

Nasal Tip Aesthetics; Review article

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Abstract

The nasal tip is one of the most important features of facial esthetics. The surgical anatomy of the nasal tip is determined by intrinsic factors, such as the nasal tip volume, shape, definition, and symmetry. These factors are intimately related to the morphology of the lower lateral cartilages and successful rhinoplasty depends on maintaining adequate nasal tip projection and rotation and their role in nasal tip definition. Securing the position and shape of the nasal tip is one of the most challenging problems in rhinoplasty. There are two main parameters which contribute to the aesthetics and subsequently the definition of the nasal tip. They are projection and rotation. A patient needing nasal tip surgery may present with any of these parameters being abnormal in any combinations. Septal extension grafting is more reliable method of controlling tip projection, shape, and rotation, particularly in patients with weak lower lateral cartilages. Septal extension grafts are proposed as a way of redefining the skeletal relationship between the nasal tip and dorsum. Creating structural support for the tip complex based on the anterior septum allows for predictable control of tip projection and/or rotation particularly in noses characterized by a weak mid-vault, a plunging tip, and drawn-up alae.

Keywords: Aesthetic Tip Parameters, Septal extension grafts

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Introduction

There are two main parameters which contribute to the aesthetics of the nasal tip. Those are projection and rotation. A patient needing nasal tip surgery may present with any of these parameters being abnormal in any combinations (1).

1. Tip Projection

In its simplest form, the concept of nasal tip projection refers to the anteroposterior extent to which the nasal tip is separated from the facial surface at the level of the alar-facial groove. However, this concept does not depict aspects of skin quality, nasal septum strength, alar cartilage morphology, and overall facial proportions (2).

The term projection of the nasal tip indicates how much it is projecting forward from the face and the rest of the nose. Thus, projection of the nose is measured in two scenarios, namely: 1. Projection of the nose in relation to the face as seen in $\frac{3}{4}$ view and lateral profile. 2. Projection of the nasal tip to the rest of the nasal dorsum as seen in the lateral profile (1).

Furthermore, alteration, either through increasing, decreasing, or preservation of nasal tip projection, will have effects on nasal tip rotation, dorsal height, and nasofacial aesthetic harmony. In several patients undergoing rhinoplasty, nasal tip projection will be adequate, and it is essential to preserve or reconstruct the tip support mechanisms to prevent loss of tip projection postoperatively. Additionally, it must be remembered that alterations in the tip projection will have influences on the nasal airflow through effects on the external and/or internal nasal valve (3).

The nasal tip projection is best assessed in the lateral profile view and the basal view. In the profile view, the projection of the nose on the face is measured in various ways. In practice clinical examination alone can say whether it is an over or under projected tip (4).

Goode method

First a vertical straight line is drawn between the nasion and alar sulcus. Another line perpendicular to this between the alar sulcus and nasal tip is drawn, with a final line connecting the nasion to nasal tip. An index, Goode's index, is then calculated to quantify the degree of projection (Fig.1).

Goode's index is AC/BC . A ratio of 0.55:0.6 corresponds to normal projection. A ratio less than 0.55 indicates hypo projection and more than 0.6 indicates hyper projection (5).

In another terms, Goode used a triangle with the nasion and tip defining point as landmarks that join at a 90° angle at the alar crease (6).

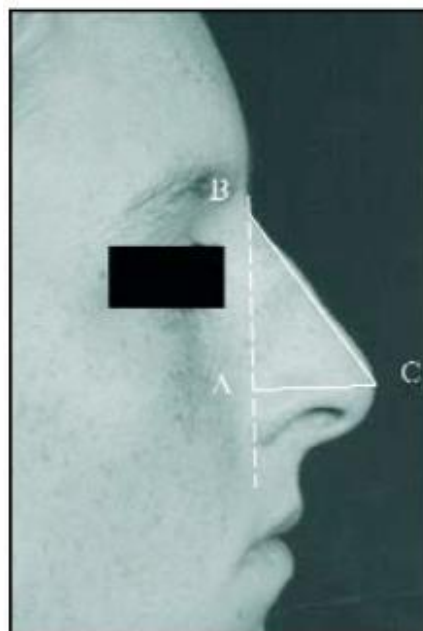


Fig. 1: Goode's method (8).

Baum method

A ratio between vertical height and tip projection was proposed by Baum. A line is drawn from nasion to subnasale, and a perpendicular line from this to nasal tip. Normal tip projection has been defined as 2:1, giving a nasofacial angle of 42 degrees (Fig.2) (7).



Fig. 2: Baum's method (7).

Powell and Humphreys

Powell and Humphreys tried to correct this interpretation. They would obtain a naso-facial angle of 36° and therefore a less obvious projection if the ratio was turned to 2.8:1. They use the entire vertical distance (denominator) of the straight line from nasion to subnasale tried to correct this interpretation (2).

Simons' method

According to Simons, nasal tip projection is determined by the height of the border of the skin of the upper lip. The ratio between the lipsubnasion and subnasion-nasal tip distances approaches 1 (Fig.3).

Simons' method has the advantage of being simple and easily applied. Upper lip examination remains essential especially during smiling. A "slanting" aspect of the latter is a sign of an over-short frenulum that requires correction in the same operation. On the other hand, when the nasal tip descends while smiling, this could indicate section of the muscle depressor septi. However, Simons' method has never been objectively assessed and has come in for criticism because of the large variability in lip size and the absence of relation to other nasal dimensions (8).



Fig. 3: Simons' method for the determination of the nasal tip projection according to the height of the cutaneous border of the upper lip (8).

The Crumley and Lanser method

The Crumley and Lanser method relates nasal length to nasal projection. A triangle is created between the tip defining point to alar crease (nasal projection CD), alar crease to nasion (AC), and nasion to tip defining point (nasal length AD), which should have a ratio of 3:4:5. The ratio of the length of a line drawn from the nasion to the vermillion cutaneous border of the upper lip (AB) should be 3.53 to the length of a line drawn perpendicular through the nasal tip (Fig.4) (2).

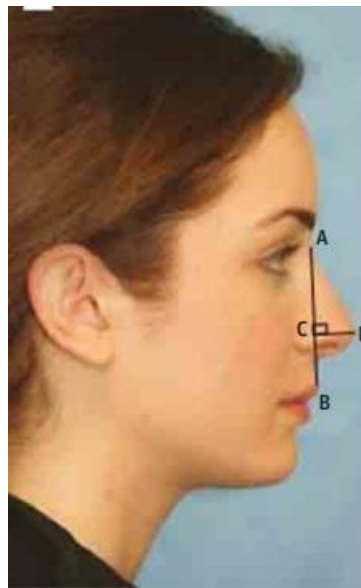


Fig. 4: The Crumley method (6).

It should be noted that these measurements are relative and not absolute since there are situations where the length of the nose is small and hence the projection line looks relatively longer. To compensate for variable clinical scenarios, more than one measuring tool is important. The nasofacial angle and fronto-nasal angle also help in deciding the projection of the nose. An ideal nasofacial angle should be around 35 degrees and an ideal naso-frontal angle between the frontal bone and the nasal dorsum should be 120 degrees' average. These angles determine the relative position

of the nasal bridge in line with the face, suggesting either over projection or under projection (Fig. 5) (1).

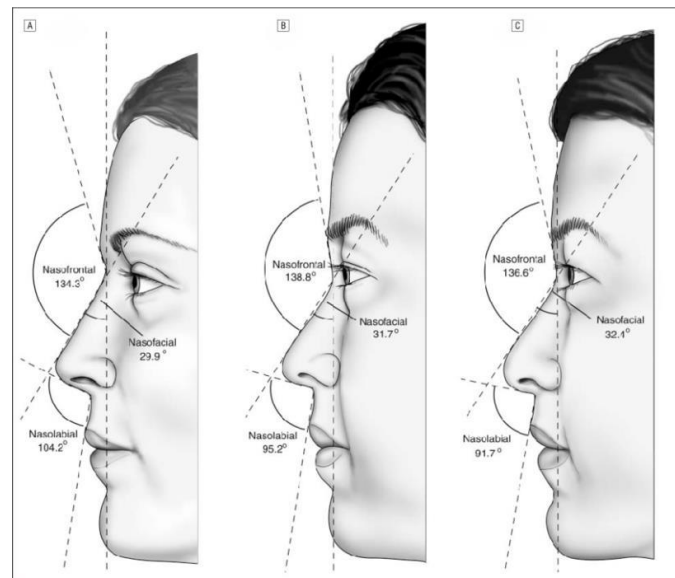


Fig. 5: Lateral views, including specified facial angle measurements of the average North American white woman (A), the attractive Korean American woman (B), and the average Korean American woman (C) (9).

Preoperative assessment of nasal projection is not complete without evaluation of chin projection. Retrognathism may exaggerate the appearance of an over projected nasal tip or give the false illusion of an over projection in a normally projected tip. Chin projection can be evaluated by dropping a vertical line from the vermillion cutaneous border of the lower lip perpendicular to the Frankfort horizontal plane in the lateral view. The pogonion should be in the same plane as the sub-nasal or vermillion border of the lower lip (10).

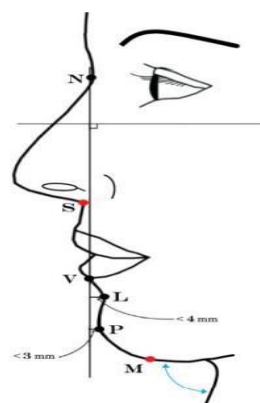


Fig: 6: Evaluating chin projection and cephalometric relations (11)

A vertical line perpendicular to the Frankfort horizontal is traced from the nasion (N) or inferior vermillion border (V) through the pogonion (P). The depth of the labio-mental sulcus is measured from this vertical line to the deepest point of the labio-mental sulcus (L). An aesthetic cervico-mental angle (blue line) is between 105 and 120 degrees. Subnasale (S) and menton (M) (Fig.6) (11).

Over-projection:

The majority of cosmetic rhinoplasties will involve either reduction of an over-projected nasal tip or maintenance of the intrinsic degree of projection. Most commonly, over-projection of the nasal tip is due to alar cartilage overdevelopment, either as an entire structure or of the individual lateral, intermediate, or medial components. When the whole alar complex is enlarged, it often creates the effect of extremely large and disproportionate nostrils (12).

Overdevelopment of the caudal septum may result in an over-projecting nose, and hypertrophy of the nasal spine may exacerbate this deformity. results from involvement of the anterior and posterior septal angles and the caudal aspect of the septum Interestingly, the lower lateral cartilages may be normal in size, hypertrophied, or even underdeveloped. The overdeveloped quadrangular cartilage creates a pedestal effect spuriously pushing the lower lateral cartilages forward. The resultant tension nose deformity tents the tip away from the face, tethers the upper lip, and blunts the nasolabial angle (Fig.7) (13).



Fig. 7: Demonstration of a “tension” nose (2).

Iatrogenic over-projection may occur from overaggressive attempts to increase tip projection. Often this is due to borrowing the lateral crura through an interrupted strip technique to enhance the central limb of the tripod. An example of this is the Goldman technique (14).

Under-projection

Under-projection is characterized by a short columella, usually due to medial crural insufficiency. Short medial crura may curve into small lateral crura without a significant segment of intermediate crura to provide caudal angulation and projection for the tip, typically resulting in an acute nasolabial angle (15).

In conditions such as Binder's syndrome (Maxillonasal dysplasia) and cleft palate, the medial crura are often of normal length but because of premaxillary insufficiency, there is underprojection of the entire tip. Loss of major tip supports (i.e., after septoplasty or previous rhinoplasty) can lead to cephalic rotation of the posterior septal angle and loss of projection (Fig.8) (15).

Additionally, a high radix may give the impression that there is no projection, which can be corrected by deepening the radix without addressing tip projection directly (16).



Fig. 8: Binder's syndrome (17).

2. Tip Rotation

The nasolabial angle has traditionally been accepted as the parameter for tip rotation. It is defined by the line from the subnasale to the upper lip vermilion border and the tangent from the subnasale along the inferior border of the columella, or the line between the subnasale and the most anterior point on the columella (18).

Yet, both the precise location of the subnasale, defined as the point at which the nasal septum merges with the upper lip, and the most anterior part of the columella may be difficult to define, especially in patients with curved transitions from the upper lip to the columella and a curved columella. As an alternative parameter for tip rotation, the tip rotation angle defined by the line between the long axis of the nostril and the Frankfurt horizontal plane has been described as being more accurate (Fig.9) (10).

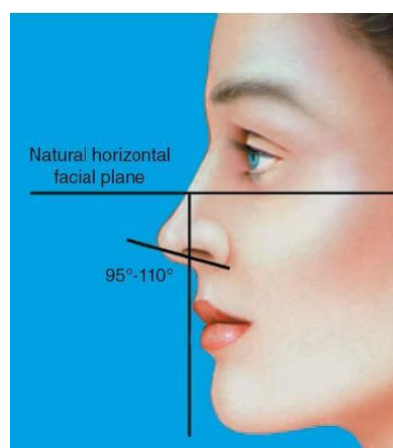


Fig 9: The nasolabial angle is measured by drawing a straight line through the most anterior and posterior points of the nostrils as seen on the lateral view. The angle this line forms with a perpendicular line to the natural horizontal facial plane is the nasolabial angle (19).

It is generally accepted that a nasolabial angle in the range from 90 to 95 degrees in men and 95 to 105 degrees in women is perceived as attractive. In individual patients, these angles offer no more than a rough rule of thumb as the desirable degree of tip rotation depends on gender, ethnicity, height, cultural influences, and personal preferences (20).

Under-Rotated Nasal Tip

There are two main underlying causes of a droopy nasal tip: 1. Extrinsic factors, which are associated with the septum, the upper lateral cartilage, the skin, etc. 2. Intrinsic factors, which are associated with the alar cartilages (21).

1- Droopy Nasal Tip Associated with Extrinsic Factors

Two problems at the level of the septum can cause a droopy nasal tip, Overdevelopment of the anterior septal angle and deficiency of the posterior septal angle or nasal spine (22).

In the case of overdevelopment of the anterior septal angle, an overdeveloped septal angle pushes the tip down. This condition is congenital and can be treated when the septal segment pushing the tip down is resected. The resection is triangular in shape, where the base of the resection must be in the dorsal septum (Fig.10) (23).

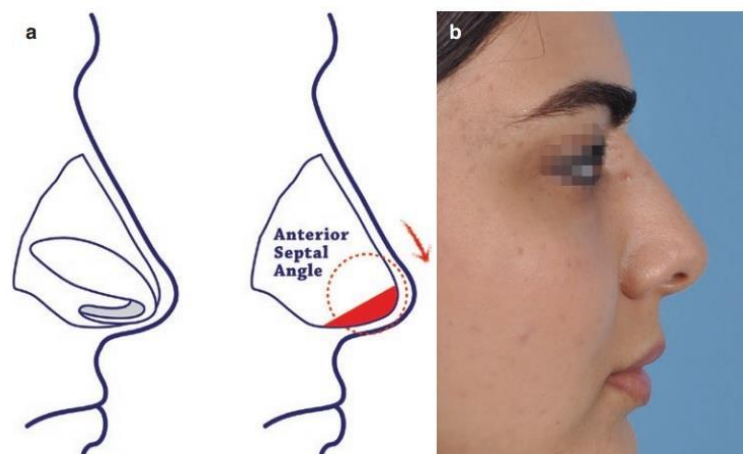


Fig. 10: (a) The red area shows excess caudal septum that is pushing the tip down. (b) Slightly under-rotated nasal tip stems from the excessive caudal septum (24).

In the case of deficiency of the posterior septal angle or nasal spine, the tip drops down due to an absence of base support. These cases show all signs of caudal septal deficiency, such as columellar retraction, an acute nasolabial angle, long upper lip, under-projected tip, etc. This is especially common in patients with previous septal surgery when the primary surgeon may either over-resect the caudal septum or cause the deformity in some other way (Fig.11) (25).

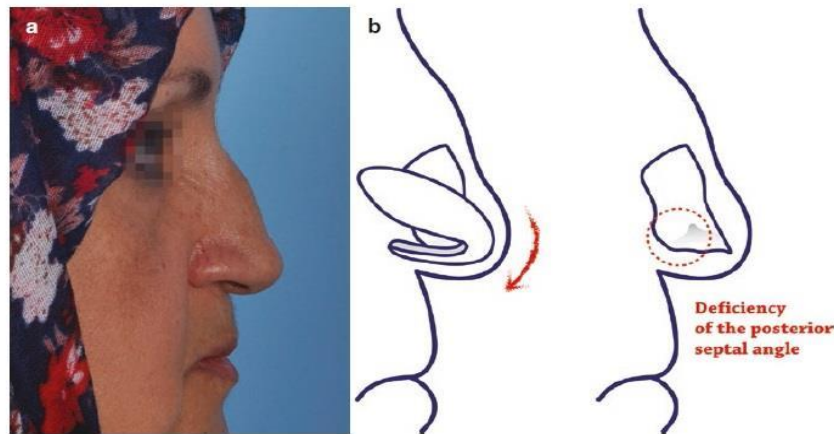


Fig. 11: (a, b) Droopy nasal tip due to deficiency of the caudal septum (24).

2- Droopy Nasal Tip Associated with Intrinsic Factors

Anatomical problems of the alar cartilages are among the main underlying causes of a droopy nasal tip where long lateral crura is the leading cause and Malposition of the lateral crura, which represents another alar cartilage abnormality, also results in a droopy nasal tip (Fig.12) (22).

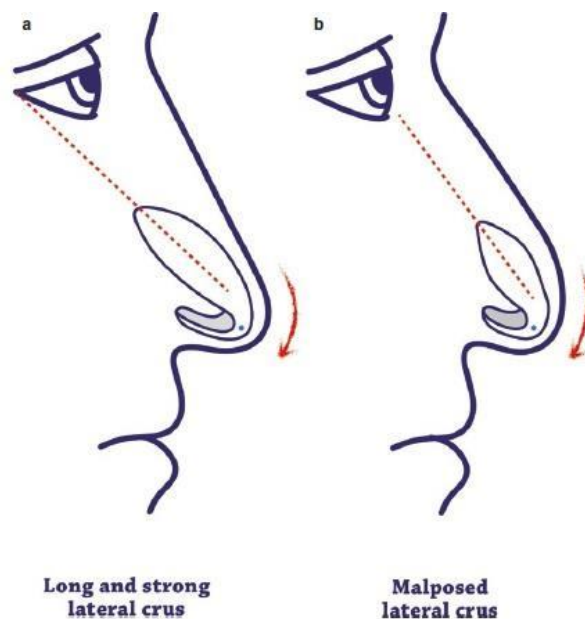


Fig. 12: (a) The long lateral crus pushes the tip down. (b) Although normal in length, the lateral crus push the tip down because it is directed towards the medial canthus (24).

Over-Rotated Nasal Tip

An over-rotated nasal tip is rarely congenital but, can be caused by certain conditions; however, it is mostly due to nasal surgery. An overrotated nasal tip mainly stems from the caudal septum and alar cartilages (26).

Excessive resection of the caudal septum without tip stabilization leads to over-rotation. In this representative case the tip rotation is ideal preoperatively, but aggressive septal resection to shorten the nose by the initial surgeon resulted in an over-rotated tip (Fig.13) (25).

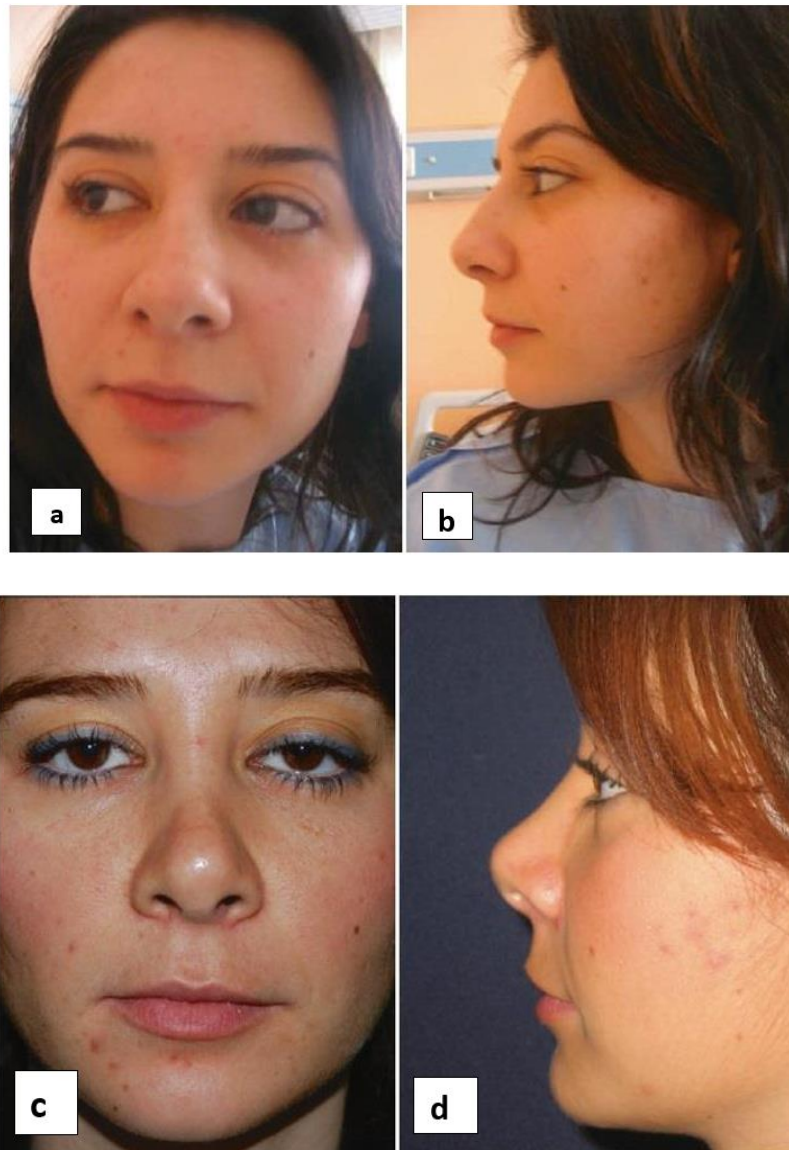


Fig. 13: (a, b) Before first rhinoplasty, there was no need to excessive septal trimming. (c,d) After first rhinoplasty, there is no sign about alar cartilage deformity. Over-rotated nasal tip comes from a deficiency of the anterior septal area (25).

Overzealous resection of the lateral crura may result in over-rotation and retraction. In the past, surgeons believed that the only way to narrow the nasal tip was through cephalic resection of the lateral crus, which was resected aggressively. However, with greater resection, the lateral crus become weaker. Moreover, if the middle-medial crus complex is long and strong, it tends to lie cranially; this type of over-rotation can shorten and weaken the lateral crus, which may in turn cause retraction and a pinched nasal tip (Fig. 14) (15).

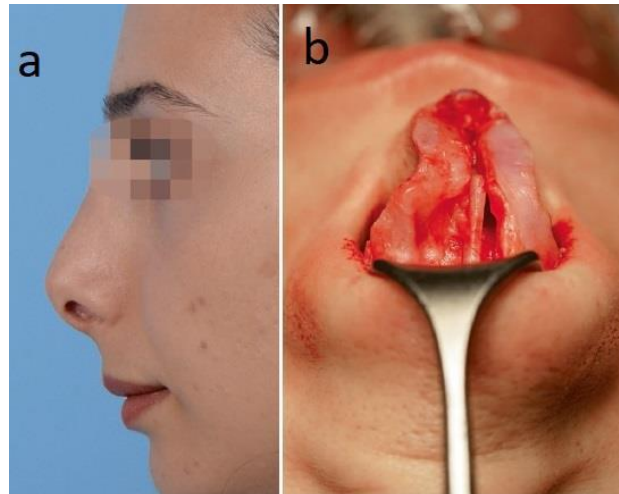


Fig. 14: (a) Preoperative profile image shows an over-rotated nasal tip. (b) Intraoperative image shows that the over-rotation was caused by overzealous cephalic resection of the lateral crura (27).

Techniques to Support Nasal Tip and Control Position

The objective of the following techniques is to control the position of the nasal tip relative to the alar facial groove. It must be remembered, however, that tip projection is only one parameter, one must allow for changes in tip rotation or shape of the alar cartilages. Surgical techniques for nasal projection have evolved from those often described as destructive to those favoured for sparing the integrity of the alar cartilage (2).

Methods to increase Projection:

Procedures to Reposition the Medial Crura

The tip-defining point correlates with the medial cephalic portion of the lower lateral cartilage. When we consider the tripod model, lengthening the central limb and thus raising this point requires changing the position of the medial crura. To be able to “elevate” the medial crura, it is essential that a firm support or “tent pole” is provided. This can be achieved either by fixation of the medial crura to the projected caudal margin of the quadrilateral cartilage or through a columellar strut. The medial crural septal suture, which anchors the medial crura to the caudal septum, can elevate or lower the medial crura with relation to the septum depending on the position of suture placement. Suture placement through the footplate and the antero-caudal septum can increase projection and rotation (2).

Columellar strut:

The Columellar strut is a structural support that can be placed between the medial crura by dissecting a pocket; when placed as a floating strut extending from just above the anterior maxillary spine to the intermediate crura, as described by Vuyk and Olde Kalter in 1993, the columellar strut can provide stability to medial crura that appear warped or buckled (Fig. 15) (28).

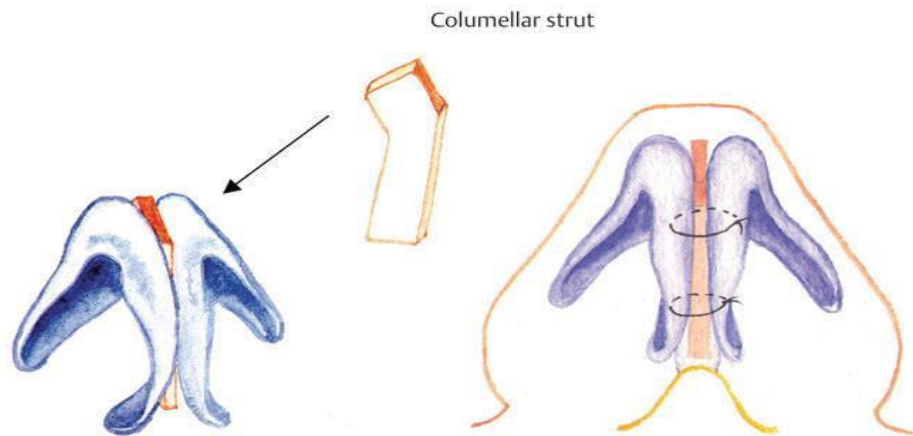


Fig. 15: Columellar strut (2).

medial crura footplate suture (Fig. 16)

The medial crural footplate suture can enhance nasal projection when excess angulation of the medial crura contributes to underprojection. In such cases, the medial footplates can appear splayed and the interdomal space widened. This suture helps maximize the length of medial crural cartilage already present but restores it from an otherwise “redundant” horizontal position back to the mid-line. Guyuron further modified this in 1998, describing the additional removal of the soft tissue between the crura and footplates and the use of a U stitch for approximation of the footplate (29).

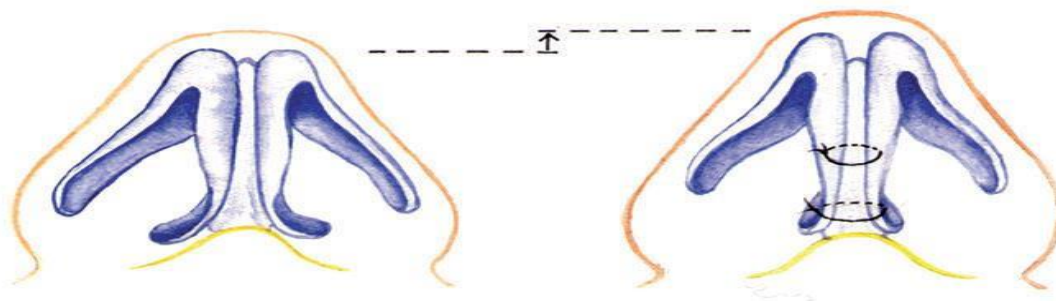


Fig. 16: Medial crural footplate suture (2).

Procedures to Increase the Medial Crural Length

A separate group of surgical techniques exist that collectively attempt to “borrow” cartilage from the lateral crus and add it to the medial crus. These are often described as “vertical dome division” techniques. The Goldman technique, described in 1954, is one such technique and requires separation of the lateral crus from the medial crus by complete transection lateral to the dome, after which it is mobilized medially and sutured to the medial crura. Often considered a destructive technique in that the integrity of the lateral crus is interrupted, it has been associated with tip asymmetry, affording a pinched appearance to the tip (30)

Modifications of this technique by Simons and Adamson have focused on improving the stability of the tripod through the use of suture stabilization, cartilage incision, incomplete excision, and overlapping as well as moving away from excision of vestibular skin as was originally described.

The lateral crural steal similarly borrows cartilage from the lateral crus and donates it to the medial crus but does so without disruption of the integrity of the alar cartilage. The resultant shortening of the lateral crus, however, confers some degree of tip rotation, and if this is not required, the technique can be modified to mobilize the entire lateral crus, disarticulating its pyriform aperture attachments and freeing the vestibular skin to the free lateral margin of the cartilage, which ultimately removes the tethering effect on the lateral crura, eliminating the potential for any “shortening” effect (Fig. 17) (30).

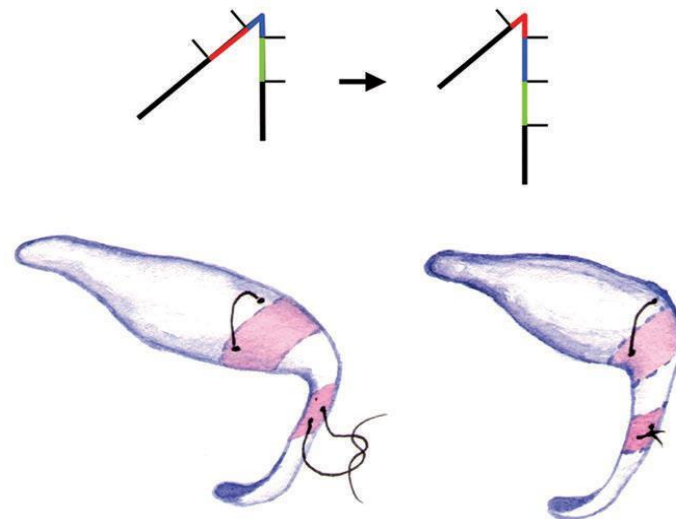


Fig. 17: Diagrammatic and pictorial representation of lateral crural steal (2).

Procedures to Modify the Shape and Length of the Lateral Crura

The lateral crural convexity control suture is a horizontal mattress suture utilized, as its name suggests, to reduce the degree of convexity of the lateral crus. However, secondary changes in nasal projection can occasionally be consequent to this suture placement (31).

The transdomal suture is a horizontal mattress suture that was first described by McCollough and English in 1985, but has since been modified by Tardy and Cheng and Daniel et al. This procedure, also known as the "dome-defining suture," begins with a medial crural stabilization suture, followed by the placement of a horizontal mattress suture through the lateral crus and out through the medial crus slightly below the new domal unit. In circumstances when the tip is under-projected in the lobule, this can add up to 2 to 3 mm of height (Fig. 18) (32).

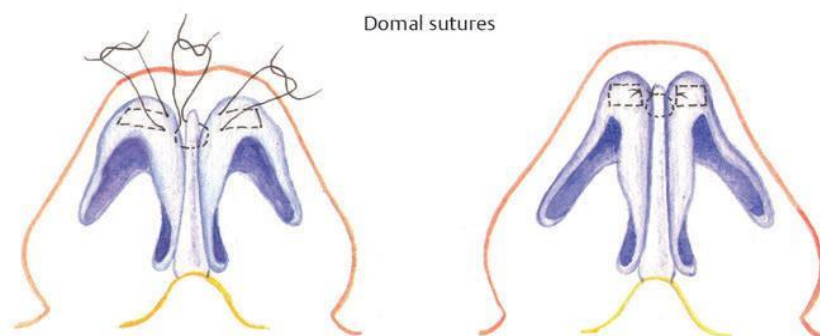


Fig. 18: Demonstration of individual dome defining and interdomal suture (2).

Procedures to Alter the Soft Tissue Envelope

The nasal tip, though, is not only defined by the alar cartilages. In contrast to the previously mentioned suture techniques on the alar cartilages, the overlying soft tissue envelope above the domal unit can also be modified to achieve extra projection. Onlay grafts using autologous septal or auricular cartilage can be placed in a subcutaneous pocket above the domes to increase height and thus projection (33).

Alternately, shield grafts can be connected to the medial crura of the infratip lobule to improve projection by pushing into the tip skin. Graft visibility postoperatively is a concern with these grafts, especially in patients with thin skin (Fig. 19) (34).

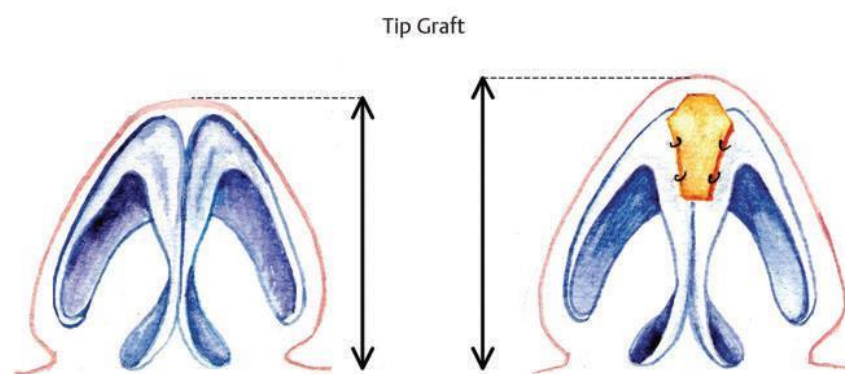


Fig. 19: Shield graft (2).

Some authors recommend that grafts should be avoided in such groups, and when used in other groups, a camouflage material such as perichondrium or fascia should be inserted at the leading edge. Alternatively, a buttress or cap graft, which consists of cartilage, can be sutured to the cephalic edge of the shield to provide a smoother transition between the shield and domes. Insertion of tip grafts can achieve the greatest effects on projection but the potential effect on tip/lobule dimensions must not be overlooked (33).

Method to decrease projection:

Procedures to Reposition the Medial Crura

Suture placement through the medial crura anteriorly and the caudal septum close to the nasal spine would have the reverse effect on projection (2).

Procedures to Modify the Shape and Length of the Lateral Crura

Addressing the overprojected nose similarly requires one to analyse the individual components of the nasal tip. Kridel and Konior described the lateral crural overlay technique for shortening the lateral crus. This technique describes the placement of a vertical incision in the middle segment of the crus, followed by overlapping of the separated ends to effectively shorten the length of the crus. However, shortening of the lateral crus can induce tip rotation (Fig.20) (35).

Wise et al. provided details of the intermediate crural overlay approach, which also led to nasal deprojection but specifically preserved the curve of the nose (36).

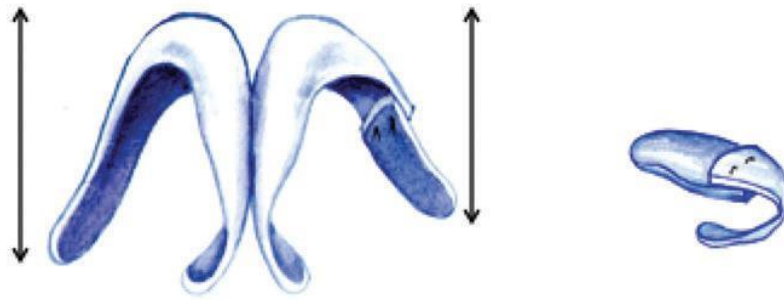


Fig. 20: Lateral crural overlay (2).

Procedures to resect alar cartilage:

To effectively de-project the nose without rotation ultimately requires resection of similar lengths of both the lateral and medial crus of the alar cartilage. This was recognized by Joseph and Safian, who recommended excision of both components of the alar cartilage, and also by Foda and Kridel and Soliemanzadeh, who incorporated medial and lateral crural overlay techniques to de-project the nose without impacting on rotation (Fig.21) (37).

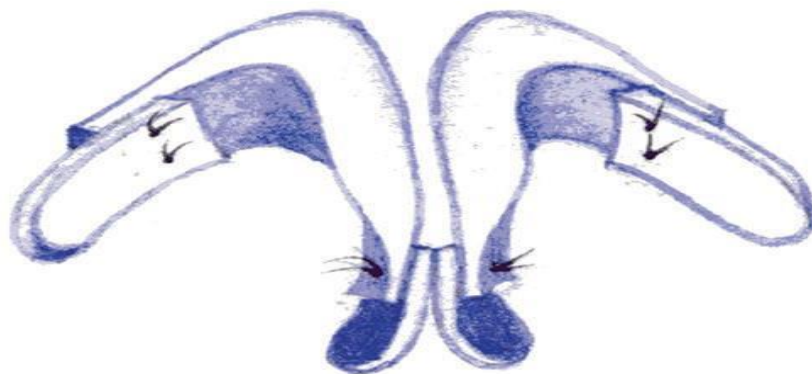


Fig. 21: Medial and lateral crural overlay (2).

Method for Increasing Tip Rotation:

Septal Reconstruction

A common cause of acquired tip ptosis (loss of projection and rotation) is a posttraumatic loss of caudal septal support to the tip. Reconstructing the caudal cartilaginous septum or repositioning a displaced cartilaginous septum (lamina quadrangularis) in itself may be sufficient to restore tip projection and rotation and in selected cases may obviate the need for surgery of the alar cartilages or grafting (38).

Columellar Translation (Anchor Suture, Columellar Strut) (Fig.22)

The medial crura suture, middle crura suture, interdomal and transdomal sutures, lateral crura suture, medial crura anchor suture, tip rotation suture, medial crura footplate suture, and lateral

crura convexity control suture are only a few suturing techniques that have endured the test of time (39).

The medial crura-septal suture increases tip projection, rotates the tip cephalically, and retracts the columella. The tip rotation suture shifts the tip cephalad while also retracting the columella. The columella may be translated with the tongue-in-groove technique, repositioning the medial crura on either side of the caudal cartilaginous septum. This lifts the columella and repositions the tip by anchoring the medial crura in a new position (29).

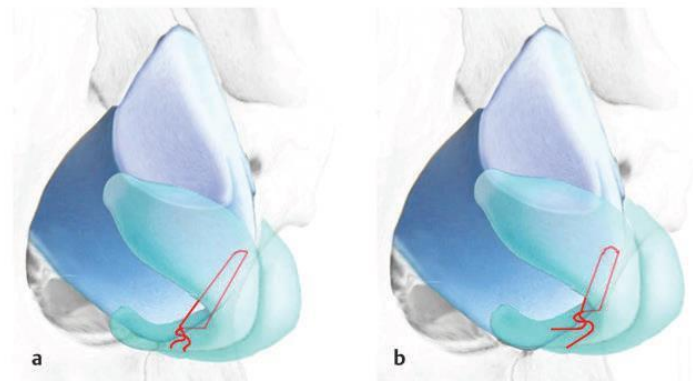


Fig. 22: (a) The columella-anchoring suture is passed through the septal angle and the medial crura. (b) It translates the columella in a ventrocephalad direction, increasing tip projection and rotation and decreasing columellar show and straightening the columella on the side view (40).

The manoeuvre provides a reliable and reproducible method for the correction of a hanging columella or excessive columellar show and control of nasal tip rotation and projection while preserving the integrity of both the alar cartilages and the caudal septum. This is particularly useful for the correction of simultaneous excess columellar show and an acute nasolabial angle. A columellar strut is a time-tested and frequently used technique, particularly after an external approach, to prevent nasal tip ptosis or increase tip projection and, to a lesser degree, tip rotation (31).

Cephalic Trimming of the Alar Cartilage

Resection of the cephalic margin of the lateral crus has been described as a suitable technique for incremental rotation of the nasal tip, with the degree of rotation depending on the width of the resected cephalic strip (31).

Shortening of the Lateral Crus: Lateral Crural Overlay and Lateral Crural Steal (Fig.23)

Shortening the lateral crus of the alar cartilage pulls the alar cartilage domes and thereby the tip-defining points into a more cephalad direction. A prerequisite for this upward rotation is an intact lateral attachment to the pyriform aperture or pyriform ligament (32). The lateral crural steal technique advances the lateral crura onto the medial crura, increasing projection and rotation of the nasal tip while preserving the integrity of the lobular cartilage (30).

In the lateral crural overlay technique, the lateral crus is shortened by a transection at a right angle and overlapping the segments that are fixed with a mattress suture. A comparison of the lateral crural steal and the lateral crural overlay techniques, performed by the same surgeon, revealed a significantly more pronounced increase of the nasolabial angle and the tip rotation angle for the lateral crural overlay technique (40).

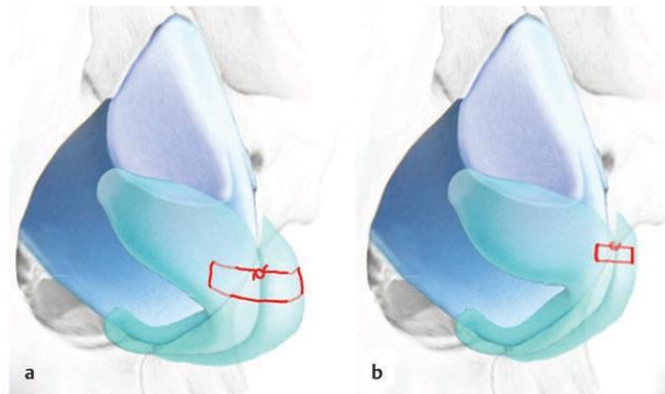


Fig. 23: (a) The lateral crural steal procedure: a horizontal mattress suture is placed lateral to the alar cartilage domes and (b) shortens the lateral crura while it lengthens the intermediate crura, narrowing and rotating the tip (40).

Suspension Sutures: Lateral Crural Pull-up

The concept of repositioning the tip with sutures only is tempting due to its simplicity. A domal stabilization suture that does not affect rotation or projection has been proposed to refine and stabilize the tip with a single suture between the cephalic borders of each dome, enabling each dome to be unified into one symmetric tip complex (41).

It goes without saying that this stitch can be used to relocate the tip by passing through the septum. Sutures between the septum or upper lateral cartilages and the alar cartilages have been advocated as being generally straightforward, effective, and dependable. In one technique, the tip is directly suspended with a permanent suture that is passed through the alar cartilage domes and the osteo-cartilaginous junction of the nasal dorsum, creating more rotation compared with a combination of a resection of the caudal septum with trimming of the upper lateral cartilages and a resection of a cephalic strip of the lateral crus (42).

Decreasing Tip Rotation:

For most surgeons, the correction of an overrotated tip is much less common than surgery of a drooping tip. Besides being constitutional, overrotation is frequently iatrogenic, after overzealous use of tip rotation techniques. As it is not uncommon to be faced with an aggressive resection of the cartilaginous framework and scarring of the vestibular lining, these deformities can be very difficult to correct (40).

Columellar Translation

A reduction of both tip projection and rotation may be achieved through a translation of the columella in a posterior direction or shortening of the columella by splitting and over- lay of the

medial or intermediate crura, as described by Lipsett. The transection must not be too close to the domes, as an overlay in the intermediate crura deprojects the tip without changing tip rotation. Care must be taken to balance the repositioning of the columella with an adequate shortening of the lateral crus if caudal rotation of the tip is to be avoided (Fig. 24) (36).

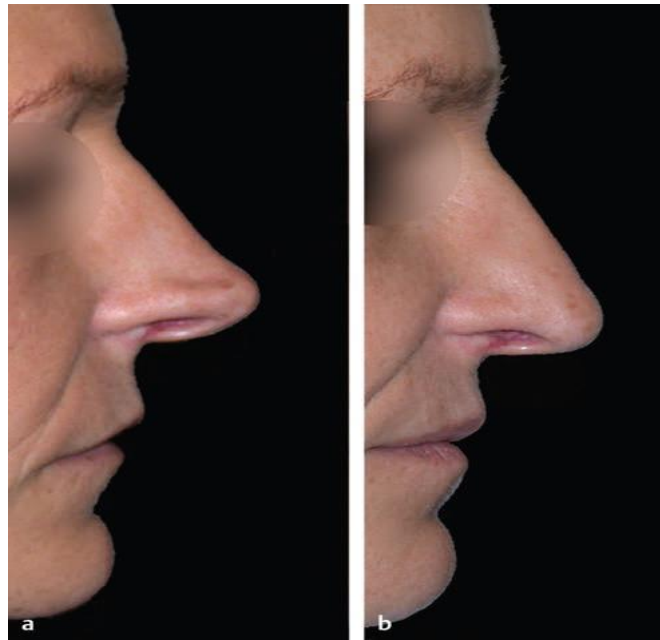


Fig. 24: (a) Deprojection of an overprojected tip by a transfixion of the membranous septum, posterior displacement of the columella, and fixation with an anchoring suture. (b) Note the unwanted counterrotation of the tip due to inadequate shortening of the lateral crura (40).

Septal Extension (Fig.25)

The nose may be lengthened and the tip counterrotated by transposing the septal angle to a more caudal position. This can be achieved with a septal extension graft, sutured on to the quadrangular plate, or with spreader grafts that extend beyond the septal angle (45).

Both the septal extension graft and the extended spreader grafts may be used prophylactically to prevent a short nose deformity and therapeutically by lengthening the nose and counter rotating the tip. For substantial lengthening, extended spreader grafts may be connected to a columellar strut graft or cartilage or composite grafts may be interposed between the upper and lower lateral cartilages (46).

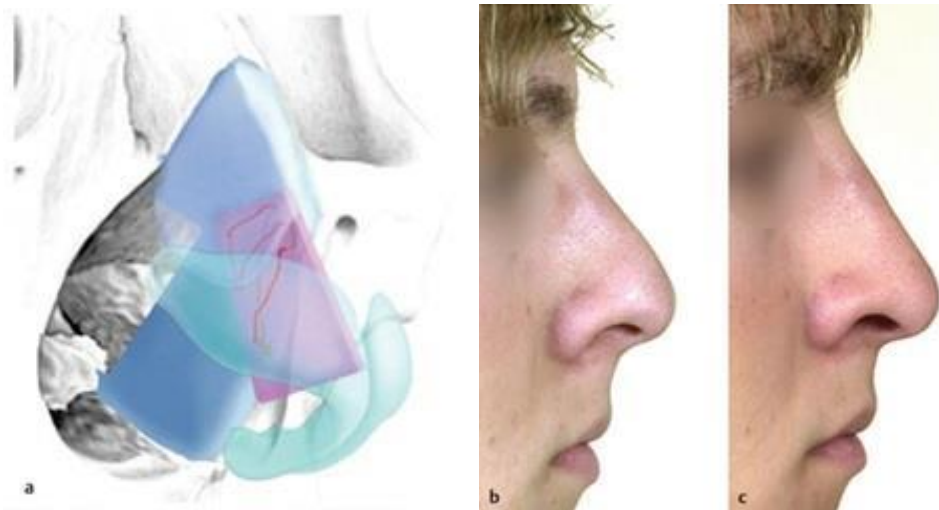


Fig. 25: (a) Lengthening and caudal rotation of the tip with a septal extension graft. The graft is sutured to the septum and creates a new septal angle in a more caudal location, rotating the tip downward. Note that this manoeuvre may accentuate preexisting alar retraction (40).

Columellar Strut (Fig.26)

For years, surgeons have called any graft placed in the columella a columellar graft, but Daniel Palhazi prefers the term crural strut to denote the purpose of the graft, which goes in between the middle and medial crura. The crural strut provides stability and allows the surgeon to shape the tip. It does not rest on the anterior nasal spine (ANS). The usual crural strut graft measures approximately 20 mm in length and 2–3 mm in width, with the thicker portion located inferiorly (47).

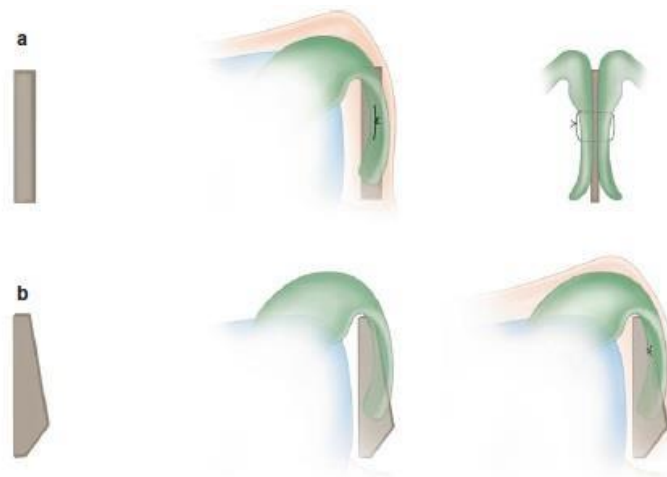


Fig. 26: Columellar struts. (a) Crural strut b) Extended columellar strut (47).

The strut is placed between the medial and middle crura, with the inferior end short of the nasal spine. The crura are then advanced upward and rotated medially 90° before being fixed to the strut just below the domes, using a #25 needle. A horizontal suture of 5-0 polydioxanone suture (PDS) fixes the crura to the strut and is placed in the middle crura above the columellar breakpoint. The

superior portion of the strut can be cut to fit beneath the domes, and the inferior portion can be cut off if there is too much fullness at the columella-labial angle (2).

Extended columellar strut grafts tend to be longer (30 mm) and are shaped to influence the columellar inclination. They measure 8–10 mm at their widest portion, which is the junction between the upper two thirds and the lower one third of the strut. After its insertion between the crura, a distinct change should be seen in the columellar inclination of the columella-labial angle. Again, the graft is kept short of the ANS to avoid clicking. These grafts are frequently used in ethnic noses and in the older patient with an acute columella-labial angle (Fig. 27) (48).

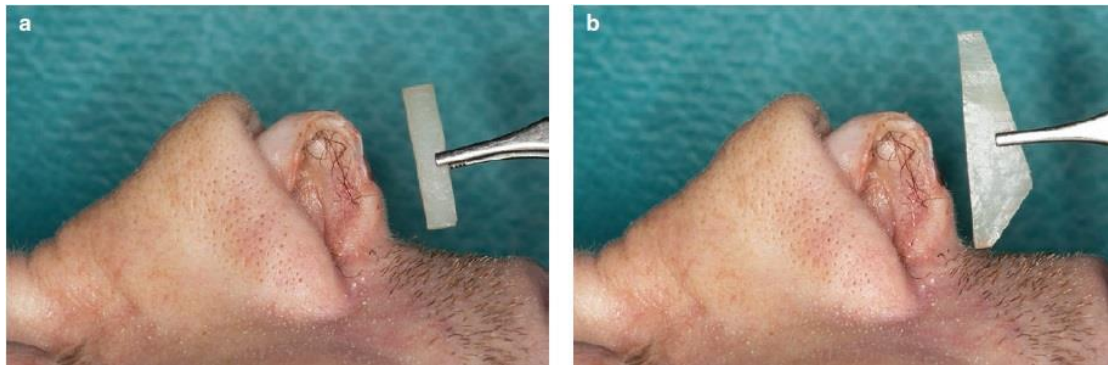


Fig. 27 (a) Crural strut graft. (b) Extended columellar strut graft (47).

Dhong et al modified technique that differs from the columellar strut or the septal extension graft by using the L-shaped columellar strut. As the L-shaped columellar strut is fixed to the caudal septum, with its vertical portion positioned between the medial crura, a droopy tip is less common than with the floating columellar strut. Its fixation is not too strong, which allows the nasal tip to feel smoother and more flexible than with the fixed columellar strut or the septal extension graft (Fig. 28) (49).

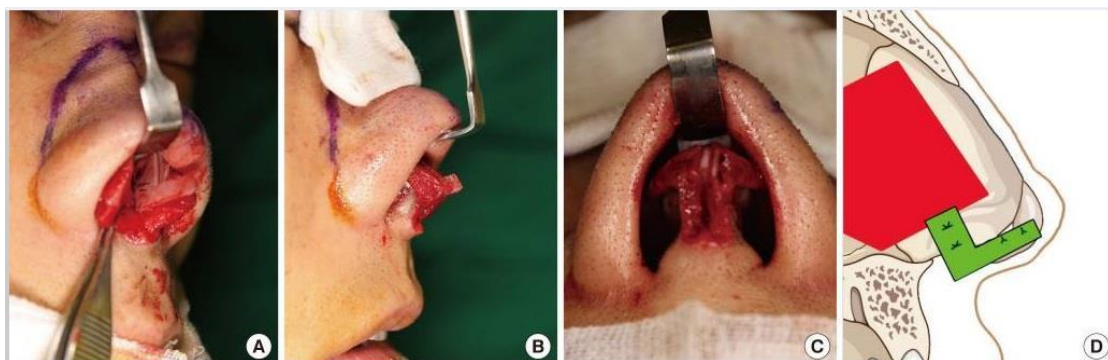


Fig. 28: Intraoperative images of the L-shaped columellar strut (A) The horizontal portion of the strut was sutured to the caudal septum. (B) The vertical portion of the strut was placed in between the lower alar cartilage. (C) The domal segment of the alar cartilage and the strut were sutured at two points. (D) Schematic diagram of the L-shaped columellar strut technique (49).

Septal extension grafts

Byrd et al. introduced septal extension grafts as a more reliable method of controlling tip projection, shape, and rotation, particularly in patients with weak lower lateral cartilages. Septal extension grafts were proposed as a way of redefining the skeletal relationship between the nasal tip and dorsum. Creating structural support for the tip complex based on the anterior septum allows for predictable control of tip projection and/or rotation particularly in noses characterized by a weak mid-vault, a plunging tip, and drawn-up alae (50).

Varieties of septal extension grafts have been described to support the medial crura and control tip shape, all of which depend on the presence of a stable caudal septum. Although these differ in their shape and points of fixation to the septum, they have similar points of fixation within the tip lobule complex. It is important to note that points of septal fixation indeed vary depending on status of the mid-vault, septal stability, and amount of available cartilage, whereas the distance that the graft extends beyond the dorsal septum is contingent on the thickness of the overlying skin (3).

To be effective, septal extension grafts should extend beyond the anterior septal angle into the interdomal space. The most caudal and inferior portion of the graft is placed on the cephalic border of the medial crus at the columellar-lobular angle. The most important point of fixation is inferior to the divergence of the middle crura, where the cephalic borders of the medial crura abut each other. At this point, the graft incorporates the desired columellar-lobular angle. A point of interdomal fixation can then be used to control wanted interdomal distance and projection. If supratip break is desired, graft fixation to the lower lateral cartilage should allow for a marked differential between the domes and nasal dorsum (51).

Paired Extended Spreader Grafts (Fig. 29)

It can be used to alter both tip projection and rotation in settings of mid-vault collapse or narrowing. An increase in internal nasal valve angle is often achieved by placement of these grafts at the junction of the upper lateral cartilage and septum in a parallel line to the nasal dorsum. Any horizontal excess in cartilage should be recessed 1 to 2 mm below the plane of the dorsum to avoid excessive dorsal widening. To increase tip projection, the distal segments of the graft need to extend vertically beyond the level of the dorsum. Finally, suturing the tip-lobule complex to the graft establishes the desired tip projection or rotation (52).



Fig. 29: Paired extended spreader grafts (19).

Caudal Extension Grafts (Fig. 30)

Toriumi described the use of caudal extension grafts in cases of caudal septal deficiency. In the foreshortened nose or in the setting of columellar retraction, caudal extension grafts can decrease tip rotation and alter the alar columellar relationship. Grafts are traditionally fixed directly to the anterior nasal angle and thus inherently unstable. Several techniques can be used to address this issue. Suture fixation in at least three points is essential, while using a significant amount of cartilage allows for greater degree of overlap between the graft and the caudal septum (19).

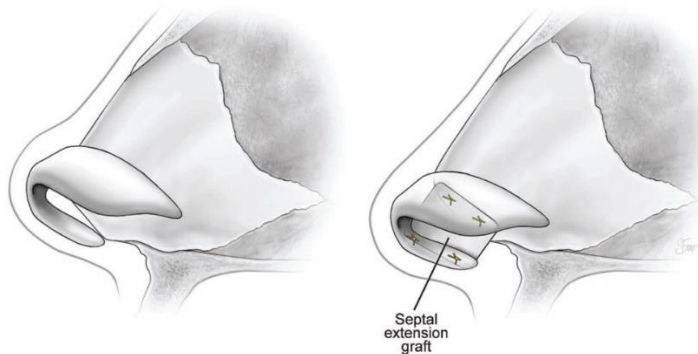


Fig. 30: Nasal length is increased by placement of a septal extension graft (53).

The tongue-in-groove technique was first described by Guyuron and Varghai as a way to effectively improve tip projection in the setting of a severely shortened nose. It allows for nasal lengthening, ensures tip alignment with the rest of the nose, and avoids tip rigidity. To accomplish this, bilateral spreader grafts extending beyond the caudal septum are sutured to the septum. A columellar strut is then placed in the groove formed by the extensions of the spreader graft. The medial crura are then sutured to a portion of the columellar strut. To prevent excessive columellar show when using the tongue-and-groove technique, it is necessary to properly mobilize the lower lateral cartilages (Fig. 31) (53).



Fig. 31: Tongue in groove technique (19).

No Conflict of interest.

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