

TITLE: Refinement of the Nasal Tip

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The nasal tip is a unique part of the nose that has an intricate supporting framework but is mobile and animate. The nasal tip is frequently addressed during rhinoplasty in order to achieve a symmetric, stable, and properly projecting structure. Because of the unique, anatomic properties of the nasal tip, it is often considered separately from other components of rhinoplasty. Techniques in surgery of the nasal tip are numerous, and use of individual techniques must be tailored to the patient's needs. A thorough understanding of the anatomy, surgical approaches, and patient desires is crucial to adequate surgery of the nasal tip, and all of these factors are discussed here.

Facial Analysis

The nose is the central and most prominent aesthetic subunit of the face. It can be divided into topographic subunits: the dorsum, sides, tip, alae and soft triangles. The boundaries of these subunits allow for camouflage of scars; when incisions lie along the margins of these natural anatomic subunits, the eye is less apt to recognize the scar. During rhinoplasty, the surgeon must avoid a sharp, unnatural overemphasis of any one subunit in relation to a surrounding subunit; each should ideally blend into the other.

Analysis of the nose is considered from three separate views: frontal, profile and caudal. On frontal view, assessment of symmetry, width of alar base and nasal dorsum, tip-defining points and columella can be made. Extending a line from the mid-glabella to menton should bisect the nasal bridge and tip. Width of the alar base should approximate the intercanthal distance. The width of the bony nasal sidewalls should be 75 to 80% of the normal alar base. The nasal tip has two tip-defining points that represent light reflection from the skin overlying the domes of the lower lateral cartilages. Attention to asymmetry of the domes or bulbosity of the tip may suggest the need for modification of the lower lateral cartilages. The columella, on frontal view has been described as having a "gull in flight" appearance. Too much view of the columella indicates a protruding/hanging columella which may require reduction. Lack of columella signifies a retracted columella which may require augmentation.

On profile, tip projection and rotation need to be assessed as well as the bony dorsum and

nasal length. Tip projection may be measured with a variety of techniques. The Goode method drops a vertical from the nasion to the alar groove, then an intersecting horizontal from the alar groove to the tip-defining point to create a right triangle with the vertical segment representing the nasal length and the horizontal segment representing the tip projection. The ideal projection is the ratio of tip projection to nasal length equaling 0.55 to 0.6. Tip rotation is evaluated by determining the nasolabial angle. To determine this angle, a line from the subnasale to the superior vermillion is compared to a tangent of the line of the columella to the subnasale. The ideal range of the nasolabial angle is 90-100 degrees in men and 100 to 110 degrees in women. The nasofrontal angle connects the brow with the nasal dorsum. The deepest point of the nasofrontal angle, the nasion, should lie at the level of the supratarsal crease. The nasofrontal angle is formed by a line from the nasion tangent to the glabella and a line tangent to the nasal tip; this is typically 115 to 130 degrees.

Evaluation of the base view of the nose should include assessment of the size, shape, orientation and symmetry of the nostrils, the width and length of the columella and the height of the lobule. The nasal base is triangular with a lobule to columella ratio of 1/3 to 2/3.

The quality of the skin should be assessed. Thick skin has a tendency for more postoperative edema and scarring and is the least ideal skin type for achieving refinement and definition. Thin skin is preferred because it heals more predictably and allows for critical definition; however, even minor deformities will be easily visible and palpable.

Surgical Anatomy

The nasal tip can be described as that portion of the nose which is animate, mobile and easily displaceable. Its configuration, attitude, and shape are largely the consequence of the shape and contour of the lower lateral cartilages. These cartilages are suspended and maintained in position by fibrous and muscular attachments to the two upper lateral cartilages, to the septum, to each other, to the piriform aperture, and to the overlying skin. Each lower lateral cartilage consists of a medial crus and a lateral crus which blend together at the dome. The tip defining point is the highest medial cephalic portion of the lateral crus and is manifest externally by a light reflex. The medial crural footplate faces outward and flares laterally as they embrace the posterior caudal septum; this relationship is one of the most important tip support mechanisms but is often sacrificed in nasal tip surgery. Loose areolar tissue interconnects the medial crura. The lateral crus and domal segments are responsible for the contour of the nasal lobule. Along the cephalic margin of the lateral crus, there is an outcurving of the upper lateral cartilage underneath an incurving of the lateral crus; this is the scroll area.

The external tip may vary considerably from the basic structure of the alar cartilages based on thickness of skin, amount of subcutaneous fat and areolar tissue and abundance of sebaceous glands. The nasal tip must also be considered as a dynamic structure, influenced by the facial mimetic muscles. These muscles influence the appearance of the nose and may exaggerate or create nasal deformity.

The mimetic muscles of the nose are encased and interconnected throughout by the nasal superficial musculoaponeurotic system (SMAS). This layer serves as a guide to the appropriate dissection plane in nasal surgery. Elevation should occur just deep to the SMAS and immediately

superficial to nasal skeleton; this results in ease of dissection, minimal bleeding, minimal damage to the neurovascular structures supplying the nasal tip skin, avoidance of damage to the intact SMAS layer, and reduced scarring.

There are major and minor tip support mechanisms. Major tip support mechanisms include the size, shape and resilience of the medial and lateral crura, medial crural footplate attachment to the caudal border of the quadrangular cartilage, attachment of the upper lateral cartilages to the alar cartilages. Minor tip support mechanisms include the ligamentous sling spanning the paired domes of the alar cartilages, the cartilaginous septal dorsum, the sesamoid complex extending the support of the lateral crura to the piriform aperture, the attachment of the alar cartilages to the overlying skin and musculature, the nasal spine and the membranous septum.

Surgical Approaches to the Nasal Tip

Nasal tip surgery usually involves modification of the lower lateral cartilages. Access to these cartilages can be made via a delivery or non-delivery approach. When minimal or conservative tip refinement is desired, nondelivery approaches can be used. This approach allows the surgeon to assess the effects of fine alterations during surgery and allows minimal disruption of the normal anatomy of the tip. However, more extensive modification of the nasal tip demands more exposure of the tip structures and this is when a delivery or open approach may be employed.

Nondelivery approach:

Nondelivery approaches to the alar cartilages include the intercartilaginous incision and the transcartilaginous incision. The intercartilaginous incision is performed at or just cephalic to the upper boundary of the lateral crus to the level of the dome. The vestibular skin is then elevated in a retrograde fashion in the supraperichondrial plane deep to the SMAS. The desired amount of lower lateral cartilage is then resected. This incision violates the attachment of the lower lateral cartilage to the upper lateral cartilage which is a major tip support mechanism; the usual result is cephalic rotation of the tip due to scarring and loss of the scroll attachment. With variable resection of a strip of the lateral crus, this rotation can be accentuated if desired. The transcartilaginous incision is performed through the cephalic to the caudal margin of the lower lateral cartilage. The vestibular skin is undermined in a cephalic direction over the portion of alar cartilage to be removed. The desired amount of alar cartilage is then resected.

Delivery approach:

Delivery of the lower lateral cartilages as bipediced chondrocutaneous flaps may be required for more complex modifications of the nasal tip. A transcartilaginous incision may be combined with a marginal incision to “deliver” these cartilages for direct inspection and modification. Modifications of the nasal tip in these patients may require more volume reduction of the medial portion of the lateral crus, weakening of the complete strip with crosshatching, morselization or interrupted strip technique.

Open rhinoplasty:

This approach is used when more radical alterations of nasal tip anatomy are executed. Exposure of the nasal skeleton in this way facilitates detection and correction of both major and minor asymmetries. Disadvantages include the columellar scar, prolonged tip edema and disruption of tip structures that are in no need of change. To expose the nasal tip structures, a marginal incision is carried out to the midcolumella bilaterally. Dissection over the lateral crura proceeds in the immediate supraperichondrial plane. The dome and interdomal area is liberated. An irregular incision is made across the columella connecting the marginal incisions and the columellar skin flap is elevated to expose the nasal tip structures.

Septal Incisions:

In order to access the septum and columella, transfixion or hemi-transfixion incisions may be required in non-open rhinoplasty approaches. The complete transfixion incision is made from the anterior septal angle along the anterior border of the cartilaginous septum and sweeping posteriorly to the nasal spine. This incision violates a major tip support mechanism: the attachment of the medial crural footplate to the nasal septum. To avoid post-operative loss of tip projection, the medial crural footplates should be resutured to the nasal septum at the end of the surgery. This incision can, however, be used when tip retro displacement is actually desired. The partial transfixion incision avoids separation of the nasal spine from the medial crural footplates by stopping short of the nasal spine. The high transfixion incision leaves a 5mm strip of caudal septum to preserve the attachments, and the Killian incision (about 1 cm deep to the columella) does not violate the septal cartilage at all.

Goals

Volume Reduction and Tip Rotation:

Nasal tip rotation results from planned surgical modifications of the alar cartilages. Complete strip techniques involve resection of a variable amount of the cephalic margin of the lower lateral cartilage. More radical cartilage resection results in a greater volume reduction and degree of tip rotation. The complete strip can be weakened in several ways to assist in tip rotation.

The complete strip can be interrupted in several ways to achieve a higher degree of tip rotation. It is important to note that interrupted strip techniques are likely to result in more cephalic tip rotation than complete strip techniques. Interrupted strip techniques may also result in a slight to moderate degree of tip projection loss. Lateral interruption techniques involve division of the complete strip in the distal lateral crus. Avoidance of medial strip interruption fosters symmetrical healing and reduces the likelihood of uneven tip-defining points. Lateral interruption also minimizes notching, pinching and other asymmetries. Medial interruption techniques can be used for patients with thicker skin and supporting structures as these characteristics minimize asymmetric healing or even overrotation. Lateral interruption with suture rotation involves a calibrated triangular excision of lateral cartilage and stabilizing this with suture fixation. Undermining the vestibular skin 2-4 mm medial and lateral to the interrupting incision will allow the medial crura to lie more medial and the lateral crura to

advance slightly medial as well. The medial crura may be sutured together, “stealing” a portion of the lateral crura to advance slightly medial. Other methods of dividing the strip are employed in various circumstances.

When the dome is overly broad and convex, carrying the reduction into the intermediate crus will allow additional narrowing and definition. In patients with a prominent scroll relationship, excision of the scroll may be necessary to attain desired tip refinement and narrowing. If the alar cartilage is thick and prominent through thin skin, the edge of the cartilage should be beveled to avoid abrupt step-off deformity.

Transdomal suture narrowing is an effective alternative maneuver to complement complete strip techniques. Sutures may be placed to oppose the upper medial crura (interdomal) or in a horizontal mattress fashion through the intermediate and lateral crural contributions to the dome (transdomal). Transdomal sutures thus reorient the attitude of the alar cartilages, preserve or improve satisfactory tip support, and may be utilized, when appropriate, to add 2-3 mm of stable projection to the tip.

Tip projection:

Surgical alteration of the nasal tip involves increasing, decreasing or preserving the projection of the nasal tip. For the majority of rhinoplasty patients, the goal is preservation of satisfactory tip projection. Preservation of tip projection requires attention to conserving major and minor tip supports. Specifically, if a complete transfixion incision has interrupted the attachment of the medial crural footplate to the caudal septum, permanent suture reattachment is vital to re-establish this support. Likewise, proper taping and splinting of the tip close to the void created at the interface between the upper and lower lateral cartilages will aid in reconstructing this major tip support.

If tip projection is adequate preoperatively, it is the surgeon’s responsibility to ensure that the major and minor tip supports are left largely intact or reconstructed to prevent an eventual loss of projection. Therefore, the complete strip should be preserved when possible. The complete transfixion incision should as well be avoided as this incision destroys the vital support provided by the medial crural footplate overlap of the caudal septum.

Additional projection can be provided by autogenous cartilage struts positioned below or between the medial crura. Alternatively, if the medial crural footplates diverge in a widely splayed fashion, further tip projection may be gained by resecting excessive inter-crural soft tissue and suturing the medial crura together. Tip grafts can be used to create height and contour to the tip. Additional projection can also be provided by use of transdomal sutures positioned between two complete alar strips.

Projection and definition of the nasal tip can be enhanced with tip grafts. The cartilage for these grafts can be harvested from the nasal septum or external ear. These grafts can be triangular, trapezoid or shield-like and are placed in carefully designed soft tissue pockets at the infra-tip lobule. The nasal tip projection can also be emphasized in relation to the nasal dorsum by reduction of the cartilaginous dorsum.

Tip projection can be reduced by incrementally sacrificing major tip supports starting

with a total transfixion incision and proceeding through more radical sacrifices until the desired result is achieved. Commonly, significant reduction of the overprojected tip will result in alar base sidewall and base flaring. This may require alar base reduction.

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