superior aspect of the osteotomized nasal bone may project or “rock” laterally when the bone is fractured. This is a rocker deformity. A 2-mm osteotome may be employed percutaneously to create a more appropriate superior fracture line and correct the rocker deformity.

Dorsal irregularities

After creation of an “open roof” by hump removal, the bony margins should be smoothed with a rasp. Any bony fragments should be removed, ensuring that all obvious particles are removed from under the skin–soft tissue envelope. Failure to remove all fragments may lead to a visible or palpable dorsal irregularity.

Nasal valve collapse

The surgeon should recognize the existence of the internal and external nasal valve. The internal nasal valve is bounded by the caudal margin of the upper lateral cartilage, septum, and floor of the nose. The external nasal valve refers to the area delineated by the cutaneous and skeletal support of the mobile alar wall. Excessive narrowness in either of these locations may cause nasal obstruction. Weakness at either of these locations may result in collapse with the negative pressure of inspiration, resulting in nasal airway obstruction. Nasal valve collapse is seen most often as a sequela of overresection of lateral crura or middle vault collapse. Overaggressive resection of the lateral crura and the subsequent postoperative soft tissue contraction frequently lead to nasal valve compromise.

to the inferior crus, of the opposite ear (eg, left ala, right ear) provides the best donor site and the best contour. An incision several millimeters from the nostril rim is followed by careful dissection with freeing of adhesions, creating a defect and displacing the alar rim inferiorly. Volume and support must be restored to hold the nostril rim in position—this role is fulfilled by the composite graft. The fashioned composite graft is sutured carefully into place [27]. Typically, the senior author uses 5-0 chromic suture. A cotton ball or other light dressing is applied intranasally to apply light pressure for 1 to 3 days.

Minimizing nasal dorsum complications

Sharp osteotomes are essential to provide for a clean, precise bony hump excision. When the osteotome is dull, the chance of an asymmetric resection or overresection of the bony hump increases. Some surgeons have at least

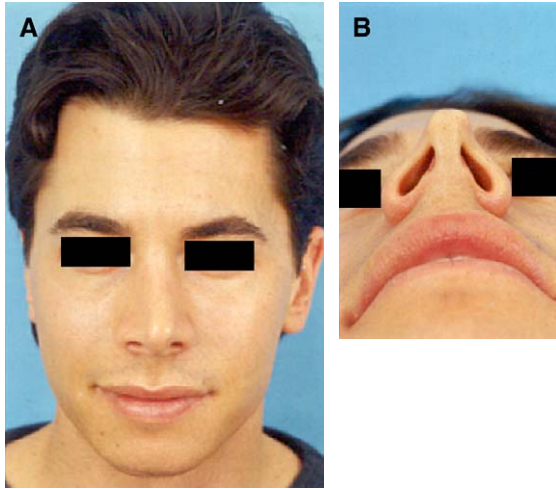


Fig. 1. Overresection of the nasal tip cartilages in this patient resulted in predictable, unfavorable changes. (Copyright © Daniel Becker, MD)

two sets of osteotomes and rotate them—one set is always out, being sharpened. Other surgeons sharpen their osteotomes manually, with a sharpening stone, during each case. Both approaches are effective.

An anatomic approach is preferable. Detailed anatomic nasal analysis should guide surgery. When undertaking a hump reduction, the surgeon

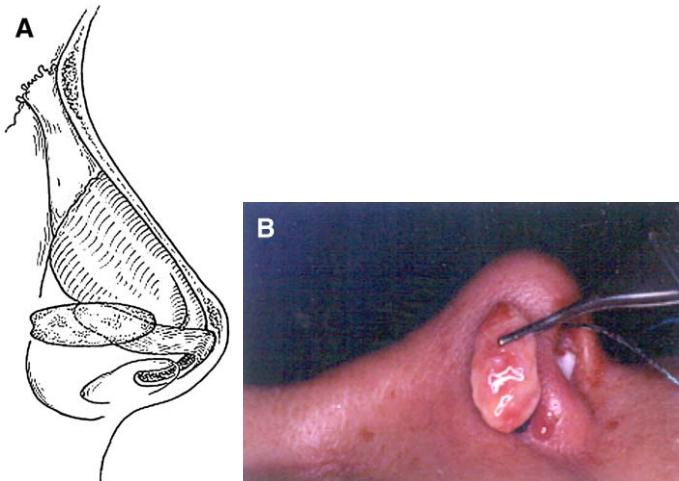


Fig. 2. Alar batten grafts may be placed via an external rhinoplasty approach or into a precise pocket made through an endonasal incision as shown here. This graft is nonanatomic and typically is placed caudal to the lateral crura, where there is maximal collapse of the lateral nasal wall and supra-alar pinching. For maximal support, the alar batten graft should extend over the bone of the piriform aperture. (Copyright © Daniel Becker, MD)



Fig. 3. Composite grafts are useful in the treatment of severe alar retraction. (Copyright © Daniel Becker, MD)

should examine the excised tissue, assessing its symmetry, and whether it was the desired excision. If the bony dorsum is rasped, this would not be possible (Fig. 4). Similar anatomic examination of the remaining cartilaginous and bony nasal dorsum also must be undertaken. It is expected that additional, calibrated refinement would be needed and should be undertaken with dogmatic adherence to the anatomic examination. Preoperative markings on the skin may be helpful to some surgeons for hump reduction and for osteotomies. Persistent irregularities of the bony dorsum may be

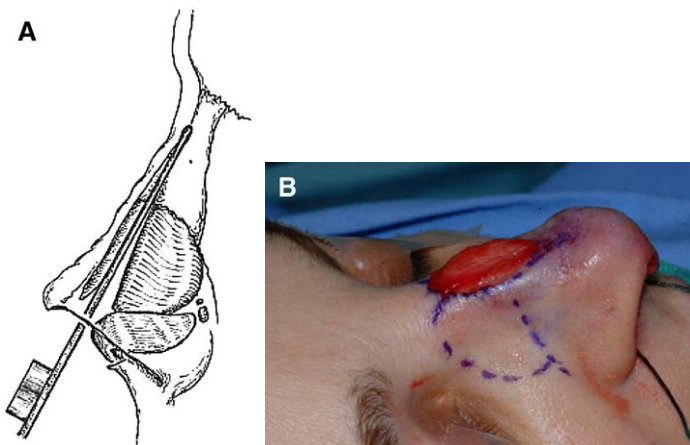


Fig. 4. En bloc resection of the nasal hump allows careful anatomic examination as the surgeon assesses the need for additional, calibrated refinements of the nasal dorsum. (Copyright © Daniel Becker, MD)

addressed by rasping. The powered rasp is preferable to manual rasping in this situation (Fig. 5) [28,29].

Pollybeak

Pollybeak refers to a specific problem of the nasal dorsum—postoperative fullness of the supratip region, with an abnormal tip-supratip relationship. This problem may have several causes, including failure to maintain adequate tip support (postoperative loss of tip projection), inadequate cartilaginous hump (anterior septal angle) removal, or supratip dead space or scar formation. Treatment of the pollybeak deformity depends on the anatomic cause [30]. The best treatment is avoidance. If the cartilaginous hump was underresected at the anterior septal angle, however, the revision surgeon should resect additional dorsal septum. Adequate tip support must be ensured; maneuvers such as placement of a columellar strut may be beneficial. If the bony hump was overresected, a graft to augment the bony dorsum may be beneficial. If a pollybeak is from excessive scar formation, triamcinolone (Kenalog) injection or skin taping in the early postoperative period should be undertaken before any consideration of surgical revision.

Overresection and saddle nose

Saddle nose refers to the appearance of the nose after loss of support of the nasal vault with subsequent collapse (Fig. 6). This deformity has been described after overresection of the septum, with failure to preserve an adequate L-strut. A minimum of 15 mm of cartilage is recommended as a rule of thumb—if a dorsal hump resection also is planned, this must be accounted for in planning adequate L-strut for nasal support. Other causes of saddle nose deformity include septal hematoma, septal abscess, and severe nasal trauma. Excessive dorsal hump resection also leads to saddle-nose deformity.

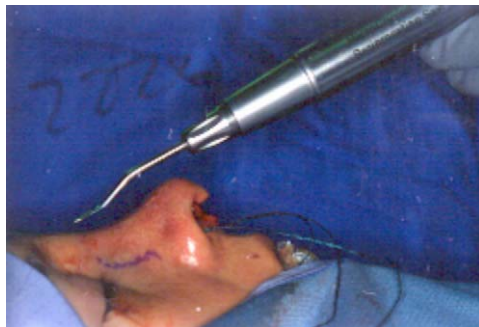


Fig. 5. The powered rasp (Linvatec-Hall Surgical, Largo, FL) oscillates at speeds of 15,000 rpm with minimal back-and-forth excursion of only several millimeters. The senior author finds the powered rasp more precise and preferable to manual rasping. (Copyright © Daniel Becker, MD)

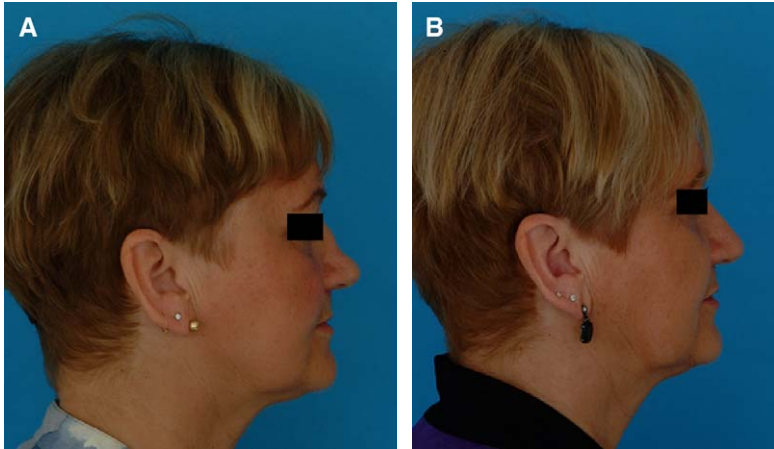


Fig. 6. Precise pocket, triple-layer cartilage onlay grafting effectively treated this patient's saddle-nose deformity. (Copyright © Daniel Becker, MD)

Onlay grafting can camouflage and correct mild and moderate saddle deformities effectively (Fig. 6). Single or multiple layers of septal cartilage or auricular cartilage commonly are used effectively [31,32]. Severe saddle-nose deformity may require major reconstruction with cantilevered cartilage or bone grafts [33,34].

Alloplasts

The senior author's experience with alloplasts has been to remove them. The author has removed alloplasts because they cause pain, because they caused an unacceptable cosmetic result, because they became infected, and because of extrusion into the nose and through the skin. There is disagreement among rhinoplasty surgeons regarding the use of alloplasts. The nose fulfills few of the requirements for use of alloplastic materials. If the alloplast extrudes through the skin, the skin-soft tissue envelope is permanently and irreparably damaged. The senior author discourages the use of alloplasts in primary and revision rhinoplasty.

Inverted V-middle vault collapse

In inverted V-middle vault collapse deformity, the caudal edge of the nasal bones are visible in broad relief. Inadequate support of the upper lateral cartilages after dorsal hump removal can lead to inferomedial collapse of the upper lateral cartilages and an inverted V deformity [35]. Inadequate infracture of the nasal bones is another significant cause of inverted V deformity. The anatomic cause of inverted V deformity must be recognized. Osteotomies with infracture of the nasal bones, spreader grafts, or both should be performed when appropriate.

Twisted nose—newly or persistently twisted

Persisting deviation after rhinoplasty may occur at the upper third, middle third, or tip of the nose or may occur postoperatively in a previously straight nose. Preoperative anatomic diagnosis is a crucial component of successful treatment. Persisting deviation of the nasal bones may occur because of greenstick fractures or other problems with osteotomies [36,37]. Inherent deviations in the cartilage of the middle nasal vault may prove especially challenging [37]. Also, hump removal may uncover asymmetries that result in postoperative deviation where none existed previously. Tip asymmetry may be overlooked preoperatively, or it may be due to asymmetric excision of lateral crura, asymmetric placement of a columellar strut, placement of an overlong columellar strut, or other causes. Numerous surgical maneuvers are available to address the deviated nose [36,37].

Skin—soft tissue envelope

In the unoperated nose, the skin—soft tissue envelope has well-defined tissue planes in which avascular dissection may be undertaken. Vascular supply and lymphatics are found superficial to the nasal musculature [38,39]. Dissection in the proper tissue planes (areolar tissue plane, ie, submusculoaponeurotic) preserves nasal blood supply and minimizes postoperative edema. Operating in the more superficial planes not only leads to a bloody surgical field, but also risks damage to the vascular supply with potential damage to the skin. When the skin—soft tissue envelope is damaged, it can never be restored fully. The damaged skin creates an esthetically displeasing appearance [38,39].

Summary

The dedicated rhinoplasty surgeon continues to acquire throughout his or her career an increasingly detailed understanding of the anatomy and the problems that occur related to rhinoplasty and a growing armamentarium of techniques to achieve improvement or correction. This article outlines the authors' approach and discusses selected technical problems and approaches to reducing their occurrence. Focusing on the two essential goals—making the patient happy and making this the patient's only nasal surgery—primary rhinoplasty can be a uniquely rewarding experience for the patient and the surgeon.

References

- [1] Goin JM, Goin MK. Changing the body—psychological effects of plastic surgery. Baltimore: Williams & Wilkins; 1981.
- [2] Kamer FM, Pieper PG. Revision rhinoplasty. In: Bailey B, editor. Head and neck surgery otolaryngology. Philadelphia: Lippincott; 1998. p. 2291–302.

- [3] Rees TD. Postoperative considerations and complications. In: Rees TD, editor. *Aesthetic plastic surgery*. Philadelphia: Saunders; 1980.
- [4] McKinney P, Cook JQ. A critical evaluation of 200 rhinoplasties. *Ann Plast Surg* 1981; 7:357.
- [5] Thomas JR, Tardy ME. Complications of rhinoplasty. *Ear Nose Throat J* 1986;65:19–34.
- [6] Tardy ME, Cheng EY, Jernstrom V. Misadventures in nasal tip surgery. *Otolaryngol Clin North Am* 1987;20:797–823.
- [7] Simons RL, Gallo JF. Rhinoplasty complications. *Facial Plast Surg Clin N Am* 1994;2: 521–9.
- [8] Becker DG. Complications in rhinoplasty. In: Papel I, editor. *Facial plastic and reconstructive surgery*. 2nd edition. New York: Theime; 2002.
- [9] Tardy ME. *Rhinoplasty: the art and the science*. Philadelphia: Saunders; 1997.
- [10] Toriumi DM, Becker DG. *Rhinoplasty dissection manual*. Philadelphia: Lippincott Williams & Wilkins; 1999.
- [11] Tardy ME, Brown R. *Surgical anatomy of the nose*. New York: Raven Press; 1990.
- [12] Johnson CM, Toriumi DM. *Open structure rhinoplasty*. Philadelphia: Saunders; 1990.
- [13] Crumley RL, Lanser M. Quantitative analysis of nasal tip projection. *Laryngoscope* 1998; 98:202–8.
- [14] Tardy ME, Patt BS, Walter MA. Alar reduction and sculpture: anatomic concepts. *Facial Plast Surg* 1993;9:295–305.
- [15] Becker DG, Weinberger MS, Greene BA, Tardy ME. Clinical study of alar anatomy and surgery of the alar base. *Arch Otolaryngol Head Neck Surg* 123:789–95.
- [16] Tardy ME, Walter MA, Patt BS. The overprojecting nose: anatomic component analysis and repair. *Facial Plast Surg* 1993;9:306–16.
- [17] Ridley MB. Aesthetic facial proportions. In: Papel I, Nachlas N, editors. *Facial plastic and reconstructive surgery*. Philadelphia: Mosby-Year Book; 1992. p. 99–109.
- [18] Tardy ME, Becker DG, Weinberger MS. Illusions in rhinoplasty. *Facial Plast Surg* 1995;11: 117–38.
- [19] Gunter JP, Rohrich RJ, Friedman RM. Classification and correction of alar-columellar discrepancies in rhinoplasty. *Plast Reconstr Surg* 1996;97:643–8.
- [20] Pownell PH, Minoli JJ, Rohrich RJ. Diagnostic nasal endoscopy. *Plast Reconstr Surg* 1997; 99:1451–8.
- [21] Levine HL. The office diagnosis of nasal and sinus disorders using rigid nasal endoscopy. *Otolaryngol Head Neck Surg* 1990;102:370.
- [22] Becker DG. Septoplasty and turbinate surgery. *Aesthetic Surg J* 2003;23:393–403.
- [23] Lanfranchi PV, Steiger J, Sparano A, et al. Diagnostic and surgical endoscopy in functional septorhinoplasty. *Facial Plast Surg* 2004;20:207–15.
- [24] Becker DG, Becker SS. Alar batten grafts for treatment of nasal valve collapse. *Journal of the Long-Term Effects of Surgical Implants* 2003;13:259–69.
- [25] Becker DG, Weinberger MS, Greene BA, Tardy ME. Clinical study of alar anatomy and surgery of the alar base. *Arch Otolaryngol Head Neck Surg* 1999;123:789–95.
- [26] Toriumi DM, Josen J, Weinberger MS, Tardy ME. Use of alar batten grafts for correction of nasal valve collapse. *Arch Otol Head Neck Surg* 1997;123:802–8.
- [27] Tardy ME, Toriumi DM. Alar retraction: composite graft correction. *Facial Plast Surg* 1989;6:101–7.
- [28] Becker DG, Park SS, Toriumi DM. Powered instrumentation for rhinoplasty and septoplasty. *Otolaryngol Clin North Am* 1999;32:683–93.
- [29] Becker DG, Toriumi DM, Gross CW, Tardy ME. Powered instrumentation for dorsal nasal reduction. *Facial Plast Surg* 1997;13:291–7.
- [30] Tardy ME, Kron TK, Younger RY, Key M. The cartilaginous pollybeak: etiology, prevention, and treatment. *Facial Plast Surg* 1989;6:113–20.
- [31] Tardy ME, Schwartz M, Parras G. Saddle nose deformity: autogenous graft repair. *Facial Plast Surg* 1989;6:121–34.

- [32] Gunter JP, Rohrich RJ. Augmentation rhinoplasty: dorsal onlay grafting using shaped autogenous septal cartilage. *Plast Reconstr Surg* 1990;86:39–45.
- [33] Daniel RK. Rhinoplasty and rib grafts: evolving a flexible operative technique. *Plast Reconstr Surg* 1992;94:597–611.
- [34] Murakami CS, Cook TA, Guida RA. Nasal reconstruction with articulated irradiated rib cartilage. *Arch Otolaryngol Head Neck Surg* 1991;117:327–30.
- [35] Toriumi DM. Management of the middle nasal vault. *Oper Tech Plast Reconst Surg* 1995;2: 16–30.
- [36] Larrabee WF Jr. Open rhinoplasty and the upper third of the nose. *Facial Plast Surg Clin N Am* 1993;1:23–38.
- [37] Toriumi DM, Ries WR. Innovative surgical management of the crooked nose. *Facial Plast Surg Clin N Am* 1993;1:63–78.
- [38] Rettinger G, Zenkel M. Skin and soft tissue complications. *Facial Plast Surg* 1997;13:51–9.
- [39] Toriumi DM, Mueller RA, Grosch T, et al. Vascular anatomy of the nose and the external rhinoplasty approach. *Arch Otol Head Neck Surg* 1996;122:24–34.