### Title
Correcting the Convex Lateral Crura of the Lower Alar Cartilages




### ISBN
9783642280528



### Authors
Furze, Alexis D
Chiu-Collins, Lynn L
Gilde, Jason
et al.



### Publication Date
2013

### DOI
10.1007/978-3-642-28053-5_30

# Correcting the Convex Lateral Crura of the Lower Alar Cartilages

# 30

Alexis D. Furze, Lynn L. Chiu-Collins, Jason Gilde, and Brian J.F. Wong

## 30.1 Introduction

Size, shape, and orientation of the lateral crura of the lower lateral cartilages (LLC) greatly influence the aesthetics and function of the lower one-third of the nose. As the lateral crura extend laterally from the intermediate crura, a mild concavity typically exists [1]. The lateral crura are ideally slightly concave in the anterior one-third and flat in the posterior two-thirds (Fig. 30.1a, b) [2]. Excess convexity of the lateral crura is often seen in the bulbous, boxy, and "parentheses" tip deformities (Fig. 30.1b–h) [3]. A number of maneuvers have been described to address these tip deformities. In these traditional descriptions, the lateral crural convexity is not often addressed. Moreover, analysis and commentary on the lateral crural convexity has only recently been included in rhinoplasty facial analysis. In cases of mild lateral crural convexity, ignoring the curvature of this cartilage generally does not compromise the aesthetic result. However, in cases where significant lateral crural convexity exists and is not addressed surgically, a persistent tip deformity may be observed postoperatively. Findings of lateral crural convexity are often subtle on both physical examination and review of preoperative photography.

In addition to the aesthetic effects of convex lateral crura, nasal airway function may also be compromised. The nasal airway may be narrowed when significant convexity of the lateral crura causes the cartilages to recurve into the nasal vestibule at their lateral aspects. Lateral crural convexity does not occur as an independent entity, and it is during the operative correction of other nasal tip deformities that this abnormality usually manifests and needs to be addressed [3, 4]. For this reason, less experienced rhinoplasty surgeons tend to overlook this nasal deformity. Correction of lateral crural convexity can involve complex

A.D. Furze, M.D.
2552 Walnut Ave. #130 , Tustin, CA 92663, USA
e-mail: alexis.furze@gmail.com

L.L. Chiu-Collins, M.D.
Division of Facial Plastic Surgery,
Department of Otolaryngology – Head and Neck Surgery,
University of California Irvine,
19182 Jamboree Road, Irvine, CA 92697, USA
e-mail: lynnchiu.md@gmail.com

J. Gilde, M.D.
Department of Otolaryngology – Head and Neck Surgery,
Kaiser Permanente, Oakland California,
280 W MacArthur Blvd, Oakland, CA 94611, USA

Keck School of Medicine,
University of Southern California,
Los Angeles, CA, USA
e-mail: jgilde@usc.edu

B.J. F. Wong, M.D., Ph.D. (✉)
Facial Plastic Surgery, Beckman Laser Institute and
Medical Clinic, University of California Irvine,
1002 Health Sciences Road East, Irvine,
CA 92617, USA

Division of Facial Plastic Surgery,
Department of Otolaryngology – Head and Neck Surgery,
University of California Irvine,
19182 Jamboree Road, Irvine, CA 92697, USA
e-mail: bjwong@uci.edu

M.A. Shiffman, A. Di Giuseppe (eds.), *Advanced Aesthetic Rhinoplasty*,
DOI 10.1007/978-3-642-28053-5_30, 

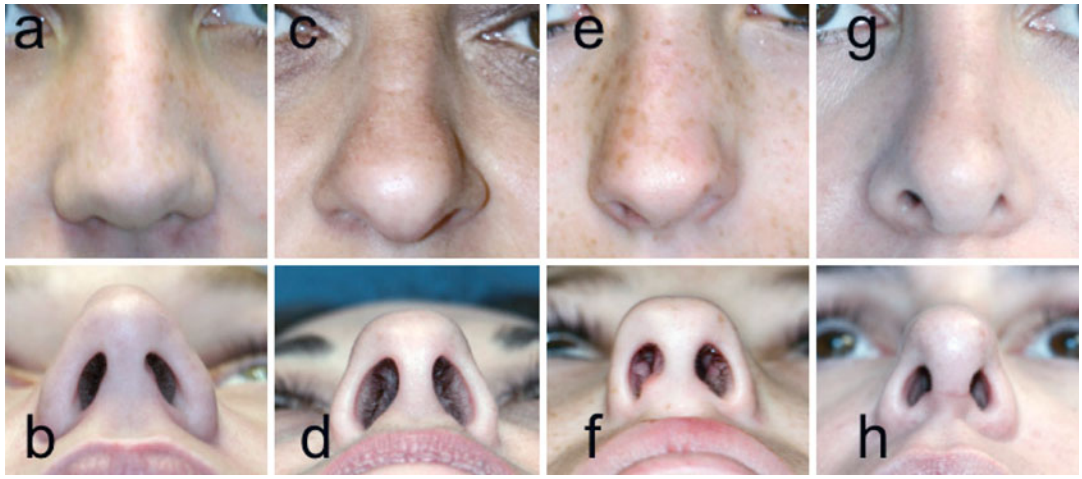


**Fig. 30.1** Close-up frontal and base views of nose with (**a**) normal convexity and (**b**) base shape, bulbous tip (**c** and **d**), boxy tip (**e** and **f**), and parenthesis tip deformity (**g** and **h**)

maneuvers with which the novice may be inexperienced or uncomfortable.

Historically, less emphasis has been placed on the curvature of the lateral crura compared to other aspects of nasal tip aesthetics. Classic nasal tip rhinoplasty usually addresses primarily the shape and orientation of these cartilages in the dome region. In addition, many of the maneuvers used to correct significant convexity of these cartilages are performed through an open approach which limits their use in endonasal rhinoplasty. As we learn more about nasal form and function, the trend in rhinoplasty has been to preserve and reshape more of the original nasal structure as opposed to resecting it. Suture techniques and other cartilage-sparing methods have gained popularity. Ideally, correction of the lateral crural convexity would achieve shape change in the least destructive way possible while maintaining the overall desired tip aesthetics and nasal function.

## 30.2 Clinical Evaluation

An estimate of the shape, size, and orientation of the lateral crura can be made on preoperative inspection of the external nose and nasal vault. On frontal view inspection, excessively large lateral crura can lead to a bulbous, ill-defined tip (Fig. 30.1c, d) [5, 6]. Another type of tip deformity, the boxy tip, exists when there is an increased width of the interdomal region (Fig. 30.1e, f) [3]. In addition, cephalic orientation of the lateral crura can lead to the "parenthesis" appearance (Fig. 30.1g, h) in which a vertical shadow is created on the lateral aspects of the tip, interrupting the smooth contour of the alar rim. The "parenthesis sign" appearance is exacerbated postoperatively due to lack or recognition of lateral crural malposition or cephalic orientation. Figure 30.2 illustrates the normal orientation of the lower lateral cartilage and shows the crus cephalically oriented which usually is accompanied by increased convexity, weakness in the soft triangle, and limited support along the alar rim. The "parenthesis sign" deformity is usually a consequence of the isolated use of dome sutures alone to refine the nasal tip [6]. Although these tip deformities can occur regardless of lateral crural convexity, when excessive convexity and curvature of these cartilages is present, the cartilages become more prominent and the deformities appear more pronounced. This is true particularly after surgery when cephalic resection and classic dome sutures alone are used.

On basal view, the boxy tip deformity and the bulbous tip deformity can be identified and differentiated (Fig. 30.1c–d, e–f). The basal view is an important vantage point for the detection of

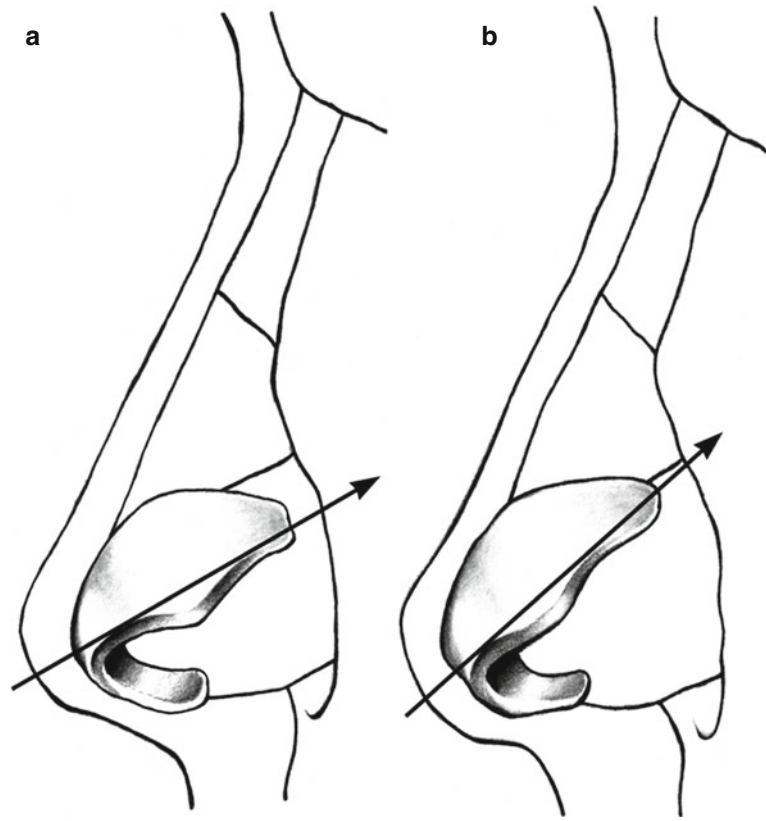


**Fig. 30.2** (**a**) Normal orientation of lower lateral cartilage with axis of orientation indicated by the vector of the *arrow*. (**b**) Cephalic orientation of lower lateral cartilage

lateral crural convexity and gives insight into the possibility of postoperative lateral recurvature into the nasal airway. This is identified by soft tissue narrowing in the lateral nasal vestibule. The area of narrowing can be palpated and identified as the lateral extent of the lateral crura. Depending on the degree of cartilage convexity and airway narrowing, patients may exhibit some level of functional nasal airway obstruction.

## 30.3 Management

There are a variety of surgical methods for correcting the convex lateral crura of the lower lateral cartilage. These methods range from simple scoring and suturing techniques to more complex repositioning and reconstructive maneuvers. Rigorous preoperative and intraoperative analyses allow the surgeon to determine the degree of convexity and assist in deciding which maneuvers will work best for the individual patient. As with other tip-contouring techniques, the nasal base and tip position should be stabilized prior to addressing the cartilage convexity since the curvature of the cartilage can be influenced by tip position [6]. The surgeon should be aware of the various methods for correcting lateral crural convexity as one given technique may not achieve the desired results in all cases. The authors present a flow chart that diagrams the approach to addressing lateral crural convexity (Fig. 30.3). The flow chart is not meant to be exhaustive, but does provide guidance for maneuvers that are discussed in the text below. In general, cartilage-sparing techniques are preferred, and structural grafting is used for severe deformities. The structure of the flow chart divides the management into addressing lateral crural convexity with and without associated tip deformities. The left side of the flow chart focuses on convexity issues alone, while the right side focuses primarily on traditional tip maneuvers. Maneuvers from both sides are combined for comprehensive management. Tip maneuvers listed in Fig. 30.3 (right side) and

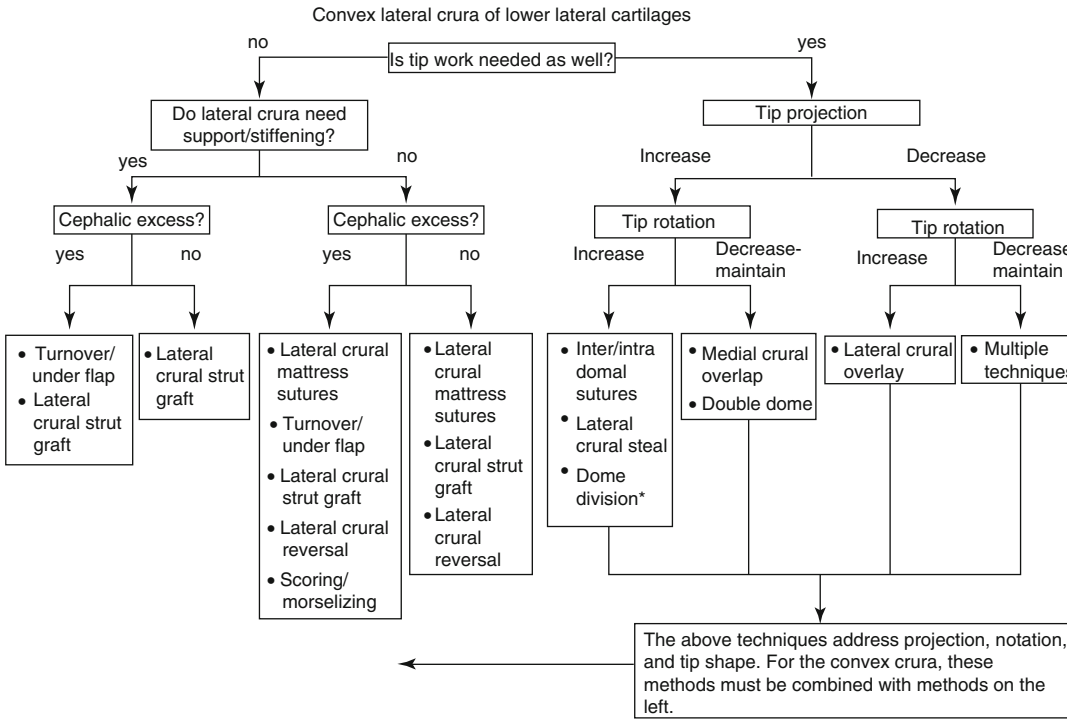


**Fig. 30.3** Flow chart on management of the convex lower lateral cartilage. The *left side* of the chart focuses exclusively on management of lateral crus convexity independent of tip maneuvers. The *right side* emphasizes tip management techniques. The listed tip maneuvers are by no means meant to be exhaustive

discussed in this chapter are by no means comprehensive, and numerous tip refinement techniques are discussed elsewhere in this volume.

## 30.4 Scoring/Cartilage Weakening

The simplest of maneuvers to alter the shape of convex lateral crura include scoring and morselization of the convex portions of the cartilage. These techniques may be useful in cases of mild convexity. Scoring involves making multiple partial thickness incisions on the concave side of the cartilages. This maneuver aims to break up the strength of the perichondrium on the contracted surface, thus weakening the overall cartilage structure and straightening the cartilage. Morselization, on the other hand, involves partially crushing the cartilage to weaken it and reduce its memory. Similar to scoring, morselization relies on weakening the cartilage to reduce curvature and thus maintain a straighter orientation. Morselization can be performed with specific morselization instruments or simply by applying a crushing force with a Brown-Adson forceps with suture pack foil wrapped around one set of the forceps teeth. Having teeth or a textured surface on one side only allows for more precise morselization and less chance for inadvertent cartilage destruction and loss of structural integrity.

Scoring or morselization can be performed as a single procedure or as an adjunct to enhance the effects of some of the other maneuvers used to correct lower lateral cartilage lateral crural convexity. When undertaking scoring or morselization, the surgeon must have a reasonable expectation for what he or she wants to achieve. These techniques weaken the cartilage and thus should be performed in a judicious manner since excessive weakening of the LLCs may lead to collapse or other contour irregularities [4]. When used in combination with other maneuvers, scoring or morselization can be highly effective. For example, if the convexity is isolated to the

cephalic margin of the lateral crura, this area can be incised, separated, and safely scored or morselized without compromising the integrity of the entire cartilage [4]. Scoring alters the integrated mechanical response of the LLC to the forces generated by wound healing over decades. If performed incorrectly or aggressively, there may be risk of long-term deformity and undesirable changes. Likewise, morselization damages cartilage tissue in very unpredictable ways. The degree of chondrocyte viability after morselization is uncertain, and reduced viability leads to long-term unfavorable changes in tip shape. This effect is often seen during revision rhinoplasty operations performed on many patients who underwent primary surgery in the 1970s and 1980s. *Overall, scoring and morselization must be undertaken with extreme caution because these procedures are irreversible and unpredictable*. They can lead to further aesthetic or functional issues many years later. The learning curve for these methods is very long as near-term outcomes may not match long-term desired results. These approaches are seldom used by the senior author.

## 30.5 Dome Division

Vertical dome division is a technique initially described by Goldman and later modified by Simons [7, 8]. Medialization of the lateral crura is a secondary effect. It is this medialization that can help in straightening convex lateral cartilages. Dome division is becoming a historical technique and has been replaced with more conservative relatively cartilage-sparing methods. The vertical dome division is classically performed via a tip delivery approach. Like the lateral crural steal, vertical dome division recruits cartilage from the lateral crura to augment the intermediate crura. Unlike the lateral crural steal, however, this technique involves making a vertical incision through the cartilage at the limit of the recruitment. This should be no more than 2–3 mm into the lateral crura. The cut ends of the medial and intermediate crura are then sutured against one another. This projects and narrows the tip while pulling the cut lateral crura medially [9].

A more recently described method of dome division involves resection of a portion of domal cartilage and suture reconstruction of the dome. This maneuver, like classical dome division, assists in narrowing and sculpting the nasal tip and, secondarily, asserts medial force on the lateral crura. Again, this force helps straighten any convexity of the cartilage [3]. The indications for dome division are similar to those of the "double-dome suture," classic suture techniques, and lateral crural steal and include wide, bulbous, counter-rotated, and under-projected nasal tips. Lateral crural convexity alone is not a true indication to perform this procedure as the tip aesthetic will be affected. There is inherent limitation whenever cartilage is cut, given the risk of long-term destabilization and imprecision, especially if performed by surgeons with limited experience with this method. If aggressive resection is performed or the lower lateral cartilages are destabilized, this can functionally lead to nasal valve collapse and aesthetically manifest as nasal tip pinching and bossa formation. As such, vertical dome division should be approached with caution and only by those more experienced in rhinoplasty surgery and its very long-term outcomes. The authors do not perform this technique.

## 30.6 Interdomal/Transdomal/Lateral Crural Spanning Sutures (Modest Convexity, Deprojected Nose, Counter-Rotated Nose)

Classic nasal tip suture techniques that are primarily used to contour the nasal tip can sometimes help to correct lateral crural convexity. One of the earlier examples of such techniques included creation of the "double-dome suture" [10]. Use of this technique is indicated in those with a boxy or bulbous tip that lacks projection and definition. This technique can be performed through an open or tip delivery approach. In the original description of this technique, cephalic trims were performed and the nasal domes were morselized to aid in refinement. The most dramatic effect of this technique, however, was cre-

ated by passing a mattress suture through and through both intermediate and lateral crura just below the domes [10]. By creating medial forces on the lateral crura to narrow the tip, this technique can also function to help straighten the convex lateral crura. As this maneuver focuses more on refining the domes, when used alone, it would be of limited value in correcting excessively convex LLC lateral crura.

In a similar fashion to the "double-dome suture," medial force on the bilateral lateral crura can be created with the placement of a lateral crural spanning suture [4]. This is performed by placing a mattress suture through and through the bilateral lateral cartilages in the area just cephalad to the nasal domes. Although this suture will help in alleviating convexity of the lateral crura, it also exerts additional effects on the nasal tip that may limit its use. Depending on how the suture is placed, it may create a decrease in the domal divergence angle, interdomal distance, and tip width above the domes, as well as an increase in tip projection and rotation [4]. Therefore, this maneuver would be indicated in the patient who requires other aspects of tip refinement in addition to the correction of convex lateral crura.

Transdomal suturing, as performed in the lateral crural steal technique, recruits the lateral crura into the nasal domes, effectively creating tension across the lateral crura and exerting a mild straightening effect on the convexity. In this technique, the nasal base is first stabilized by suturing both medial crura to one another, or to a columellar strut or caudal septal extension graft in the interdomal area. The horizontal mattress domal sutures are then placed in a way that includes a larger portion of the lateral crus; a portion of the lateral crus is therefore "borrowed" by the intermediate crus. One can best describe this effect using the tripod concept. In lateral crural steal, the "medial crural" leg of the tripod is lengthened, while the "lateral crural" legs of the tripod are shortened. This results in increased projection and rotation [11]. The lateral crural steal technique would be ideal for patients with modestly convex lateral crura as well as an under-projected and counter-rotated tip. It is of limited value in patients with natively normal or excessive tip rotation and projection.

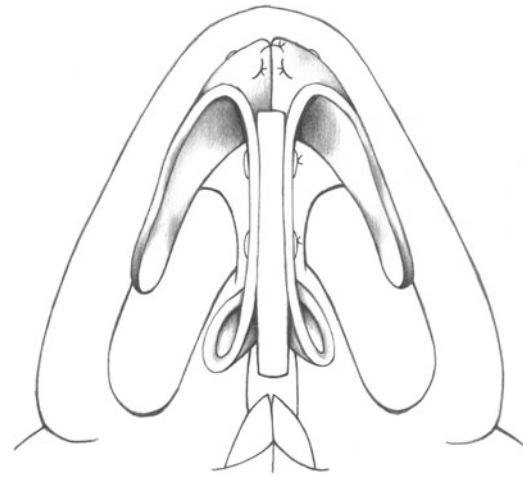

**Fig. 30.4** Correct placement of inter- and transdomal nasal tip sutures. Note that both sutures are placed cephalically to create a double tip-defining point

Although interdomal and transdomal suturing can be performed independent of one another, these sutures can be used synergistically for tip narrowing and to create modest tensile forces across the crura that lead to straightening of convex deformities. Classic interdomal and transdomal (intradomal) sutures are positioned to create two tip-defining points with the interdomal sutures placed cephalically and the transdomal sutures placed at an angle (Fig. 30.4). This combination is sometimes needed to correct the wide, boxy tip deformity and may result in a satisfactory outcome without the need for structural grafting in many patients (Fig. 30.5), where a more triangular nasal base can be created and the modest residual dome convexity is tolerated. The patient also had conservative cephalic trims and a tongue-in-groove nasal tip stabilization maneuver along with modest hump reduction [3]. As with other suturing procedures described, the primary goal of interdomal and transdomal suturing is to refine the nasal tip and the correction of lateral crural convexity is a secondary effect. In fact, these suturing techniques are often applied irrespective of the shape of the lateral crura. One should use the techniques carefully since they can cause unwanted deformity of the lateral crural


**Fig. 30.5** (**a**) Preoperative patient with a boxy nasal tip. (**b**) Postoperative primary rhinoplasty using inter- and transdomal suturing alone

cartilages, necessitating additional graft placement and correction [3, 6]. Therefore, inter- and transdomal suturing techniques should only be employed to correct tip deformities, and as an added benefit, they may correct mild lateral crural convexity. One would likely upset the aesthetic ideal by applying these techniques solely as an attempt to straighten the convex lateral crura.

## 30.7 Lateral Crural Mattress Suturing

Suture techniques are another useful method for altering cartilage shape. Suturing is advantageous because it is essentially nondestructive, reversible, and can be adjusted intraoperatively with great precision [4]. The LLC lateral crural mattress suture is aimed at specifically decreasing convexity of the lateral crura [2, 12–14]. Exposure of the LLC lateral crura can be performed in either an open rhinoplasty or delivery approach. If a cephalic trim is indicated, this should be performed prior to suture placement. Conceptually, these spanning sutures have been described to work in a manner analogous to reinforcement bars incorporated into reinforced concrete or masonry. The composite structure of suture and cartilage is stiffer than native cartilage alone, and the suture under tension resists the native forces within cartilage that create convexity.

A horizontal mattress suture, with either 5-0 nylon or polydioxanone (PDS), is placed with the longer limbs of the suture on the convex side, running parallel to the long axis of the LLC lateral crura (Fig. 30.6). The suture is also designed such that the knot is tied on the convex side of the cartilage across the curvature. Before securing the knot, an assistant will straighten the cartilage with forceps [2]. The length of the long limb of the mattress suture should be approximately 6–8 mm, and the length of the short limb should be about 3 mm long. The cartilages should not be scored or

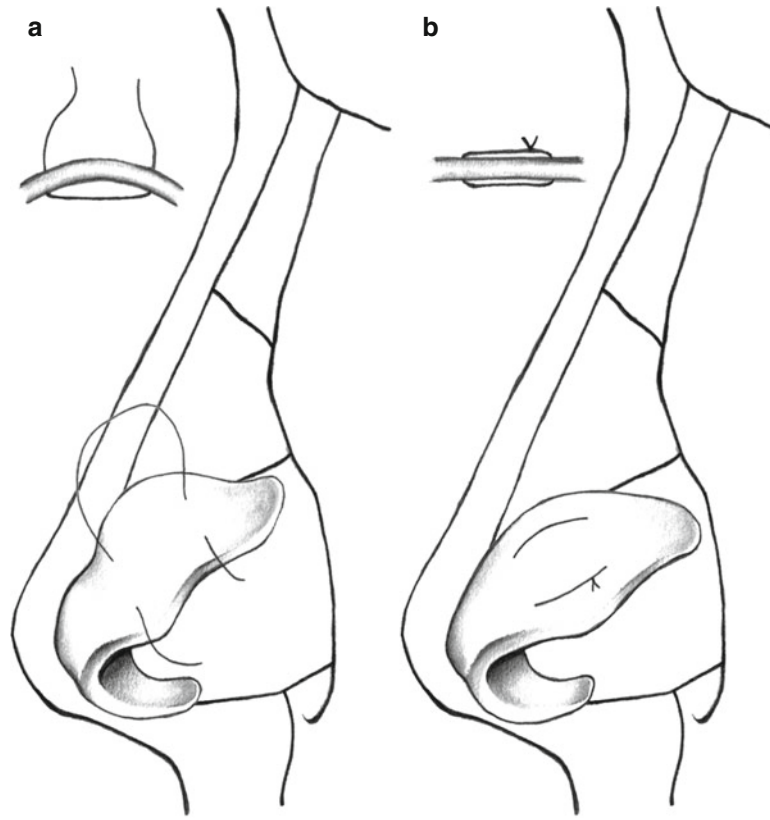


**Fig. 30.6** Lateral crural mattress sutures. (**a**) Sutures are carefully placed through the lower lateral crus cartilage and passed between the vestibular skin and cartilage. The suture is exposed on the outer surface of the crus and then tightened. (**b**) Tightening corrects the convexity. Inset diagrams illustrate conceptually how curvature correction is achieved

morselized with this technique [12]. Tying the knot straightens the curved cartilage (Fig. 30.6). In the case where the convex portion of cartilage is longer than 8 mm, two sutures can be placed adjacent to or overlapped on one another to address the entire length of the cartilage.

The LLC lateral crural mattress suture is versatile and can be used in essentially any case of lateral crural convexity. Figure 30.7 is a montage illustrating the use of this suture for a unilateral left-sided convexity in a functional rhinoplasty operation. Lateral crural mattress sutures can even be used in the opposite fashion for lateral crural concavity [13]. The limitations of the technique are few, though very long-term outcomes have not been reported. Some potential limitations include the risk of the suture breaking, suture stretching, or suture sawing through the cartilage. In addition, it is also possible that the suturing technique may be inadequate to completely flatten the cartilages. In cases where these sutures are inadequate or cause undesired changes, they can be removed and the effects removed. Hence, the surgeon may initially place the lateral crural mattress sutures, and if ineffective, the sutures can be removed and other techniques attempted.

## 30.8 Lateral Crural Overlay (Severe Convex Deformity)

The lateral crural overlay (or overlap) technique helps position the nasal tip in a more aesthetically pleasing and functional orientation, particularly in patients with a long nose and counter-rotated tip [15]. This technique also functions to flatten any flaring or convexity of the lateral crura. The lateral crural overlay technique is performed through an open rhinoplasty approach. Any dorsal adjustments or cephalic trimming is performed prior to manipulation of the tip. The tip is then manually rotated in position, and any excess lateral crural flaring is noted. Vertical incisions are planned at the midportion of each lateral crus and should be at least 10 mm

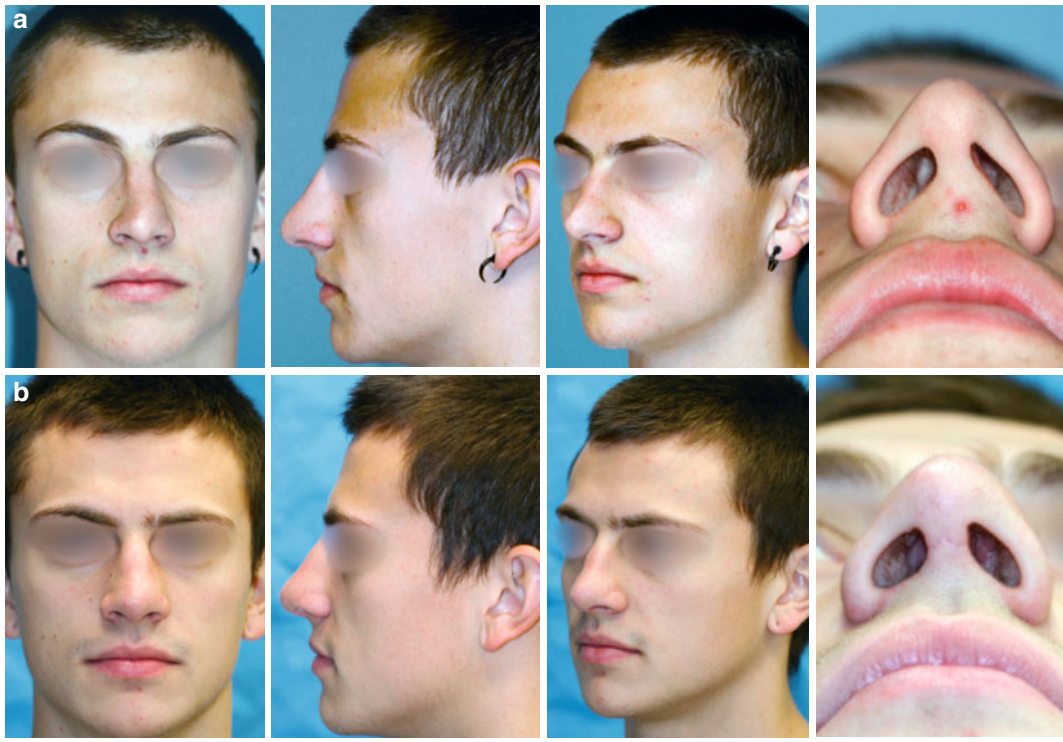


**Fig. 30.7** (**a**) Preoperative. (**b**) Postoperative primary rhinoplasty with lateral crural mattress suture placed on the left side to correct convexity

away from the dome. The vestibular skin is elevated from the cartilage around the area of the planned incision. Once the cartilage is divided, the medial portion is rotated and overlapped onto the lateral portion of the crura. The cartilage portions are then sutured together with horizontal mattress sutures at two fixation points. The caudal border of the reconstructed cartilage is then inspected, and any excess cartilage overlapping the margin is trimmed to create a smooth contour. A columellar strut is typically performed once the tip is in adequate position to aid in tip support [15].

The crural overlay technique functions by shortening the lateral crura and creating tension across this region, which both contribute to a reduction in convexity. When these cartilages are shortened, the nasal tip is subsequently rotated and deprojected, unless the medial crura and domes are rigidly secured to the caudal septum by a tongue-in-groove method or a caudal septal extension graft. When using only a columellar strut, this technique is a powerful one for the long, under-rotated nose. In patients with a short nose or an overly rotated tip, a caudal septal extension graft is used to overcome these limitations, as projection and rotation can be increased independent of one another to a user-defined geometry. Lateral crural overlay is a powerful, fast, and efficient approach, with lateral crural structural stability reconstituted due to the secure suture approximation and overlap.

## 30.9 Lateral Crural Turnover or Turn-Under Graft (Moderate to Severe Convexity, External Nasal Valve Weakness, No Impact on Tip Shape)

The lateral crural turnover or turn-under graft is another option in correcting convexity of the cartilages. This technique is one that can address the lateral crura as an isolated structural unit, and its effects need not necessarily be translated into changes in the position or orientation of the nasal

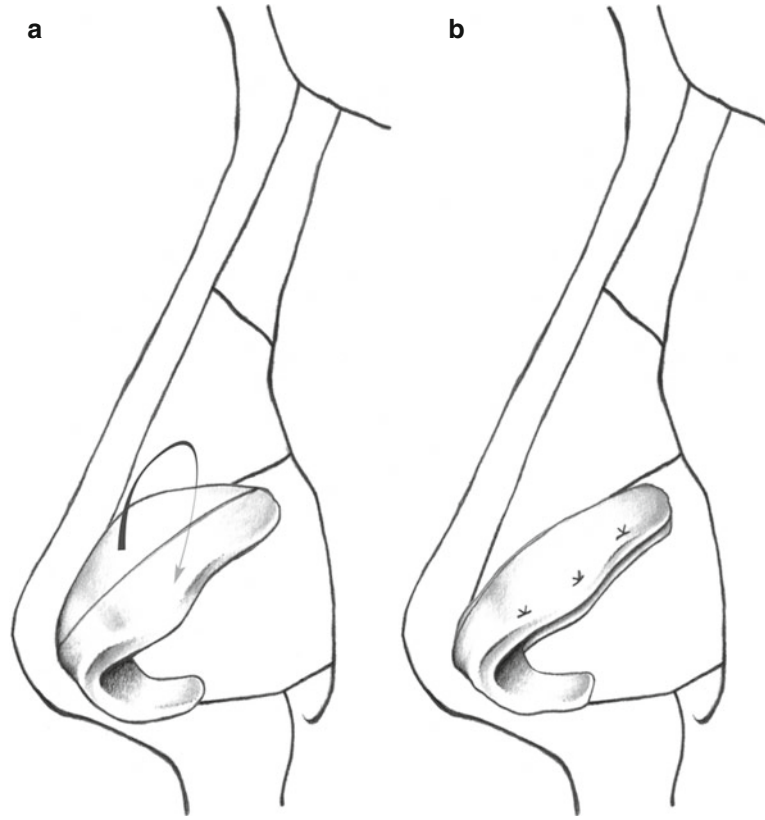


**Fig. 30.8** Lateral crural turnover/turn-under (turn-in) flap. (**a**) A partial thickness incision is made across the long axis of the lateral crus. (**b**) Vestibular skin is widely dissected off the lateral crus, and the crus is then folded on itself to correct convexity

tip. The original description of this technique was to correct concave lateral crural cartilages [16]. However, because this maneuver is designed to straighten the lateral crura, it can also be applied to correct convex lateral crura.

The lateral crural turnover graft can be performed either through an open rhinoplasty approach or a tip delivery approach. A partial thickness incision is made across the long axis of the crura (Fig. 30.8a), and this cartilage flap is either folded over (turnover) or folded under (turn-under/turn-in) the remaining cartilage. Once the lateral crura are exposed, a cephalic trim is performed, making sure to preserve 6 mm of intact cartilage. The cartilage portion that is trimmed from the cephalic region is separated from the vestibular skin and removed as a free cartilage graft. This graft is then turned over so that its concavity opposes the convexity of the remaining lateral cartilage. The graft is then replaced on top of the remaining lateral crura, and the cartilages are sutured back to back with an absorbable suture. The opposing curvatures of the remaining lateral crura and the graft, when sutured together, will counteract each other and function to straighten and reinforce the lateral cartilage [16]. This reinforcement is critical since stiffening the lateral nasal wall within the alar lobule also may significantly correct a dynamically collapsing external nasal valve.

Although the original description involved removing and replacing the cephalic portion of the lower lateral cartilage, modifications on this original description have been made that include using partial thickness cephalic trim incisions so that the graft can be folded over or under on itself (Fig. 30.8). Figure 30.9 illustrates a series of close-up operative images where flattening of the convex crura was achieved through use of this technique. This modification typically must be performed through the open rhinoplasty approach (Fig. 30.9) because the vestibular skin must be meticulously and carefully dissected free from the lateral crura from a cephalad approach so that

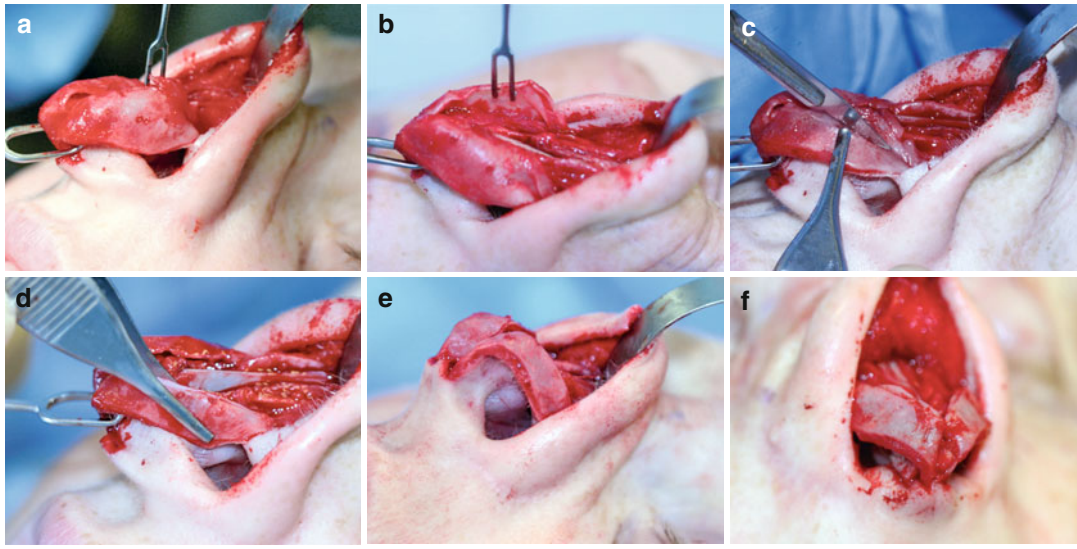


**Fig. 30.9** Lateral crural turn-under (turn-in) operative images. (**a**) An open rhinoplasty approach is used to widely expose the lateral crus. (**b**) The vestibular skin is carefully dissected off the lateral crura down close to its caudal margin. Next, (**c**) a partial thickness incision is made on the outer surface of the lateral crura, and the graft is folded under the remaining lateral crura. (**d**) When suturing the folded lateral crura together, Brown-Adson forceps are used to maintain the new crura in the desired curvature (**e**) until adequate sutures are placed. (**f**) Dome sutures are placed in the conventional fashion to refine the tip

the partial thickness incision can be made on the vestibular surface of the lateral crura. The graft can then be folded onto the more caudal remaining lateral crura [17]. A further modification involves folding an attached graft under the remaining lateral crura [18]. This is performed by carefully elevating the vestibular skin off the lateral crura down close to its caudal margin (Fig. 30.9). Then, a partial thickness incision is made on the outer surface of the lateral crura (Fig. 30.9), and the graft is folded under the remaining lateral crura (Fig. 30.9). In both the attached turn-over and turn-under techniques, sutures must be placed to affix the cartilages and equalize the curvature. When suturing the folded lateral crura together, Brown-Adson forceps are used to maintain the new crura in the desired curvature until adequate sutures are placed (Fig. 30.9). Dome sutures are placed in the conventional fashion to refine the tip (Fig. 30.9). In general, resorbable sutures are placed. Figure 30.10 shows pre-/postoperative images of a primary rhinoplasty surgery patient who had lateral crural turn-in flaps combined with conservative hump reduction. The tip was secured using a tongue and groove technique to the caudal septum.

A major limitation of using the cephalic lateral crus as its own curvature-equalizing graft is that its use is predicated upon having broad lateral crura with excess cartilage that, under normal circumstance, would undergo cephalic trim. Like conventional cephalic trims, it is important to maintain at least a 6-mm strip of cartilage intact when performing this technique; if the width of the cartilage is only slightly more than this, the cephalic graft may be too thin to provide adequate force to equalize the remaining curvature of the lateral crura. This is more commonly encountered in revision rhinoplasty operations where a cephalic trim has previously been performed and the trimmed tissue discarded. In these cases, another technique to straighten the lateral crura must be considered. Again, it must be noted that these turn-over or turn-in approaches do not directly impact nasal tip shape, which is a major advantage. A turn-in flap approach may result in a reduction in airway cross-sectional area and external valve compromise; however, usually the


**Fig. 30.10** (**a**) Preoperative. (**b**) Postoperative primary rhinoplasty with lateral crural turn-under flaps placed

stiffening of the external valve with this maneuver will be adequate compensation.

## 30.10 Lateral Crural Strut Graft (Severe Convexity or Deformity, Secondary Rhinoplasty, Severe External Valve Collapse)

The lateral crural strut graft is a versatile and powerful technique that can be used to reshape, reposition, or reconstruct the lateral crura [19]. The design of this graft isolates change to lateral crural structure so that graft placement is independent of preexisting or desired nasal tip aesthetic. One application of the lateral crural strut graft is to correct lateral crural concavity or convexity by straightening the lateral crura [3].

Lateral crural strut grafts are ideally harvested from septal cartilage, although conchal or costal cartilage will also suffice. The grafts are shaped to be 3–4 mm in width and 15–25 mm in length. These grafts are placed on the undersurface of the lateral crura between the cartilage and the vestibular skin (Fig. 30.11). The graft is

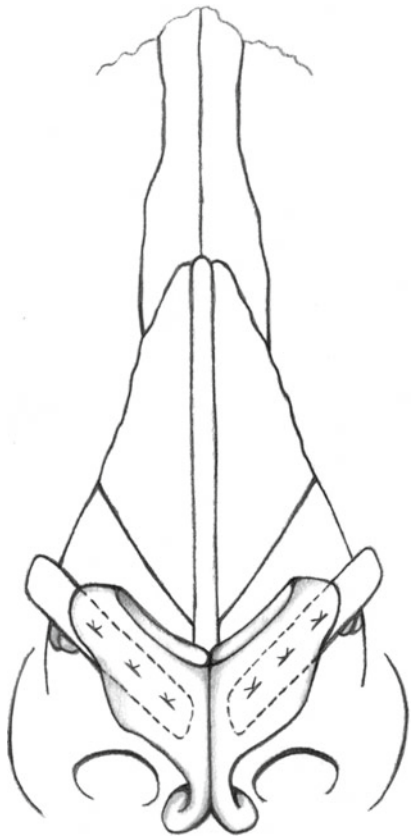

**Fig. 30.11** Lateral crural strut grafts are placed between the vestibular skin and cartilage. They can be extended to just overlap the pyriform aperture to function like a batten graft

generally oriented along the long axis of the crura and can extend past the pyriform aperture in cases of crural malposition, alar retraction, or severe alar collapse. The graft is also positioned caudal to the alar groove to prevent visibility of the graft. The strut is sutured to the lateral crura with 2–3 mattress sutures. The struts are typically straight or slightly curved, and when sutured into place, the lateral crura will conform to the shape of the thicker graft, correcting any concavity or convexity present [19]. Figure 30.12 illustrates the placement of a lateral crural strut graft beneath the native lower lateral cartilage in a primary rhinoplasty case. Repositioning of the lower lateral crura was also performed in this instance.

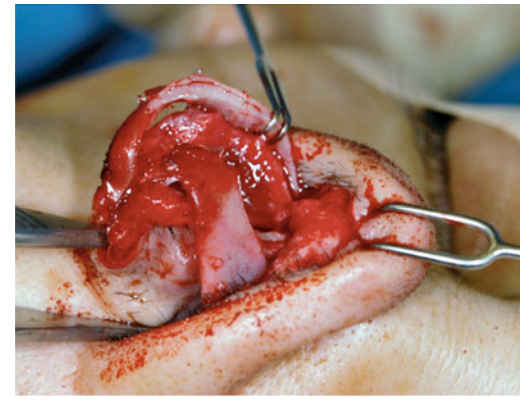

**Fig. 30.12** Lateral crural strut grafts attached to lateral crus. Lateral crus repositioning was also performed

Lateral crural strut grafts are quite versatile and have few limitations. In most primary rhinoplasty patients, there is ample donor cartilage present to fashion the grafts from the septum, although consent should be obtained for conchal or costal cartilage if there is any possibility that septal cartilage is inadequate. In addition, the placement of these grafts requires a moderate amount of surgical expertise and experience in dissecting the lateral crura from the vestibular skin and out to the pyriform aperture. Therefore, the inexperienced rhinoplasty surgeon should perform this surgical technique with caution, particularly if complete repositioning of the lateral crura-graft complex is required. Overall, the lateral crural strut graft is quite versatile and can be performed in tandem with many other rhinoplasty maneuvers. It is a very powerful maneuver for lateral crural shaping and reconstruction and can be used both aesthetically and functionally in the rhinoplasty patient. One caveat is that this approach does reduce the cross-sectional area of the external nasal valve, so its use must be carefully considered in the patient with the narrow vestibule. As with turn-over or turn-in grafts, lateral crural strut grafts stiffen the lateral nasal wall within the alar lobule and can alone be used to correct external valve collapse. Figure 30.13 shows images of a primary rhinoplasty patient in whom a lateral crural strut graft was used to correct and extremely convex lower lateral cartilage.

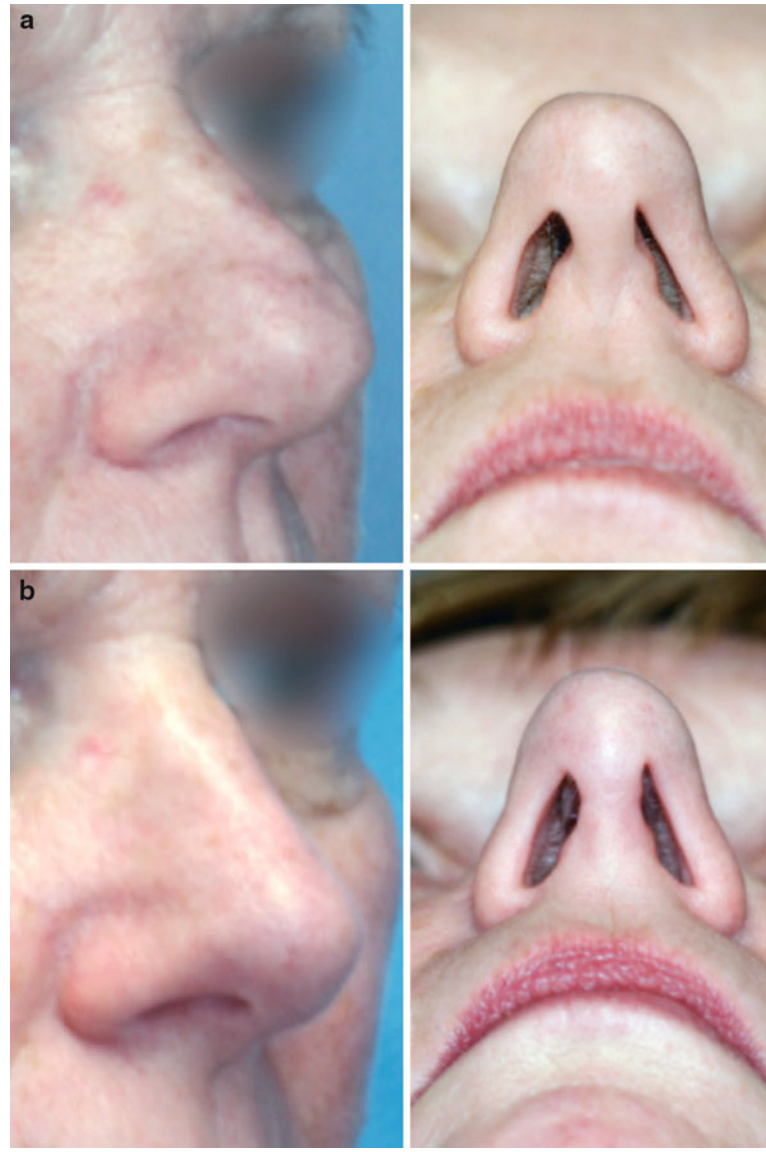


**Fig. 30.13** (**a**) Preoperative. (**b**) Postoperative primary rhinoplasty after lateral strut grafts were placed to correct convexity/boxy nasal tip shape

## 30.11 Lateral Crural Reversal

One of the more extreme maneuvers used to correct tip convexity is the lateral crural reversal technique. Given many other options for correcting convexity of the lateral crura, the reversal technique is reserved for the more extreme cases. This technique is simple in concept and involves transecting the curved portion of the cartilage in two places, reversing its orientation, and suturing it back into place [20]. This technique essentially trades a convexity for a concavity but can yield an acceptable and functional result.

The limitations behind this technique involve the inherent weakening of the lateral crura by transecting it in two locations. The replaced cartilage will obviously be weakened at the junctions where it is reattached to the remaining crura. It is possible, however, that this weakness functions like scored cartilage to reduce the memory of the cartilage and allow it to lie in a straighter configuration. A modification on the reversal

technique has been made to possibly limit postoperative deformities and involves keeping a 2-mm caudal strip of lateral crura intact during the resection in order to maintain the form and continuity of the caudal border and prevent alar retraction and deformity [21]. Despite this modification, this technique is still limited to specific cases and is not as predictable as some of the other methods of correcting lateral crural convexity.

## Conclusions

Lateral crural convexity can cause both aesthetic and functional nasal problems. It is important for the surgeon to make an accurate preoperative and intraoperative assessment of this nasal deformity. This will allow the surgeon to choose one or more of the techniques available to adequately correct the issue. In the surgeon's assessment, it is important to pay particular attention to the nasal tip because a number of techniques will address many tip deformities at the same time as the lateral crural convexity. It is also important for the rhinoplasty surgeon to be familiar with the procedures available to correct the particular deformities. With this information, the surgeon can be more efficient, accurate, and predictable with both surgical technique and overall results in the rhinoplasty patient.

## References


1. Daniel RK (1992) The nasal tip: anatomy and aesthetics. Plast Reconstr Surg 89(2):216–224
2. Gruber RP, Friedman GD (2002) Suture algorithm for the broad or bulbous nasal tip. Plast Reconstr Surg 110(7):1752–1764; discussion 1765–1768
3. Rohrich RJ, Adams WP Jr (2001) The boxy nasal tip: classification and management based on alar cartilage suturing techniques. Plast Reconstr Surg 107(7):1849–1863; discussion 1864–1868
4. Tebbetts JB (1994) Shaping and positioning the nasal tip without structural disruption: a new, systematic approach. Plast Reconstr Surg 94(1):61–77
5. Boahene KD, Orten SS, Hilger PA (2009) Facial plastic and reconstructive surgery. In: Papel ID (ed). Thieme, New York, p 481 http://www.amazon.com/Facial-Plastic-Reconstructive-Surgery-Papel/dp/1588905152
6. Toriumi DM (2006) New concepts in nasal tip contouring. Arch Facial Plast Surg 8(3):156–185
7. Goldman IB (1954) Surgical tips on the nasal tip. Eye Ear Nose Throat Mon 33(10):583–586
8. Simons RL (1987) Vertical dome division in rhinoplasty. Otolaryngol Clin North Am 20(4):785–796
9. Simons RL, Rhee JS (2009) Surgery of the nasal tip: vertical dome division. In: Papel ID (ed) Facial plastic and reconstructive surgery. Thieme, New York, pp 577–587
10. McCollough EG, English JL (1985) A new twist in nasal tip surgery. An alternative to the Goldman tip for the wide or bulbous lobule. Arch Otolaryngol 111(8):524–529
11. Kridel RW, Konior RJ, Shumrick KA, Wright WK (1989) Advances in nasal tip surgery. The lateral crural steal. Arch Otolaryngol Head Neck Surg 115(10):1206–1212
12. Gruber RP, Nahai F, Bogdan MA, Friedman GD (2005) Changing the convexity and concavity of nasal cartilages and cartilage grafts with horizontal mattress sutures: part I. Experimental results. Part I. Plast Reconstr Surg 115(2):589–594
13. Gruber RP, Nahai F, Bogdan MA, Friedman GD (2005) Changing the convexity and concavity of nasal cartilages and cartilage grafts with horizontal mattress sutures: part II. Clinical results. Plast Reconstr Surg 115(2):595–606; discussion 607–608
14. Gruber RP, Chang E, Buchanan E (2010) Suture techniques in rhinoplasty. Clin Plast Surg 37(2):231–243
15. Kridel RW, Konior RJ (1991) Controlled nasal tip rotation via the lateral crural overlay technique. Arch Otolaryngol Head Neck Surg 117(4):411–415
16. McCollough EG, Fedok FG (1993) The lateral crural turnover graft: correction of the concave lateral crus. Laryngoscope 103(4 Pt 1):463–469
17. Janis JE, Trussler A, Ghavami A, Marin V, Rohrich RJ, Gunter JP (2009) Lower lateral crural turnover flap in open rhinoplasty. Plast Reconstr Surg 123(6):1830–1841
18. Murakami CS, Barrera JE, Most SP (2009) Preserving structural integrity of the alar cartilage in aesthetic rhinoplasty using a cephalic turn-in flap. Arch Facial Plast Surg 11(2):126–128
19. Gunter JP, Friedman RM (1997) Lateral crural strut graft: technique and clinical applications in rhinoplasty. Plast Reconstr Surg 99(4):943–952; discussion 953–955
20. Gruber RP (1988) Open rhinoplasty. Clin Plast Surg 15(1):95–114
21. Haack S, Gubisch W (2011) Lower lateral crural reverse plasty: a technique to correct severe concavities of the lateral crus. Aesthetic Plast Surg 35(3):349–356