

## Role of cartilage correcting sutures in single-stage secondary rhinoplasty for unilateral cleft lip nose deformity

### ABSTRACT

**Introduction:** The purpose of this study is to highlight the role of cartilage correcting suture in single-stage surgical correction for secondary unilateral cleft lip nose deformity with three-dimensional observations of preoperative and postoperative nasal forms.

**Material and Methods:** Between July 2017 and June 2019, 18 consecutive patients of unilateral cleft lip nose deformity aged between 16 and 28 years underwent surgical correction. The corrective procedure of nose involved columellar lengthening, medial and lateral nasal osteotomies along with augmentation of premaxilla by bone graft at premaxilla, and alar base wedge resections. Focus was laid to correct nasal cartilaginous framework using tip sutures along with repositioning of lower lateral cartilages, fixation of the alar cartilage complex to the septum, and the upper lateral cartilages. We investigated the following surgical interventions and nasal tip suture techniques, which were transdomal suture, interdomal suture, lateral crural mattress suture, columella septal suture, and intercrural suture.

**Results:** We achieved adequate esthetic and functional results in all the patients without any morbidity.

**Conclusion:** This concept of simultaneous approach toward complete single-stage correction of secondary cleft lip nasal deformity incorporating various cartilage suture using 5-0 nylon in developing nation like ours, where the patient presents late with complex conditions showed promising esthetic and functional outcome.

**Keywords:** Cleft lip nose deformity, columella septal suture, intercrural suture, lateral crural mattress suture, nasal tip suture techniques, transdomal and interdomal suture

### INTRODUCTION

So much has already been said and written in literature by many surgeons, about secondary procedures in cleft surgery that testify not only the complexity and variable expression of cleft nose deformity itself but also the need to find methods of corrective surgery that will reduce deformity. Patient has to undergo multi-stage reconstruction since childhood exposing them to social and psychological stress.

It is more challenging in developing nations where complexity of the condition is worsened by:

- Late presentation in developing world
- Poor follow-up of primary lip repair due to domestic constraints, financial constraints, logistic constraints, etc.

“Poor follow-up after surgery is a major concern to achieve complete correction of cleft lip nasal deformity.”

Cleft lip deformity is one of the most common congenital anomalies in humans and associated cleft lip nasal deformity

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continues to be a unique reconstructive challenge for the plastic surgeons.<sup>[1]</sup>

Children with cleft lip nose have varied clinical presentation, and deformity is also severely asymmetric that makes surgical correction difficult, requiring vast surgical expertise and intervention with a range of techniques.

The right time for rhinoplasty is controversial, whether synchronous or staged with cleft lip repair; as this nasal anomaly affects the pediatric population, surgical intervention may adversely affect nose growth.

In cases of cleft lip nose deformity, the lower lateral alar cartilage is hypoplastic and displaced caudally and posteriorly, leading to collapse along with deviation of its covering soft tissue.<sup>[2-5]</sup>

The generations of cleft surgeons have been struggling to understand the biomechanics of cleft lip nasal deformity.<sup>[6]</sup>

Efforts have been made to have detailed analyses of biomechanical consequence of different surgical maneuvers that would serve significantly to achieve stability of the corrective outcomes or the occurrence of relapse.

Cleft lip nasal deformity is associated with esthetic problems, as well as impaired nasal airflow due to distorted anatomy. Nasal rhinometry finding suggests smaller airways in patients with cleft deformity when compared with patients without cleft deformity. Warren *et al.* showed that children with unilateral cleft deformity have smaller airways than children with bilateral cleft deformity.<sup>[7]</sup>

### Surgery

The indication for surgery cleft lip nasal deformity includes the following:

- Nasal airway: Previous studies have shown that postsurgically corrected noses maintain significantly smaller airways than noncleft noses; hence, parallel goals of cosmetic and functional improvement of airflow must be served
- Septal deformity: Surgical intervention aims to attain a patent nasal airway while keeping esthetic external nasal appearance in mind
- Columellar deformity: The columella is shortened in cleft lip nasal deformity; two views during surgical management exist, while some surgeons believe that the columella requires primary correction and others argue that reshaping the nasal ala will achieve sufficient columellar length
- Alar deformity: Surgical techniques is also categorized into external and internal approaches; in mild defects, the

nostril may be repositioned by excising a wedge of skin anterior to the rim margin and advancing the rim forward

- Maxillary hypoplasia: Correction is achieved by premaxillary augmentation
- Dorsal deformity: Correction of septal deflection could also be sufficient to attain normal dorsal symmetry.<sup>[8-11]</sup>

There are several important points that must be considered important to obtain the desired result. First, the nasal involvement is always there that must be addressed primarily at the time of lip surgery. Second, the treatment requires a multidisciplinary approach, involving the cleft surgeon, orthodontist, and speech pathologist whenever the palate is involved. Third, the problem being encountered here is dynamic, involving the essential phase of child's growth and development, and therefore, treatment protocols made should be spanning over a time period rather than one-time "home-run" solutions without any exception.

There is no standard surgical technique although numerous secondary rhinoplasty methods have been described in the literature for lengthening of the columella or for grafting techniques. Our aim with this study was to standardize the secondary rhinoplasty surgical technique by highlighting role of cartilage correcting sutures in single-stage rhinoplasty to correct nasal tip in secondary cleft lip nasal deformities who presents late.

### MATERIALS AND METHODS

Patients reporting to the department of burns, plastic, and maxillofacial surgery of our institution were enrolled in the study. The study was conducted during the period July 2017 to June 2019, where we had included 18 consecutive patients with combined cleft lip palate deformities, who had undergone nasal reconstructive surgery. All the surgeries were performed by the same surgical team.

All patients were treated by open rhinoplasty through a bilateral reverse-U incision and transcolumellar incision and correction of the cartilage and bony frame work; in case of requirement correction of septal deviation and premaxillary augmentation, lip revision was done.

We had included 10 males and 8 females of age between 16 and 28 years, whose parents or the patients themselves were able to provide their voluntary written informed consent for participation in the study. The study was approved by the institutional ethical committee.

Every patient already underwent dental and maxillofacial rehabilitation (orthodontia, oronasal fistula closure, bimaxillary

orthognathic surgery, etc.); no further surgical intervention was planned in connection with their congenital malformation.

The indications of surgery were, on the one hand, difficult nasal breathing and altered nasal function (tendency for chronic rhinosinusitis) and, on the other hand, the esthetic appearance related to nasal deformity.

**Inclusion criteria:** This study includes patients both male and female having secondary cleft lip nose deformity. No exclusion criteria were stated.

On initial presentation, the patients were clinically and radiographically evaluated and photographs were taken. Pre- and post-operative photographs were used for the evaluation of esthetics in the vertical and horizontal planes before and after the surgery.

As all surgical methods have already been published in the literature, our innovation was to combine of the different techniques into a standard surgical protocol.

### Surgical technique

Surgery was always carried out under general anesthesia, via an open rhinoplasty approach.

Our strategy was to achieve complete single-stage correction of the nasal and secondary lip deformity. The following

surgical procedures were carried out in a single stage in these patients included lip revision; columellar lengthening; repair of anterior fistula; and premaxillary augmentation by bone grafts. Medial and lateral nasal osteotomies were performed along with augmentation of nasal dorsum by bone graft and alar base wedge resections. Focus was laid to correct nasal cartilaginous framework using tip sutures along with repositioning of lower lateral cartilages, fixation of the alar cartilage complex to the septum, and the upper lateral cartilages.

The following surgical procedure, nasal tip suture techniques were investigated: Transdomal suture [Figure 1a and b], interdomal suture [Figure 2a and b], lateral crural mattress suture [Figure 3a and b], columella septal suture [Figure 4a-c], and intercrural suture [Figure 5a and b].<sup>112-14]</sup>

### Transdomal suture

The transdomal suture (dome creating, dome binding, domal definition) is perhaps the single most important suture technique for bringing the tip cartilages under control.

### Interdomal suture

The interdomal suture provides tip strength and symmetry [Figure 2a and b]. This stitch is particularly important if the domes are weak and tend to splay apart. The purchase is made approximately 3 mm posterior to the domes. Usually, the cephalic ends of the domes are allowed to be separate from one another by about 3 mm.

### Lateral crural mattress suture

This is a universal horizontal mattress suture applied to

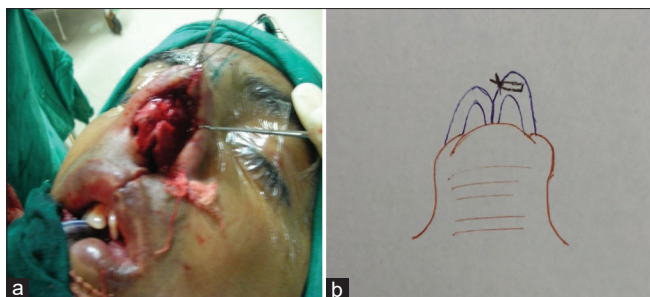


Figure 1: (a) Intraoperative view of transdomal suture of right. Note improvement to tip of width on the right side. (b) The transdomal suture is a horizontal mattress suture that narrows the dome and therefore the nasal tip

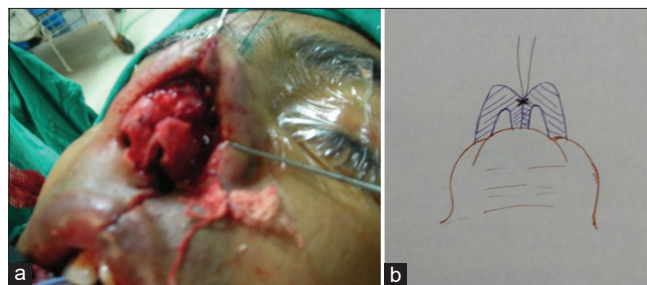


Figure 2: (a) Intraoperative view of interdomal suture. (b) An interdomal suture brings the two tips together, prevents them from splaying, and contributes to the narrowing of the nasal tip

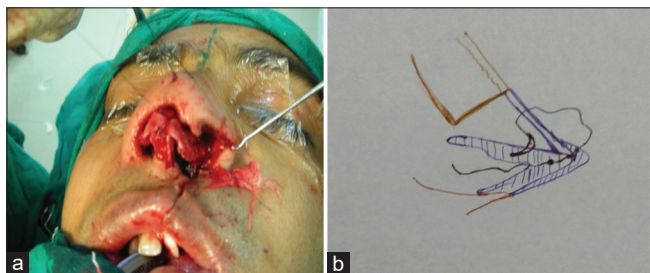


Figure 3: (a) Intraoperative view of lateral crural mattress suture. (b) Lateral crural mattress suture

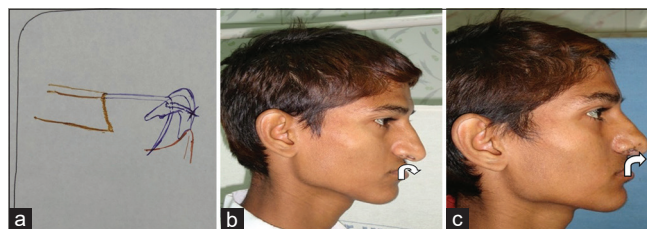


Figure 4: (a) Columella-septal suture. (b) Preoperative with drooping Nasal tip. (c) Postoperative of elevated Nasal tip

the most convex surface of the convex lateral crus. It is frequently necessary to apply a second lateral crural mattress suture posterior to the first to flatten out the entire lateral crus [Figure 3a and b].

### Columella-septal suture

The principle of the columella-septal suture is evident in similar suture techniques that also attempt to secure the tip cartilages to the caudal septum to effect both tip projection and rotation. Two purchases of the anterior septal angle should be taken to achieve a good purchase. Also, care should be taken not to tie the knot too tightly because that action could cause columellar retraction [Figure 4a-c].

### Intercrural suture

Not infrequently, the middle crura splay at their caudal ends yielding what will undoubtedly be a wide columella. The suture is applied at the middle crus level. Care is taken not to tie the knot too tightly and cause an overly narrow columella [Figure 5a and b].

## RESULTS

All of these cases had been followed up from the time of operation on a monthly basis until 12 months. Patients were examined for pain, any discomfort following the procedure and for function. During the follow-up period, assessment of results was based on satisfaction by comparing preoperative and postoperative clinical photographs by surgeon and patient relatives and patient satisfaction questionnaires.

The three questions asked are listed; patients had to score each question with 0–4 points, where 0 was the least and 4 was the highest value; the total score was 12 points.

- How much do you like the appearance of your nose?
- How much can you breathe through your nose?
- Do you think the appearance of your nose has improved after surgery?

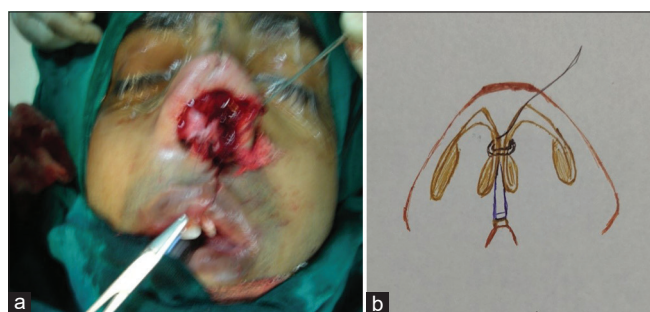


Figure 5: (a) Intraoperative view of needle being passed from one middle crus to the other. (b) The intercrustral suture brings the caudal aspect of the tip cartilages together and therefore narrows the columella

With the above-detailed standardized surgical steps, adequate esthetic and functional results were achieved in all patients. The postoperative outcome revealed patient's satisfaction with significant improvement between pre- and post-operative mean values for each individual question ( $P = 0005$ ) [Table 1 and Figure 6], with highest visual analog scale scores at the nasal tip in most of the patients, followed by the dorsum, unequal alar bases, and nostril [Figures 7a-d and 8a-f].

## DISCUSSION

After centuries of evolution, modern corrective procedures could well restore the morphology of the lip, but the residue asymmetry and deviation in the nose are still a significant challenge to plastic surgeons. The shape of the nose is decided by its underlying cartilage framework and correction of a cleft lip nasal deformity continues to be a difficult problem.

The focus of this study is to achieve one-stage definite correction of nasal deformity with residual cleft lip and palate abnormality. As stated by Ahuja *et al.*<sup>[15]</sup> "that all the deformities could be corrected at the same time, leaving no active deforming vector."

In this study, we gave more attention to avoid social and psychological stress patient suffers by multi-staged surgical correction. This was agreed with Scopelliti *et al.*<sup>[16]</sup> who studied simultaneous correction techniques for secondary cleft deformities and found that simultaneous correction of the deformities is indicated as to avoid several surgical distresses for the patient and to reduce risk of psychological consequences.

Table 1: Comparison of preoperative and postoperative ROE score

Parameter	Preoperative	Postoperative	t, df	P
ROE	5.00±0.91	10.28±1.13	-19.000, 17	0.001*

Paired t-test applied.  $P=0.001$ , significant. ROE: Rhinoplasty outcomes evaluation

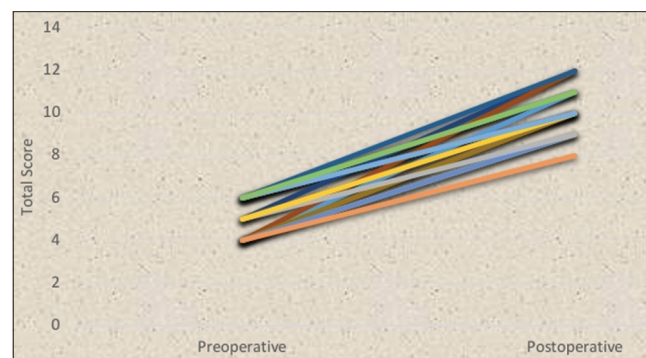


Figure 6: Graph showing change in preoperative and postoperative rhinoplasty outcomes evaluation score



**Figure 7:** (a) Before surgery with drooping nasal tip. (b) Postoperative result showing restoration of nasal tip projection. (c) Worm's eye view showing drooping of alar cartilage. (d) Postoperative result with symmetry and projection

It is well known that a single procedure cannot achieve all these; so the individual deformities were fully analyzed and a corrective plan was made according to the need.

Nasal surgery is the end result of an overall treatment program for secondary cleft lip. These patients have associated facial skeletal deformities as depressed and wide nasal dome, alveolar arch malalignments and anterior fistulae along with residual lip deformity are seen which are to be corrected simultaneously.

These patients present with a wide range of nasal deformities. The open rhinoplasty incision provides adequate exposure to correct deformity under vision. Subperiosteal or subperichondrial correction of the perioral and perinasal muscle was done to attain symmetry. Columella strut for the tip projection, shield graft/tip graft for tip definition and dorsal graft for dorsal height were used to correct the asymmetries. The alar base symmetry was achieved by 'Weir wedge excision procedure'. Nasal hump correction was achieved in six cases via medial and lateral osteotomies. Residual palate fistula was repaired in three cases. Lip revision was done in five cases and premaxillary augmentation had to be done in all cases.

The nasal tip projection, stabilization, rotation along with base position was set using nasal tip sutures in all eighteen



**Figure 8:** (a) Before surgery with classic cleft nose deformity. (b) Postoperative results with alar symmetry and tip projection. (c) Worm's eye view showing drooping of alar cartilage. (d) Postoperative results with elevated alar cartilage. (e) Preoperative view with hanging columella. (f) Elevated columella

cases. The following tip suture techniques were investigated to correct cartilaginous framework transdomal, interdomal, lateral crural, collumelar-septal, intercrural sutures and it was concluded that tip suture when used solely or in combination are efficient to support the nasal tip and correct its cosmetics as well as functional problems.<sup>[17,18]</sup> Tip sutures reduce the need for grafts and allow the surgeon to manipulate the tip with a high degree of precision.<sup>[19]</sup>

The results of our procedure were encouraging in all 18 consecutive patients with no additional morbidity and better appearance of nose correction especially in the adolescent age group, following surgery all of our patients were relieved from nasal congestion and obstructive symptoms. It is a well-known fact "beauty lies in the eyes of the observer," most of our patients were quite satisfied and confident about their appearance and esthetic outcome after surgical correction.

## CONCLUSION

In our opinion with the above-mentioned concept of simultaneous approach toward complete single-stage correction of secondary cleft lip nasal deformity incorporating various cartilage suture using 5-0 nylon, we were able to standardize the surgical technique in developing nation like ours, where patient presents late with complex conditions showed promising esthetic and functional outcome.

Statistical comparative analysis of pre- and postoperative data from our ROE questionnaire confirmed that our standardized

concept of simultaneous approach toward complete single-stage correction of secondary cleft lip nasal deformity incorporating various cartilage suture improved esthetic and functional results and good patient satisfaction was achieved.

#### Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the legal guardian has given his consent for images and other clinical information to be reported in the journal. The guardian understands that names and initials will not be published and due efforts will be made to conceal identity, but anonymity cannot be guaranteed.

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Nil.

#### Conflicts of interest

There are no conflicts of interest.

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