Section A-Research paper

An Overview about Techniques to Support Nasal Tip and Control Position

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Abstract

Background: Support for the nasal tip is derived from a combination of bony, cartilaginous, and soft tissue structures. Bone of the midface provides the foundation for nasal support. Medially, the maxillary crest serves as a buttress for the nasal septum. The septum in return provides crucial support for the external nose and nasal tip. Soft tissue attachments from the dorsal and caudal septum to the lower lateral cartilages have a direct influence on tip support and location. Laterally, soft tissue attachments connect the lower lateral cartilage complex to the bony piriform aperture. The lower lateral cartilages are considerably supported by the dorsal and caudal septum. Lower lateral cartilage shape, location, and integrity are crucial for the appearance and function of the nasal tip and external nasal valves. Each lower lateral cartilage is composed of a medial crus, middle crus, and lateral crus. The outward appearance of the nasal tip is governed by the features of these crura and the soft tissue connections to neighboring structures. Facial analysis transforms the aesthetic appearance of the face into its underlying anatomical features. The surgeon can precisely establish the structure underneath the SSTE through careful visual and tactile examination. The anatomy can be palpated to determine the strength of the underlying framework. This analysis enables the surgeon to predict structural defects and arrange the necessary modifications to obtain the desired results for the patient. 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.

Keywords: Support, Nasal Tip, Control Position

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Introduction

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1. Methods to increase Projection:

1.1 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 anterocaudal septum can increase projection and rotation **(Robinson & Thornton, 2012).**

1.2 Columellar strut (Fig. 56):

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 **(Rohrich et al., 2012).**

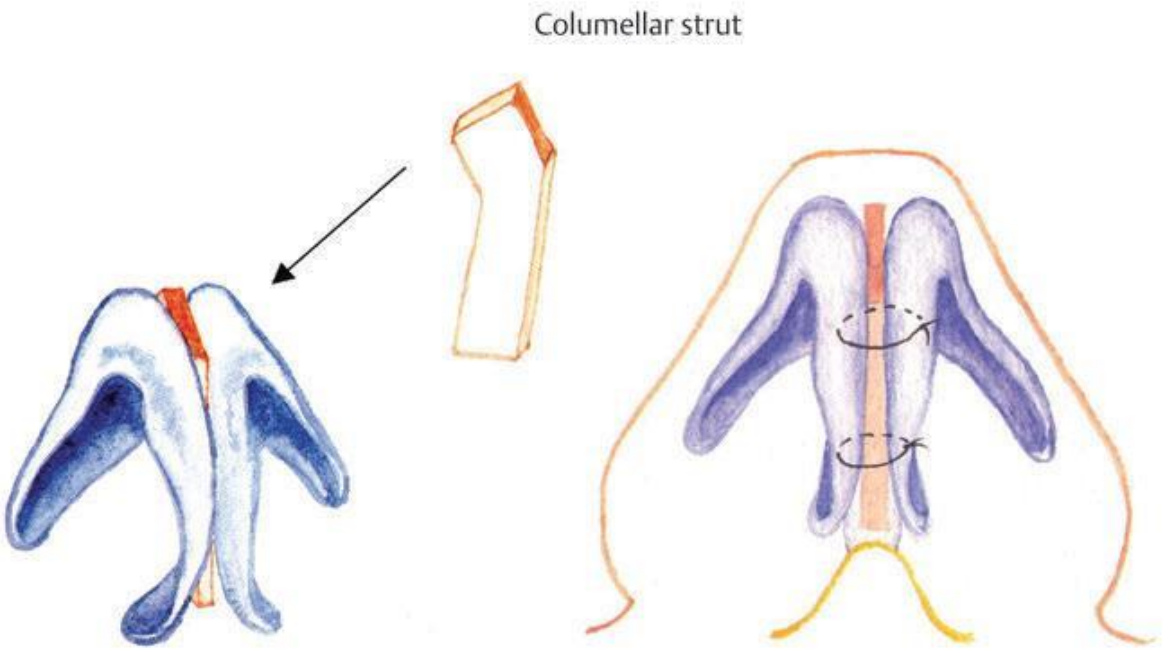

Fig. 56: Columellar strut **(Robinson & Thornton, 2012).**

1.3 medial crura footplate suture

The medial crural footplate suture can enhance nasal projection when excess angulation of the medial crura contributes to underprojection **(Fig. 57).** 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 **(Guyuron, 1998; Toriumi, 2020).**

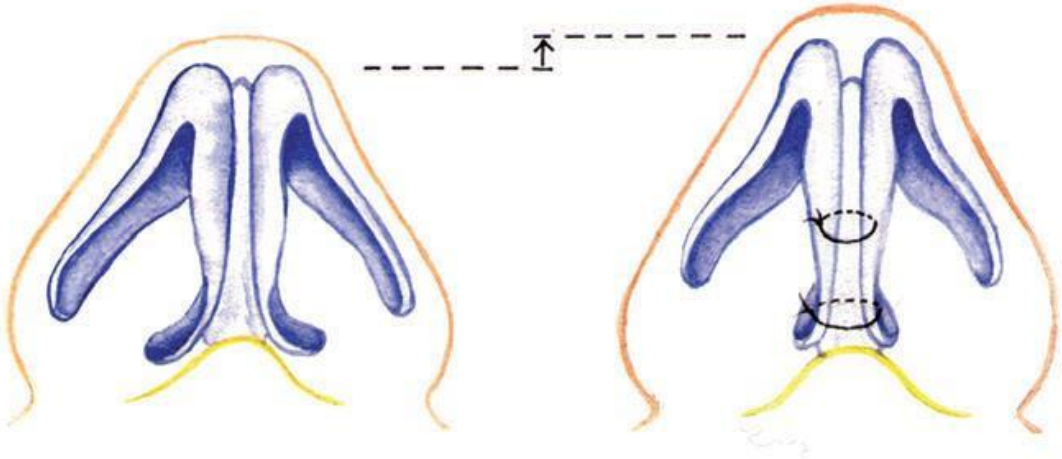

Fig. 57: Medial crural footplate suture **(Robinson & Thornton, 2012).**

1.4 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 **(Davis et al., 2004).**

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 **(Adamson & Gantous, 2019).**

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. 58) (Davis, 2015).**

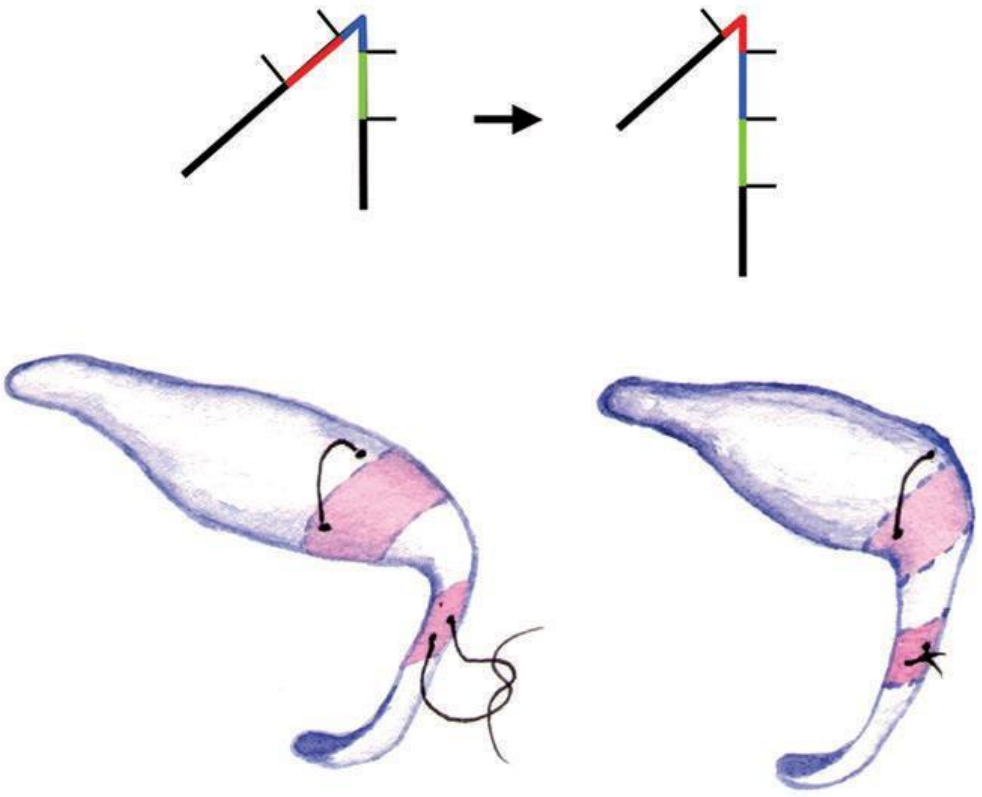

Fig. 58: Diagrammatic and pictorial representation of lateral crural steal **(Robinson & Thornton, 2012).**

1.5 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 **(Balaji, 2020c).**

The transdomal suture **(Fig. 59)** 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 **(Fig 59).** In circumstances when the tip is under-projected in the lobule, this can add up to 2 to 3 mm of height **(Moyer, 2018).**

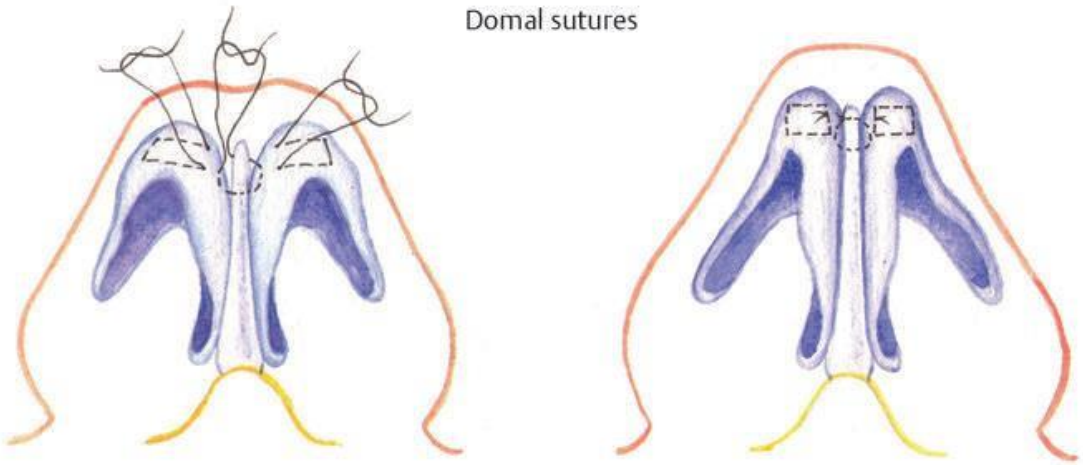

Fig. 59: Demonstration of individual dome defining and interdomal suture **(Robinson & Thornton, 2012).**

1.6 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 **(Kim, 2018).**

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 60) (Adamson et al., 2014)**.

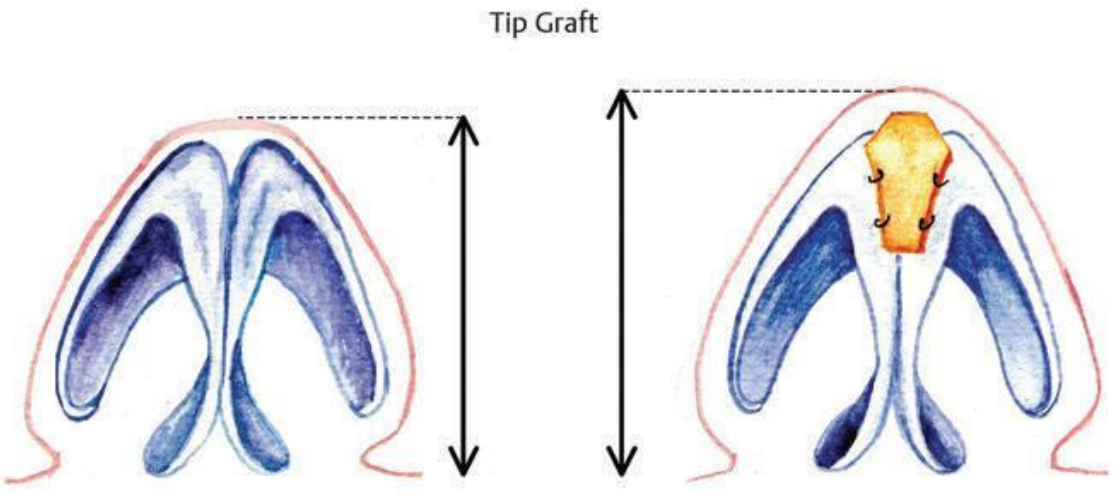

Fig. 60: Shield graft **(Robinson & Thornton, 2012).**

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 **(Kim, 2018).**

2. Method to decrease projection:

2.1 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 **(Robinson & Thornton, 2012).**

2.2 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 **(Fig. 61).** 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 **(Sands & Adamson, 2015).**

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 **(Wise et al., 2006).**

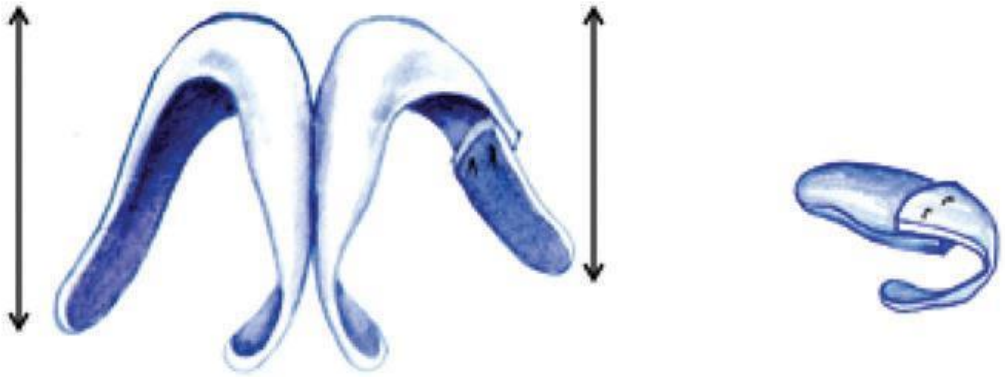

Fig. 61: Lateral crural overlay **(Robinson & Thornton, 2012).**

2.3 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 **(Fig. 62)**. 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 **(Soliemanzadeh & Kridel, 2005).**

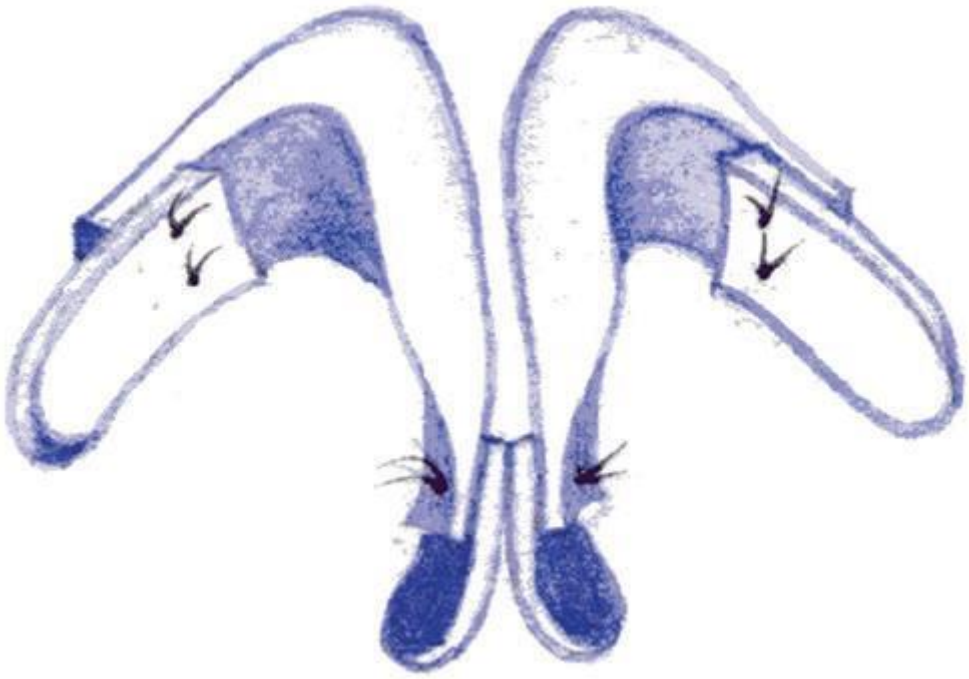

Fig. 62: Medial and lateral crural overlay **(Robinson & Thornton, 2012).**

3. Method for Increasing Tip Rotation:

3.1 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 **(Nasser, 2021).**

3.2 Columellar Translation (Anchor Suture, Columellar Strut)

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 **(Celik et al., 2017).**

The medial crura-septal suture increases tip projection, rotates the tip cephalically, and retracts the columella **(Fig. 63)**. 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 **(Guyuron & Behmand, 2003).**

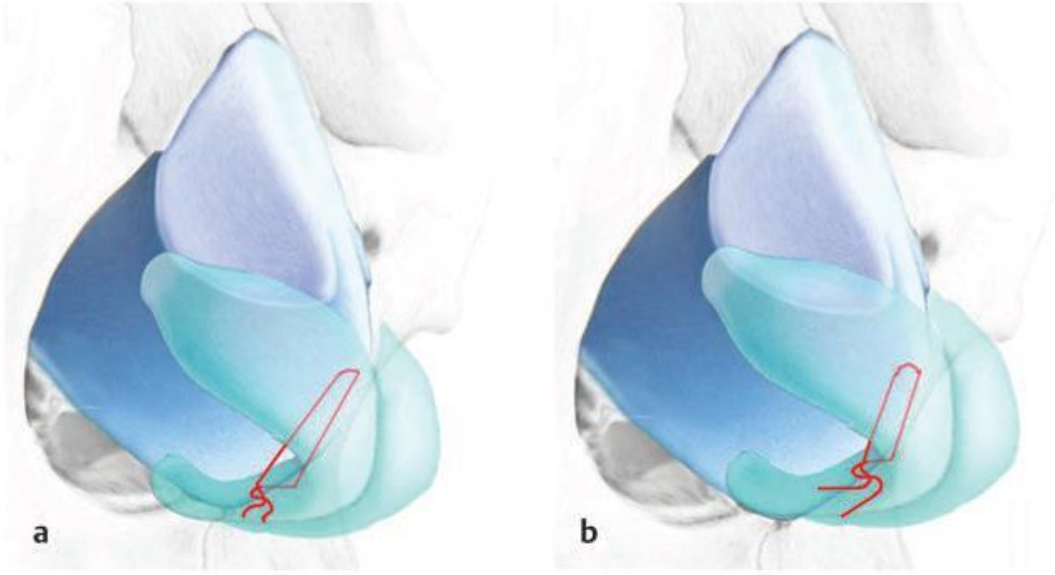

Fig. 63: (a) The columella-anchoring suture is passed through the septal angle and the medial crura. (b) It translates the columella in a ventrocephalad direction, increasing tip projection and rotation and decreasing columellar show and straightening the columella on the side view **(Tasman & Lohuis, 2012).**

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 a simultaneous excess columellar show and an acute nasolabial angle **(Brito et al., 2020).**

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 **(Balaji, 2020c).**

3.3 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 **(Behrbohm & Tardy, 2004).**

3.4 Shortening of the Lateral Crus: Lateral Crural Overlay and Lateral Crural Steal

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 **(Korkmaz & Korkmaz, 2015).**

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 **(Davis, 2015).**

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 **(Fig. 64).**

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 **(Tasman & Lohuis, 2012).**

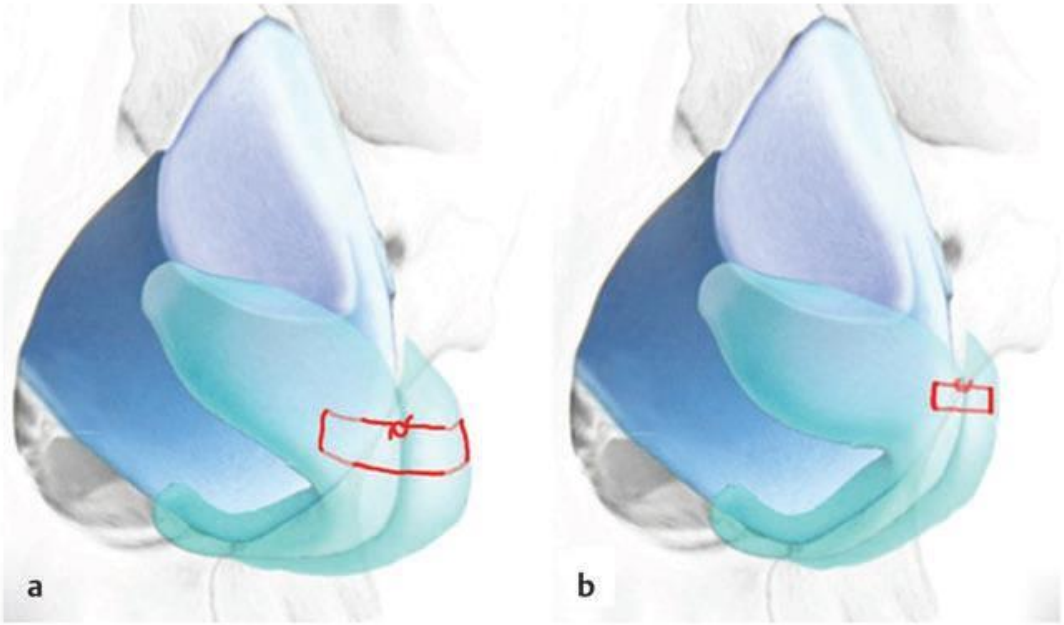

Fig. 64: (a) The lateral crural steal procedure: a horizontal mattress suture is placed lateral to the alar cartilage domes and **(b)** shortens the lateral crura while it lengthens the intermediate crura, narrowing and rotating the tip **(Tasman & Lohuis, 2012).**

3.5 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 **(Corrado et al., 2009).**

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 **(Eroğlu et al., 2021).**

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 **(Barrios, 2008).**

4. 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 **(Tasman & Lohuis, 2012).**

4.1 Columellar Translation

A reduction of both tip projection and rotation may be achieved through a translation of the columella in a posterior direction **(Fig. 65)** 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 retroposition of the columella with an adequate shortening of the lateral crus if caudal rotation of the tip is to be avoided **(Wise et al., 2006).**

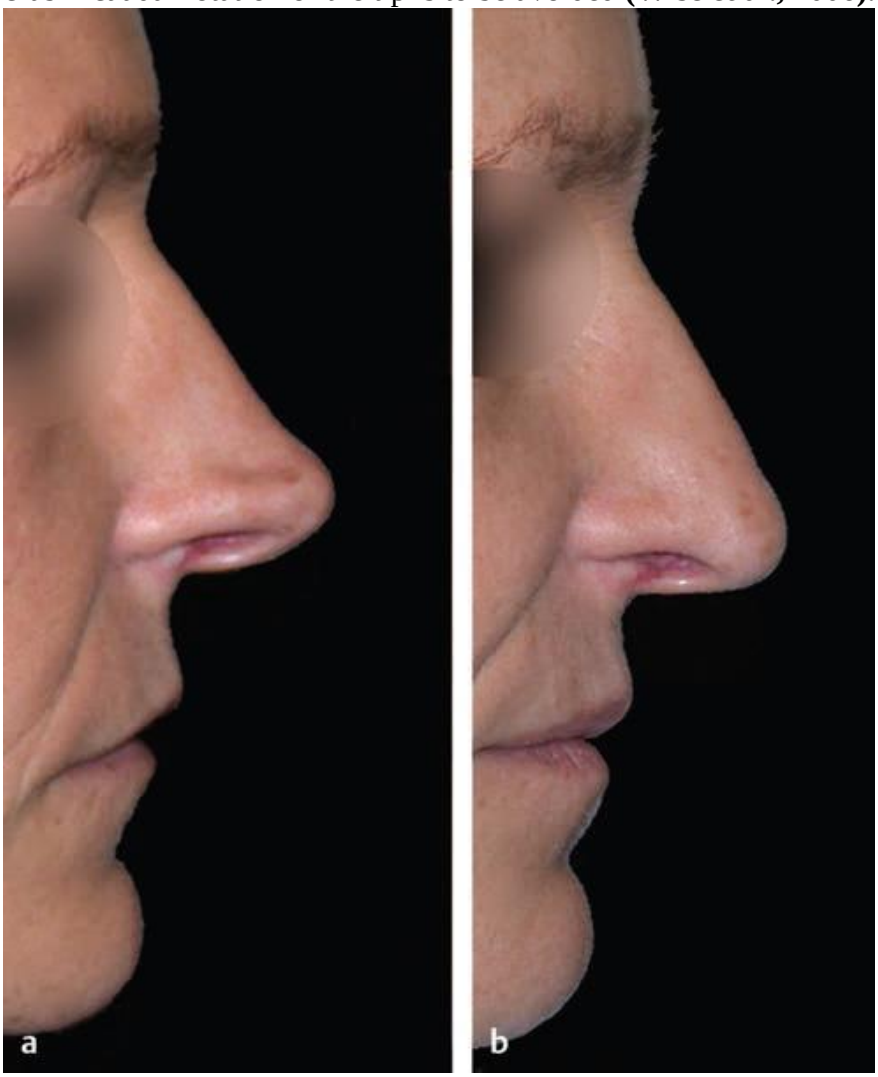

Fig. 65: (a) Deprojection of an overprojected tip by a transfixion of the membranous septum, posterior displacement of the columella, and fixation with an anchoring suture. **(b)** Note the unwanted

counterrotation of the tip due to inadequate shortening of the lateral crura **(Tasman & Lohuis, 2012).**

5.2 Septal Extension

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 **(Suh et al., 2018).**

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 **(Fig. 66)**. 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 **(Hobar et al., 2010).**

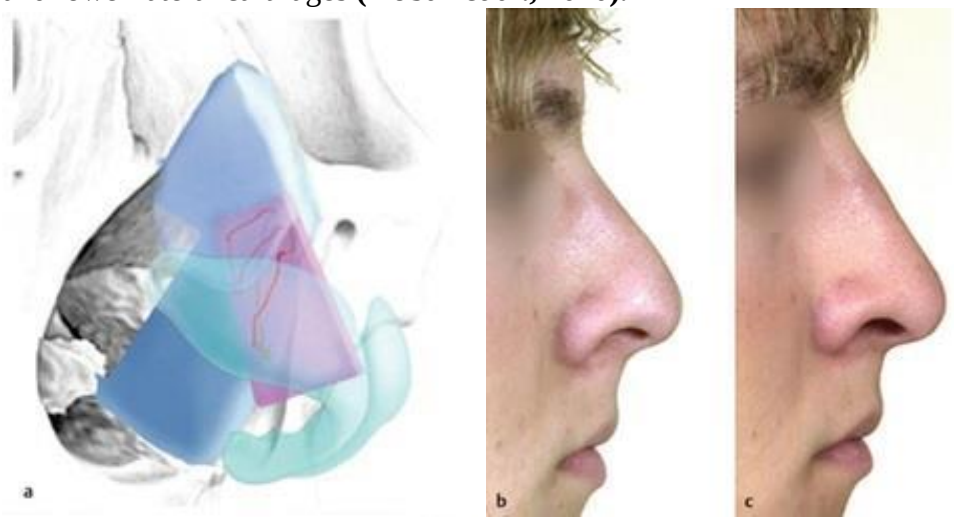

Fig. 66: (a) Lengthening and caudal rotation of the tip with a septal extension graft. The graft is sutured to the septum and creates a new septal angle in a more caudal location, rotating the tip downward. **(b,c)** Note that this manoeuvre may accentuate preexisting alar retraction **(Tasman & Lohuis, 2012).**

Columellar Strut:

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 **(Fig 67a, 68a).** 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 **(Daniel & Pálházi, 2018b).**

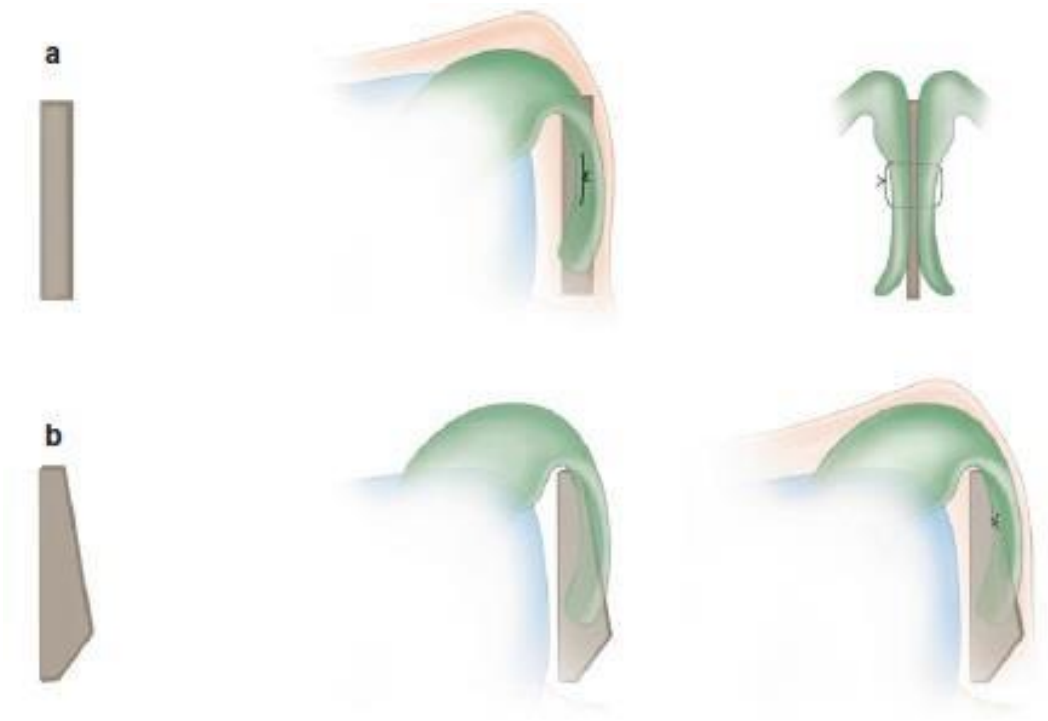

Fig. 67: Columellar struts. **(a)** Crural strut **b)** Extended columellar strut **(Daniel & Pálházi, 2018b).**

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 **(Rohrich et al., 2020).**

Extended columellar strut grafts **(Figs. 68b and 69b)** 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 **(Toriumi, 2005).**

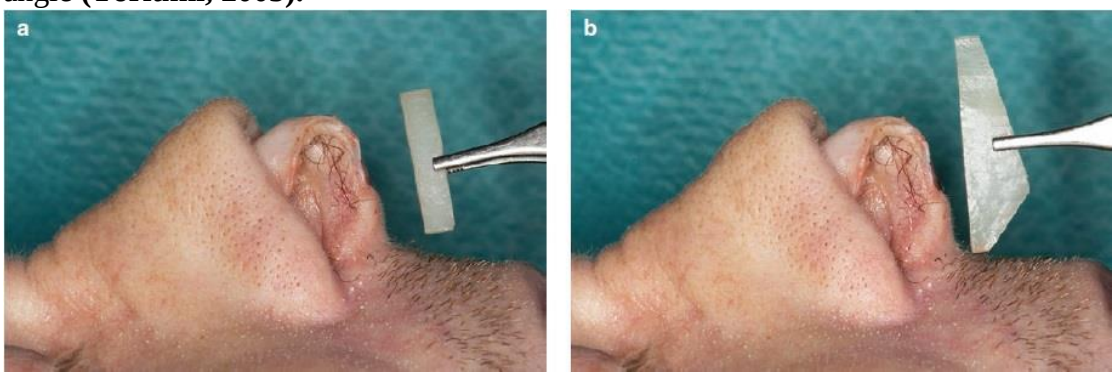

Fig. 68 (a) Crural strut graft. **(b)** Extended columellar strut graft **(Daniel & Pálházi, 2018b).**

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 **(Fig. 69)**, 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 **(Dhong et al., 2013).**

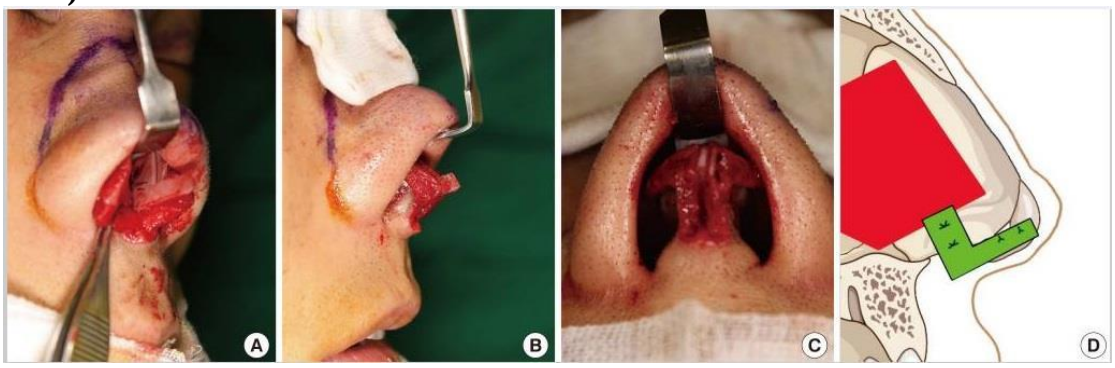

Fig. 69: Intraoperative images of the L-shaped columellar strut **(A)** The horizontal portion of the strut was sutured to the caudal septum. **(B)** The vertical portion of the strut was placed in between the lower alar cartilage. **(C)** The domal segment of the alar cartilage and the strut were sutured at two points. **(D)** Schematic diagram of the L-shaped columellar strut technique **(Dhong et al., 2013).**

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