Adjusting nasal tip projection and rotation is considered one of the most challenging maneuvers in rhinoplasty. Nasal tip projection refers to the posterior–anterior extension of the tip from the vertical facial plane. Tip rotation is defined as movement of the tip along an arc, with its radius maintained from the facial plane [1]. Alar cartilage-modifying techniques can result in predictable changes in the degree of projection and rotation, but these changes can be maintained only in the presence of adequate tip support [2, 3].

**Changes in projection and rotation maintained only in the presence of adequate tip support**

Important mechanisms that provide tip support to maintain the degree of projection and rotation include the ligamentous attachment of medial crural footplates to the caudal septal cartilage, the fibrous attachment between the upper and lower lateral cartilages, and the interdomal ligament which spans over the anterior septal angle. However, the major support of the nasal tip is derived primarily from the alar cartilages themselves, namely from the length and strength of the medial and lateral crura [4].

The overprojected nasal tip can be a primary overprojection due to overdeveloped alar cartilages (Fig. 1) or a secondary overprojection due to overdeveloped septal cartilage and anterior nasal spine, which is commonly referred to as a tension nose (Fig. 2). In cases of primary overprojection, where the alar cartilages are overdeveloped with long medial and lateral crura, adequate tip deprojection is practically impossible without decreasing the length of the medial and/or lateral crura.

In the 1930s, Joseph [5] and Safian [6] first described shortening of medial and lateral crura to deproject the nasal tip. Since then, many refinements of lateral crural shortening have been described to preserve vestibular skin and to suture or overlap the divided segments [1, 2, 3, 7, 8, 9, 10, 11, 12]. In 1959, Lipsett [13] pioneered medial crural shortening, which has been subsequently modified by many authors [2, 14, 15, 16, 17, 18]. In the current article, we present our experience in shortening the medial and lateral crura using the medial crural overlay (MCO) and lateral crural overlay (LCO) techniques through an external rhinoplasty approach.

**Tip dynamics**

Both the tripod concept described by Anderson in 1969 [19] and its recent modernization into the M-arch model by Adamson et al. [20] are very helpful to comprehend the effects that alar cartilage-modifying techniques have on the degree of tip projection and rotation. The tripod concept portrays the alar cartilages as a tripod, with two upper legs formed by the lateral crura on each side and one lower leg formed by the conjoined medial crura. Applying the tripod analogy, the LCO, carried out alone, (Fig. 3, top)

---

**Fig. 1** A case of primary overprojection where the overdeveloped alar cartilages are the main cause of the overprojection

**Fig. 2** A case of secondary overprojection or tension nose where the septum is the main cause of overprojection
will shorten the upper legs of the tripod which will move the tip backwards and upwards, thus, decreasing projection, increasing rotation, and shortening the nose. MCO, carried out alone, (Fig. 3, bottom) will shorten the lower leg of the tripod which will move the tip backwards and downwards, resulting in a decrease in projection, inferior rotation, and increase the nasal length. Combining LCO with MCO (Fig. 3, center) will result in additional deprojection without altering the degree of rotation.

**Nasal examination**

It is necessary to fully examine the nose both externally and internally. The first thing to evaluate is the thickness of the nasal skin and the degree of tip support available by examining alar cartilage size, strength, and orientation as well as the condition of caudal septum and the anterior nasal spine. Other areas that need careful assessment include the tip, ala, and columella. The tip is evaluated for its degree of projection and rotation and any broadness, bifidity, or deflection, while the ala is examined for its thickness and any degree of retraction or collapse. Finally, the columella is evaluated to determine whether it is short, long, hanging, retracted, deflected, wide, or bifid.

**Preoperative planning**

The vital part in rhinoplasty planning is to fully understand the patient’s desires and objectives; this is greatly helped by performing computer imaging as the surgeon can monitor the patient’s reaction to the modifications in the degree of tip projection and rotation.

On evaluating the degree of tip projection, it is important to exclude factors that may cause an illusion of overprojection, such as a deep nasofrontal angle, marked

---

**Fig. 3** Schematic illustration of the effects of shortening lateral and medial crura on the degree of tip projection and rotation. **Top** Lateral crural overlay (LCO) decreased projection and resulted in superior rotation. **Center** The combination of LCO and MCO resulted in deprojection with no change in rotation. **Bottom** Medial crural overlay (MCO) decreased projection and resulted in inferior rotation.

**Fig. 4** Intraoperative photos of the steps of lateral crural overlay technique. **Left** Lateral crural transection, **center** overlap of cut segments, **right** suture fixation of overlapped cartilage.
dorsal saddling, receding chin, or short upper lip. Once true overprojection is determined, the next step is to detect whether it is a primary overprojection due to overdeveloped alar cartilages or secondary overprojection due to overdeveloped septal cartilage, or a combination of both.

When the septal cartilage is the main cause for the overprojection, the deformity is referred to as tension nose (Fig. 2) and is characterized by a high anterior septal angle and overdeveloped caudal septum and/or anterior nasal spine. Correction of the tension nose requires elimination of the pedestal effect of the overdeveloped septum on the normal alar cartilages which can now fall backward to a less projected position; this can be achieved through volume reduction of septal cartilage and rarely the anterior nasal spine. In cases of primary overprojection, where the main cause of overprojection is the overdeveloped alar cartilages with long medial and lateral crura (Fig. 1), adequate depoprojection is only possible through shortening the crural length by MCO, LCO, or both. The choice depends largely on whether rotation is adequate or will need to be increased or decreased.

The droopy inferiorly rotated tip is a much more common finding than the superiorly rotated tip, it occurs in about 75% of our rhinoplasty cases [3]. The pathogenesis of the droopy tip may be divided into two groups. The first group has abnormally long lateral crura, vertically malpositioned lateral crura with high abutment to pyriform aperture, or short and weak medial crura. The second group has normally shaped lateral crura which are displaced inferiorly by the effect of extrinsic forces. These forces may be pushing from above, as in cases with long upper lateral cartilages, high anterior septal angle, and overdeveloped caudal septum, or forces pulling from below, as in cases with thick heavy nasal skin, overactive depressor septi nasi muscle, or by the effect of gravity on cases with weakened tip support as a result of aging or previous operations. The first step in the management of the droopy tip is to eliminate any extrinsic forces pushing the tip downwards, thus, allowing the alar cartilages the freedom to move upwards, during the healing phase, and to rest in a more cephalic orientation. This is possible though maneuvers as excision of overdeveloped scrolls of upper lateral cartilages, cephalic trim of lateral crus, lowering the anterior septal angle, or weakening of the depressor septi muscle. These maneuvers may be sufficient in cases with mild degrees of droopy tip; however, cases with more advanced degrees of droopy tip can only be corrected by alar cartilage-modifying techniques aiming at shortening the lateral crura as in lateral crural overlay.

Abstract

Primary nasal tip overprojection, due to overdeveloped alar cartilages with long medial and lateral crura, is one of the most challenging tip deformities to correct. The aim of this study is to evaluate the role of lateral crural overlay (LCO) and medial crural overlay (MCO) techniques in managing the primary overprojected nasal tip. On reviewing 480 patients with primary overprojected nasal tips, the deformity was corrected using LCO in 298 (62.1%), MCO in 71 (14.8%), and both LCO and MCO in 111 (23.1%). All patients were followed for a mean period of 18 months (range 6–120 months). The LCO and MCO both resulted in effective deprojection of the nasal tip, while retaining a strong and stable alar cartilage complex that maintained its new position over the long follow-up period. The technique requires an external rhinoplasty approach in order to be executed precisely, under direct vision, and with the alar cartilages in their normal resting position. No cases of infection or suture extrusion were encountered; however, a simultaneous alar base resection was required in 30% of cases.

The English full-text version of this article is available at SpringerLink (under “Supplemental”).

Keywords

Exterior nose · Otorhinolaryngologic surgical procedures · Nasal cartilages · Esthetic surgery · External approach

Externe Rhinoplastik bei Nasenspitzenüberprojektion

Zusammenfassung


Schlüsselwörter

Äußere Nase · HNO-ärztliche Operationen · Nasenknorpel · Ästhetische Chirurgie · Externer Interventionsansatz

Surgical technique

The technique is performed through an external rhinoplasty approach as the exposure provided by this approach allows direct and accurate assessment of the tip cartilages to be conducted, while the cartilages are in their natural, undistorted position. The approach also permits alar cartilage modifications to be performed in a precise manner and under direct vision. Bilateral marginal (infracartilaginous) incisions are connected via an inverted V-shaped mid-columellar incision [21, 22]. The columellar skin flap is carefully elevated off the medial crura and dissection...
is continued in the supraperichondrial plane to fully expose the alar cartilages, the dorsal skin flap elevation proceeds upwards over the bony-cartilaginous framework making sure to stay in the avascular sub-SMAS plane, until reaching the nasofrontal angle. Wide undermining is necessary to allow for better redraping of the skin-soft tissue envelope after deprojecting the nose. Any subcutaneous fatty tissue found between the domes or medial crura is carefully removed. Alar cartilage modification starts by performing a conservative cephalic trim of lateral crura; the width of the remaining lateral crus should not be less than 6 mm to maintain adequate tip support, but this may increase to 8 mm in cases with thick heavy nasal skin. Any required dorsal modifications are made before modifying the tip cartilages to avoid inadvertent disruption of the delicate reconstructed alar cartilages.

Lateral crural overlay (LCO)

In cases where the lateral crura are overly long leading to an overprojected inferiorly rotated tip, an incision is planned in the lateral crus at the junction of its lateral third with the medial two thirds (Fig. 4, left) as the alar skin is relatively thicker at this area and can, thus, easily camouflage the cut and overlapped edges of the lateral crus. Before the cartilage cut is made, the vestibular skin is elevated off the undersurface of lateral crus for about 5 mm on each side of the planned cartilaginous incision (Fig. 4, center) to release the tethering forces that may prevent the free overlap of the cut edges. The cartilaginous cut is made by a number 15 blade extending in a straight line from the cephalic to the caudal margin of the lateral crus. The free medial segment of the lateral crus is advanced and rotated over the lateral segment in order to shorten the lateral crus to achieve the desired degree of deprojection and rotation. The integrity of the lateral crus is then reestablished by fixing the overlapped segments with a 6/0 Prolene suture in a horizontal mattress fashion (Fig. 4, right). This maneuver will move the domes upwards and backwards resulting in superior rotation and decrease in tip projection (Fig. 5).

Medial crural overlay (MCO)

This is performed to shorten the medial crura in cases where the overly long medial crura result in an overprojected and/or overrotated nasal tip. The level of the columella-lobular junction, which usually corresponds to the nostrils’ apex, is identified and marked on the medial crura using a marking pen. The level of transection of the medial crura (Fig. 6, left) is planned according to the preexisting relative length of lobule to the columella. If the columella was found to be disproportionately longer than the lobule, then the transection is done in the columellar segment of the medial crura.

However, in cases where the lobule is relatively long as compared to the columella, the transection is performed in the lobular segment of the medial crura in order to shorten the lobule and correct the preexisting disproportion between the lobule and columella.

After determining the desired level of transection, the vestibular skin is elevated from the overlying medial crus for a few millimeters on each side, the integrity of the medial crus is reestablished by overlapping and fixing the cut edges together with 6/0 Prolene sutures in a horizontal mattress fashion (Fig. 6, right). At completion of MCO, the domes move backwards and downwards resulting in deprojection and inferior rotation of nasal tip (Fig. 7). To avoid excessive widening of columella in cases where a columellar strut is used in combination with MCO, the overlapped segments of medial crura are excised and the cut ends are directly approximated and splinted to the columellar strut using 5/0 polydioxanone suture (PDS) in a horizontal mattress fashion as described in the alar setback technique [2].
Combining LCO and MCO

In cases with severe overprojection that could not be corrected by LCO or MCO alone, a combination of both techniques can be used to provide maximum deprojection without significantly changing the degree of rotation (Fig. 8). In these cases we usually start with the LCO as after its completion you can precisely determine any need for further deprojection or alteration in the degree of tip rotation.

At completion of the procedure, the nasal skin is redraped to its normal anatomic position and the external rhinoplasty incisions are closed starting with the columnellar incision which is closed using a 6/0 PDS deep subcutaneous suture in a horizontal mattress fashion followed by 6/0 Prolene interrupted sutures on the skin surface. The marginal incisions are closed using 5/0 Vicryl rapid sutures. Meticulous taping is necessary to maintain the proper positioning of the reconstructed tip cartilages: this is performed using 0.5 inch brown Micropore tape after applying Mastisol to the skin surface; a metal splint is then positioned over the dorsum and secured by a second layer of tape.

Combining LCO and MCO provides maximum deprojection without significant changes in rotation

The splint is removed after 1 week along with the columellar sutures, and the nose is retaped for another week to help support the tip during the early healing phase where new fibrous attachments are being developed between the bony cartilaginous nasal framework and the overlying skin.

Results

On reviewing 3,400 rhinoplasties performed by the author from July 1994–June 2012, primary overprojected nasal tip with long medial and/or lateral crura was found in 14.1% (480 patients, 345 women and 135 men) with mean age of 28.5 years (range 15–64 years). Of the 480 patients, 298 (62.1%) were corrected using LCO, 71 (14.8%) using the MCO, and 111 (23.1%) using both LCO and MCO. All cases were operated upon through an external rhinoplasty approach and simultaneous alar base reduction was required in 144 cases (30%).

All patients were subjected to periodical follow-up for a mean period of 18 months (range 6–120 months), during which subjective assessment of the outcome of the surgical procedure was performed by clinical examination, comparison of preoperative and postoperative photos, and recording the degree of patients’ satisfaction with the aesthetic outcome of the procedure. The LCO and MCO both resulted in effective correc-
tion of the overprojected nasal tip and provided additional support to the nasal tip, allowing it to maintain its new position over the long-term follow-up period (with no loss in the degree of projection or rotation). No cases of infection or suture extrusion were encountered. Minor revision surgery related to the LCO and MCO techniques was required in 8 cases, 4 for alar base reduction and 4 for excessive loss of tip projection.

Discussion

The primary overprojected nasal tip presents a unique challenge in rhinoplasty as effective deprojection in these cases can only be achieved through volume reduction of the alar cartilages. On reviewing the literature, many of the techniques described to correct primary overprojection depended on sacrifice of the domal segment of the alar cartilage by directly excising the domes [11, 12, 23, 24]. Although these techniques resulted in effective deprojection, they were associated with a high risk of tip contour irregularities in the form of pinching, notchting, or bossa formation, as the transected and weakened cartilages were liable to displacement and distortion during the healing phase. This made many authors [1, 2, 3, 7, 8, 9, 10, 13, 14, 15, 16, 17, 18] endorse domal preservation by describing alternative techniques, for alar cartilage reduction, depending on shortening the medial crura, lateral crura, or both. In the current study, we found that the LCO and MCO resulted in controlled predictable changes in the degree of tip projection as well as tip rotation. These changes depended mainly on the level of cartilage transection and degree of overlap of the cut segments as shortening the medial crura caused deprojection and inferior rotation, whereas shortening the lateral crus caused deprojection and superior rotation.

Using the external approach allowed direct assessment of the tip cartilages to be conducted while the cartilages are in their natural, undistorted position in order to properly evaluate the length and strength of the medial and lateral crura. In addition, the wide exposure provided by the external approach permitted incremental shortening of medial and lateral crura to be performed meticulously under direct vision, thus, leading to more accurate results with less asymmetry. Furthermore, the use of sutures to fix and stabilize the overlapped cartilage helps maintain the achieved degree of projection and rotation and avoids any migration or displacement of the transected cartilages that may result in lobular contour irregularities. Another factor that may predispose to surface irregularities is taking the LCO too medially in cases with thin nasal skin.

Suturing overlapped cartilage helps maintain projection and rotation and avoid any cartilage migration or displacement

In the current study, the complications related to MCO and LCO were extremely rare as excessive loss of tip projection or increased nasal base width occurred in less than 1% of cases.

The excessive loss of projection was either due to an error in judgment regarding the amount of overlap needed to achieve the desired degree of deprojection or from failure to provide adequate support to the nasal tip which resulted in postoperative tip drop. Accordingly, it is advisable to use a strong columellar strut in case any doubts exist regarding the degree of tip support.

Finally, simultaneous alar base narrowing procedure [25, 26] was performed whenever major deprojection was performed (30% of cases) to avoid any increase in nasal base width which may result from the increased alar flaring.

Conclusion

The external rhinoplasty approach allowed LCO and MCO to be performed in a precise manner, under
direct vision, and with the alar cartilages in their resting normal position.  

The MCO and LCO allowed incremental deprojection to be performed without any cartilage excision, thus, eliminating the risk of cartilage weakening or buckling.  

The use of sutures to fix and stabilize the overlapped cartilage helped maintaining a strong and stable alar cartilage complex, thus, ensuring a stable long-term result with no change in the achieved degree of projection and rotation.

Corresponding address

H.M.T. Foda  
Facial Plastic Surgery Division, Otolaryngology Department, Alexandria Medical School  
11 Roushdy Str. Alexandria, Egypt  
hfoda@dataxprs.com.eg

Conflict of interest. The author states that there are no conflicts of interest.

References

5. Joseph J (1931) Nasoplastik und Sonstige Gei-  
24. Joseph J (1931) Nasoplastik und Sonstige Gei-  