

Revision of the Cleft Lip Nose

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ABSTRACT

Secondary or revision rhinoplasty for the cleft nasal deformity represents one of the most challenging problems in rhinoplasty surgery. The secondary nasal deformity of the unilateral cleft lip involves a retrodisplaced dome of the ipsilateral nasal tip, hooding of the alar rim, a secondary alar-columellar web, and other deficiencies.

This article discusses techniques to achieve the best possible outcome for patients with cleft nasal deformities. We emphasize the importance of early intervention by way of primary cleft rhinoplasty and highlight the typical challenges presented in delayed (secondary) or revision cleft rhinoplasty. We describe how the sliding-flap cheilorhinoplasty effectively corrects these deformities using a laterally based chondrocutaneous flap via an open rhinoplasty approach. Columellar struts and shield grafts are some of the techniques combined with this approach to produce optimal results.

Keywords:

- Rhinoplasty, Cleft, Revision

Abbreviations:

- Cleft Lip (CL)
- Lower lateral cartilage (LLC)

INTRODUCTION

The cleft nasal deformity presents a formidable challenge in rhinoplasty surgery. There are three critical factors that contribute to the complexity of the deformity that must be understood to achieve optimal results. These include a combination of anatomic deficiency or aberrancy, surgical scarring from previous reconstructive attempts, and the inevitable effects of growth over time. The number of rhinoplasty techniques described in the literature and the often number of revision procedures endured by the patient is a testament to the difficult nature of secondary or revision rhinoplasty in the cleft nasal deformity. All of the described techniques attempt to address some aspect of the problem. However, complete correction of all of the deficiencies of some noses remains an elusive goal for many, hence the common need for revisions in these challenging patients. It should also be noted that each patient presents a unique challenge due to a combination of factors and certain techniques may be more suitable than others in individual cases.

UNILATERAL CLEFT NASAL DEFORMITY

The unilateral cleft lip nasal deformity results from tissue deficiencies in the soft tissues of the lip, the bony premaxilla, and abnormal muscle orientation and pull on the nasal structures. In the secondary or revision cleft nose patient, this deformity must be distinguished from the unrepaired cleft lip nasal deformity mainly by the position of the alar base.¹ In the repaired lip, the alar base displacement can be corrected in most patients. The typical secondary cleft nasal deformity consists of the features described in **Table 1**.

PRIMARY UNILATERAL CLEFT RHINOPLASTY

Primary rhinoplasty at the time of cleft lip repair can help to improve the cleft nasal deformity by achieving better symmetry, which may allow the nose to grow in a symmetric fashion, and potentially improve long-term appearance and final outcome. A detailed description of primary cleft rhinoplasty is beyond the scope of this article. We instead refer the reader to an excellent commentary recently published on the subject.² Briefly, the philosophy is as follows. The primary lip repair is performed by the time the patient is 3 months of age preferably with pre-surgical repositioning, which narrows the cleft gap, improves alar base symmetry, and elongates the columella. The goals of primary cleft rhinoplasty include closure of the nasal floor and sill, repositioning of the alar base, and symmetric repositioning of the lower lateral cartilage. All attempts are made to minimize nasal tissue trauma and scarring, which may potentially affect subsequent growth. This is a controversial topic, but one study by McComb and Coghlan found no significant difference in nasal and midfacial growth.³ In this longitudinal study, the symmetry produced during primary rhinoplasty was maintained into adulthood.

SECONDARY UNILATERAL CLEFT RHINOPLASTY

Secondary nasal surgery includes intermediate and definitive rhinoplasty. Intermediate rhinoplasty is a term used for procedures that are performed between the time of the lip repair and definitive rhinoplasty. These procedures are generally less involved, more conservative, and have the goals of achieving symmetry during continued nasal growth and achieving a platform for more successful definitive repair. Intermediate rhinoplasty is performed before the completion of nasal growth. Three situations have

been described that warrant intermediate procedures including severe nasal obstruction caused by caudal septal deviation, a deformity not addressed with primary rhinoplasty, and a child who is suffering severe emotional distress from peer psychological pressure.⁴

There are two distinct timing strategies in intermediate rhinoplasty.⁵ In one scenario, the intermediate rhinoplasty is done between the ages of 4 and 6 years of age as this sometimes coincides with the timing of lip revision if necessary and the time in which peer psychological pressure tends to mount. The other scenario involves waiting until 8 to 12 years of age or after the completion of orthodontic alignment and alveolar bone grafting. This allows for a better skeletal base for a longer lasting correction of severe nasal deformities.

Definitive rhinoplasty is performed after the completion of maxillary and nasal growth. This usually occurs between 14-16 years of age in women and 16-18 years of age in men. Rhinoplasty at this time is definitive in that more aggressive septoplasty, osteotomies, and cartilage grafting maneuvers may be performed without concerns for affecting nasal and midfacial growth. The goals of definitive rhinoplasty include final creation of lasting symmetry, achieving definition of the nasal base and tip, relief of nasal obstruction, and management of nasal scarring and webbing.⁴ Each patient will require a personalized approach to timing of secondary rhinoplasty, based on the severity of soft tissue and skeletal deformities as well as previous procedures performed. This combination of the underlying anatomic and pathophysiologic changes, coupled with scarring from previous procedures, makes secondary rhinoplasty or revision of the cleft lip nose extremely challenging for the facial plastic surgeon. A summary of the timing and goals in cleft rhinoplasty is provided in **Table 2**.

OUR SURGICAL TECHNIQUE IN SECONDARY CLEFT RHINOPLASTY

The senior author's preferred technique for secondary rhinoplasty involves the use of the sliding chondrocutaneous flap or sliding cheilorhinoplasty.^{1,5,6} This technique is designed to address the deficiencies present on the cleft side of the nose. These deficiencies include a lowered height of the dome, malposition of the lower lateral cartilage, lateralization of the alar base, presence of an alar-columellar web, and a vestibular lining deficit. A laterally based chondrocutaneous flap based on the lower lateral cartilage, vestibular skin, and lip scar tissue is utilized to address these problems, typically through an external rhinoplasty approach. The addition of structural cartilage grafting is also used to maintain nasal tip support and contour symmetry between the cleft and non-cleft sides.

The sliding cheilorhinoplasty technique, as shown in **Figure 1**, utilizes the existing upper lip scar as part of the advancement flap for increasing the lining of the nasal vestibule. Marking is performed with methylene-blue tattoo marks via a fine gauge needle. The vermillion is marked first. Next, 2 parallel incisions, centered on and encompassing the unilateral cleft lip scar to be revised/excised are marked. The width of the flap obviously depends on the width of the original scar, but should be at least 5 mm. The length of the flap is dictated by the amount of lip scar to be excised. The incisions paralleling the lip scar are extended into the nose. Here at the columella, the medial incision becomes continuous with the marginal incision for the external rhinoplasty approach. This incision is extended superiorly to encompass any alar webbing and is marked to create a rim margin on the

cleft side that is symmetric with the normal rim on the non-cleft side. This incision continues laterally to merge with the marginal incision for external rhinoplasty.

The lateral lip incision transitions into an intercartilaginous incision as in endonasal rhinoplasty, and is continued superiorly and then laterally to outline the entirety of the LLC. It is important here to maintain the lateral attachment of the flap to preserve the blood supply.

Local anesthetic solution with epinephrine is infiltrated primarily for hemostatic purposes. The minimum amount needed for adequate vasoconstriction is used as to minimize tissue distortion.

Starting with the lip incisions, the flap is elevated by continuing to dissect superiorly and laterally to encompass the lip scar and the LLC. Once again, the lateral attachment of the flap is maintained to preserve the vascularity of the flap. The remainder of the nasal dorsum and the non-cleft LLC is then exposed via the standard external rhinoplasty approach.

At this time, any septal work that needs to be performed is accomplished. This includes septoplasty and the harvesting of grafting material if needed. As always, care should be taken to preserve sufficient dorsal caudal support of the nose leaving sufficient structural cartilage behind.

A columellar pocket is next created for a columellar strut. The strut, which is used to anchor the LLC of the cleft side to the non-cleft LLC, is carved from previously harvested septal cartilage or other autologous sources. The crucial maneuver in achieving symmetry of the vestibular dome height is the positioning of the LLC's. Achieving this symmetry typically requires advancement of the medial crus of the LLC on the cleft side superiorly to

match the vestibular dome height of the non-cleft side. The superior advancement of the flap in turn utilizes the residual lip scar for lining of the nasal vestibule. Once the appropriate and symmetric dome positioning has been established, the medial crura of the LLC's are secured to the columellar strut with horizontal mattress sutures.

The upper lip is then repaired in layers. The re-approximation of the orbicularis musculature bears the tension of the closure and is critical to achieving optimal outcomes in revision of the lip scar.

Once the base of the nose has been stabilized, attention is directed toward refining the nasal tip. Cephalic trim(s) of the LLC(s) may be performed as indicated. Also, if indicated, a shield-type tip graft of autologous cartilage can be sutured into position to maintain tip support and projection. This graft has the added benefit of allowing camouflage of underlying minor tip asymmetries.

Closure of all of the incisions is then performed. A slight in folding of the alar-columellar web tissue on re-approximation of the marginal incision will improve alar-margin symmetry. Finally routine intranasal and external dressings and splint are applied.

EVOLUTION OF TECHNIQUES IN SECONDARY CLEFT RHINOPLASTY

As previously noted, many different techniques have been described for the correction of the unilateral cleft deformity. In Millard's Cleft Craft Volume 1 and later in his Rhinoplasty Tetralogy, he gives an excellent review of the evolution of the surgery of nasal correction in the unilateral cleft. ⁷

Corrective, Secondary, Congenital, Reconstructive, 211-320} ⁷ The following brief history of these procedures to direct displaced tissues into normal position is described.

Gillies and Kilner in 1952 described a superior advancement of the composite chondrocutaneous hemicolumella flap. This was effective in lifting the slumped alar cartilage on the cleft side and was performed in combination with reduction of the normal alar cartilage. Gillies also described correction of the septum and medial displacement of the alar base and advocated for an onlay cartilage graft. Converse would later modify this approach with a marginal incision and used an auricular composite graft.

Potter's Rethi exposure in 1954 was similar in design, but the flap was from the opposite direction (lateral to medial advancement of the lateral crural composite chondrocutaneous flap). Charles Horton in 1965 also designed a similar procedure to lift the depressed alar cartilage on the cleft side that was slightly more practical than previous versions according to Millard. In 1972, Igor Kozin added only grafting of cartilage to the depressed bony alar base for symmetry and support of the reconstruction.

In 1982 David Dibbel performed nostril rotation with external incisions and excisions as previously described by Blair, Sheehan, Young, and Joseph. Dibbels procedure kept the incisions and scars within the nostril margin.

Millard was careful to point out that all of these procedures had great merit in correcting many of the problems encountered in the unilateral cleft deformity, but none corrected all of the deformities. He summarized that "The nasal deformity in unilateral clefts presents a different problem with multiple facets. The most exasperating of which is its overall asymmetry in the adult deformity, which is set in its ways and probably has suffered unsuccessful attempts at surgical correction which add scars to the deformity." Millard also reviews other techniques including the oblique cartilage strut, the alar cinch, alar sculpting, alar flaps, composite auricular grafts, and a potpourri of other techniques.

OTHER TECHNIQUES IN SECONDARY CLEFT RHINOPLASTY

Tajima and Maruyama advanced the evolution in cleft rhinoplasty with the “reverse-U” incision in 1977. Their method was an extension of marginal incision into a rim incision at the point of the alar web. They incorporated the skin of the web with the vestibular skin and the LLC flap. The flap was suture suspended medially and cephalically from the LLC to the ipsilateral upper lateral cartilage and the septum. This conversion of the external skin of the alar web to vestibular lining also corrects the deficiency of vestibular skin associated with the unilateral cleft nasal deformity.

In a recent article of a slight modification of this technique, Fugimoto et al presented their follow up results in Eighty-nine patients over nine years with an average of over seven years of follow up.⁸ Eighty-one percent of all cases maintained acceptable results without relapse. Fair results were attributed to an unclear alar crease or relapse. They concluded that rigid fixation and release of nasal cartilage are very important to achieving lasting results.

In 2006, Ayhan et al published a series of 12 cases in which composite chondrocutaneous grafts were applied in various forms to repair the columellar deficit, to form the nasal tubercle and nostril sill in cleft lip nose patients.⁹ The authors felt that composite conchal cartilage grafts achieved a symmetrical and functional result. These techniques are similar in nature to previously described composite grafting techniques and may be appropriate on a case by case basis.

Carlino, in 2008, described the use of a modified forked flap for controlling columella length in cleft rhinoplasty in a small number of patients.¹⁰ They used a

modification of the classical forked flap for controlling the tension created by the columellar suture in effort to reduce the tip projection gained by the technique. They described the columella incision followed the classic tepee shape, although the inverted V was extremely narrow and long, with its arms extending beyond the columellar rims, stopping at the base of the vestibule, then making acute angles and heading vertically towards the nostril tip, and continuing into the nostrils as normal marginal incisions. Consequently, a complete "W" was used, in which the lateral angles and arms lay in the nostrils, while the central inverted V was in the columella. The rhinoplasty was performed as planned and a triple "V-Y" suture was made. They felt that this technique provided real lengthening of the columella or, at least, it closed the columellar incision without tension, thereby preserving the tip projection.

Another novel approach recently published was by Turkaslan et al in 2008.¹¹ They described their technique as to placing a cartilage graft at the posterior dome area after the release of cleft-side ala from vestibular mucosa and skin to elevate the ala depression and tip projection. They used this technique in 16 cases with the aim to increase the direct lateral crura's elastic support strength and to support the new position of alar cartilage.

In a combination of the Dibbell and Tajima techniques, Flores in 2009 published a retrospective review of their results in 35 patients.¹² The revision rate was 11 percent for alar base position, 3 percent for depressed lower lateral cartilage, and 3 percent for nostril apex overhang. After the procedure, there was a statistically significant decrease in alar base width, and an increase in columellar height and nostril apex height on the affected side. The differences in alar base width, columellar height, and nostril apex height between the affected and nonaffected sides all decreased significantly postoperatively. They

concluded that this procedure is safe, has a low revision rate, and is associated with a statistically significant objective changes as noted.

OUTCOMES IN CLEFT RHINOPLASTY

As noted in a recent review by Lee et al for cleft and hemangioma-related nasal deformities, overall the past few years, there appears to be a greater emphasis on functional outcome in cleft rhinoplasty.¹³ Complications from primary cleft rhinoplasty and presurgical nasolabial molding are being reported. There are several new studies that compare different rhinoplasty techniques to determine which approaches offer superior surgical outcomes, but there are no standardized objective measurements across these studies.

There is little data available concerning the functional results of cleft rhinoplasty. In a prospective study of 68 cleft rhinoplasty patients, Huempfer-Hiere et al evaluated aesthetic and respiratory outcome with active anterior rhinomanometry, rhinoresistometry, and acoustic rhinometry.¹⁴ These were performed preoperatively and 6 months postoperatively. A significant improvement in many parameters was seen. Although analysis of functional respiratory data showed a significant increase in nasal volume, no change in nasal airflow and hydraulic diameter could be found. The authors concluded that while aesthetic improvement of the cleft nose is a goal, which can be achieved with regularity, nasal respiration still seems to be a challenge in cleft patients. This study highlights the necessity of taking functional data to learn more about the effects of surgery.

What does seem to be clear is that patients undergoing surgery for cleft nasal deformity seem to have high satisfaction rates with their procedures. In a study by Sandor and Ylikontiola ¹⁵, thirty-five patients with cleft nasal deformity treated by external rhinoplasty were evaluated for satisfaction and perception of outcomes. Treatment involved alar base relocation and augmentation of the asymmetric nasal tip with auricular cartilage grafts. The patients completed a satisfaction survey and interview at the 2-year follow-up visit. A visual analogue scale (VAS) numbered 0-10 was also used by the patients to grade outcome compared to preoperative appearance at 4 anatomic sites. The highest improvements in VAS score was for the tip, followed by alar position, dorsum and symmetry of nostrils. They noted that all patients were prepared to undergo such procedure for a second time, if necessary. In another study, as similar in the Leipzig experience, the authors have also described high satisfaction rates by patients undergoing surgery for cleft nasal deformities. ^{16 17}

FURTHER REVISIONS IN CLEFT RHINOPLASTY

Secondary or definitive cleft rhinoplasty may be the “ultimate” revision rhinoplasty and its technical difficulty relates to the previously discussed factors and the number of previous interventions. The principles of cleft rhinoplasty apply in revisions as they do in primary and secondary cleft rhinoplasty. It remains important to recognize asymmetries and scarring that may affect the patient’s functional and aesthetic outcome. Early recognition after a planned definitive procedure may allow for touch up work before further scarring sets in. While it is important to consider cleft patients on case by case basis, if the facial plastic surgeon is able to follow a logical progression via primary cleft

rhinoplasty, possible intermediate cleft rhinoplasty, and our described technique for definitive cleft rhinoplasty, he or she can achieve a lasting aesthetic and functional result, as demonstrated in **Figure 2**, hopefully without the need for further revisions.

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FIGURES/TABLES

Table 1 Characteristics of the unilateral cleft lip nasal deformity.

Table 2 Timing and goals of primary and secondary cleft rhinoplasty.

Figure 1 Sliding chondrocutaneous flap.

Figure 2 (A-G) Pre and postoperative views of a patient who is 2 yrs s/p sliding flap cleft rhinoplasty with ear cartilage structural grafting and septoplasty. She had undergone previous rhinoplasty x 2. She shows improvement of her overall nasal tip and an especially improved base view, which is the hardest view to achieve symmetry.