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Nasal Light Reflex: A Useful Intraoperative Tool in Correction of Cleft Lip Nasal Deformity

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Background: The correction of a unilateral cleft lip nasal deformity remains a challenge to cleft surgeons. It is difficult to obtain a routinely predictable outcome. This is in part due to there being no objective intraoperative method to assess the correction.

Methods: We have come up with a simple objective intraoperative method to plan and assess the correction of the nasal deformity. This is done by assessing the nasal light reflex using a mobile phone camera to define the deformity. The points of the desired correction of the lower lateral cartilage are transposed onto the patient. Once the lip and nose repair is completed, another photograph is taken to assess the nasal light reflex and assess the extent of correction. If this is inadequate, further nasal correction is performed. We have used this procedure in 122 cleft lip patients with 93 complete and 29 incomplete.

Results: We have found this to be a useful objective intraoperative method to assist in obtaining improved nasal correction in cleft lip patients. As is well known, relapse of the nose is common in cleft lip repairs, but this method allows one to better gauge the correction at the primary surgery.

Conclusion: Nasal light reflex should be added to the armamentarium of cleft surgeons to assist in superior correction of the nose, which is an item that continues to vex these surgeons. *(Plast Reconstr Surg Glob Open 2024; 12:e6187; doi: 10.1097/GOX.0000000000006187; Published online 23 October 2024.)*

INTRODUCTION

A cleft lip is associated with a concomitant nasal deformity. The correction of the nasal deformity in cleft lip repair remains an entity where it is difficult to obtain a predictable and satisfactory outcome. Cleft lips vary in the deformity of the nose, and this is dependent on whether the cleft lip is complete or incomplete and if there is an associated cleft palate as well. It is generally accepted amongst cleft surgeons that primary nasal correction should be performed at the time of lip repair. The previous fear of possible interference with nasal growth has been put to rest by several authors with good long term results after primary nasal surgery.[1–3] McComb was the first to take the bold step to perform significant dissection of the lower lateral cartilage (LLC) from the skin and repositioning this cartilage with the use of external bolster sutures. Soon after Salyer published a similar method with the addition of dissecting the cartilage from both the skin and mucosa. There are several techniques described in performing primary nasal correction and these can be done via a closed, semiopen and open approach. The open methods are via rim incisions or complete open techniques.[4–10] Nasoalveolar molding, if available, has certainly resulted in better nasal outcomes.[11–15] Nasal conformers have also influenced the outcomes of the correction and appearance.[16,17] Zelko et al performed a systematic review on 25 primary rhinoplasty studies in cleft patients with overwhelming support for this procedure.[18] Recent studies from different institutions have also described their method and support for primary nasal surgery.[19–21]

The anatomical changes in cleft lip nasal deformity has been detailed by many authors. The septum is deviated to the contralateral side in the majority of cases. The major source of the deformity is that of the LLC. The LLC is slumped in an inferior, lateral and posterior direction. The dome on the cleft side is dissociated from the normal side. The ala base on the cleft side is retropositioned in a caudal, posterior and lateral direction.

The technique in primary nasal correction centers mainly on suspension and repositioning of the LLC. In addition, many surgeons choose to perform septal repositioning if the septum is deviated. The septum is usually deviated in

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all cases of complete cleft lips and in a proportion of incomplete cleft lips. In repositioning of the LLC, the LLC is first freed from the skin and then to a varying extent from the nasal mucosa. The repositioning of the LLC is performed by using sutures in an external bolster fashion or as internal sutures. The internal sutures can be placed either directly via an open technique or indirectly via a closed technique.

In assessing correction at the primary surgery, this is done almost entirely by visual inspection and correlation intraoperatively. The correction is closely monitored and modified by removal and placement of additional sutures until the perceived optimal result is attained. We have used an intraoperative method to objectively assess nasal correction.

Takeaways

Question: How to correct unilateral cleft lip nose deformity?

Findings: Light reflex is useful to assess nasal correction.

Meaning: Light reflex is a useful tool to assess correction of nose.

MATERIALS AND METHOD

We have been using the light reflex as an objective method to assess the nasal correction obtained and to modify it if necessary. The use of light reflex in the nasal tip is very familiar to aesthetic rhinoplasty surgeons.[18–25] The double light reflection creates a diamond shape consisting of two triangles, one being interdomal and one infralobular. This is usually assessed from preoperative and postoperative pictures. The most useful views to assess these aesthetics are the frontal and worms eye views. Any asymmetries and deformities are readily visible once these photographs are analyzed. We have used a modified version of this tool to assist in the analysis and correction of the nasal deformity at the time of cleft lip repair. The analysis and assessment of the nasal deformity can be done in the operating room with the use of a mobile phone. This is done in theater when the patient is under general anesthesia. A smart mobile phone is used using the room light with no theater lights or flash. The most informative view is the worm's eye caudal view, although the frontal view is also useful. These views clearly depict the displacement and malposition of the LLC. The normal light reflex in a noncleft lip patient is shown in Figure 1. In cleft patients, the dome on the cleft side is displaced in a caudal, inferior, and retropositioned fashion. The caudal border of the LLC can be visualized on the light reflex with an inferior and retropositioned displacement (Fig. 2). This caudal margin is usually a concavity on the medial aspect of the cleft side, and this can be slight or pronounced (Fig. 3). The length and shape of this concave deformity varies and largely determines the the degree of severity of the nasal deformity. The depth of this concavity usually corresponds to the junction of the dome and lateral crus. Lateral to this concavity the ala margin is flattened, giving the impression that it is elongated. If one measures and compares it to the normal side, it confirms that this is a visual illusion. There is a corresponding change in the shape of the nostril opening which can vary from flat and elongated to one with marked obliteration of the cavity (Fig. 4).

One may have just a convex deformity which is elongated laterally and caudally displaced. One may have a convex deformity with an intervening concave element in the middle of it.

The picture on the mobile phone is placed next to the patient (Fig. 5A). The light reflex visible on the phone image is transposed and drawn on the patient's nose (Fig. 5B). One can then get a clear picture of the normal side and the pattern of deformity on the cleft side. It now becomes clearer as to where the abnormality is and the points at which correction is required. Points are marked as to where the intended sutures need to be placed to obtain the desired correction.

The repair of the cleft is usually done at 3 months of age, although in our population, presentation after this age is common. Informed consent for the procedure and use of photographs was duly obtained. The cleft repair is performed using whatever method the unit chooses. We use the symmetrical philtral column repair described by Madaree.[24] The nasal correction is performed via a closed method using a columella and ala base approach from the cleft lip repair incisions. The LLC on the cleft side is freed from both the the overlying skin and mucosa. In addition,

Fig. 1. Normal nose. A, Light reflex. B, Depiction of light reflex in yellow.

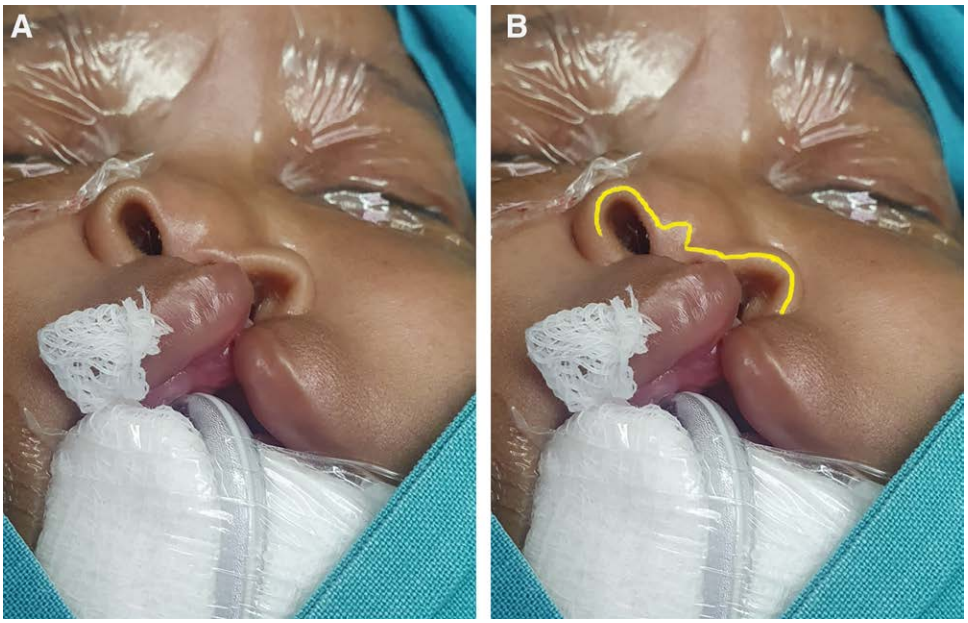

Fig. 2. Unilateral complete cleft lip. A, Light reflex. B, Depiction of light reflex in yellow.

Fig. 3. Depiction of light reflex in yellow. A, Left complete cleft lip. B, Right complete cleft lip.

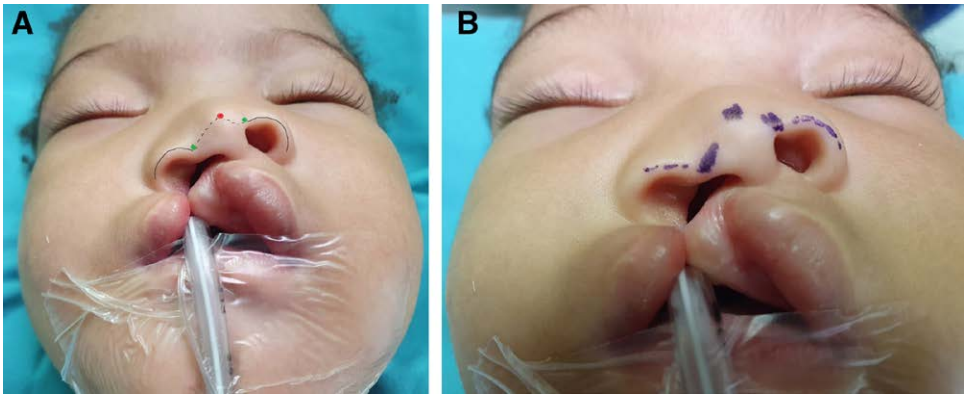

Fig. 4. Right unilateral cleft lip. A, Desired nasal correction points on photograph. B, Desired correction points transposed to patient.

there is wide undermining of the skin of the nasal tip and ala on both sides. If the septum is deviated, subperiosteal dissection is performed to the anterior nasal spine and the septum repositioned. The dome and LLC repositioning and suspension is performed with internal suspension sutures. The points on the nose that were previously

Fig. 5. Left complete unilateral cleft lip. A, Depiction of light reflex in black. B, Immediate postoperative result. C, Depiction of postoperative light reflex in black.

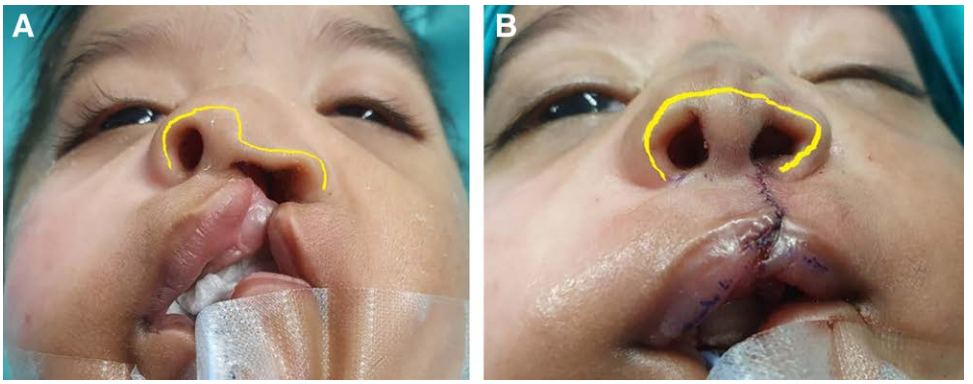

Fig. 6. Left complete cleft lip. A, Depiction of preoperative light reflex in yellow. B, Depiction of postoperative light reflex in yellow.

marked using the light reflex are identified. Sutures are used to approximate the domes and upper aspect of the medial crura to obtain the desired correction. This is done using a hollow needle and threading 5.0 novofil sutures, as previously described.[26] In addition, 5.0 novofil sutures are used to suspend the LLC from the upper lateral cartilage. "Concreting" 6.0 maxon sutures are used to attempt to adhere the skin, ala cartilage, and mucosa.

After the nasal correction, an anteroposterior and worm's eye picture is taken with the mobile phone. The light reflex of the nasal tip is assessed (Fig 5C). One could assess the improvement of the position of the dome on the cleft side. The caudal margin of the LLC can be similarly assessed. If the correction is deemed not to be optimal, further sutures may be inserted to achieve a better outcome.

We have used this strategy to correct the nose in 122 unilateral cleft lips, of which 93 were complete and 29 were incomplete. We found that this proved to be a useful method in helping us achieve better nasal correction in the cleft lip nasal deformity. This is evident immediately postoperatively. As is well known, there is a certain degree of relapse which may be attributable to cartilage memory, loss of suture integrity or other deforming forces. This begs the question of whether one should overcorrect at the primary procedure (Figs. 6–10).

DISCUSSION

Primary nasal correction is advocated as the standard of care when repairing cleft lips. Cleft surgeons vary in the extent and method of primary nasal correction. The approach may be open or closed, and the goal is to reposition the LLC. In addition, other adjuncts are septal repositioning, use of polglycolic templates, and various bolster techniques. Although correction of the nasal deformity may seem adequate at the end of the surgery, there is definitely a significant high rate of relapse which may be evident a few months or years postsurgery. Reasons for this relapse include cartilage memory, soft tissue scarring, and attenuation of sutures. Some authors advocate overcorrection of the nasal deformity in anticipation of the expected relapse. Another reason for relapse may be inadequate correction at the primary surgery. The adequacy of nasal correction presently has no objective criteria. The only method readily available to assess adequacy of nasal correction immediately postoperatively is a visual assessment. This is largely subjective and therefore prone to error. The use of preoperative and postoperative mobile pictures can provide a more objective assessment of the nasal correction. The light reflex of the nasal tip and ala can help one delineate the ala domes and the caudal margin of the LLC. A direct anteroposterior and a worm's eye view are best to assess this. If the postoperative views are considered not to have achieved the desired correction, further surgical modifications and additional sutures can be performed to improve the final outcome. The additional use of computer programs or artificial intelligence tools in conjunction with the mobile photographs may enhance the assessment and correction of the nasal deformity. The use of preoperative nonalveolar molding

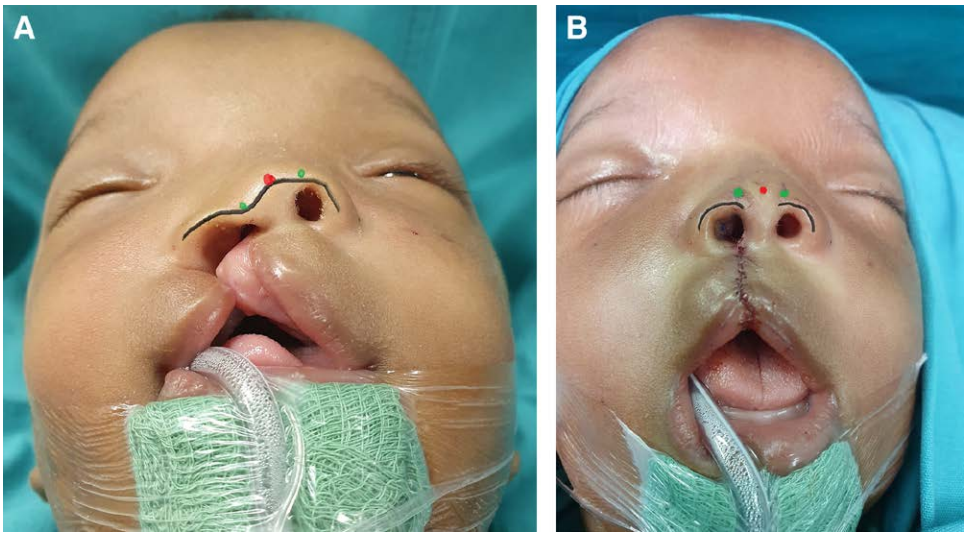

Fig. 7. Right complete cleft lip. A, Depiction of preoperative light reflex in black. B, Depiction of postoperative light reflex in black. Red dots depict midline; green dots depict domes.

Fig. 8. Left unilateral cleft lip. A, Black lines depict preoperative light reflex. B, Black lines depict postoperative light reflex; red dots depict midline; green dots depict domes.

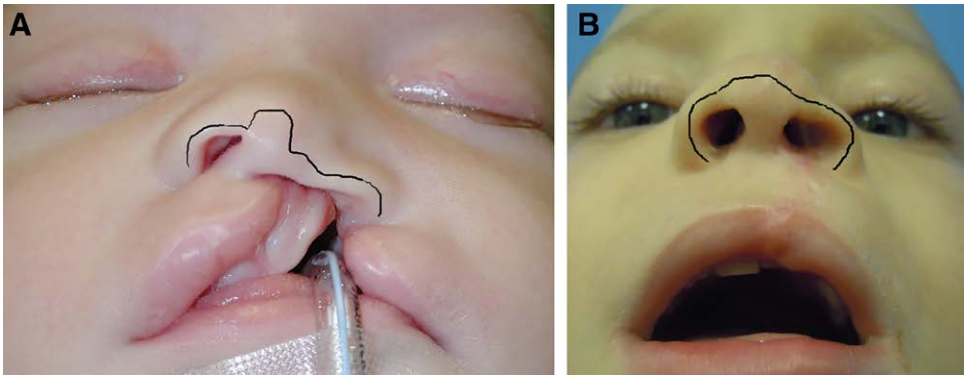

Fig. 9. Left unilateral cleft lip. A, Depiction of preoperative light reflex. B, Depiction of 5 year postoperative light reflex.

in optimizing lip alignment and nasal correction cannot be underestimated in cleft lip and nose correction. This is not readily available especially in low- or middle-income countries. The nasal light reflex is a good tool for this sector and can also be used by surgeons who do have access to nonalveolar molding to better assess the outcome in

Fig. 10. Right unilateral complete cleft lip. A, Preoperative depiction. B, Nine months postoperative depiction. Red dots depict midline; purple dots depict domes; green dots depict upper aspect of medial crurae.

theater. Additional measures such as postoperative nasal conformers are further measures to help obtain the best result possible.

CONCLUSIONS

An intraoperative tool in the form of preoperative and postoperative mobile phone pictures is advocated to assess adequacy of nasal correction in cleft lip repair. This is done by using the light reflex to delineate the LLC. This has no additional costs, requires no training, and is readily usable in any cleft unit settings, including developing and low income countries.

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DISCLOSURE

The author has no financial interest to declare in relation to the content of this article.

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