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Nasal Deformity in Association with Cleft Lip - Management from Infancy to Adulthood

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Abstract

Nasal deformity in association with a cleft lip is quite characteristic and remains to be a stigma for the individual with this deformity. As a newborn, a cleft lip is the most obvious deformity viewed by average individuals and parents, but in the long-term it is the nose. Most of the previously described corrective techniques for addressing the nasal deformity associated with a cleft lip have focused on the dermal approximation of the adjacent lip by securing the freed cartilages to the skin temporarily and repositioning the nasal tip cartilages. We developed a corrective technique in which the nose is effectively lifted and suspended internally to the radix in a semi-closed manner. Secondary corrections to the nose or lip in childhood should be avoided unless problems in these areas are causing psychological disturbances. In such situations, minimal incisions and/or old lip scars should be used for access. Introduction of scars to the columella must be avoided in children, as this procedure hinders future formal cleft rhinoplasty. Unilateral cleft-associated nasal deformity has been more challenging due to the relative asymmetry compared to the bi-lateral counterpart. Secondary cleft septo-rhinoplasty is considered a challenging operation requiring significant surgical expertise. In adults, an open tip approach is required in addition to the use of sturdy cartilage grafts to augment the columella, tip, and dorsum, and to address functional nasal issues. In cases of severe and or poorly treated bilateral cleft lips and nasal deformities in adults, the nose and columella are first to be reconstructed with prolabial flap followed by an Abbe flap to the lip.

Keywords: cleft lip, nasal, deformity, unilateral, bilateral, asymmetry, correction, primary, secondary, scar, adult, rhinoplasty, techniques, reconstruction, cartilage, rib, graft, flap

1. Introduction

The nasal deformity in individuals with cleft lip (CLND) is a challenging and controversial topic that has been addressed with a diversity of surgical techniques. Most of the time, the esthetic outcomes have barely been acceptable or dissatisfactory to the surgeons worldwide [1–3].

Only after spending several years of practice with pediatric facial surgery can one appreciate the difficulty of achieving good results to the nose in cleft lip patients. Earlier in one's medical practice, closing a wide cleft lip and achieving a good alignment were the main challenges. It has been truly stated: "Cleft lip surgery is essentially an operation to the nose" [4, 5]. Therefore, a diagnosis of "a case of

cleft lip” is probably underestimating and inappropriately deficient and lacks the major challenging aspect of the anomaly, namely nasal deformity.

Although it may have a higher incidence in certain geographical and ethnic groups, the anomaly of a cleft lip is quite common globally, and it occurs regardless of maternal nutritional and/or socioeconomic status. Therefore, cleft patients are recognizable by both laypersons and medical professionals. It is interesting that in a certain languages and cultures, the term cleft lip has been translated in lay terms as the “Rabbit lip”.

CLND is the most likely stigma that remains visible despite vigorous and repeated attempts at correction; it has already been established that due to the several factors involved in the nasal cleft patho-anatomy, *the deformity is not, in fact, amenable to correction at the index operation* [6, 7]. This finding explains the need for secondary corrections to the nose later on in childhood and adulthood even in the best hands. This is similar to a large size scar or nevus for which serial correction in stages is planned that would benefit from the stress relaxation of the tissues over time. Having few surgical stages or revisions throughout a patient’s facial growth is therefore unavoidable but what truly matters is how to minimally complicate future surgeries.

We believe that with the currently available developments, it will be relatively easier for the cleft surgeon to obtain results in patients who have symmetric bilateral cleft lip nasal deformity (BCLND) compared to unilateral cleft lip nasal deformity (UCLND).

UCLND is a relatively more common presentation as a primary or secondary case, and it has been investigated and written about far more frequently than its bilateral counterpart BCLND, an observation that can be easily made upon reviewing this subject [3, 6–9]. The rationale is not specific to either case, and the solutions applied to the former can-not simply be applied on both sides in case of the later or vice versa. The tilt of the tripod in the unilateral cases beginning with the infrastructure, the maxilla, and all of the above layers up to the skin and hence the *persistent asymmetry* have challenged surgeons the most.

Secondary correction to the CLND in childhood or while facial growth is still in progress presents quite different strategies from the case of performing surgery on an adult with CLND. The intrinsic forces responsible for clefting in the first place continue to be active. Therefore, nasal correction in preschool up to teenage years must be considered more or less a symptomatic and a temporary measure for the child, his or her peers, and parents.

This chapter aims to provide an understanding of several aspects of this deformity: 1. The patho-anatomy of the cleft lip associated nasal deformity, 2. Evolution of the surgical techniques used for CLND as primary correction, 3. Concept of *Nasal lift* or *Nasal cantilever technique* as a primary procedure, 4. Methods or surgical maneuvers which must be avoided in primary surgery in infancy and or revisionary surgery in childhood, 5. Reliable techniques for correction of nasal deformity in childhood as interceptive measures, 6. Evaluation and management of the adult patient consulting for cleft lip associated nasal deformity, and 7. Surgical strategies and methods of correcting severe nasal deformities in adults with secondary cleft lip deformities.

2. Primary cleft lip-nasal correction

Whether it is a unilateral or bilateral cleft lip, the nose tends to act as a collapsing pyramid with a tilt in the case of the former. This gives the nose a tethered and flattened look with varying degrees of asymmetries [8]. The underlying cartilaginous deformity

possesses some characteristic features in the unilateral versus the bilateral clefts. Columellar shortening (and foreshortened medial crus of the lower lateral cartilages [LLC]) seems to be a major initiating cause for the resultant deformity, which in turn, is proportionately related to the severity or width of the cleft. This process is the case for both UCLND and BCLND. A cascade of deformities to the cartilages, lining (mucosa), and cover (skin) are then expected to occur. In UCLND, the contralateral side grows more freely, which in turn, leads to the tilt and asymmetry of the nose (**Figure 1**). The LLCs on the ipsilateral side in case of UCLND or on the more severe side in case of the BCLND, besides their deformed configuration, are also hypoplastic. This structure causes the dissection, handling, and correction to be a tedious process. Due to the horizontal orientation of the nostril, the lateral crus of the LLC is somewhat straighter than the normal semi-oval shape. The dome has a poor definition and is retracted and retro-displaced. Certain ethnic noses are known to have much weaker cartilages and thicker, more sebaceous skin, for example, Mediterranean, Asian and African patients. Therefore, such variations should be taken into consideration whenever operating on cleft patients with such ethnic backgrounds. In these patients, the caudal nasal septum deviates toward the contralateral side in case of UCLND or toward the side of less severity in case of BCLND. The middle aspect of the septum hence tends to do the opposite. Lateral and more cephalic displacement of the alar rim is associated with the abnormality and contains semi-vertically attached orbicularis oris fibers. Interesting, all of the above basic features are still encountered in adults who present for cleft septo-rhinoplasty [9].

Cleft lip and CLND are the results of *in utero* fusion failure of various facial processes, which results in both mesodermal and ectodermal malformations. The deformity involves all tissue planes (nasal mucosa, cartilages, muscle fibers, and skin). To realize the magnitude of the problem, an analogy of a different congenital anomaly, such as “Camptodactyly”, which is a congenitally flexed digit, can be used and will result in a congenital reduction in lengths of flexor tendons, nerves, and vessels with secondary changes to joints and deficiency of overlying skin. This

Figure 1.
Underlying cartilaginous deformity: (a) a child with relatively symmetric bilateral cleft lip nasal deformity (BCLND) in which the lower lateral cartilages lack the medial crus and are apart with the deficient columella. The triangular cartilages are also splayed horizontally. The nose altogether is flattened and widened. (b) A child with unilateral cleft lip nasal deformity (UCLND) in which the lower lateral cartilage on the cleft side is hypoplastic and almost lacking the curvature with the unilaterally deficient columella. The triangular cartilage and nasal bone accordingly are at a lower position on the same side ipsilaterally. Hence, the nose seems to have a broken beam and is about to collapse on the cleft side and shows flaring of the nasal ala and deficient underlying maxilla.

condition is usually treated with serial splinting to produce lengthening of the shortened structures throughout growth spurts. This type of process means that correction is not straightforward because various tissues are adapted to their status (also known as *tissue memory*) and the deformity tends to recur. Therefore, one may argue, a congenital shortening of the lip associated with nasal flattening and tethering is not much different.

Most of the cleft surgeons in the current era attempt to undertake a primary correction of the nasal deformity at the time of lip surgery; however, the techniques vary significantly. It has been a common practice that children undergo another correction at preschool age due to some recurrence of the original deformity. However, it is critical to remember the primary intervention to the nose must be considered as an interceptive procedure using the least number of external incisions as possible. The reason for this choice involves the significant changes that are expected to take place in the following years. Almost all adults who once had a cleft lip, end up having a formal cleft rhinoplasty. Less scarring from earlier interventions leads to a better final nasal shape, and esthetics can be achieved after the completion of facial growth. Many surgeons would have a good lip in results after primary surgery but less than average noses, rarely vice versa. This is also why secondary “cleft rhinoplasty” in adults is not combined with lip revision. *The Nasal and Lip units share borders and when there is clefting, it acts very much like a malformation.* The fact primary correction requires concurrent repair of both lip and the nose; however, the question arises: “Will one of them needs to be compromised?”

It is almost impossible not to incorporate the cleft lip repair technique or to discuss it while describing the primary nasal correction simply because lips and nose represent a continuation of the midface’s soft tissues. Poorly planned and or poorly executed cleft lip surgery will further compromise the nose and vice versa in addition to threatening long terms facial esthetics. Therefore, cleft lip surgery is considered surgery for life. One might argue that the preoperative severity of the case should be taken into consideration upon judging outcomes and esthetic results; however, no excuses for dehiscence, obvious stitch marks or scars crossing esthetic units, and/or gross lip malalignment exist (**Figure 2**). When it comes to the use of a specifically described technique, novice reconstructive surgeons generally tend to follow the methods that they were originally taught by their mentors. Since it takes a significant learning curve and duration to eventually master a technique, it is very difficult to change one’s way. The cleft lip is an area that does not permit experimentation. *Unlike microsurgical anastomosis of blood vessels in free tissue transfer, for example, cleft lip surgery is not amenable to revision during the primary correction, and the smallest misjudged incision on the lip cannot be redone.*

We initially used modified Millard’s techniques due to the fact it allows the surgeon to “cut as you go”. We were trained with Dr. Fisher; however, we were initially hesitant to apply the anatomic subunit principle-based technique since the margin for error is even more limited. However, with time, we gradually adopted this technique due to the appealing concept of limiting scars to the natural seams. In bilateral clefts, we tend to use Dr. Mulliken’s concept of recruiting the lateral crus and building the columella but with the exception that most of the philtral skin is saved. This skin is invaluable for future adult cleft rhinoplasty. We completely condemn the historical idea of initial columellar lengthening using forked flaps because of the associated unnecessary scars. No matter what or after whom the technique is named, the bottom line is that incisions and hence scars should not be placed in locations in which they are going to be obvious with time and will compromise permanent future esthetics for the child. An example is the peri alar incisions, which are routinely used at the time of primary surgery by many surgeons in an attempt to close a large cleft. Such scars are still seen in many adolescents and adults who underwent rhinoplasty, and unfortunately, they cannot be removed.

Figure 2.

Examples of outcomes and complications for cleft lip primary surgery when performed by non-specialized surgeons in the field. A one-year-old girl with UCLND and severe mal-alignment of the lip beside the poor suturing marks and scar extending into peri alar area (a). A teenage girl underwent BCLND surgery earlier in life that resulted in scars and suture marks violating the entire lip (b). A seven-year-old boy with a history of BCLND was repaired at infancy that soon dehiscd post-surgery (c). A three-year-old boy had a BCLND with oro-cutaneous fistula and poor red lip definition repaired earlier in life (d).

It is interesting that not too long ago, surgeons began giving more serious consideration to the early cleft nose approach. Historically, different suturing techniques have been suggested and described to secure the surgically dissected cartilages and free them both at the dome area and cephalically. To secure the repositioned LLCs, mattress sutures were used by Tajima in 1977 by holding the lower laterals to the triangular cartilages as part of their described approach to secondary correction of the cleft nose. Kernahan et al. presented their results using the same technique as Tajima and then presented their long-term results of the original approach with some additions. McComb used mattress sutures to reposition the nasal cartilages after undermining nasal skin, securing them externally as bolster sutures. Those mattress sutures depend on dermal resistance to maintain their traction and need to be removed in approximately 5 days. They initially demonstrated the technique in the UCLND and later presented their long-term follow-ups for both unilateral and bilateral clefts. Stenstrom, besides making rim incisions, added a small external incision on the dorsum to lift the affected alar cartilages and secure them to the septal cartilage with non-absorbable sutures. Mulliken's idea of adding length to the columella mostly for bilateral cleft lip cases was a milestone in addressing the cleft nasal deformity. The technique proved to be equally useful for the UCLND (Figure 3).

Presurgical orthopedic correction, postoperative nostril splints, or the more recent naso-alveolar molding practice all aim at simplifying the repair and reducing tension to yield a better esthetic outcome. Our surgical approach of “Nasal lift” or “Nasal Cantilever technique” provides maximum correction to the deformity in the most closed manner. This corrective technique provides an internal scaffold to the nose during the healing phase. Due to securing the nasal soft tissues to the

Figure 3. Unilateral incomplete cleft lip child with columellar shortening and typical deformity due to the underlying pathology at the time of primary repair (a). During the procedure, the nasal correction was achieved with closed technique and application of trans-domal sutures. This method requires bilateral rim incisions and tying the knot(s) on the contralateral side. The nose had already and significantly been addressed before the lip repair (b).

periosteum, this method makes it possible to overcome tissue memory and forces despite not having any of the preoperative or postoperative nostril splints. This advantage is true for UCLND or BCLND. The technique aims at lifting the mobile soft tissue cartilaginous structures and securing them to a fixed point at the radix by using needle-induced stab incisions and suspension sutures; this is in addition to trans-domal correction via infra-cartilaginous incisions (**Figures 4–6**). Regardless of the severity of the defect, minimal incisions can be used, large clefts of the lip

Figure 4. Primary nasal correction using the author's technique and illustration of the "lifting" * cable suture that was looped around the nasal tip cartilages in the process to be pulled cephalically at the radix after which it was traversed through the nasal bone periosteum (a). The other key sutures can be seen, cinch "green" and Domal suture(s) "blue". The cinch suture is to be tied first followed by domal and at last the suspension cable suture (b). *this method is known as the nasal lift technique or the nasal cantilever technique.

Figure 5. Fourteen-month-old girl with BCLND, supine lateral view on the operating table (a). Artist's illustration of nasal soft tissue with the underlying cartilages (b). Preoperative oblique photo of the child (c).

Figure 6. BCLND correction continued. At end of nasal correction, the “lift” procedure is independent of the lip repair would be resumed at this stage. The nose can be seen to be lifted with subtle overcorrection and the columella has been lengthened (a) Author's illustration showing that the entire cartilaginous framework has been repositioned and held cephalically with the looped cable suture, simulating a check rein mechanism (b). Postoperative oblique photo of the same patient at six months (c).

can be reconstructed, lip height can be addressed, and pleasing results of the nose and lip can be achieved (Figures 7–10).

The timing of primary cleft lip surgery may vary from one surgeon to another, and it is also significantly dependent on logistics. The original rule of 10 (hemoglobin of 10 g, age of 10 weeks, and weight of 10 pounds) was only intended to convey these are the minimal prerequisites for undertaking the surgery to ensure

Figure 7. Primary nasal correction in a child with UCLND who underwent surgery at the age of four months (a, b). Intraoperatively, the three key sutures include the suspension suture (c). Immediately following the completion of nasal lift and tying the three key sutures, the nasal deformity was already optimally addressed independently of the lip repair (d). A single mattress suture with a bolster was used solely to obliterate dead space; this suture is usually removed within 48 h (e). Five-month follow-up picture in which the nose maintains its reconstructed shape. Some scar hypertrophy can be noted at the lip-nasal sill (e).

Figure 8. Primary cleft lip/nasal correction in a quite asymmetric BCLND utilizing the author's technique and emphasizing the concept of minimizing incisions to the lip skin, regardless of the alveolar gaps and severity of the cleft. At the completion of the surgery, notice the absence of any horizontal or peri Lar surgical wounds (a, b). At the completion of the surgery, soft external nasal taping is being commonly used for protection and control of edema. Two bolster sutures are also being used at alar rims in this case for the obliteration of dead space, these are removed in 48 h (d).

Figure 9.
Primary nasal correction with nasal lift technique in UCLND in the case of a 12-month-old child who had the “All in one (AOI) procedure” for lip and palate primary surgery (a, c). Follow-up at six months, frontal view shows nasal tip has been redefined (b) and well-lifted on the lateral view (d).

Figure 10.
Primary nasal correction with nasal lift technique in children with BCLND. Above, this child underwent surgery at the age of eight months, and the result is shown two years postoperatively (a, b). Below, this case underwent surgery age six months, follow up one and half years postoperatively (c, d). We intentionally do not discard most the philtral skin at this age.

Figure 11.
Other cases, examples of UCLND patients who underwent nasal lift at primary surgery. Above, a child with forme-fruste with moderate nasal deformity, however, who underwent surgery at the age of two years, and a follow-up ten years postoperatively (this patient was one of our earliest cases with the nasal lift technique) (a, b). Below, the girl who underwent surgery at the age of eleven months, and a follow-up six years postoperatively (c, d).

relative safety and healing [10, 11]. However, many of these children have combined comorbidities or syndromes. Furthermore, lip-nasal surgery nowadays is a major undertaking in terms of expectations. Most surgeons prefer using diluted adrenaline infiltration to the lip and nose, and heart rate monitoring during surgical steps should be cautiously performed. Although, loupe magnification should be a routine practice for all surgical cases, tissue handling is relatively easier in an older infant. For those reasons, delaying the primary lip-nasal surgery for a few months is indeed worth considering. An older child at the primary surgery provides a sense of safety and reassurance for the surgeon [12].

In many busy referral centers, the waiting time for surgery might be quite lengthy, and it is not uncommon that even time-sensitive procedures, such as cleft lip and palate repairs, are often delayed. Although this delay is purely a logistical issue it is, however, a fact that one may have to face. In children with cleft lip and palate, we commonly perform an “All in one (AIO) procedure” during which the cleft lip, nasal deformity, cleft palate, and bilateral myringotomies with ventilation tubes are corrected in one longer surgery under anesthesia. This method is a well-known strategy and has been practiced especially in missionary cleft programs [13, 14]. In this process, the initial basic surgical care is taken care of with one admission and limited downtime. The safer age to do such an AIO procedure in our opinion is around 12 months or older. Even though we often do the primary correction to the lip

and nose in toddlers (12–24 months) using the nasal lift approach, we can produce quite reproducible stable results to the nose with follow-up to the age of 10 years and without the need for secondary or preschool nasal correction (**Figure 11**) [15, 16].

3. Secondary nasal correction in childhood¹

In children with CLND, preschool age (4–5 years) can be an extremely sensitive time of life in terms of psychological disturbances secondary to their physical distinct appearance and exposure to ridicule by their peers. Children begin to become self-conscious about any deformity they might have around this time. Some might refuse to go to kindergarten or attend school, and they even might not like to be seen in virtual classes. We occasionally have seen children as young as 2 or 3 years with facial anomalies who are upset about having their pictures taken. Their eye contact is usually negligible. Having a photo taken by a stranger makes them feel even more discriminated against from a facial appearance point-of-view. Preoperative photos are essential for planning reasons, documentation, and education; however, sometimes one has to develop the necessary skills of taking pictures especially for photo-sensitive children, and parents' acceptance is a necessary factor for obtaining these photos.

Most cleft lip children who are brought for secondary or revisionary surgery at preschool age have undergone a primary correction or an attempt to the nose by a primary surgeon with some technique. However, for reasons explained below and due to the accelerated facial growth, a preschool nasal correction is still a frequent request and a frequently performed operation. It is important to point out to the parents that in case the lip requires revision or reconstruction, this process should be addressed at a separate surgery. The exception to this rule would be a revision to the red lip alone. If the surgeon feels and believes that it is the lip contributing to the deformity more than the nose at this stage (infrequent occurrence), it should then be given a priority. *The parent's opinion and wishes must be followed at this stage since whatever intervention is being considered, it is an entirely symptomatic, short-term treatment.* However, it should be kept in mind that operating on the nose soon after the lip revision may cause lip shortening. Due to the technical complexity of cleft rhinoplasty, its inconsistent and variable results depending on multiple factors, patients and or their parents should always be advised to be as patient as possible [6].

It is crucial here that any nasal esthetic intervention in childhood or early teens should be considered in as closed an approach as possible. Unnecessary scars must be avoided, simply because this is an interceptive procedure. Columellar incisions or alar excisions mean burning your bridges at the time of definitive adult cleft rhinoplasty. It is critical to educate parents about this concept. In other words, one may express: "I can produce greater results now, but they are going to be temporary, and it will cause future definitive nose surgery complicated!" For the same reasons, our primary approach for lip repair utilizes techniques that use minimal horizontal incisions or extension of incisions to the peri-alar crease regardless of the extent of alveolar gap or severity of the case. *Our focus in reducing tension should not be aimed at the skin but more so on the release of cartilaginous tissues and muscle and to a lesser extent, to the mucosa (Figures 12–14).* Old scars in the soft triangle area can be used to access the columella, which can be lifted with a good size rib graft and secured in place with a bolster suture at the tip and a similar one in the gingiva at the anterior

¹ None of the secondary correction or adult patients have shown had their initial infancy surgeries performed by the author, rather, they only presented for a second opinion concerning revisionary and reconstructive surgery.

Figure 12. Secondary nasal correction, a seven-year-old girl with BCLND sequelae whose primary surgery was performed elsewhere (a). Rib cartilage graft is to be used for columellar support utilizing the lip scars as access, the graft approximate size and site are shown on the surface for demonstration purpose (b) six months postoperative picture (c). This procedure was an interceptive one.

Figure 13. Above case cont'd. Showing preoperative (a, c) and postoperative results (b, d). The objective at this age is to perform an interceptive and least invasive procedure with the avoidance of new scars. Such interventions help to improve a child's self-esteem and confidence for a few years.

Figure 14. Secondary nasal correction, a nine-year-old girl with UCLND sequelae (primary surgery was elsewhere) (a). An interceptive procedure with rib cartilage was done for which the old lip scar at the base of columella was used for access with the bolster mattress suture is holding the strut graft in the desired orientation (b). One-year follow-up and better nasal tip and symmetry are achieved (c).

Figure 15. Secondary nasal correction in a teenage with UCLND, a rib graft was used as a columellar strut utilizing old lip scar (a) one year postoperatively, the patient also underwent laser resurfacing to the lip scar (b).

Figure 16.

The nasal and lip units share borders, hence the cleft acts as a malformation. Concurrent repair to both whether at primary surgery at infancy or as a secondary surgery means attempting to recruit tissues in opposite vectors. Tissues will resist due to their inherent memory and compromise of results on either side is probable; hence, the analogy “Tug of War” phenomenon exists.

nasal spine. By learning closed maneuvers and utilizing instruments, such as suture passers, significant changes can be achieved (**Figure 15**). It is only in case of severe BCLND and near absent columella does opening the nose mostly to recruit pro-labial skin becomes necessary.

Since the original surgery of primary cleft lip repair attempts at lengthening the lip height in caudal direction while lifting the nose in a cephalic direction or “*opposite vectors*”, tissues do their best to overcome and return to the location in which they were originally while trying to overcome the fibrosis created by the surgical intervention at the same time. It often becomes difficult to reach an optimal situation, and a compromise on either side is expected. Hence, our analogy, “*Tug of war*”, applies, which we believe best explains the situation with primary or secondary corrections to the nose or the lip (**Figure 16**) [8].

4. Adult cleft rhinoplasty and reconstruction¹

Adulthood for a cleft lip patient presents a different wave of psychosocial difficulty and struggle. Many such adults want to be in a serious social relationship but are often held back due to their facial esthetic dissatisfaction; both males and females are equally concerned with their esthetics. By this time, they have already been through several treatments, including orthognathic surgery. Few patients may have not had the privilege of proper cleft care or were somewhat neglected, and they might still be suffering from speech problems or poor dental alignment, for example. Such patients are not usually interested in taking care of each issue; instead, they might have specific goals, and nasal and lip appearances are the two most common. Therefore,

patient priorities must be respected, and options should be given accordingly. However, it is important to educate the patient, and in cases in which orthognathic surgery is a possibility, nasal or lip surgery must be then postponed.

Adult cleft rhinoplasty has many different components, and it is far more complex and challenging compared to the conventional nose job. Very few esthetic rhinoplasty surgeons like to deal with cleft noses. When an adult patient with congenital anomaly consults a rhinoplasty surgeon, they usually have very high expectations. The surgeon in turn knows that he/she will not be able to produce a result anywhere close to their average cosmetic rhinoplasties [6, 17]. Ethnic factors play a major role in the strategy and planning process; however, in general, a more aggressive approach in rebuilding the cartilaginous framework is generally required. This type of surgery is especially true in the Middle-Eastern, Asian, Hispanic, and African noses.

In adults who are also unhappy about their lip shape and asking for it to be revised, this surgery must be deferred until after the nose surgery. It is very often that white lip tissue needs to be recruited to build the columella. Apart from that, alar repositioning often requires incisions extending onto the lip.

We cannot over-stress on the fact that patient's expectations must be reasonable. The nose itself is an area generally considered prone to claims and conflicts; furthermore, the psychologic disturbance related to the congenital anomaly makes it even more prone to these aspects [18, 19].

Functional aspects need to be analyzed and addressed, apart from significant septal deformities, internal valves Collapse are quite frequent. A facial computed tomography (CT) scan is often helpful in cases in which the primary reason for consultation is a nasal airway, and a consultation with an oto-rhinologist is recommended. UCLND is usually a more challenging deformity due to its significantly more asymmetric nature. On the affected side, the maxilla is usually hypoplastic, the nasal bone often deviates, and the tip is tethered and under-projected. Nostril asymmetry is not fully visible except in a true worm's eye view, but it is practically what most patients primarily express concern about (**Figure 17**). The operation aims at balancing the cleft side changes as closely as possible to the normal side while the patient is on the operating table, which obviously can be misjudged and under or overdone due to various factors, including the infiltration fluid, the intraoperative edematous skin, and oozing. The fact that the patient is seen in a supine position from a very short distance from an oblique view causes the decision to often be made while nasal skin is not fully re-draped and closed.

A rib cartilage graft is the most useful and practical type of cartilage that should be considered. It provides quite an ample amount for various areas (**Figure 18**). Septal cartilage is a second choice; however, it is usually sub-optimal. Conchal cartilage grafts are only useful for minor touch-up procedures. The other advantage of a rib graft is the fact that rectus fascia can also be taken if needed as a supplementary material to wrap around diced cartilage grafts, for the radix area. The following points are mostly made about to UCLND. An open tip approach with full exposure of upper laterals is required most of the time. An inverted V-type incision is recommended with the tip of the flap toward the nasal tip, and some columellar lengthening is achievable with the v-y effect. Septal work follows and then spreader grafts and flaps are used when indicated followed by possible osteotomies. Tip work usually needs a lateral crural steal maneuver to rebuild the columella, especially on the cleft side. Onlay grafting is commonly used for balancing the contour in addition to batten grafts to the alar rim. The final steps include alar repositioning or reshaping as well as the addition of diced cartilage to radix (**Figures 19–21**).

In BCLND, the main problem remains the symmetrically short columella with an overall under the projection of the entire nose on the profile view in addition to an increased nasal width and flaring of the alae on frontal and basal views.

Figure 17. Some common presentations of adults with UCLND. A patient with significant deformity and nasal asymmetry and deviation (a). Computed tomography (CT) image of the same patient, showing severe deviation of the nasal septum with total obliteration ipsilaterally (b). This coronal view is best to diagnose true bony pyramid deviation and planning of osteotomies (c) this patient has the typical horizontally oriented nostril ipsilaterally (d) a patient with quite widened and rounded nostril ipsilaterally (e) patient with severe nostril fibrosis and constriction due to techniques based on circumferential incisions and attempt of reorienting the shape of nostril openings (f).

Figure 18. Rib graft is the most effective material for adult cleft rhinoplasty. The 7th rib is longer and straighter compared to the 6th rib. An incision of 4 cm length on average is often quite adequate and can easily be positioned at the infra-mammary crease in female patients (a). Anticipated cartilage grafts shapes and sizes should be prepared and carved first as any warping would be apparent by the time they are about to be grafted and then can be further addressed if needed (b). Patient undergoing open cleft septorhinoplasty, with spreader grafts, flaps, and septal extension.

Figure 19. Adult UCLND patient with a lazy C-shape curvature of entire dorsum and the septum, tip asymmetry, and irregularity (a). Marking illustrates the nasal deviation to midline represented by the center of forehead and center of the chin (b). The postoperative outcome for which the dorsum, tip, and alar position was addressed to a realistically acceptable degree considering the preoperative morphology (c). The patient must be educated about such realistic expectations ahead of the surgery.

Figure 20. The previous patient shown in profile view, alar retraction is a very common stigma in UCLND (a). An effective technique involves a Y-to-V advancement of the alar rim (b) postoperative result (c). It should be emphasized that nostril size and shape adjustment must be discussed thoroughly with the patient beforehand and somewhat preliminarily planned but not executed until toward the end of the surgery. Exact symmetry is not a realistic goal.

Figure 21. Adult female with UCLND sequelae, ill-defined droopy tip (a). The surgical plan shown: (red bars = midline); (blue bars = spreader graft on the blocked nasal airway side as well batten graft to nasal ala); (yellow bars = onlay and tip grafts); (yellow dots = diced cartilage to the radix); (red arrow = Y-V advancement to the retracted ala) (b). The patient is shown five months postoperatively (c).

However, what helps to somewhat contribute to the result is the fact that the nose was relatively symmetric initially, indicating that performing symmetric work on the operating table is quite reliable. The milder cases of BCLND can be dealt with a standard esthetic open rhinoplasty approach (a strategy that cannot be applied for UCLND). The more severe cases of BCLND or those patients who have had several revisions to their lips and noses will have associated central lip deficiency usually

Figure 22. Adult with neglected BCLND sequelae. Preoperative basal view with wide, spread out, and short nose (a). Prolabial skin has been lifted as a nasally based flap and open tip approach (b). A template is used to assess the optimum length of rib graft to be used, generally 30–35 mm length is required and be secured to the anterior nasal spine (c). Nasal closure, the secondary defect would be temporarily closed with a postauricular skin graft, and eventually with an Abbe flap (d).

more horizontally (tightness) in addition to atrophic vermilion and tubercle. This finding is secondary to their several previous surgeries (cleft lip crippled). Due to the significant fibrosis and poor tissue laxity, it becomes almost impossible to lengthen the columella at this stage without recruiting tissues from the lip. A forked flap would not be sufficient to accommodate a good length columellar strut graft. What makes the most sense is to use the entire philtral tissue as a nasally based flap (Prolabial flap) and use it in addition to a vascularized cover over the cartilage graft as the new columella with the complete nasal reshaping [20]. The donor site is usually temporarily covered with a full-thickness skin graft. A second stage reconstruction involves an Abbe flap reconstruction to the philtrum, vermilion, and tubercle units (**Figures 22–25**). A similar strategy is used in patients who did not

Figure 23. Adult with BCLND sequelae showing wide base, flared nostrils, and deficient columella and dorsum (a, c). Six months post-surgery with rib cartilage graft to the columella, prolabial flap and dorsum augmentation with wrapped diced cartilage. The patient will be undergoing an Abbe flap as a second stage. It is interesting how the patient's whistle deformity became more obvious due to the “Tug of war” phenomenon (b, d). This case demonstrates why cleft rhinoplasty should not be combined with lip revision or reconstruction.

Figure 24. Patient in previous figure cont'd. Basal view with short columella and wide nose preoperatively (a) six months post, the entire nose including dorsum has been lifted. A temporary full-thickness skin graft on the philtrum is noted, the patient will undergo an Abbe flap for final lip esthetics (b).

Figure 25. Adult with BCLND sequelae showing severe retrusion of midface on the lateral view, the nasal tip almost attached to the remnant of the white lip, the patient has been living with a mask on most of the time as a cover since early childhood (a). Two- years following nasal reconstruction and an Abbe flap (b).

have the lip and/or nose repaired earlier in life, and at this point, they would still have an extremely short or non-existent columella with much stiffer nasal tissues (Figure 26).

Figure 26.
Patient in previous figure cont'd. Frontal view preop. (a) Two years postoperatively, the role of Abbe flap in nasal–lip reconstruction for such patients has proven to be invaluable (b).

Both procedures (prolabial flap with nasal reconstruction and Abbe flap reconstruction of secondary defect in the lip) can and have been combined in one surgical stage [21]. This process would avoid the need for a temporary small skin graft but in return will also increase the burden to a quite limited region, especially at the nasolabial angle for which both flaps (prolabial and Abbe) distal edges are being inset or repaired to each other.

5. Conclusion

- A cleft nose deformity correction, whether primary or secondary, is a daunting task to many cleft surgeons.
- Parameters, such as presurgical orthopedic manipulation, strict collaborative programs, and compliance, play a major role in cleft surgery outcomes.
- In the current era, the surgeon's satisfaction with BCLND surgery is higher compared to UCLND due to the newer techniques enabling a surgeon to build a less scarred columella meanwhile with the advantage of a preexistent relative nasal symmetry.
- The nasal correction aspect is the dominant part of surgery for a cleft lip, and this technique is less forgiving compared to the lip correction relatively speaking.
- Cleft surgery should only be done by sub-specialized and dedicated surgeons in the field.
- The nasal cantilever technique, which lifts the entire nasal collapsing “tent” and holds it into a fixed base (the nasion), is a new solid concept and promises to be an ultimate primary corrective approach to the “patho-anatomy” in children with cleft nasal–lip deformity.

- Primary cleft lip surgery should be planned with a technique that utilizes the least incisions on the lip and nasal skin.
- Secondary nasal shape correction in children must be aimed as a temporary interceptive measure to satisfy the child and his or her parents. Therefore, it should be done utilizing most of the existing scars for access with minimal added incision if any.
- The cleft nasal–lip surgery tends to be more challenging with time because our earlier minor misjudgments tend to become more pronounced after several years of follow-up. New philosophies and approaches to primary surgery will always be evolving.
- The cleft surgeon must possess a combination of pediatric and adult reconstructive facial skills and have a sense of esthetics.

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