

**TITLE: Rhinoplasty and the Nasal Tip**

**SOURCE: Grand Rounds Presentation, UTMB, Dept. of Otolaryngology**

**DATE: March 31, 2009**

**RESIDENT PHYSICIAN: Jean Paul Font, MD**

**FACULTY PHYSICIAN: Raghu Athre, MD**

**SERIES EDITORS: Francis B. Quinn, Jr., MD**

**ARCHIVIST: Melinda Stoner Quinn, MS(ICS)**

---

*"This material was prepared by resident physicians in partial fulfillment of educational requirements established for the Postgraduate Training Program of the UTMB Department of Otolaryngology/Head and Neck Surgery and was not intended for clinical use in its present form. It was prepared for the purpose of stimulating group discussion in a conference setting. No warranties, either express or implied, are made with respect to its accuracy, completeness, or timeliness. The material does not necessarily reflect the current or past opinions of members of the UTMB faculty and should not be used for purposes of diagnosis or treatment without consulting appropriate literature sources and informed professional opinion."*

---

## **History of Rhinoplasty**

Rhinoplasty was first developed by Sushruta, an important physician who lived in ancient India circa 500 BC, which he first described in his text Sushruta Samhita. He and his later students and disciples used rhinoplasty to reconstruct noses that were amputated as a punishment for crimes. The first intranasal rhinoplasty in the West was performed by John Orlando Roe in 1887. It was later used for cosmetic purposes by Jacques Joseph in 1898 to help a patient who felt that the shape or size of his nose caused embarrassment and social discomfort. Joseph's first rhinoplasty patient was a young man whose large nose caused him such embarrassment that he felt unable to appear in public. He also employed the first nasal tip suture which was named the orthopedic suture as Jacques Joseph was an Orthopedic surgeon who developed a particular interest in the field of facial plastics. Dr Joseph is considered the father of modern facial plastic surgery.

## **Introduction**

Many consider rhinoplasty to be the most difficult facial plastic operation. It requires a precise assessment of the deformity, nasal support mechanisms and soft tissue skin envelope. Airway function is dependent on multiple factors modulated with every surgical maneuver. Postoperative scar contracture and healing may later modify the nasal structure over the lifetime of the patient. Not surprisingly the estimated rate of revision rhinoplasty is 8% to 15%.

Surgically manipulating the nasal tip to achieve predictable results is the most difficult feature of rhinoplasty. One who can control the nasal tip is said to be able to master rhinoplasty. Attaining a well-defined, accurately rotated and properly projected nasal tip is a vital component for success in tip shaping and is predicated on a fundamental understanding of the anatomical components that provide nasal tip support and their influences on tip projection and shape.

## Preoperative Assessment and Planning

Preoperative and postoperative photographic documentation is essential. Full-face frontal, oblique, lateral images, and close-up base views should be standard. Images should be obtained with dual flash sources angled 45 degrees toward the patient. An additional frontal view taken with a single flash placed in front of and above the patient allows for shadowing and highlighting of the dorsal line. Close-up views should be taken to document any irregularities or damage to the skin. Whereas analysis of the patient is done in the office setting, high-quality preoperative photographs allow for more detailed study at a later time. The base view provides information about the shape and size of the columella, alar base, nostrils, and lobule. On the lateral view, the dorsum is assessed for smoothness, vertical position of the nasal starting point, convexity or concavity, and presence of a supratip break.

On frontal view, nasal width, symmetry, and presence of dorsal deviation are noted. Ideally the width between each alar groove is equal to the intercanthal distance, or is equal to 70% of the distance from the nasion to the tip-defining point. Wider interalar distance is present in oriental and black patients.

On profile view, the nasal properties to evaluate should include the bony dorsum, the projection and rotation of the nasal tip, and the nasal length. Dorsal nasal humps should be noted. Tip projection is evaluated by determining the protrusion of the nasal tip defining point from the anterior facial plane. 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 hypotenuse representing the nasal length (nasion to the tip-defining point). The ratio of the tip projection (horizontal) to the nasal length (hypotenuse) ideally equals .55 to .6 to 1. Tip rotation is evaluated by determining the nasolabial angle. The nasolabial angle is defined by measuring the angle between a line tangent to the columellar line and a line from the subnasale to upper lip's vermilion border. The angle should be 90 to 105 degrees in men and 100 to 120 degrees in women, though ethnic differences may influence this, with Mediterranean, Middle Eastern, and South Asian peoples often having smaller nasolabial angles. The ala to lobule ratio laterally should be equal; and about 2 to 4 millimeters of columellar show is normal.

The caudal view of the nose should show an equilateral triangle, with the columella in the center. The columella to lobule ratio should be about 2:1, and the nostrils should flare mildly laterally.

The skin and subcutaneous tissues should be assessed during facial analysis. Thick nasal tip skin has a tendency for more postoperative edema and scarring, predisposing the patient to postoperative pollybeak deformity. Thin skin is preferred because it heals more predictably, though with extremely thin skin, even minor deformities after surgery will be easily visible and palpable.

Key to preoperative nasal analysis is to take into consideration the patient's view of nasal cosmetic deficits. For instance, though the above measurements are considered generally ideal, the individual patient may not wish to alter characteristics that they feel define their ethnicity or family traits. Careful discussion with the patient with pictures or a three way mirrors helps to hash out patient expectations and the feasibility of meeting those expectations prior to any

surgery. Computer imaging techniques will continue to play a larger role in helping a patient have realistic expectations of surgical results.

## **Tripod Theory**

The tripod concept of tip projection, support, and rotation described by Anderson provides an understanding of the dynamics of tip rhinoplasty. The anatomy of the two alar cartilages forms a functional tripod that provides tip support. The right and left lateral crura comprise two legs of the tripod, and two conjoined medial crura function as the third leg. Anatomically, the medial crura are shorter than the lateral crura. The medial crural foundation is supported by the attachments to the superior and inferior septum. (Punjabi 2008)

## **Tip Rotation**

The tripod concept of nasal tip support and the major and minor tip support mechanisms must be considered in nasal tip rotation especially ptosis. In addition, the integrity of the medial and lateral crura, the attachment of the medial crural feet to the caudal end of the quadrangular cartilage, and the scroll-like attachment of the caudal end of the upper lateral cartilage to the cephalic margins of the lateral crura are the major tip support structures to consider. The minor tip support mechanisms include (1) the dorsal cartilaginous septum, (2) the interdomal ligaments, (3) the nasal spine, (4) the membranous septum, and (5) the alar attachments to the skin. Alterations in the size, shape, and integrity of the limbs of the tripod, together with the disruption of the major and minor tip support mechanisms, result in profound alteration in tip rotation.

A major step in any tip rotation procedure is the cephalic resection of a portion of the lower lateral cartilage. Such a resection leaves a gap between the lower lateral and upper cartilages. This gap is partially closed as the lower lateral cartilages scar upwards, resulting in tip rotation. Two basic types of cephalic cartilage resection include those techniques that preserve an intact strip of cartilage, and those that interrupt the entire lower lateral cartilage. Complete strip techniques resect a variable amount of the cephalic lower lateral cartilages. More cartilage is resected for a greater amount of volume reduction and for a greater degree of cephalic tip rotation. The complete strip can be weakened in several ways to assist in cephalic rotation. These methods must, however leave the lower lateral cartilages with sufficient strength to maintain tip support. For patients who have significant tip depression, interrupted cartilage techniques may be required to achieve sufficient tip rotation. The interruption of the lower lateral cartilage releases the spring-like tension on the nasal tip and allows much greater cephalic rotation of the tip. However, interruption also destroys a major tip support mechanism and also leaves the nasal tip subject to less predictable scar formation and asymmetries.

Adjunctive tip rotation maneuvers are often necessary to achieve adequate tip rotation, especially when complete strip techniques are used, as discussed above. Various degrees of excision of the caudal septum can effect tip rotation. This is because excision of the caudal septum can provide room for the infratip lobule to ascend during healing. The medial crura should be left attached to the caudal septum when possible, though, or resutured if the attachment is violated. Excessive caudal septum resection should be avoided, as this can lead to loss of cephalic tip rotation and projection. A high transfixion incision can be used on the caudal septum with excision of a triangular wedge of septal cartilage. This allows immediate cephalic

tip rotation, though projection may be sacrificed if resection is excessive. Excision of redundant portions of the upper lateral cartilages may be necessary if the alar cartilages are altered to a degree that they impinge on the upper lateral cartilages. This resection should be conservative to reduce the likelihood of resultant depressions in those areas. Excision of excess vestibular skin can create a minor force for cephalic rotation. Division of the depressor septi nasi muscle decreases dynamic tip depression and can greatly complement other modalities of tip rotation. Imbrication of this muscle has been shown to have greater and longer-lasting effect than simple division. Proper taping of the nose after nasal surgery may provide tip support during the healing process.

Other tip rotation techniques can create the appearance of tip rotation by altering the nasolabial angle. Morselized cartilage grafts into the columella-philtrum junction can result in increasing the nasolabial angle so that the illusion of tip rotation is created. Cephalic resection of the lower lateral cartilages to a point beyond the tip defining points can lead to a supratip dip that creates the illusion of tip rotation.

## **Tip Projection**

After primary rhinoplasty there is a postoperative decrease in nasal tip projection unless steps are taken to increase the length and strength of the medial crural segment. Either the cartilage-delivery or cartilage-splitting approach weakens or disrupts the support mechanism of the nasal tip. One of the ways to preserve tip projection after nasal surgery is to resuture the medial crural footplates to the caudal septum when they are detached. Additionally, a caudal strut may be fashioned from autogenous cartilage. The caudal strut should be fashioned with a curve that matches the columella and should be positioned and sutured between the medial crura. A pocket is dissected between the medial crura and the graft is placed here. The graft should not project beyond the domes of the lower lateral cartilages in order to avoid a tented up appearance of the nasal skin. The graft should not rest on the nasal spine, as displacement from the spine will cause the patient to experience nasal clicking and discomfort. Often the caudal strut can be sutured to the caudal septum.

Medialization of the lateral crura of the lower lateral cartilages can enhance tip projection. This can be accomplished in several ways. One method that is rarely used is the division of the lateral domes of the lower lateral cartilages and suturing of these cartilages together over the midline with permanent sutures. Although this procedure increases tip projection, it may also lead to a tent-pole appearance of the nasal tip. Another procedure, often referred to as the “Lateral Crural Steal,” (2), involves rotation of the lateral crura medially and placing an interdomal stitch to hold the crura in place. This procedure narrows the nasal tip, increases tip projection moderately, and leads to mild cephalic tip rotation.

Tip grafts can achieve the effect of increased nasal tip projection. The tip grafts can be of varying sizes and shapes. The grafts are placed in positions that enhance bilateral tip-defining points and therefore achieve maximum aesthetic results. Stabilization of the graft must be assured with sutures or creation of a snug pocket so that the graft does not become displaced. A single graft that is trapezoid or shield shaped can be fashioned and placed in the midline to overlap both tip defining points. Some surgeons, however, utilize rectangular or circular smaller

grafts and suture them individually over each dome so as to more closely approximate the natural separation of the tip defining points.

Other methods can create the illusion of increased tip projection. One such method is the removal of a dorsal hump, which makes the nasal tip appear more prominent. Cephalic rotation itself can create the illusion of tip rotation.

Reduction of tip projection is occasionally required. Reduction of tip projection is best achieved by assessing the cause of the problem and sacrificing major and minor tip support mechanisms directly related to this. Often this overprojection is due to an overdeveloped quadrangular cartilage of the septum. In such patients, the septal cartilage may place tension on the lower lateral cartilages, leading to overprojection. This can be corrected by reduction of the dorsal septum. When the lower lateral cartilages are responsible for overprojection, an interrupted strip technique with conservative resection of a rectangular wedge of cartilage with resuturing will aid in correcting the problem. An alternative method is the lateral crural overlay technique discussed above. Another tip support mechanism can be sacrificed to reduce tip projection via the transfixion incision, which sacrifices the medial crural footplate's attachment to the caudal septum. Most of the reduction of tip projection methods discussed above will lead to widening of the nasal ala. Wedge excision of the alar bases may be necessary to achieve nasal harmony.

## **Tip Definition**

One of the most common problems encountered when addressing tip definition is the bulbous tip. In order to correct this deformity it is important to recognize the underlying problem. The most common causes of bulbous tip are the wide interdomal distance, widening of the domes, weak lower lateral cartilage and thick skin with lack of definition. Many of the already describe maneuvers address the definition. The transdomal suture in particular plays an important role in definition by narrowing the domal structure and by end result the tip. Interdomal suture and medial crura suture will also improve definition by decreasing the interdomal distance. The dome division with binding suture significantly increase tip definition by decreasing the domal width.

## **Conclusion**

Understanding the importance of proper preoperative evaluation, intraoperative assessment and the individual and additive effects of tip-modification maneuvers is paramount to a successful outcome. Improved long-term results occur when the supporting structures of the tip are preserved or restore. A predictable result will be obtained if harmony between the major components of the nasal tip refinement which are nasal tip rotation, definition and projection.

## Reference

- Ghavami A, Janis JE Tip shaping in primary rhinoplasty: an algorithmic approach. *Plast Reconstr Surg*. 2008 Oct;122(4):1229-41.
- Constantian MB. The two essential elements for planning tip surgery in primary and secondary rhinoplasty: observations based on review of 100 consecutive patients. *Plast Reconstr Surg*. 2004 Nov;114(6):1571-81; discussion 1582-5.
- Cummings. Surgical refinement of the nasal tip. *Otolaryngology: Head & Neck Surgery*, 4th ed., Chapter 46-48
- Behmand R, Ghavami A., Guyuron B. Nasal Tip Sutures Part I: The Evolution. *Plastic and reconstructive surgery*. Volume 112(4), 15 September 2003, pp 1125-1129.
- Guyuron B, Behmand R. Nasal Tip Sutures Part II: The Interplays. *Plastic and reconstructive surgery*. Volume 112(4), 15 September 2003, pp 1130-1145
- Tardy, Eugene, M. *Rhinoplasty, the Art and Science*, pgs 375-571; W.B. Saunders Company, Philadelphia 1997
- Foda, Hossam M. T. MD. Kridel, Russell W. H. MD. "Lateral Crural Steal and Lateral Crural Overlay: An Objective Evaluation," *Archives of Otolaryngology -- Head & Neck Surgery*. 125(12):1365-1370, December 1999.
- Tardy, Eugene M. *et al*. "Surgical Anatomy of the Nose," Byron J. Bailey's *Head and Neck Surgery – Otolaryngology Third Edition*, pgs.2211-2227, Lippincott Williams and Wilkins 2001.
- Calhoun, Karen, "Introduction to Rhinoplasty," Byron J. Bailey's *Head and Neck Surgery – Otolaryngology Third Edition*, pgs.2229-2240, Lippincott Williams and Wilkins 2001.
- Tardy, Eugene M. *et al*. "Refinement of the Nasal Tip," Byron J. Bailey's *Head and Neck Surgery – Otolaryngology Third Edition*, pgs. 2255-2271, Lippincott Williams and Wilkins 2001.
- Kridel, RW, *et al*. "Advances in nasal tip surgery," *Arch Otolaryngol Head and Neck Surg*. 115:1206-1212, 1989.
- Farrior, EH. "Dramatic Refinement of the Nasal Tip," *Otolaryngology Clinics of North America*. 32:621-636, 1999