New Concepts in Nasal Tip Contouring

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Control of nasal tip contour has always been a key component of a successful rhinoplasty. Typically, this procedure is performed with an emphasis on narrowing the nasal tip structure. Creating a natural-appearing nasal tip contour is a complex task and requires a 3-dimensional approach. In an effort to identify the characteristics that make an ideal nasal tip, I evaluated numerous aesthetically pleasing nasal tips. After extensive study, I created a series of images to demonstrate how specific contours create highlights and shadows that will help guide the surgeon in creating a natural-appearing nasal tip contour. Many commonly used nasal tip techniques can pinch the tip structures if an overemphasis is placed on narrowing. These changes isolate the dome region of the nasal tip and can create an undesirable shadow between the tip lobule and alar lobule. Prior to contouring the nasal tip, the surgeon must stabilize the base of the nose with a columellar strut, suturing the medial crura to a long caudal septum, caudal extension graft, or an extended columellar strut graft. Stabilizing the nasal base will ensure that tip projection is maintained postoperatively. To contour the nasal tip, dome sutures are frequently used to flatten the lateral crura and eliminate tip bulbosity. Placement of dome sutures can deform the lateral crura and displace the caudal margin of the lateral crura well below the cephalic margin. This can result in a pinched nasal tip with the characteristic demarcation between the tip and the alar lobule. Alar rim grafts can be used to support the alar margin and create a defined ridge that extends from the tip lobule to the alar lobule. This form of restructuring can create a natural-appearing nasal tip contour with a horizontal tip orientation continuing out to the alar lobule. When dome sutures alone are inadequate, lateral crural strut grafts are used to eliminate convexity and prevent deformity of the lateral crura. Shield tip grafts can be used in patients with thick skin and an underprojected nasal tip. Whenever a shield tip graft is used, it must be appropriately camouflaged to avoid undesirable visualization of the graft as the postoperative edema subsides. When contouring the nasal tip, the surgeon should focus more on creating favorable shadows and highlights and less on narrowing. Nasal tips contoured in this manner will look more natural and will better withstand the forces of scar contracture that can negatively affect rhinoplasty outcomes.

Arch Facial Plast Surg. 2006;8:156-185

Control of nasal tip contour has always been a key component of a successful rhinoplasty. In a typical rhinoplasty operation, an effort is often made to make the nasal tip narrower and more defined. Many nasal tip techniques involve modification of the nasal tip cartilages by suturing cartilages, dividing cartilages, or a combination of both. With such techniques, some patients develop excessive narrow-
ing of the nasal tip, resulting in pinching and deformity. After many years of healing and scar contracture, such narrowing can become accentuated, resulting in an unnatural, pinched nasal tip that disrupts the balance between the upper, middle, and lower thirds of the nose. Loss of this balance creates a nasal contour that draws attention to the nose rather than the eyes. Ideally, the nose should be balanced with curvilinear contours drawing attention away from the nose and toward the eyes and other facial features. The nose should be natural in appearance with good symmetry and appropriate length and rotation. Despite the fact that many patients ask for a smaller, narrower nasal tip, this is not necessarily what the patient needs or actually desires.

When performing rhinoplasty, the surgeon’s primary objectives tend to include creating a pleasant-
appearing profile and narrowing the nose on the frontal view. Altering the lateral view is a 2-dimensional task primarily focused on setting the dorsal profile and outline of the nasal tip as it meets the upper lip. Managing the frontal view is much more complex because it is a 3-dimensional task that involves controlling how light strikes the dorsum and nasal tip to create contour through highlights and shadows. This 3-dimensional concept of tip contouring is much more complex than the 2-dimensional concept of profile alignment and is why many rhinoplasty patients have an acceptable profile but look unnatural or deformed on the frontal view. Patients who have undergone rhinoplasty will frequently present with a pinched or asymmetric middle nasal vault, supra-alar pinching of the nasal sidewall, or an unnaturally pointed or asymmetric nasal tip. Small concavities or asymmetries in the tip create unbalanced shadows that can mar an otherwise good rhinoplasty outcome.

The effect of shadowing leaves little room for error on the frontal view. Altering the lateral view is a 2-dimensional task primarily focused on setting the dorsal profile and outline of the nasal tip as it meets the upper lip. Managing the frontal view is much more complex because it is a 3-dimensional task that involves controlling how light strikes the dorsum and nasal tip to create contour through highlights and shadows. This 3-dimensional concept of tip contouring is much more complex than the 2-dimensional concept of profile alignment and is why many rhinoplasty patients have an acceptable profile but look unnatural or deformed on the frontal view. Patients who have undergone rhinoplasty will frequently present with a pinched or asymmetric middle nasal vault, supra-alar pinching of the nasal sidewall, or an unnaturally pointed or asymmetric nasal tip. Small concavities or asymmetries in the tip create unbalanced shadows that can mar an otherwise good rhinoplasty outcome.

The effect of shadowing leaves little room for error on the frontal view, whereas the lateral view is much more forgiving. This is because the line of the dorsum and tip can vary 2 to 3 mm from the ideal and still look acceptable on lateral view. To complicate matters, as the nose heals the profile will tend to stabilize while the frontal view can change dramatically creating asymmetries, pinching, or unbalanced contours. One must remember that the frontal view is what the patient sees when gazing into a mirror. No matter how good the profile looks, if the frontal view is unbalanced or irregular, the patient is likely to be dissatisfied. Unfortunately, achieving the desired frontal view of the nose is exponentially more complex and less forgiving than alignment of the profile. With this in mind, this article will focus on contouring the frontal appearance of the nasal tip.

ANALYZING NASAL CONTOURS

Ideally, the nose should have a subtle hourglass appearance on frontal view with 2 divergent concave lines (Figure 1). These gently curving lines extend from the infraorbital rim to the nasofrontal angle and then into a slightly narrower middle nasal vault. Tardy referred to this as the brow-tip aesthetic line. The transition from the middle nasal vault to the nasal tip should show a slight divergence at the nasal tip as it approaches the alar margins. Excessive fullness in the supratip region will create a bulbous appearance to the tip, which creates unfavorable shadowing. Such fullness may be due to lateral crura that have excessive vertical height or are cephalically positioned. Ideally, fullness in the supratip region should be eliminated to create a supratip shadow and resultant attractive nasal tip.

Many patients who have undergone rhinoplasty complain that their nasal tip looks like a ball and is poorly
Figure 5. On the oblique view, a favorable tip contour should demonstrate a subtle supratip break shadow that continues into the supra-alar groove. These shadows represent narrowing as the tip transitions into the supratip and middle nasal vault. The soft tissue triangles or facets should be subtle, casting only an attenuated shadow.

Figure 6. The base view shows a triangular shape with no notching between the tip lobule and the alar lobule. Note the horizontal component of the nasal tip with a defined width set by the position of the domes.

Figure 7. On the lateral view, the tip projects above the dorsum with a supratip break. Most surgically untreated noses have a slightly more cephalic supratip break, preserving a rounder nasal tip. The double break is soft with a subtle shadow at the soft tissue triangle. A more refined tip is created by lowering the position of the supratip break.

Figure 8. The normal divergence of the intermediate crura creates the columnar-lobular angle or double break. For clarity of illustration, the columnar lobular angle and divergence between the intermediate crura have been exaggerated. The distance between the domes and divergence of the intermediate crura can be decreased to create favorable tip contour. One should avoid suturing the intermediate crura together to avoid blunting the columnar-lobular angle.
Figure 9. To maximize support of the alar margin, the caudal margin of the lateral crura should lie near the same level as the cephalic margin of the lateral crura. A, This patient had cephalic positioning of the lateral crura. The lateral crura were dissected from the vestibular skin, and a lateral crural strut graft was sutured to the undersurface of the lateral crura. The lateral crura were then repositioned into caudally positioned pockets. Note how the caudal margin of the lateral crura lie near the same level as the cephalic margin of the lateral crura. B, Postoperative frontal view of this patient shows a natural-appearing nasal tip with normal contours. The width of the nose fits with the round shape of her face. C, This close-up postoperative frontal view of the same patient shows how the alar margins are well supported with a good transition from tip to alar lobule. There is shadowing in the supratip that transitions into the supra-alar groove. The horizontal orientation of the tip is represented by the 2 light reflexes over the dome structures and is highlighted by the 2 light sources directed at 45° off of midline.
Figure 10. To provide good support to the alar margin, it is preferable to have the caudal margin of the lateral crura lie close to the same level as the cephalic margin of the lateral crura. The inset shows a cross section of this favorable orientation illustrating how the caudal margin of the lateral crura lies near the same level as the cephalic margin.

Figure 11. In this patient, the dome suturing method created an abnormal relationship between the caudal and cephalic margins of the lateral crura. A. Intraoperative view of the cartilages reveals that the caudal margin of the lateral crus is well below the cephalic margin of the lateral crus. B. From the frontal view, one can see the dome sutures that are pinching the domes. This view demonstrates the extent of descent of the caudal margin of the lateral crura below the cephalic margin. C. The frontal view of this patient demonstrates the isolation of the tip lobule and pinched appearance to the nasal tip. There is an obvious demarcation of the nasal tip and visible shadows between the tip and alar lobule. The descent of the caudal margin of the lateral crura resulted in loss of support of the alar margin. Additionally, the pinched cartilage structure is too small for this patient’s skin envelope, leaving the amorphous tip contour.
Figure 12. When the caudal margin of the lateral crura is displaced below the cephalic margin, the alar lobule may lose support, giving the tip a pinched appearance. The inset shows a cross section through the lateral crus, illustrating the unfavorable angulation of the cartilage with the caudal margin well below the cephalic margin. This is particularly problematic when the caudal margin was close to the level of the cephalic margin preoperatively. This change creates a smaller tip structure to support the same sized skin envelope.

Figure 13. The length and strength of the medial crura provides insight into the stability of the nasal base and the likelihood of losing projection postoperatively. A, Patient with long, strong medial crura that extend to the nasal spine. B, Patient with short medial crura and footplates that do not reach the nasal spine and sit along the caudal margin of the septum. The patient with the long medial crura will be less likely to lose projection postoperatively.
defined. In fact, these patients may refer to their nasal tip as “bulbous” even though it is too narrow. Many of these surgically created small nasal tips demonstrate collapse of the alar margin and have a characteristic demarcation between the tip and alar lobule (Figure 2A). On the base view, the alar margins begin to collapse medially, creating a pinched appearance (Figure 2B). With this concavity along the alar margin, the tip lobule becomes isolated, creating a round contour that is similar to a constricted ball. Preventing this pinched look requires preservation of a smooth uninterrupted transition between the nasal tip and alar lobule. These deformities occur when support of the alar margin is adjusted medially by narrowing the dome angle or deforming the lateral crus. The dome angle is the angle created at the domes between the medial crura and lateral crus (Figure 3). Typical tip narrowing techniques act to narrow the dome angle and medialize the lateral crus, which supports the alar margin. In vertical dome division, the tip is narrowed by movement of the lateral crus medial and inferiorly to the domes. Dome sutures can create a similar effect of pinching the domes and pulling the lateral crus medially with the cinching of the suture. A narrow shield-type tip graft can create a pinched appearance to the nasal tip as well, if it is isolated above the lateral crus without appropriate camouflage.

In many patients, the pinching effect does not appear until years after the surgery as a result of the scar contraction process that shrinks the skin envelope over the modified tip structure. Unfortunately, many patients seeking secondary rhinoplasty present with these iatrogenic deformities. In an effort to prevent these unnatural-appearing contour irregularities, this article presents a new concept in nasal tip design that will permit the surgeon to create a natural-looking nose that will age well over the patient’s lifetime.

**IDEAL NASAL TIP CONTOUR**

In an effort to identify the characteristics that make an ideal nasal tip, I studied numerous aesthetically pleasing nasal tips. This included the noses of fashion models, which are often a good reference for natural-looking, attractive nasal tips because their noses tend to appear unoperated, balanced, and symmetric. Even broad tips that possess favorable shadowing can look very good. When addressing the nasal tip, the surgeon should preserve the favorable contours of the lower lateral cartilages and modify those that are unfavorable. To do this reliably, it is important to understand the correlation between the external nasal contour and shape of the underlying tip structures.

By understanding the relationship between the external tip shape and the underlying structure, the surgeon can simplify nasal tip surgery to reorienting existing tip structures and adding cartilage based on the location of the desired high points and low points and their corresponding highlights and shadows, respectively. This approach requires very little excision and instead emphasizes cartilage rearrangement and augmentation to create a sound tip structure that will better tolerate the forces of scar contracture over time. Unfortunately, there are no formulas, specific angles, or precise anatomic proportions that describe this approach. The ability to correlate external nasal contour with the underlying anatomic structure is one of the most important skills necessary to attain consistent results in rhinoplasty. This skill permits the surgeon to set the end point of a naturally-appearing 3-dimensional nasal tip contour and formulate a plan to attain that goal.

Sheen and Sheen described the ideal tip shape as 2 equilateral geodesic triangles with a common base formed by a line connecting both domes. They noted that the highest projecting point of the tip should lie along the apogee of the curved line that connects both domes. They defined the intercrural distance as the distance between the domes, which also represents the common base of the 2 geodesic triangles. Daniel1 noted an angle of dome definition at the domal junction line with the most aesthetically pleasing tips having a convex domal segment and a concave lateral crus. Many of the commonly described tip-refining techniques act to convert a convex

![Figure 14](image-url)
Figure 15. This patient has an overly long caudal septum, hanging columella, and a prominent tip lobule. She underwent dissection between her medial crura with elevation of bilateral mucoperichondrial flaps. The medial crura were sutured to the overly long midline caudal septum to elevate her tip lobule and correct the hanging columella. She also underwent placement of lateral crural strut grafts and dome sutures to correct the bulbous tip. Panels A, C, E, and G show preoperative views; panels B, D, F, and H, 2-year postoperative views.
The caudal extension graft typically overlaps the existing caudal septum and is sutured with at least three 5-0 clear nylon sutures. This graft is rectangular in shape to provide support with little change in rotation or nasal length. The caudal margin of this graft must be in the midline; otherwise, the tip may deviate or the airway may be obstructed. A 4-0 plain catgut suture and 5-0 clear nylon suture are used to fix the medial crura to the caudal extension graft.

A. The caudal extension graft is overlapping the existing caudal septum. Care is taken to make sure the caudal margin of the extension graft is in the midline and that the cephalic margin is not blocking the airway. The caudal septum was slightly deviated to the patient’s right in this case, so the caudal extension graft was overlapped on the left. The extension graft has a slight curvature to bring the caudal margin back to the midline. B. The medial crura are sutured to the caudal margin of the extension graft with multiple 5-0 clear nylon sutures. Note the midline tip structure.

Caudal extension graft used for correction of the ptotic nasal tip with acute nasolabial angle. A contoured septal cartilage graft that is longer along the inferior margin is used to augment the nasolabial angle and rotate the nasal tip. This graft can be fixed to the periosteum around the nasal spine to further stabilize the graft.
lateral crus into one that is concave. Accentuation of such a concavity in the lateral crus can pinch the nasal tip and create an unnatural demarcation between the tip and the alar lobule.

In an effort to communicate concepts of favorable nasal tip contour, I have designed a series of images to demonstrate how specific contours create highlights and shadows that impart a 3-dimensional perspective. On frontal view, the aesthetically pleasing nasal tip possesses some width in a horizontal plane that extends in continuity into the alar lobule (Figure 4B). The horizontally oriented tip highlight is best visualized with a single midline light source directed toward the patient. If one uses 2 light sources or flash units situated slightly above the patient and directed toward the nasal structure at a 45° angle off of the midline, then one will see 2 light reflexes that are horizontally oriented. The exact configuration of this highlight varies between patients, but in most women it is 8 mm in width, with a range of 6 mm to 14 mm. These dimensions are slightly increased in men and ethnic patients with thicker skin.

Equally important, there is a subtle shadow in the supratip region that continues laterally into the supra-alar groove, representing a narrowing effect cephalic (above) to the nasal tip (Figure 5). The shadow in the supra-alar groove and supratip is accentuated by the prominence or elevated ridge along the alar margin as it meets the horizontal tip highlight. The contrast of the supratip shadow correlates with the depth of the supratip break. The height of the supratip shadow on the frontal view correlates with the position of the supratip break on the lateral view. In most unoperated noses the supratip break is poorly defined or higher than ideal. Once the vertical height of the domes is reduced (cephalic trim of lateral crus), the supratip break moves down on frontal view creating a more refined tip. The infratip lobule contour is also critical to creating a natural-looking nose. It is created by the junction between the columella and the tip. On frontal view there should be a gull-in-flight contour to the infratip lobule as the alar margins meet the columella.

On the base view, the nose should be triangular without pinching or concavity between the tip and alar lobule (Figure 6). A relatively straight alar sidewall extending from tip lobule to alar lobule will ensure a smooth transition between both structures on the frontal view. The soft tissue triangles or facets should be soft and not too defined, which would detract from the remainder of the tip structure.

On lateral view there should be a subtle supratip break defined by the separation between the most projecting point of the domes and the more posteriorly positioned septum near the anterior septal angle (Figure 7). Preferably, the supratip break is subtle, seen as an attenuated supratip shadow. The desired distance set surgically between the domes and septum to create the supratip break will depend on the thickness of the skin. Patients with thick skin may require an 8- to 10-mm distance between the leading point of the domes and the anterior septal angle, whereas patients with thin skin may need only a 6- to 8-mm distance. It is imperative to understand that these distances are based on a tip position that will not change significantly postoperatively. If the base is not appropriately stabilized, postoperative loss of tip projection could eliminate the supratip break and may result in supratip fullness (pollybeak deformity). Some surgeons create a pronounced supratip break to account for an anticipated postoperative loss of tip projection. This approach can leave a significant variance in the prominence of the supratip break from patient to patient. It is preferable to create a stable nasal base and reliably set tip projection for more consistent outcomes.

The nasal tip should have a curvilinear shape with no sharp contours on lateral view, which can be achieved by preserving the vertical height of the domes and avoiding shield grafts that lack appropriate camouflage. The columellar-lobular angle or double break can be preserved by avoiding blunting the normal divergence of the intermediate crura (Figure 8). Subtle control of the double break can be achieved by using cartilage grafts placed around the dome structure. Soft bruised cartilage placed caudally to the intermediate crura adds bulk and can blunt a pronounced columellar lobular angle or double break. Thick or double-layered shield grafts or those that are long and stiff can obliterate the double break and create a flat appearance to the tip lobule on lateral view. Therefore, tip grafts must be slightly curved cephalically to preserve the normal double break.

To create a favorable nasal tip contour, it is preferable to have the caudal margin of the lateral crus lie close to the same level as the cephalic margin (Figure 9 and Figure 10). In addition, the caudal margin of the dome should be positioned above the cephalic margin of the dome. When the caudal margin of the lateral crus arches above the cephalic margin, the alar lobule and alar margin are well supported, creating a defined ridge between the tip lobule and alar lobule (Figure 4). In the process of narrowing the nasal tip, the ala can move medially, disrupting the smooth transition from tip to alar lobule and creating an unnatural shadow between the 2 structures. Similarly, the act of pinching the domes tends to displace the caudal margin of the lateral crus below the cephalic margin (Figure 11). When the caudal margin of the lateral crus is displaced below the cephalic margin, the support of the alar lobule and alar margin may be compromised, which can result in loss of the normal transition from tip lobule to alar lobule (Figure 12). Some of this effect on tip contour may be due to creation of a nasal tip structure that is too small for the fixed skin envelope, thus creating an ill-defined tip shape. In many patients, their normal cartilage anatomy demonstrates an orientation with the caudal margin well below the cephalic margin. In these patients, nasal tip contour can be improved with alar rim grafts, which act to support the alar margin and create a defined ridge between the tip and alar lobule.

If used properly, most nasal tip techniques can create a nasal tip that looks natural. It is when techniques are overdone that deformity occurs. Some methods of nasal tip surgery deliver more predictable results than others.
Figure 19. This patient has a modest retraction of her nasolabial angle with weakness in her nasal base. She underwent placement of a caudal extension graft to augment her nasolabial angle. The graft was longer along its inferior margin. Dome sutures were used after placing lateral crural strut grafts to flatten the lateral crura. A bruised cartilage graft was placed horizontally over the domes to provide additional tip definition. Panels A, C, E, and G show preoperative views; panels B, D, F, and H, 1-year postoperative views.
Figure 3. Stabilizing the base will ensure a solid foundation for the lower third of the nose. One must first dissect between the medial crura to expose the septum and raise bilateral mucoperichondrial flaps. Then the medial crura can be sutured to the extra length of the caudal septum. This method, described by Kridel et al., can be used instead of placing a columellar strut. A 4-0 plain catgut suture on a straight septal needle is used to fix the medial crura to the caudal septum (Figure 14B). The caudal septum is usually fixed to the cephalic margin of the medial crura to avoid retraction of the columella. Prior to suturing, the caudal septum must be in the midline; otherwise, the tip will be deviated. After initial fixation, careful assessment of tip projection, nasolabial angle, alar-columellar relationship, and tip rotation is critical to avoid deformity. When all parameters have been set appropriately, the position is stabilized with a 5-0 clear nylon suture, which is placed from the internal surface of the intermediate crura along its cephalic margin to the caudal septum. After this suture is placed, the domes and medial crura should be at the same level with symmetry of the base of the nose. I should emphasize that this maneuver should only be used in patients who have a redundancy of caudal septal length that otherwise would require trimming. Patients with a short upper lip are ideal candidates because fixation of the medial crura to the caudal septum will usually lengthen the upper lip. Patients with a hanging columella due to a long caudal septum are ideal for this technique (Figure 15).

If the caudal septum is short or of appropriate length but tip position must be altered or stabilized, a caudal extension graft may be placed to lengthen the caudal septum so that it can be used as a stable fixation point for the medial crura (Figure 16). The caudal extension graft is a relatively straight segment of cartilage that typically overlaps the existing caudal septum (Figure 17). When the graft is placed in an overlapping fashion, inherent deviations in the caudal septum or the extension graft are used to one's advantage to maintain a midline tip structure. If the caudal extension graft creates deformity when overlapped with the caudal septum, then this graft can be placed end-to-end with the septum and stabilized with thin splinting grafts placed on both sides of the junction to ensure that the graft is midline. Long extended spreader grafts that project caudally to the septum can also be used to stabilize the extension graft. Patients undergoing placement of caudal extension grafts should be told that their nose will be stiffer after surgery with less tip recoil.

Depending on need, the shape and orientation of the caudal extension graft can be altered to provide different effects on tip position. For the ptotic nasal tip with

Figure 20. Caudal extension graft used for correction of the foreshortened nose. This graft is longer along its superior border to counterrotate the tip and lengthen the nose. The graft can be further stabilized using bilateral extended spreader grafts.

The techniques described herein are reliable and versatile methods for creating a strong, natural-looking nasal tip.

STABILIZING THE BASE OF THE NOSE

Prior to working on the contour of the nasal tip lobule, one must stabilize the base or pedestal of the nose (Figure 3). Stabilizing the base will ensure a solid foundation for the lower third of the nose and set the position of the nasolabial angle and alar-columellar relationship. This maneuver is critical to avoid postoperative loss of nasal tip projection. Many surgeons spend most of their time altering the region of the domes and do not correct deficiencies of the base of the nose, resulting in unpredictable loss of tip projection postoperatively. Examination of the nasal base will provide important information about its stability and potential for loss of tip projection. Noses with long, strong medial crura and medial crural footplates that extend down to the nasal spine have excellent support and will tend not to lose projection postoperatively (Figure 13A). Conversely, noses with short medial crura and footplates that do not reach the posterior septal angle/nasal spine are more likely to lose projection postoperatively (Figure 13B). If the base is well supported by the medial crura and the alar-columellar relationship is appropriate, a sutured-in-place columellar strut can effectively stabilize the base. This graft is placed into
Figure 21. The extended columellar strut is usually carved from autologous costal cartilage and fixed to the nasal spine periosteum or to a notch in a premaxillary graft. To aid in fixation, a notch can be created at the base of the strut to integrate with the nasal spine and premaxilla. Splinting grafts can be sandwiched on both sides of the graft to stabilize the graft superiorly. In the left inset, note how the lower lateral cartilages are suture fixated to the extended columellar strut.

Figure 22. Cephalically positioned lateral crus. A, Cephalically positioned lateral crura create excess vertical supratip tip fullness. Prior to manipulation, the caudal margin of the lateral crura lies below the cephalic margin. B, The lateral crura are dissected from the underlying vestibular skin. C, Lateral crural strut grafts are sutured to the undersurface of the lateral crura with 5-0 clear nylon sutures. D, A more caudally positioned pocket is created to accommodate the lateral crus. E, After lateral crural strut grafts are sutured to the undersurface of the lateral crura, the lateral crura are repositioned into the new, caudally positioned pockets to correct the cephalic positioning. After graft placement and repositioning, the lateral crura are now oriented close to 45° off of midline instead of the preoperative cephalic orientation.
an acute nasolabial angle, the caudal extension graft should be longer along its inferior margin to achieve tip rotation (Figure 18). The longer inferior extension will augment the deficient nasolabial angle and stabilize the base of the nose (Figure 19). If nasal lengthening is needed, the extension graft should be longer superiorly to counterrotate the nasal tip (Figure 20). In this scenario, the superior margin of the extension graft will push the tip down to lengthen the nose.

Once the graft is in position, the medial crura can then be sutured to the caudal margin of the caudal extension graft with 5-0 clear nylon sutures to stabilize the base of the nose, set tip position, and create an appropriate alar-columellar relationship. The nylon sutures are placed through the internal surface of the intermediate crura and then fixed to the caudal extension graft. Symmetry of these sutures is critical to avoid tip deformity. If maximum support is needed, the caudal extension graft can be sutured inferiorly to the periosteum about the nasal spine or stabilized with 2 splinting grafts or extended spreader grafts. The caudal margin of the caudal extension graft must be vertical and midline; otherwise, the tip will be deviated. The cephalic margin of the graft that overlaps the caudal septum should be trimmed or beveled so that it does not obstruct the airway. The use of caudal extension grafts requires special attention to selecting the appropriately shaped graft, careful placement, stable fixation, and setting the tip position and alar-columellar relationship. One can easily create a deformity or airway obstruction if these grafts are not placed properly.

Figure 23. Lateral crural strut grafts are shown in light blue. These cartilage grafts are sutured to the undersurface of the lateral crura to flatten the crura and eliminate the bulbous contour of the nasal tip. After the lateral crural strut grafts are placed, dome sutures can be positioned to narrow the domes and decrease the dome angle. Note how the 5-0 clear nylon sutures are oriented with the knots above the lateral crura. The dark blue structure between the medial crura represents a strut or caudal extension graft.

Figure 24. Placement of 2 separate 5-0 clear nylon dome sutures will narrow the dome angle. Then a 5-0 clear nylon interdomeal suture sets the width between the domes. Note how there is some pinching at the junction between the tip lobule and alar lobule. This will require placement of alar rim grafts to reposition the alar margin and avoid a visible transition from tip lobule to alar lobule. Note how the alar rim grafts create a triangular shape to the nasal base.

Figure 25. Alar rim grafts are soft, thin cartilage grafts placed into a pocket along the caudal margin of the marginal incision. Note how the medial margins of the grafts are crushed to make them soft after they are sutured to the surrounding soft tissue. The sutures are placed around the graft to avoid fracture.
If the base of the nose is severely deficient or major augmentation of the premaxilla is needed, the surgeon can use an extended columnellar strut with or without a premaxillary graft. It is best to flare the base of the strut and cut a notch in the posterior surface of the graft to sit over the nasal spine and allow the caudal septum to integrate with the graft (Figure 21). The base of the strut is fixed with two 4-0 polydioxanone sutures applied through the nasal spine. To allow placement of the suture, a hole can be drilled across the nasal spine with a 14-gauge needle. Fixation in this manner will help to ensure that the strut is in the midline and will not deviate or become dislodged. With such a strut, major changes in tip position and projection can be effected. These patients should be told that their nasal tip will be rigid and still postoperatively. Once the base of the nose is stabilized, the nasal tip lobule can be contoured.

CONTROLLING NASAL TIP CONTOUR

If the nasal tip is broad, bulbous, or poorly defined, changes in contour can be achieved by a conservative cephalic trim of the lateral crura followed by reorientation of the existing tip structures. Management of the nasal tip typically requires reorientation in both the horizontal (dome to dome) and vertical (caudal margin to cephalic margin) dimensions of the lower lateral cartilages. If the tip cartilages are too wide in the vertical plane (excess vertical height) with normally oriented lateral crura, there will be supratip fullness noted on lateral view. A conservative cephalic trim of the lateral crura will decrease vertical height and supratip fullness. However, cephalic trim of the lateral crura is not the primary method used to decrease supratip fullness. It may be necessary to trim the anterior septal angle if it approaches the level of the domes. Dome sutures are also an effective means of decreasing supratip fullness.

It is usually appropriate to narrow the nasal tip by performing a conservative cephalic trim leaving 8 to 10 mm of lateral crus laterally and approximately 5 to 7 mm medially at the domes. If the domes are narrow, it is best not to perform medial cartilage excision near the domes. It is important to note that cephalic trim of the lateral crura is performed primarily medially and does not extend into the lateral third of the lateral crus to avoid excessive supra-alar pinching and lateral wall collapse. Supra-alar pinching and lateral wall collapse with nasal obstruction are common findings in patients who have undergone rhinoplasty and tend to worsen significantly over time. In fact, alar haken grafts are used in most patients and are placed in a pocket just medial to the supra-alar crease as a prophylactic maneuver to prevent collapse of the lateral wall.

Patients with cephalic positioning of the lateral crura require a completely different approach to changing nasal tip contour. In these patients, the lateral crura are in a cephalic orientation instead of the more normal oblique orientation approximately 45° off midline (Figure 22A). Cephalically oriented, bulbous lateral crura typically create a “parentheses” appearance on frontal view. In patients with bulbous cephalically positioned lateral crura, one can perform a cephalic trim and dissect the lateral crura from the vestibular skin, suture lateral crural strut grafts to the undersurfaces of the lateral crura, and then reposition the lateral crura into caudally positioned pockets (Figure 22). The lateral crural strut grafts act to flatten the bulbous lateral crura and create a more favorable tip contour. Repositioning the lateral crura places supportive cartilage along the sidewall of the nose and prevents lateral wall collapse. This maneuver also acts to create a more favorable positioning of the caudal margin of the lateral crura closer to the same level as the cephalic margin of the lateral crura (Figure 10). If the cephalically positioned lateral crura are flat and do not contribute to tip bulbosity or middle vault width, they can be left in position using alar batten grafts to support the lateral nasal wall.

Once appropriate vertical dimensions of the nasal tip are achieved, the horizontal dimensions must be managed. Dome binding sutures are a good way to decrease the horizontal contribution of the bulbous nasal tip contour in the primary rhinoplasty patient. The dome sutures act to variably narrow the dome angle, depending on the stiffness of the lateral crura and on how tightly the sutures are tied. The objective is to create flat lateral crura with the dome sutures. However, in most cases some degree of concavity will be noted. In patients with soft cartilages, the dome sutures will tend to pinch and deform the dome and leave convexity of the lateral crus laterally. If the lateral crura do not flatten properly or deform (buckle) with the suture, a lateral crural strut graft sutured to the undersurface of the lateral crus can be used (Figure 23). The lateral crural strut grafts will act to stiffen the lateral crura and minimize the degree of buckling or lateral convexity of the lateral crus seen after placement of the dome sutures. When combined with dome sutures, these grafts will flatten the lateral crura and eliminate the bulbous appearance of the nasal tip.

Using 2 separate dome sutures is usually preferred to prevent pinching the domes together. The sutures are placed in a horizontal mattress fashion, tying the knots medially between the domes (Figure 24). Symmetric placement along the axis of the anatomic dome will slightly rotate the nasal tip lobule. By using 2 separate dome sutures, the normal divergence of the intermediate crura can be preserved. Surgeons frequently try to further narrow the tip by bringing the domes too close together. Unfortunately, this maneuver will tend to obliterate the normal columnellar lobular angle, excessively narrow the tip, and create a vertical orientation instead of the normal horizontal orientation of the nasal tip highlight. Preservation of the divergence between the intermediate crura preserves the desirable columnellar lobular angle or double break (Figure 8). A 5-0 clear nylon interdomal suture from the internal surface of both intermediate crura sets the width between the domes (Figure 24). This suture should not be tied too tightly; otherwise, the domes will be too close together, creating abnormal anatomy. By using a transdomal suture (a single dome suture that pinches both domes together) or other tip-narrowing methods that unify the domes, the divergence between the intermediate crura may be eliminated and the columnellar lobular angle can be blunted.
Narrowing the dome angle with a dome suture can result in descent of the caudal margin of the lateral crus below the cephalic margin (Figure 12) and concavity of the lateral crus (Figure 24). This deformity is even more likely to occur when a single transdomal suture is used to narrow the tip as it traverses both domes at an oblique angle, displacing the caudal margin of the lateral crus below the cephalic margin. The combination of these structural changes can result in a pinched tip and notching of the alar margin. This is seen as a shadow demarcating the junction between tip and alar lobule (Figure 2A). After placing the dome sutures, the support and contour of the alar margins can be reconstituted to re-create the elevated ridge along the alar margin that transitions from tip to alar lobule. To reposition the alar margin and create favorable tip contour, alar rim grafts are placed into pockets along the caudal margin of the marginal incision (Figure 25). Alar rim grafts typically are thin, soft cartilage grafts that measure approximately 12 to 15 mm in length and 2 to 3 mm in width (Figure 26). With converse scissors, a pocket is made along the caudal margin of the marginal incision. Special care is taken not to puncture the skin of the alar lobule by staying close to the vestibular skin. Then the alar rim graft is placed into the pocket and sutured to surrounding soft tissue with a 6-0 Monocryl suture (Ethicon Inc, Somerville, NJ). The suture is tied around the graft to avoid fracturing the cartilage. Prior to closure, the medial margin of the alar rim graft should be gently crushed with Brown-Adson forceps to reduce the risk of visibility or palpability of the graft. If the alar rim grafts are too long or not crushed medially they may leave a visible irregularity in the nasal tip postoperatively. The alar rim grafts re-create the elevated ridge between the tip and alar lobule and fill the void created by any concavity of the lateral crura and/or descent of the caudal margin of the lateral crura. The combination of conservative cephalic trim, dome-binding sutures, and alar rim grafts can effectively correct a bulbous tip and create the desired contour of the nasal tip (Figure 27).

The preoperative state of some patients' lower lateral cartilages may show the caudal margin below the cephalic margin. Many of these patients possess a favorable tip contour owing to the soft tissue contributions along the alar lobule and do not need alar rim grafts. Patients with thicker skin (eg, Asian and other nonwhite patients) may have adequate support of the alar lobule from the thick skin and soft tissues. Alar rim grafts are used in those patients who have a narrow (pinched), poorly balanced nasal tip. In these patients, alar rim grafts will support and elevate the alar margin creating a good transition from tip to alar lobule with a horizontal tip highlight. Alar rim grafts are usually not necessary in patients with lateral crura that extend caudally beyond the normal position or in patients in whom the caudal margin of the lateral crura is positioned at the same level as or above (anterior to) the cephalic margin (Figure 9 and Figure 10). Lateral crura that extend further caudally than normal can be identified when the marginal incision must be positioned more caudally than normal, leaving little room for placement of an alar rim graft.

After placement of alar rim grafts, there tends to be an increase in the size of the nostrils as well as flaring of the ala. The use of alar rim grafts tends to result in more frequent need for alar base reduction to decrease the alar flare and nostril size. Usually, an internal alar base reduction, taking a triangle of skin at the junction between the ala and nostril sill, is necessary to correct this. Incisions made in this area of the nose can create unsightly scars if not executed properly. In an effort to evert the skin edge, one can create a subtle favorable bevel with
the excision (Figure 28). This bevel should be symmetric and angle no greater than 10° to 15° from the perpendicular. An excessive bevel or improper beveling will result in an unsightly scar. A 5-0 polydioxanone suture is used to approximate the subcutaneous tissues. Special care is taken when suturing the beveled skin edge to ensure precise alignment. Multiple 7-0 vertical mattress nylon sutures are used for the cutaneous closure. Unlike the midcolumnellar sutures, which are removed 1 week after surgery, the alar-base sutures are best removed 2 weeks postoperatively to provide additional support for the incision. This type of excision will decrease the flare and nostril size created by placement of the alar rim grafts. This maneuver is extremely technique sensitive and if not performed precisely can result in visible scars and deformities such as small or asymmetric nostrils, notched nostril sill, or altered alar insertions. Placement of alar rim grafts with the subsequent correction of the alar flare adds at least 40 minutes to the duration of the operation.

Figure 26. Alar rim grafts. A, After dome sutures are placed, shadows are created between the right tip lobule and alar lobule. The tip contour is unfavorable. B, Alar rim grafts are placed about 3 mm caudally to the alar margin. C, The grafts are relatively thin and measure around 12 to 15 mm in length. D, Converse scissors are used to make a narrow pocket along the caudal margin of the marginal incision. The pocket extends laterally and is made closer to the internal vestibular skin so that the graft is not visible postoperatively. E, The thin strip of cartilage is placed into the pocket. F, Suture fixation with 6-0 Monocryl (Ethicon Inc, Somerville, NJ) passed through soft tissue and around the graft. G, Brown-Adson forceps are used to crush the medial margin of the graft. H, Note how the medial margin of the graft is soft, so it will not be visible in the tip. I, After alar rim grafts are placed, there are deeper shadows in the supra-alar region, and the shadow between the tip lobule and alar lobule is eliminated. There is a prominence or ridge that extends from the tip to the alar lobule that aids in defining the supra-alar shadows. These changes represent the elevation of the alar lobule with placement of the alar rim grafts.
Figure 27. Patient with bulbous nasal tip treated with conservative cephalic trim, lateral crural strut grafts, dome sutures, and bilateral alar rim grafts. The caudal septum was long, but it was not trimmed. Instead, the medial crura were sutured to the caudal septum to stabilize the base of the nose. The medial crura were sutured to the caudal septum in a slightly deprojected position. Panels A, C, E, and G show preoperative views; panels B, D, F, and H, 1-year postoperative views.
Figure 28. Alar base reduction after placement of alar rim grafts. Small triangular segments of skin are excised near the junction between the nostril and nostril sill. The excision will make the nostril smaller and decrease flare of the alar margin created by placement of the alar rim grafts. The excision is executed with a slight favorable bevel of the skin excision to promote eversion of the skin edges with closure. A 5-0 polydioxanone subcutaneous suture is placed followed by skin closure with 7-0 nylon vertical mattress sutures.

Figure 30. The sutured-in-place shield tip graft. A, The graft is camouflaged with a soft, bruised cartilage graft sutured behind the leading edge of the graft. B, Note how the soft graft extends laterally to the margins of the tip graft to help with the transitions to the existing lateral crura.
Figure 29. Soft cartilage (cephalic trim of lateral crus) can be sutured across the domes to provide additional projection and definition. A, Domes after placement of separate dome sutures and interdomal suture to set interdomal distance. Note that the normal divergence between the intermediate crura is preserved. B, Orientation of soft cartilage graft (cephalic trim of lateral crus) across domes (horizontally oriented). The graft sits along the caudal margin of the domes and extends lateral to the domes. C, 6-0 Monocryl sutures (Ethicon Inc, Somerville, NJ) are used to fix the graft. D, Note how the graft is relatively flat, thus avoiding postoperative visibility.

Figure 31. Shield tip grafts that project over 3 mm above the existing domes are stabilized with lateral crural grafts. A, These grafts are oriented obliquely off of the posterior surface of the tip graft and then sutured to the lateral crura. B, The lateral crural grafts typically overlap the lateral crura by at least 5 mm.
Figure 32. This Asian patient underwent prior placement of a silicone implant that extruded through her nasal tip and left a scar. Reconstruction required use of a costal cartilage extended columellar strut fixed to the nasal spine periosteum. A costal cartilage dorsal graft was used as well. A shield tip graft with lateral crural grafts was used to contour the nasal tip. The tip graft was covered with a layer of perichondrium from costal cartilage. Panels A, C, E, and G show preoperative views; panels B, D, F, and H, 2-year postoperative views. Note the change in the nasolabial angle with the extended columellar strut. The shield tip graft is supported from behind with the lateral crural grafts to prevent cephalic rotation and provide improved nasal tip definition with a horizontal tip orientation.
Figure 34. Patient who underwent 3 previous rhinoplasties. Overreduction of the cartilage structure and thick skin resulted in a constricted ball appearance to the nasal tip and polly beak deformity. Correction required a tip graft with lateral crural grafts. A cartilage dorsal graft was used to increase dorsal height. The nose was made larger on the lateral view to expand the thick skin and create a more defined frontal view. Note the horizontally oriented nasal tip highlight on the postoperative frontal view. Panels A, C, E, and G show preoperative views; panels B, D, F, and H, 2-year postoperative views.
If one is not able to take the time to execute these maneuvers properly, then alar rim grafts should not be used.

To provide additional tip projection and definition, a soft, gently crushed cartilage graft can be sutured horizontally across both domes with 6-0 Monocryl suture. It is important to gently crush the cartilage by compressing it with Brown-Adson forceps or by gently crushing the cartilage in a block-type morcellizer; otherwise, the graft may become visible postoperatively. The graft should be sutured to the caudal margin of the domes to ensure that the caudal margin of the dome structure lies above the cephalic margin. The cartilage excised during the cephalic margin of the lateral crura is ideal for this graft because it is pliable and has soft tissue attached to it for easy fixation to the domes (Figure 29). The soft tissue also helps to hold the crushed cartilage together. Horizontal positioning of this soft cartilage ensures preservation of the proper horizontal tip highlight and a smooth transition from tip to alar lobule. The graft should extend just beyond the domes laterally to help soften the transition from dome to alar lobule. In patients with very thin skin, such grafts should be avoided because graft visibility is likely.

Rarely should shield tip grafts be used in patients undergoing primary rhinoplasty because these grafts are unnecessary when the surgeon can work with the patient’s existing domes. Routine use of shield tip grafts to increase tip projection in primary rhinoplasty also introduces the potential of graft visibility. Tip projection can be controlled in most primary rhinoplasty patients by grafting and stabilizing the base (columellar strut graft, fixing medial crura to caudal septum, caudal extension graft, or extended columellar strut graft) followed by placement of dome sutures and soft cartilage grafts positioned over the domes to project and further refine the tip. In some patients needing tip projection, the lower lateral cartilages are very weak or diminutive and will not provide adequate projection with suturing methods alone. In such patients sutured-in-place shield tip grafts can be used to help project and define the tip. Shield tip grafts are used primarily in secondary rhinoplasty, augmentation rhinoplasty, or in primary rhinoplasty patients who have an underprojected tip with thick skin and a deficient tip lobule. If one does use a shield tip graft, it must be properly carved and camouflaged to avoid visibility of the graft, since the skin tends to thin and contract over time. Any shield tip graft that projects above the existing domes is at risk of becoming visible regardless of skin thickness. The sutured-in-place shield tip graft can be camouflaged using bruised or gently crushed cartilage placed around the leading edge of the graft (Figure 30). The softened cartilage will create a smooth transition from shield tip graft to the lateral crura and will camouflage the graft.

If the shield tip graft projects more than 3 mm above the existing domes, lateral crural grafts are typically used to create a smooth transition from the lateral margin of the shield tip graft to the existing lateral crura (Figure 31). Pressure of the skin envelope on a shield tip graft will tend to rotate the graft cephalically, blunting the infratip lobule. The lateral crural grafts will support the graft from behind and prevent the shield tip graft from tilting cephalically. This is particularly important when the shield tip graft is projected into a thick, tight skin envelope (Figure 32). The lateral crural grafts are oriented at an oblique angle to diverge off the back of the shield tip graft to the lateral crura and are sutured in place with 6-0 Monocryl suture. Lateral crural grafts should not be confused with lateral crural strut grafts, which are sutured to the undersurface of the lateral crura adjacent to the vestibular skin. A sheet of gently crushed cartilage can be placed over the shield tip graft/lateral crural graft construction to further camouflage the grafts.

If available, perichondrium, instead of gently crushed cartilage, can be placed over the entire shield tip graft reconstruction to provide additional camouflage (Figure 33). The perichondrium can be harvested from the back surface of the conchal bowl or from costal cartilage. Costal cartilage perichondrium is thicker and provides better coverage of the shield tip graft. Alar rim grafts are then placed along the caudal aspect of the marginal incisions to create a transition off the lateral margin of the shield tip graft and create the appropriate shadows and highlights of the nasal tip. In some cases it is necessary to suture the medial margin of the alar rim graft to the lateral margin of the shield tip graft. This will help to camouflage of the lateral margin of the shield tip graft. With the combination of nasal base support, shield tip graft with lateral crural grafts and alar rim grafts, and appropriate camouflage, nearly complete tip reconstructions can be executed creating natural-looking tip contours in secondary and augmentation rhinoplasty (Figure 34). Even for complex nasal tip reconstructions, creating favorable shadows with a horizontally oriented tip highlight is the ultimate goal.

**SUMMARY**

Many deformities noted after rhinoplasty are created by using nasal tip narrowing techniques that tend to pinch the domes and create an abnormal shadow between the tip lobule and alar lobule. For a more natural appearance to the nasal tip, a horizontally oriented tip highlight with a smooth transition from tip lobule to alar lobule should be created. This can be accomplished by stabilizing the base of the nose, conservatively suturing the tip, applying appropriate grafting techniques, and placing alar rim grafts. All tip suturing and grafting tech-
niques are executed with the goal of preserving the horizontally oriented tip highlight and smooth transition from tip to alar lobule. By focusing on strategic placement of shadows and highlights in the nasal tip, the surgeon will be better able to create natural-appearing nasal tip contours. Use of these techniques requires great attention to detail and will lengthen the time spent performing rhinoplasty surgery. A clear understanding of the 3-dimensional topography of the favorable nasal tip will allow the surgeon to focus less on specific maneuvers and more on creating the intended shape. Committing to this method of nasal tip surgery will enhance one’s ability to reach a predetermined aesthetic goal and more accurately predict long-term results while avoiding the stigma of the operated nose.

Accepted for Publication: March 8, 2006.

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Acknowledgment: I wish to thank Grant S. Hamilton III, MD, and Jaimie DeRosa, MD, for their editorial assistance. I would also like to thank Bill Winn, BS, MS, and Casey Steffen, BA, MS, for rendering the art and Eric Johnson, MEd, and Chet Childs, BSc, for their photographic contributions.

REFERENCES