

New Flap from Non-Cleft to Cleft Side during Intermediate Rhinoplasty for Unilateral Cleft Lip Nasal Deformity

ALI A.A. ALHAZZAB, M.B.B.Ch.*; HELMY A. SHALABY, M.D.*; AYMAN A. ELNEMR, M.D.** and MOHAMED M. KHEDR, M.D.*

The Department of Plastic & Reconstructive Surgery* and General Surgery Department**, Faculty of Medicine, Tanta University

ABSTRACT

Background: Nasal distortion associated with a cleft lip is known as cleft lip nasal deformity. Because of the asymmetry, the characteristics of unilateral and bilateral cleft lip nasal deformity differ. Surgical correction is staged based on the time of the surgery: Primary, intermediate, and secondary repair. We performed intermediate cleft rhinoplasty using a septum based adipofascial flap from non-cleft to cleft side of the nose as a new flap.

Objectives: To reduce the tip asymmetry and maintaining new medial position of the corrected lower lateral cartilage.

Patients and Methods: Twenty-one patients with unilateral cleft lip nasal deformity aged 4 to 12 years participated in this prospective study. They were treated with an intermediate cleft rhinoplasty that included a new flap technique. Subjective and objective assessments were performed before and after surgery.

Results: The average ages were 7.5 ± 2.9 years, with 16 males and 5 females, 17 left side and 4 right side clefts, and 15 patients with accompanied lip redo. A significant improvement achieved in one year post-operative subjective assessment score (p -value < 0.001). There was a significant difference in comparing both sides Pronasale-Subnasale distance (Prn-Sn distance) pre-operative (p -value < 0.01). After surgery by one month and one year, a non-significant difference in both sides Prn-Sn distance was noticed (p -value > 0.1 , > 0.2 respectively).

Conclusion: Intermediate cleft rhinoplasty provides more symmetrical nasal growth, which reduces the need for secondary rhinoplasty. It helps youngsters with unilateral cleft lip nose in their psycho-social issues. During intermediate cleft rhinoplasty, a new adipofascial flap was used to improve the tip symmetry and reduce the risk of relapse.

Key Words: Unilateral – Cleft – Nose – Intermediate – Rhinoplasty.

Level of Evidence: Level IV, therapeutic study.

INTRODUCTION

In 1931, Blair and Brown [1] were the first to throw light on cleft nose, critically identifying the pathology's subtleties. Because of the asymmetry; the features of unilateral and bilateral cleft lip

nasal deformity differ, but with the same anatomical base [2]. Cleft lip nasal deformity occurs in all varieties of cleft lip regardless the presence of cleft palate [3].

The degree of nose deformity is dependent on the severity of labial cleft; even in a microform cleft lip, there is a minute nasal deformity that often becomes more obvious with time [2].

The aberrant insertion of orbicularis oris muscle into the columella on noncleft side pulls the premaxilla, columella, and caudal nasal septum towards that side in unilateral cleft deformity. However, on cleft side, orbicularis oris inserts into the alar base, pulling it laterally, inferiorly, and posteriorly. Nasal tip deformity is caused mainly by deformed lower lateral cartilage on the side of cleft, which causes it to be flatter on the cleft side; shorter medial crus and longer lateral crus result in a horizontally wider and displaced nostril [4,5].

On cleft side, there are vestibular webbing and soft tissue hypoplasia, primarily subcutaneous fat, septal bending, and hypoplasia of upper lateral cartilage and pyriform rim [6].

Cleft nasal deformity surgery is commonly staged according to the time of surgery: Primary, intermediate and secondary repair. Primary rhinoplasty is combined with cleft lip correction. Cleft lip correction is usually done around three months [7,8]. Intermediate rhinoplasty is performed between 4 and 12 years, most commonly between 4 and 6 years (preschool age). After face is grown completely with gender difference, secondary or definitive rhinoplasty is usually performed. It is usually performed in females at 14 to 16 years, while in boys at 16 to 18 years [4,8].

Primary cleft rhinoplasty aims to improve nose tip projection, symmetry, and contour by releasing

and repositioning the lower lateral cartilage. The malpositioned and hypoplastic lower lateral cartilage, shorter columella, and lateral vestibular webbing are addressed in intermediate cleft rhinoplasty. On the other hand, septal surgery and cartilage grafting are not performed until maturation of facial skeleton in adulthood [4,8].

Septoplasty, inferior turbinoplasty, osteotomies, and structural or contour cartilage grafting are addressed in definitive cleft rhinoplasty to treat the residual deformity. Before a definitive cleft rhinoplasty, any orthognathic surgery should be performed [4].

We performed intermediate cleft rhinoplasty in this study to ameliorate the psycho-social anguish of children with unilateral cleft lip nasal deformity and the age-related deformity worsening. For better tip symmetry and to minimize relapse, we added new flap technique to the intermediate cleft rhinoplasty.

PATIENTS AND METHODS

Twenty-one children with unilateral cleft lip nose deformity participated in this prospective clinical trial. Between February 2020 and February 2021, the study was done at Tanta University Hospitals, Plastic & Reconstructive Surgery Department. The Local ethics committee approved the trial in February 2020. All parents gave their explicit consent participation, photography, and research publishing.

The study eliminated patients with bilateral cleft lip nose deformity, Syndromic ones, and previous nasal trauma. All patients had a full medical history, a thorough general and local clinical examination, and routine laboratory tests; including complete blood count, bleeding time, clotting time, and prothrombin time and activity.

Operation technique:

- Transcolumellar (typically with V-Y advancement on cleft side) and infracartilaginous incisions (Fig. 1).
- The upper and lower lateral nasal cartilages were exposed after nasal envelope was dissected supraperichondrially and raised (Fig. 2).
- V-Y advancement in the vestibular web releases lower lateral cartilage on cleft side (Fig. 3).
- Trans-domal nonabsorbable 5/0 mattress suture was used to reposition the lower lateral cartilage, lengthen the medial crus and shorten the lateral crus to enhance tip definition and projection.

- To improve tip asymmetry, an inter-domal nonabsorbable 5/0 mattress suture was used (Fig. 7).
- We used adipofascial flap that was obliquely taken from non-cleft side upward downward based on the septum caudally then turned on the genu of cleft side lower lateral cartilage (adipofascial tissue displacement) to augment cleft side nasal dome and secure cleft side lower lateral cartilage in its new medial position (Figs. 4,5,6,7).

Hemostasis and closure:

Nasal envelope was redraped and closed using absorbable 5/0 suture material for marginal incision, nonabsorbable 6/0 suture material for Transcolumellar incision, and layered closure of the accompanying cleft lip revision after thorough hemostasis.

Dressing:

Use Vaseline gauze to pack nose and apply steri-strips to nose.

Post-operative follow-up:

Post-operative care: Prophylactic antibiotic (e.g., amoxicillin/clavulanic acid IV vial, twice daily) was administered with analgesia (Diclofenac sodium suppositories and paracetamol infusion) during the first 48-72 hours after surgery. To minimize nasal oedema, head was elevated 30 degrees. Nasal pack was removed after 48 hours, while removing columellar sutures were after 7 days.

Patient assessment:

2D photographs were obtained (frontal, lateral, and basal views) pre-operative, one month, three months, six months, and one year after surgery.

All patients were evaluated subjectively and objectively before and after surgery:

A- Subjective assessment:

This assessment, for the aesthetic look on 2D photographs pre-operatively and up to one year post-operatively, was done by asking the parents or the older children to give a score from 0-10 to express the aesthetic appearance on nasal symmetry scale score: (9-10): Very good, (7-8): Good, (5-6): Fair, (3-4): Bad, and (1-2): Very bad aesthetic appearance [8].

B- Objective assessment:

Rather than the operators, two other independent plastic surgeons performed this evaluation. They used caliper for anthropometric measurement (Fig. 8). They assessed pronasale-subnasale distance in millimeters (Prn-Sn) on both sides to compare pre-operatively, one month afterwards, and one year

post-operatively to determine the effect of surgery after nasal oedema had subsided (one month post-operative) and early identification of relapse (one year post-operative) using non-cleft non-touched side as a control.

Statistical analysis:

- The Statistical Program for Social Science, SPSS (Version 16) was used to analyze data. Mean \pm

standard deviation (SD) was used to express quantitative data. Frequency and percentage were used to express qualitative data.

- Changes in anthropometric measurements were evaluated using paired *t*-tests.

Probability (*p*-value).

- *p*-value <0.01 was deemed significant.

- *p*-value >0.01 was deemed insignificant.



Fig. (1): Transcolumellar Incision with V-Y advancement on the cleft side.



Fig. (2): Elevated nasal envelope supraperichondrially with exposed nasal cartilages.



Fig. (3): V to Y incision in the vestibular web and medialization of cleft side lower lateral cartilage (arrow).



Fig. (4): Tissue forceps refers to the upper end of adipofascial flap (arrow).

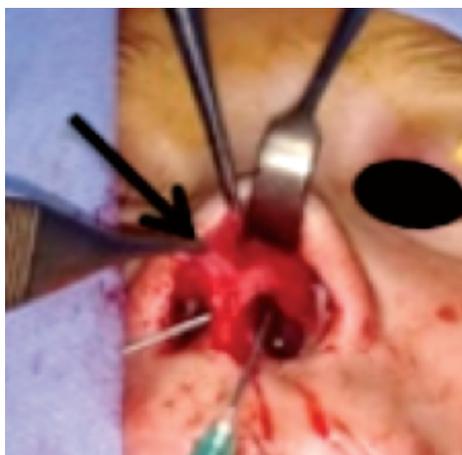


Fig. (5): The beginning of adipofascial flap raising (arrow).



Fig. (6 A,B,C): Complete raising of septum based adipofascial flap from noncleft side to cleft side in different patients (arrows).

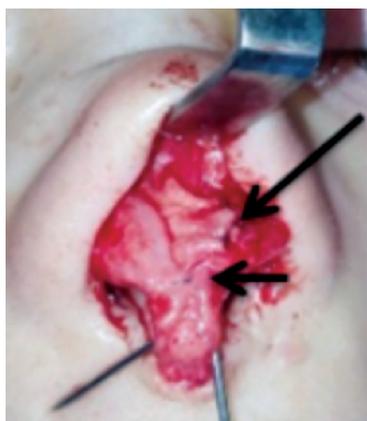


Fig. (7): Flap inseting and suturing to cleft side lower lateral cartilage (long arrow), nonabsorbable 5/0 polypropylene interdomal suture (short arrow).



Fig. (8): Caliper as measurement tool for assessment, cleft side Pronasale-Subnasale distance (Prnc-Sn distance).

RESULTS

Twenty-one patients with unilateral cleft lip nasal deformity were included in our study with a mean age of 7.5 ± 2.9 , 16 males and 5 females. There were 17 left side clefts and 4 right side clefts. In 15 cases, intermediate cleft rhinoplasty was combined with lip redo, while 6 cases had only intermediate cleft rhinoplasty.

A- Subjective assessment:

We documented one year post-operative subjective assessment score. When compared to pre-

operative one, there was a highly significant improvement (Table 1; p -value < 0.001). Only two cases had a fair postoperative aesthetic look; they had a significantly deviated caudal septum and marked hypoplasia of the ipsilateral pyriform rim which made the aesthetic appearance worse.

B- Objective assessment:

Our sample revealed a significant difference in a pre-operative Prn-Sn distance between two sides where the cleft side Mean \pm SD was 12.26 ± 1.5 and the non-cleft side was 13.9 ± 2.01 , (p -value < 0.01).

There was insignificant difference in Prn-Sn distance between the two sides one month after operation. As the Mean \pm SD of this distance on cleft side was 13.31 ± 1.9 while on non-cleft non-touched side was 13.9 ± 2.01 , (p -value > 0.1). So, there was improvement of the cleft side pronasale-subnasale distance one month after surgery due to increase cleft side tip projection by transdomal suture, medialization of afflicted lower lateral

cartilage by interdomal sutures and newly created adipofascial flap on the corrected dome.

There was insignificant difference in Prn-Sn distance between the two sides one year after surgery (cleft side: 14 ± 1.8 and non-cleft non-touched side: 14.5 ± 1.6 (p -value > 0.2). So, one year after surgery, both distances were virtually equal, and there was no relapse.



Fig. (9): Basal view (A): Pre-operative, (B): One year post-operative.



Fig. (10): Basal view (A): Pre-operative, (B): One year post-operative.



Fig. (11): Basal view (A): Pre-operative, (B): One year post-operative.

Table (1): Pre and one year post-operative Aesthetic appearance; number and percentage.

| Scoring | Number (percentage) Pre-operative | Number (percentage) Post-operative | <i>p</i> -value |
|-----------------------------|-----------------------------------|------------------------------------|-----------------|
| Very good aesthetic outcome | Zero | 11 (52.3%) | <0.001* |
| Good aesthetic outcome | 3 (14.2%) | 8 (38.1%) | |
| Fair aesthetic outcome | 16 (76.2%) | 2 (9.5%) | |
| Bad aesthetic outcome | 2 (9.5%) | Zero | |

* Significant *p*-value.

DISCUSSION

Prior to the 1970s, the correction of cleft nasal deformity was done later in adulthood [9] because the deformity is complex, Gillies and Millard [10] believed in 1957 that any primary nasal correction is unacceptable. They also believed that if the early correction was successful, it would not prevent future intervention.

According to Cronin and Denkler [11] and Auffericht [12] the adolescence years were the best period to correct the unilateral cleft nasal deformity. Broadbent and Woolf reported that fixing nose in infancy was not a good idea as the outcomes were inconsistent [13]. Earlier reports of primary repair were not satisfying since characteristic stigma of nose will develop later [13].

Early treatment of cleft nasal deformity was opposed for three reasons: (1) Growth disruption of the midface and nose, (2) Scarring from the considerable dissection, which would make future procedures more difficult, and (3) The inability to manipulate weak cartilages and sparse soft tissue [11]. Despite the opposing opinions regarding the time, surgeons started working on primary rhinoplasty [4,14] and after their long-term outcomes were published, fears about early surgery affecting growth began to fade. Concomitant primary lip and nose repair in unilateral clefts was reported by McComb and Coghlan, [15] Salyer et al., [16] and Anderl et al., [17]. They have showed that the results of operation were stable and long-term with no negative effects on midface growth.

Our goal for doing a septum based adipofascial flap from non-cleft side to cleft one as a novel idea in intermediate cleft rhinoplasty is soft tissue displacement in unilateral cleft lip nose to increase cleft side tip and minimize the non-cleft one aiming to nasal tip symmetry. Also, to maintain the new

medial position of cleft side lower lateral cartilage to limit the risk of nasal deformity recurring after surgery.

Twenty-one children with non-syndromic unilateral cleft lip nasal abnormalities were included in our study; this agreed with different researches in different nations as Mancini et al., [18] whose study included twenty infants with unilateral cleft lip nasal deformity where 70% of them (14 patients) having left-side cleft lip nasal deformity. Chaithanyaa et al., [19] study included ten patients with non-syndromic cleft lip palate and classified into: six patients with left-side cleft, one patient with right-side cleft, and three patients with bilateral defect. William et al., [20] study included sixteen patients with non-syndromic cleft lip palate, nine patients had left-side cleft, three had right-side cleft, and four had bilateral cleft.

Our findings matched with those of Ayeroff et al., [21] who reported no septoplasty, alveoloplasty, revisions, and wound complications.

There are two opinions about the timing of septal surgery in unilateral cleft lip nasal deformity: One of them states that early septal correction is unnecessary and may affect negatively the growth of the nasal and midfacial complex [16]. While the other opinion believes in correcting the septum as soon as possible. It also suggests that early treatment of a deviated septum is vital because it ensures nasal tip stability [22].

Limitations in our study were cases with marked maxillary hypoplasia or septal deviation as we did not do alveolar bone grafting or septoplasty simultaneously. So, the aesthetic appearance of these cases in the subjective assessment got worse. So, alveolar bone grafting or caudal septal reposition was recommend for these cases respectively with intermediate cleft rhinoplasty.

Because our sample comprised a small number of case series and a short follow-up period, we recommend that future studies include more case series and longer follow-up period to demonstrate developmental improvements after the surgery and the role of definitive cleft rhinoplasty.

Conclusion:

Intermediate cleft rhinoplasty allows symmetrical nasal growth and decreases the need of secondary rhinoplasty. It helps youngsters with unilateral cleft lip nose in their psychosocial issues. During intermediate cleft rhinoplasty, the newly created adipofascial flap improved nasal tip symmetry and reduced the risk of relapse.

Funding:

The authors state that they did not receive any funding, grants, or other support during the preparation of this paper.

Disclosures:

There are no relevant financial or non-financial interests that the authors should disclose.

Contributions from authors:

All authors contributed significantly to all of the following:

- 1- The study idea and design, data gathering, analysis and interpretation.
- 2- Writing the manuscript and critically reviewing it for essential intellectual content.
- 3- Final approval of the version presented.

Ethics clearance:

This research was carried out in accordance with the principles of the Helsinki Declaration. The University Ethics Committee gave clearance with approval code (33707/2/20).

Participation permission:

Parents gave their written informed consent to participate in this study.

Permission to publish:

The Authors confirm that the parents of human research participating children agreed that the images in all figures to be published.

REFERENCES

- 1- Blair V. and Brown J.B.: Nasal abnormalities, fancied and real surgery. *Gynecol. Obstet.*, 53: 797-819, 1931.
- 2- Allori A.C. and Mulliken J.B.: Evidence-based medicine: Secondary correction of cleft lip nasal deformity. *Plast. Reconstr. Surg.* 140 (1): 166e-76e, 2017.
- 3- Hoh E.Y. and Sulaiman W.A.: Analysis of pre-operative measurements in unilateral cleft lip patients toward the outcome of secondary cleft deformities. *Cleft lip J. Palate-craniofac Anomal*, 6 (2): 93-8, 2019.
- 4- Bonanthaya K. and Jalil J.: Management of the Nasal Deformity in the Unilateral cleft Lip and Nose, *J. Maxillofac Oral Surg.*, 19 (3): 332-41, 2020.
- 5- Cuzalina A. and Jung C.: Rhinoplasty for the cleft lip and palate patient, *Oral Maxillofac. Surg. Clin. North Am.*, 28 (2): 189-202, 2016.
- 6- Agarwal R. and Chandra R.: Alar web in cleft lip nose deformity: Study in adult unilateral clefts; *J. Craniofac. Surg.*, 23 (5): 1349-54, 2012.
- 7- Berkowitz S.: (Ed.). *Cleft lip and palate: Diagnosis and management.* Springer Science & Business Media, p 315-51, 2006.
- 8- Stebel A., Urbanova W., Klimova I., et al.: The Slavcleft: A three-center study of the outcome of treatment of cleft lip and palate. *Nasolabial appearance, Peer J.*, 9 (4): e10631, 2021.
- 9- Guyuron B.: MOC-PS (SM) CME article: Late cleft lip nasal deformity. *Plastic and Reconstructive Surgery*, 121 (4): 1-11, 2008.
- 10- Gillies H. and Millard D.R.: *The principles and art of plastic surgery.* Boston, Little, Brown & Company, 1957.
- 11- Cronin T.D. and Denkler K.A.: Correction of the unilateral cleft lip nose, *Plast. Reconstr. Surg.*, 82 (3): 419-32, 1988.
- 12- Aufricht G.: Presentation at the annual meeting of the American Society of maxillo-facial surgeons. Philadelphia, Pa., 1955.
- 13- Broadbent T.R. and Woolf R.M.: Cleft lip nasal deformity, *Ann. Plast. Surg.*, 12 (3): 216-34, 1984.
- 14- Abdulrauf B.M.I.: The nasal cantilever technique in children undergoing primary cleft lip surgery: Novel concepts and review, *Innov Surg Sci*, 5 (1-2): 53-62, 2020. Quoted from McComb H. Treatment of the unilateral cleft lip nose, *Plast. Reconstr. Surg.*, 55 (5): 596-601, 1975.
- 15- Sakamoto Y., Miyamoyo J. and Kishi K.: Beware of Optical Illusion of the Alar Base in Unilateral Cleft Lip Nasal Deformity, *Plast Reconstr Surg Glob Open*, 9 (4): e 3523, 2021. Quoted from McComb H.K., Coghlan B.A. Primary repair of the unilateral cleft lip nose: Completion of a longitudinal study. *The Cleft palate-craniofacial journal*, 33 (1): 23-31, 1996.
- 16- Kamel G.N., Segal R.M., Tsai C., et al.: How to Get Consistently Good Results in Cleft Lip Repair, *Plast Reconstr Surg Glob Open*, 9(7): e 3677, 2021. Quoted from Salyer K.E., Genecov E.R., Genecov D.G. Unilateral cleft lip-nose repair: A 33-year experience, *J. Craniofac. Surg.*, 14 (4): 549-58, 2003.
- 17- Han K., Park J., Lee S. and Jeong W.: Personal technique for definite repair of complete unilateral cleft lip: Modified Millard technique, *Arch. Craniofac. Surg.*, 19 (1): 3-12, 2018. Quoted from Anderl H., Hussl H., Ninkovic M. Primary simultaneous lip and nose repair in the unilateral cleft lip and palate, *Plast. Reconstr. Surg.*, 121 (3): 959-70, 2008.
- 18- Mancini L., Gibson T.L., Grayson B.H., et al.: Three-dimensional soft tissue nasal changes after nasoalveolar molding and primary cheilorhinoplasty in infants with unilateral cleft lip and palate, *Cleft Palate-Craniofacial J.*, 56 (1): 31-8, 2019.
- 19- Chaithanyaa N., Rai K.K., Shivakumar H.R. and Upasi A.: Evaluation of the outcome of secondary rhinoplasty in cleft lip and palate patients. *Journal of plastic, reconstructive & aesthetic surgery*, 64 (1): 27-33, 2011.
- 20- Tiong W.H., Zain M.A.M. and Basiron N.H.: Augmentation rhinoplasty in cleft lip nasal deformity: Preliminary patients' perspective. *Plastic Surgery International*, 2014.
- 21- Ayeroff J.R., Volpicelli E.J., Mandelbaum R.S., et al.: Component restoration in the unilateral intermediate cleft lip rhinoplasty: Technique and long-term outcomes. *Plast. Reconstr. Surg.*, 143 (3): 572e-80e, 2019.
- 22- Gosla-Reddy S., Nagy K., Mommaerts M.Y., et al.: Primary septoplasty in the repair of unilateral complete cleft lip and palate, *Plast. Reconstr. Surg.*, 127 (2): 761-7, 2011.