SURGICAL PROJECTION
OF THE NASAL TIP
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A - INTRODUCTION
In the past two decades increasing emphasis has been placed on creating appropriate nasal tip projection during rhinoplasty (Fig. 1). Failure to preserve or establish suitable tip projection inevitably produces a non-ideal and even surgical-appearing outcome.

- In every rhinoplasty operation, without fail, projection of the nasal tip is either increased, preserved or diminished.
- Preservation of the existing projection is the desirable surgical goal, if, as is true in the majority of Caucasian rhinoplasty patients, pre-operative projection of the tip is satisfactory.
- A smaller number of patients will require an increase in the projection of the tip relative to the newly-established profile line (Table I).

A variety of reliable operative methods exist for creating or augmenting tip projection; these techniques will be reviewed in this discussion.

- Finally, in a limited number of patients, tip projection will be decreased, either in the intentional reduction of the overprojecting tip, or as a consequence of post-operative "tip ptosis" secondary to the inadvertent sacrifice of tip support mechanisms, a preventable surgical misadventure.

The pathogenesis of alterations in tip projection becomes clear when the various major and minor tip support mechanisms are identified, clearly understood and respected during surgery.

The universal importance of these concepts must be appreciated by all nasal surgeons, since once stable and lasting tip sculpture, alignment and projection are achieved, the desirable alterations of the osseocartilaginous vault may be calculated and achieved with greater accuracy. Modern methods of establishing increased tip projection during both endonasal and open approaches have helped to secure improved surgical outcomes.

The relative projection (or lack of projection) of the nasal tip is the consequence of several anatomic nasal factors, usually interrelated, which vary in importance from patient to patient (Table II).

These include:
- the thickness and character of tip skin,
- the length of the infratip lobule including the length of the intermediate and medial crura,
- the overall columnellar length,
- the anatomy of the quadrangular cartilage (in particular the anterior septal angle),
- the nasal spine size, and
- the size and position of the premaxilla.

B - NASAL TIP PROJECTION PRINCIPLES

In the course of tip rhinoplasty, the need to enhance projection of the nasal tip is common. **Accurate and exacting diagnosis is essential to plan and execute the proper steps to stable tip projection.** Tip asymmetries, projection deficits, contour irregularities and the frequent demands of revision rhinoplasty may require cartilaginous grafts of varying size and shapes. These may consist of stiffening and supportive strut implants to the columella or alae, cartilage tip grafts for refining definition and projection, and occasionally concomitant premaxillary augmentation (Table).

*Only two tissues are deemed suitable for implanting into the mobile nasal tip: autogenous cartilage and fascia.* Without exception allografts are avoided and felt to be contraindicated in the nose.

Since cartilage grafts are ordinarily placed quite superficially beneath the nasal skin, it is imperative that they be somewhat stiff but not inflexible, that they be well tolerated, and that they may be easily harvested, fabricated and contoured. In patients with inordinately thin skin, cartilage tip grafts are best avoided, since they commonly become visible in the long-term healing phase when the thin skin shrink-wraps around the grafted cartilage. However, cushioning grafts by wrapping them with fascia or perichondrium my reduce the percentage of visible grafts long-term. Whether soft-tissue fillers such as Alloderm (lyophilized dermis) or Goretex can safely supply this cushioning long-term remains to be discovered. Thus autogenous cartilage and fascia are preferred when nasal tip implants are required. Cartilage harvested from the nasal septum or the external auricle, which represents an abundant regional storehouse of spare parts for nasal structural reconstitution, persists long-term after appropriate autografting.

Fascia is derived from the supra-auricular temporalis fascia (and occasionally from SMAS fascia during concomitant rhytidoplasty); layering and lamination can increase its bulk for contouring, effacement and irregularity smoothing. Infrequently, mature scar derived from tissue excess elsewhere in the nose or face serves well for soft tissue tip contouring in revision rhinoplasty.

*Tip projection is often created by suture reorientation* of the shape and attitude of the alar cartilages, borrowing from the lateral crura to augment the projection of the intermediate crura. Modern suture techniques allow increased tip projection while maintaining an intact complete strip of alar cartilage, thus helping to insure more symmetric healing.

Cephalic rotation of the alar cartilages in patients exhibiting a dependent tip can increase tip projection. The following techniques are dependable and useful in realizing permanent nasal tip projection during rhinoplasty.

C - NASAL TIP PROJECTION TECHNIQUES

1 - Preservation of existent projection and major tip supports

In the majority of Caucasian patients conservative cephalic *volume reduction of the alar cartilage with preservation of the tip defining points is an essential principle*, avoiding needless weakening of the major structural support to the nasal tip (Fig. 2,3). If the tip support provided by the medial crural footplate relationship to the caudal septum has been interrupted by a complete transfixion incision, permanent suture reattachment with concomitant columnellar cartilage grafts is indicated. Thereafter, an adequately sized tip graft is selected to provide continued support, augmentation, and projection (Table).
important support in order to avoid post-operative tip ptosis. Proper taping and splinting of the tip to close the tissue void created at the interface between the upper and lower lateral cartilages will aid in reconstructing this major tip support with favorable scar tissue development.

Failure to observe these principles risks tip settling and dependent ptosis, a preventable complication.

*Complete transfixion incisions* are best avoided in typical rhinoplasty procedures, unless retroprojection of an overprojected tip is desired (Fig. 4).

Fig. 3. Excellent preoperative tip projection maintained at 15 years following primary rhinoplasty.

Fig. 4a. Complete transfixion incision utilized only when tip overprojection requires tip repositioning. In this patient, tip overprojection has been reduced as a consequence of a complete

Fig. 4b. Partial transfixion incision, preserving medial crural footplate relationship to caudal septum which helps to preserve tip projection.
2 - Creation of improved columellar support and thrust

Stable long-term projection of the nasal tip may be improved by establishing a cartilaginous platform with consequent upward thrust to the columella. *Autogenous cartilage graft struts*, positioned below and/or between the medial crura, are effective in establishing permanent projection. *(Fig. 5).*

"Plumping" grafts of cartilage fragments introduced into the lower columella through a low lateral columellar incision are quite useful in columellar support in conjunction with effacement of and filling out the acute or retracted columella-labial angle *(Fig. 6, 7).* Patients with deficient skeletal supports (Binders syndrome, non-Caucasian rhinoplasty, etc.) may require premaxillary augmentation. Layered septal or auricular cartilage and/or carved costal cartilage can be used to augment the premaxilla and support the columella.

![Fig. 5. Curvilinear supportive columellar strut, to be positioned and suture-flasted between medial crura via a lateral columellar stab incision.](image)

![Fig. 6. "Plumping" grafts of autogenous cartilage, harvested from the nasal septum or external ear, improve tip support and improve columellar-labial angle aesthetics.](image)

![Fig. 7a. Patient demonstrating an acute naso-labial angle;](image)

![Fig. 7b. 11 years following rhinoplasty, including the use of plumping cartilage grafts to columella at columellar-labial angle.](image)

Columellar cartilage struts should be shaped with a gentle curve to match the anatomy of the curved columella, at times aiding in the creation of a distinct desirable "double break", but should never extend to the apex of the tip skin, lest a visible "tent-pole" appearance develop.

When applied via the external rhinoplasty approach, columellar struts can be sutured into a precise pocket between the medial crura, with the dual purpose of improving tip support and projection, as well as straightening the asymmetric, crooked medial crura.

Struts alone are infrequently used in to increase projection, finding greater value as one segment of a combination of tip projection techniques.

If the medial crural footplates diverge in a widely splayed fashion, further tip support may be gained by resecting intercrural soft tissue and suturing the lower medial crura together, converting a degree of horizontal width to vertical height.
3 - Transdomal suture techniques

In patients with strong well-developed alar cartilages, thin skin and subcutaneous tissues, bifidity and delicate alar sidewalls, the conversion of horizontal tip width to improved vertical tip height is favorably carried out by positioning one or more transdomal sutures through the residual complete strips developed after bilateral cephalic volume reduction of the alar cartilage (Fig. 8).

4-0 clear nylon or PDS (polydioxone) sutures are used to permanently alter the shape, attitude and relative projection of the dome (and therefore the tip defining points), insuring that the knot comes to rest between the domes, buried as deeply as possible from the tip surface epithelium.

The rigid anatomic criteria listed above must be met to insure a pleasing aesthetic outcome from this transdomal suture technique (Fig. 9,10). 2-4 mm of increased nasal projection is possible utilizing transdomal suture methods, in which a portion of the horizontal width of the broad domal angle is converted to increase vertical height, thus enhancing tip projection. Domal angles are narrowed and tip bifidity is corrected. Tip support is increased as well. The domal integrity remains intact, better insuring a symmetrical long-term outcome and improved tip triangularity.

The transdomal suture method has been successfully utilized for over 20 years in thousands of patients, and remains one of the stalwarts of tip techniques. Patients who present with strong cartilages, broad domal angles and bifidity between the domes represent ideal candidates for transdomal suture techniques. Highly natural long-term outcomes result from this favorable procedure, which simply reorients the alar cartilages and avoids any vertical division of the cartilages.
4 - Vertical dome interruption with lateral crural "steal"

In certain patients with broad tips, increased vertical height for tip projection may be recruited from the transverse or horizontal dimension of the alar cartilage lateral crura. The classical Goldman tip technique achieves added projection by an elongation of the medial crura by interrupting the complete strip and rotating borrowed cartilage from the lateral crus into the medial crus, maintaining this relationship by suture apposition (Fig. 11).

![Fig. 11. Goldman technique for increasing nasal tip projection.](image)

This interrupted strip technique however can lead to collapse of the lateral alar sidewalls in improperly selected patients unless the minor tip support mechanisms (the tip skin, soft tissue and alar sidewalls) are sufficiently strong and thick to compensate for the support lost by vertically interrupting the dome areas.

In addition, this approach may create a distinct "surgical look" to the nose in poorly selected patients, a price too high to be paid for projection enhancement.

Consequently, this technique is reserved for those patients who demonstrate markedly inadequate lobular length, inadequate tip projection, thick skin and supporting soft tissues (Fig. 12), and in whom more conservative tip projection techniques are judged to be adequate.

![Fig. 12. Two-year result of Goldman technique selected for patient demonstrating inadequate tip projection, bulbosity, a short infra tip lobule and thick, sebaceous skin.](image)
With the favorable results obtained by cartilage tip grafts combined with complete strip techniques, infrequent need exists in our practice for employing this more radical tip technique, which permanently interrupts the residual alar cartilage segments, thus setting the stage for potential asymmetrical healing.

5 - Projection with cartilage tip grafts

In the past two decades greater emphasis has been placed on the value of adding height (and therefore projection) to the nasal tip; pleasant definition of the tip anatomy can be achieved with carefully sculptured and judiciously positioned autogenous cartilage grafts from the nasal septum (Fig. 13) or the external ear (Fig. 14); our preference is the thicker nasal septal cartilage.

Since these tip grafts lie immediately subcutaneously, intimately subjacent to the skin, great care must be taken in their positioning and stabilization. If inserted through the endonasal approach, exacting "pocket preparation" becomes a basic prerequisite for their use, fashioning a pocket into which the graft will fit as precisely as a hand into a glove. Bilateral domal marginal incisions, limited to the region of the domes, allow excellent access for securing precise pockets at the infra tip lobule. If desired, the graft may be held temporarily in place within the prepared pocket by two transcutaneous 30-gauge needles while suture-stabilization is effected (Fig. 15). If the open rhinoplasty approach is selected, tip grafts are routinely sutured to the intermediate crura (Fig. 16).
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Carved in triangular, trapezoid or shield-like fashion, tip grafts may accentuate favorable tip defining points and highlights, and can succeed in creating a more normal appearance to tips with congenital or post-surgical inadequacies (Fig. 17, 18).

Fig. 17. Improved tip projection and aesthetic nasal balance following sutured-in-place cartilage tip graft.

Fig. 18. Nasal harmony and balance improved by use of cartilage tip graft inserted into precise infratip lobule pocket, employing no suture fixation.
Our twenty-five year experience with the stability and fate of infratip cartilage grafts is highly satisfactory. Cartilage "cap" onlay grafts, shaped like an inverted saucer, may be useful in increasing tip projection and contouring the apex of the nasal tip in Asian, African-American and certain revision rhinoplasties (Fig. 19, 20).

Fig. 19. In selected patients requiring improved tip projection, contoured auricular cap (CAP) grafts represent an alternate method of tip projection.

- Cap graft position to improve tip projection and contour.
- Layered cap grafts may be placed over domes in nasal tip to create added projection.

Fig. 20. Improvement in tip projection and contour following nasal tip projection with CAP graft.

Cap grafts, unlike traditional infratip lobule cartilage grafts, are positioned on top of the alar domes in precise pockets, thus achieving favorable contour and increased tip projection. In patients exhibiting extremely thin skin, cartilage tip grafts are best avoided.
6 - Cephalic rotation of tip

An actual increase in projection, or a significant illusion of increased projection, may be produced by techniques which are designed to result in cephalic rotation of the nasal tip structures. By reorienting the attitude tip structures in a more cephalic direction and stabilizing this reorientation, projection is enhanced (Fig. 21, 22). However, not all tip techniques which result in tip rotation automatically create added projection, and in fact the division of the intact complete strip of alar cartilage not uncommonly produces a loss actual tip projection, both initially and during the healing process long-term.

*Fig. 21. Improvement in stable tip projection following indicated nasal tip cephalic rotation (no strut or graft used in this patient).*

*Fig. 22. Nasal tip rotation resulting in improved tip projection.*

An important distinction must be drawn between tip rotation and tip projection. While certain tip rotation techniques may result in desirable increases in tip projection, the converse is not true.

Tip rotation and projection are in fact complementary to each other, and their proper achievement in individual patients is constantly interrelated. A classic example of this interdependent relationship is illustrated by the almost inevitable loss of the tip projection when interrupted strip techniques are chosen in order to enhance cephalic rotation; steps must be planned to restore adequate long-term tip projection by one of the several methods recommended.
7 - Illusory enhancement of tip projection

The perceptual illusion of enhanced tip projection may be created in the humped nose by simply reversing the usual relationship between the tip and supratip area. Incremental reduction of the cartilaginous dorsum produces a redefinition of the tip-supratip relationship, thus allowing the tip to project 2-3mm forward of the supratip dorsum and ideally lead the remainder of the ossecartilaginous profile when bony hump realignment is accomplished (Fig. 23). Satisfactory nasal tip projection must exist prior to profile realignment to invoke this illusory principle; likewise, all tip support mechanisms must be preserved or reconstituted without fail, since even a minute "settling" of the tip may rob it of pleasing projection and definition.

Fig. 23a. By aligning the supra-tip dorsum 2-3mm below the defining points, the illusion of favorable tip projection occurs. Adequate and stable tip projection must still preoperatively and postoperatively rely on this illusory method, and all primary tip supports must be preserved or reconstituted to insure long-term preservation of adequate tip support and projection.

Fig. 23b. The illusion of tip projection created by proper lowering of the dorsal profile line.
SUMMARY

In the overwhelming majority of Caucasian patients seeking rhinoplasty, tip projection is satisfactory; during rhinoplasty, the surgeon must ensure that all major tip supports are preserved or reconstructed to prevent tip retroproposition during healing.

In those patients demonstrating inadequate tip projection, an improved permanent forward thrust of the tip must be established by suture reorientation of the alar cartilages, cartilage graft augmentation of the tip and/or columella or by cephalic tip rotation maneuvers to convert tip dependency to satisfactory tip projection.

Utilized independently and often in tandem, the techniques described herein produce reliable effective long-term tip projection.

Table I

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<th>Factors influencing nasal tip projection</th>
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<td>1. Thickness and character of nasal tip skin</td>
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<td>2. Alar cartilage shape, strength and attitude</td>
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<td>3. Length of infra tip lobule and intermediate crura</td>
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<td>4. Length of columella</td>
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<td>5. Height of anterior septal angle</td>
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<td>6. Height of nasal spine</td>
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<td>7. Height of premaxilla</td>
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REFERENCES