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Mixed Dentition Period Follow-up of Primary Unilateral Cleft Nose Deformity Repair

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Background: Recently, there has been an increased acceptance of the primary cleft rhinoplasty providing acceptable outcomes. Nose reconstruction, and specifically cleft nose deformity, should be addressed based on this philosophy. The purpose of this study was to evaluate surgical outcomes during the mixed dentition period after primary surgery to address unilateral cleft lip nose deformity based on the proposed technique.

Methods: This is a retrospective cohort study. Thirty-two primary complete unilateral cleft lip patients were operated on by a single surgeon using the V-Y-Z cleft rhinoplasty. This method combines a composite V-Y advancement flap with lateral Z-plasty. Data collection was accomplished by evaluation of nasal symmetry through anthropometric measurements performed under general anesthesia during primary cleft palatoplasty and alveolar bone graft. The outcomes were evaluated through anthropometric measurements of the repaired nose during the mixed dentition period of follow-up, and no type of presurgical management was performed for any of the patients.

Results: Total nasal symmetry has been observed in 34.37% of patients at 7 years or more and 40.62% at 1-year follow-up. Nonstatistically significant differences were observed during follow-up, and major revision requirement (>3 mm of asymmetry in any of the nose measurements) was observed in 9.37% of patients.

Conclusions: The proposed primary cleft rhinoplasty is a good approach to improve nasal appearance in patients with complete unilateral cleft lip and palate.
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INTRODUCTION

Diverse surgeons with various methods have reported outstanding outcomes in cleft rhinoplasty. However, a consensus on the ideal technique for a cleft nose has yet to be determined. Divergences in these techniques are highlighted in cartilaginous structure repositioning, soft tissue management, and grafting.[1–5]

In a unilateral cleft lip deformity, the anatomical structures are malpositioned; thus, the cartilage's role is essential. Cartilage repositioning is essential in most developed surgical techniques. However, during repositioning, it is our understanding that addressing the nasal lining is the critical juncture in primary cleft rhinoplasty and may explain most deformity relapses. The recurrence of the nose deformity may be associated with the healing contracture of the soft tissues. Specifically, the healing contracture increases after soft tissue resection, explaining the success of techniques like those of Potter and Berkeley, as these methods preserve the nasal lining.[6,7] Applying nasal lining preservation in cleft lip rhinoplasty importantly guarantees desirable surgical results, preserving the anatomy and function of the nose.[8]

A method described by Lu et al (which involves the utilization of primary cartilage grafts for nasal repair) uses tissues other than skin to resect during primary cleft rhinoplasty.[9] Overall, rhinoplasty using soft tissue resection may create a more complex scenario for any secondary nose correction if required.

After 30 years in the field, the author could ascertain the need for structure to resist the forces of contracture; adequate lining of these elements is also undeniable. The fundamental goals, after the quality of the aesthetic outcome, are to preserve nasal function and anatomy and create a more favorable scenario for any secondary correction.

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Therefore, this study evaluated long-term surgical outcomes after primary surgery to address unilateral cleft lip nose deformity based on the V-Y-Z rhinoplasty (a combination of the Potter and Berkeley concepts).[6,7]

METHODS

A retrospective cohort study of 32 children with nonsyndromic unilateral cleft lip and palate repaired by a single surgeon (P.R.P) were analyzed. Measurements were performed under general anesthesia immediately before the primary palatoplasty and alveolar bone graft procedures (1 and 7 years of age respectively). The inclusion criteria were as follows:

(a) Nonsyndromic complete unilateral cleft lip and palate.
(b) Primary cheiloplasty performed at the age of 3 months by the same surgeon (P.R.P.).
(c) Postoperative nasal stent use for 6 months.
(d) Postoperative anthropometric measurements at the age of 1 year and at least 7 years (mixed dentition period).

During follow-up, all patients were subjected to the following measurements on both sides of the nose using a caliper (Vernier; Fig. 1):

(a) Nostril height: the lateral border at the base of the columella to the highest point of the nostril on each side.
(b) Nostril width: the widest horizontal distance between the nostril's inner medial and lateral border.
(c) Nasal base width: the midpoint at the base of the columella to the most lateral point of the ala, in a line perpendicular to the axis of the columella.

We did not consider the septal/columellar angle in this study because we measured only nostril anatomy.

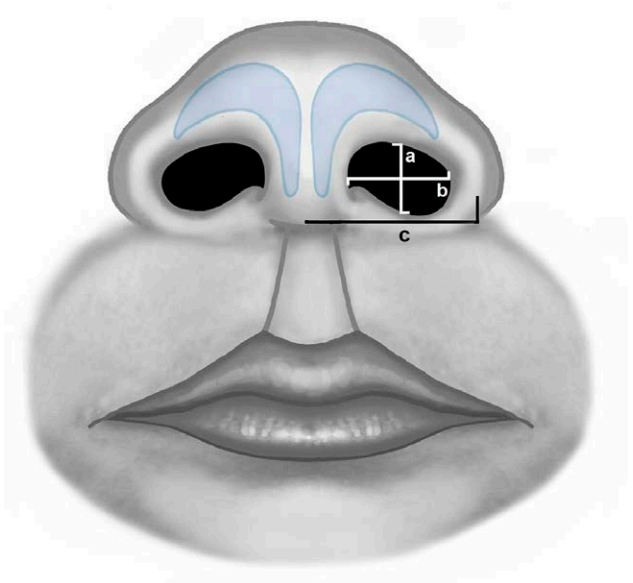

Fig. 1. Standard anthropometric measurements. a, nostril height; b, nostril width; c, nasal base width.

Takeaways

Question: Is the surgical outcome after using the proposed method for primary cleft rhinoplasty maintained during the mixed dentition period?

Findings: The present study concluded that the proposed method provides long-term outcomes.

Meaning: V-Y-Z rhinoplasty can be a good alternative in primary unilateral cleft lip nose repair.

The angle was, therefore, not applicable. Additionally, these measurements were not included because all procedures were performed under general anesthesia

The degree of nasal asymmetry was evaluated using the following scale:

1. No difference in measurements of the cleft and noncleft sides (no secondary revision necessary).
2. The difference in measurements of the cleft and noncleft sides was less than 3 mm (minor secondary revision required).
3. The difference in measurements of the cleft and noncleft sides was 3 mm or greater (major secondary revision required).

All patients underwent primary cheilorhinoplasty, including the following procedures[8,9]:

(a) Primary cheiloplasty using a modification of Pool's triangular method.[10]
(b) Primary rhinoplasty using the V-Y-Z method (Figs. 2–4).
(c) Autologous bone graft during the mixed dentition period.

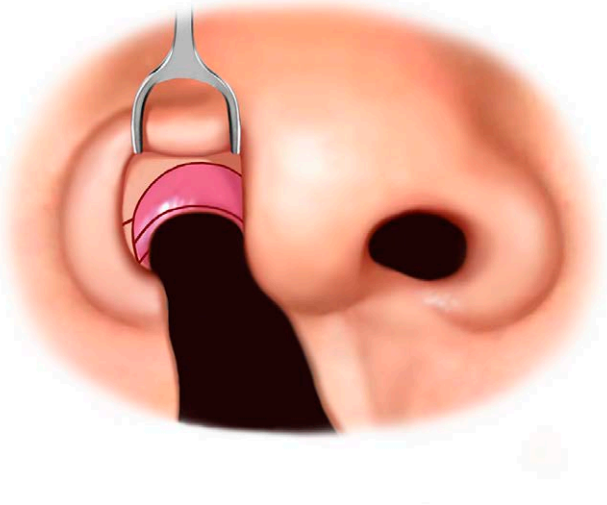

Fig. 2. V-Y-Z cleft rhinoplasty markings for unilateral complete cleft lip and palate (preoperative view). The V-Y advanced composite flap is designed by following two lines: the inferior curved line following the lower border of the alar cartilage (line of the marginal incision) and the superior line located at the intercartilaginous border. The lateral Z-plasty is designed using two transpositional branches located at the lateral end of the V composite flap.

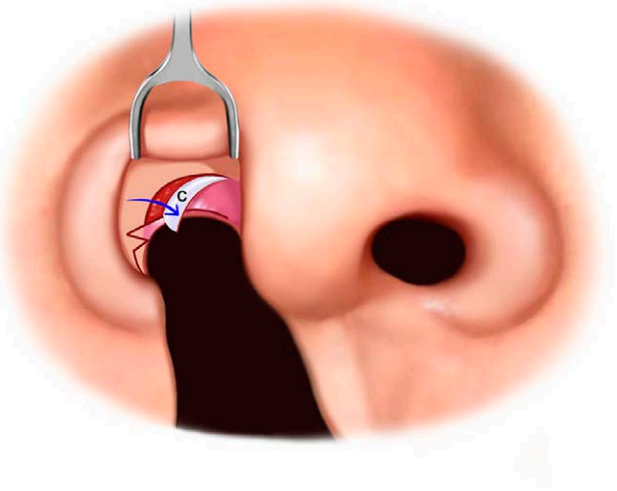

Fig. 3. V-Y-Z cleft rhinoplasty for unilateral complete cleft lip and palate (intraoperative view). The nose dissection is performed using fine scissors. The nasal tip is dissected on both sides through the vestibular incision on the supracartilaginous plane, elevating the advanced V composite flap. Z-plasty transpositional flaps are elevated at the subcutaneous level.

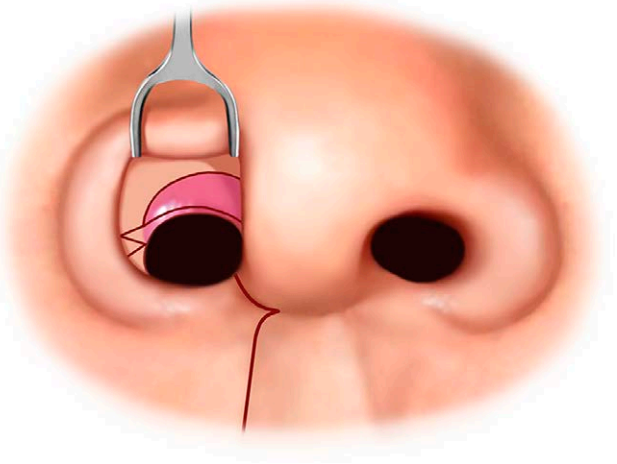

Fig. 4. V-Y-Z cleft rhinoplasty for unilateral complete cleft lip and palate (postoperative view). The V composite flap is closed in a V-Y advancement form, and lateral Z-plasty is transposed. All incisions were closed using transcutaneous absorbable stitches (PDS 5/0).

The author performed no presurgical management in this group of patients.

Surgical Technique

The patient was operated on under general anesthesia. The nose was repaired, preserving nasal tissues using the V-Y-Z technique and producing nasal vestibular lengthening of the cleft side (described previously as surgical "NAM").[11,12] First, the lip and nose tissues were infiltrated using local anesthetic with 2% lidocaine in combination with epinephrine (1/10,0000 at the external branch of the anterior ethmoidal and infraorbital nerve blocks). An incision along the marginal and intercartilaginous borders created a composite flap (of vestibular skin and alar cartilage) in a V form. A Z-plasty was placed laterally, lengthening the vestibule and preventing lateral scar contracture.

The V-Y advanced composite flap is designed by following two lines: the inferior curved line following the lower border of the alar cartilage (line of the marginal incision) and the superior line located at the intercartilaginous border (limen nassi; Fig. 2). Both markings create a V-form composite flap. The lateral Z-plasty is designed using two transpositional branches located at the lateral end of the V composite flap (Fig. 2).

The nose dissection starts with the use of fine scissors; the nasal tip is dissected in both sides through the vestibular incision on the supracartilaginous plane, elevating the advanced V composite flap, which includes alar cartilage and vestibular skin (Fig. 3).

Transpositional flaps are elevated at the subcutaneous level. Then the alar base is elevated using a supraperiosteal dissection from the pyriform aperture (Fig. 3). All incisions were closed using transcutaneous absorbable stitches (PDS 5/0) (Fig. 4).

During primary cheiloplasty, the caudal portion of the nasal septum was repaired by suturing the nasolabial muscles to the base of the septum. In brief, the method consisted of dissecting the labial muscles, identifying the nasal fascicle of the levator labii superioris alaeque nasi, and fixing the caudal septum previously exposed through the medial cleft incision to the perichondrium using PDS 5/0. The nasal fascicle of the levator labii superioris alaeque nasi muscle laterally pulls the base of the caudal septum to the midline. (Of note, muscular action is produced over the lower portion of the cartilaginous caudal septum between this portion and the columella, a segment known as the membranous nasal septum. The muscle acts primarily over this membranous section and produces a correction of the columellar angle, as in the presented cases.)

The nasal floor was repaired using the upper portion of the lateral lip segment and the alar base. The alar base was released from the piriform margin, using a lateral lip incision in combination with an upper buccal sulcus incision and supraperiosteal dissection over the maxilla. The muscular repair of the upper lip provides the structural support of the anterior segment of the nasal floor.

In all cases, nasal packing was used inside the operated nostril to prevent bleeding and was removed the next day. Postoperative nostril stenting prevents scar contracture of the vestibular incisions for 6 months. The custom-made acrylic stents were maintained using tapes and were applied 1 week after surgery.[13] These devices have a perforated extension into the nose that keeps the airway clear and prevents scar retraction that may develop airway obstruction. Due to the patient tolerance, the conformers were recommended to be used for at least 8 hours daily.

Statistical Analysis

We assessed statistical significance using the McNemar–Bowker (chi-squared symmetry) test because these are paired nominal data, and the normality assumption was unmet. The α error was set as a P value less than 0.05,

Table 1. Characteristics of the Studied Group

Characteristic	n (N = 32)
Sex	
Female	12 (37.5%)
Male	20 (62.5%)
Affected side	
Left	23 (71.87%)
Right	9 (28.12%)
Age at the time of surgery (mo)	
Mean	4.4 mo
SD [CI]	0.762 [3.86–4.95]
Follow-up time (y)	
Mean	8.2 y
SD [CI]	1.553 [7.85–9.64]

yielding a confidence interval (CI) of 95%. Analyses were performed with SPSS, v 15.0 (SPSS Inc., Chicago, Ill.).

Ethics

Each child's parents were informed, and they provided signed consent before surgery. The Declaration of Helsinki was followed.

RESULTS

Since 2014, 32 patients with complete unilateral cleft and palate underwent primary anatomical repair of the cleft lip nose deformity using the proposed technique and were followed up for a minimum of 7 years. Table 1 presents the demographic characteristics of the patients, and Table 2, the observed degree of asymmetry. Total nostril symmetry was observed in 40.62% at the 1-year follow-up and 34.37% of patients at the 7 years or more follow-up without statistically significant differences. Major revision requirement (more than 3 mm of asymmetry in any of the nostril measurements) was observed in 9.37% of patients. No recurrence of a deformity was observed during the follow-up (Table 2). Table 3 presents descriptive data for surgical complications. Figures 5–10 show surgical outcomes.

DISCUSSION

During the last decades there has been an increased acceptance of primary cleft rhinoplasty providing acceptable outcomes. Nose reconstruction, and specifically cleft nose deformity, should be addressed based on this philosophy.[1–5]

The aesthetic nasal outcomes of this study represent the senior author's (P.R.P.) surgical experience of observing 34.37% of total nostril symmetries. Minor nasal

Table 2. Postoperative Nasal Profile Comparisons during Follow-up

Measurement	Degree of Asymmetry	A		B		*P*
		n	%	n	%	
Nostril height	1	13	40.62	12	37.5	0.317
	2	16	50	17	31.25	
	3	3	9.37	3	9.37	
Nostril width	1	13	40.62	11	34–37	0.250
	2	16	59.38	20	62.5	
	3	0	0	1	3.12	
Alar base width	1	13	40.62	11	34.37	0.135
	2	18	56.25	19	59.38	
	3	1	30.12	2	6.25	

A: 1-year follow-up; B: More than 7 years follow-up. Significance level was set as $P < 0.05$.
*McNemar–Bowker test.

Table 3. Observed Complications Associated with Primary Cleft Lip Nose Management Based on the Preservation Rhinoplasty Concept

	n (%)
Granuloma	5 (15.6%)
Scar contracture	4 (12.5%)
Pinched nose	4 (12.5%)
Synechia	2 (6.25%)
Infection	0 (0%)

Fig. 5. Preoperative view of a 3-month-old unilateral cleft lip and palate patient.

Fig. 6. Postoperative frontal view of the patient in Figure 5, at 8 years old.

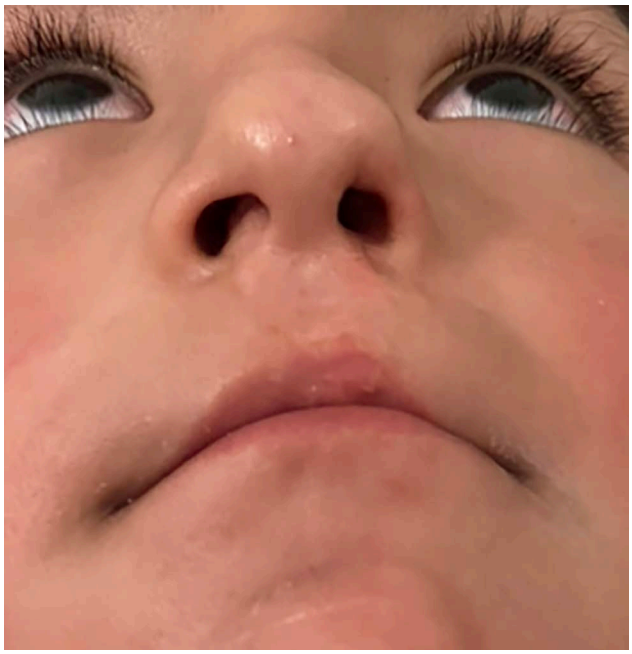

Fig. 7. Postoperative close up worm's eye view of the patient in Figure 5, at 8 years old.

Fig. 8. Preoperative frontal view of 3-month-old unilateral cleft lip and palate patient.

Fig. 9. Postoperative frontal view of the patient in Figure 8 at 9 years old.

Fig. 10. Close up worm's eye view of the patient in Figure 8 at 9 years old.

revisions were required in 56.26% of patients (Table 2). Yao and Mulliken reported 65% of nasal revisions after primary cleft nose repair in unilateral cleft patients,[14] whereas Salyer et al[15] observed a lower revision rate at 35%. Kane et al reported a secondary rhinoplasty rate of 30%–40%.[16]

In contrast, the major secondary revision observed in our study was significantly lower at 9.37% (Table 4). Total nasal revisions (minor and major) correcting the unilateral cleft lip nose deformity using the preservation rhinoplasty concept were estimated in 65.63% of cases, and those requiring major secondary rhinoplasty, in only 9.37% of patients (Table 2). However, we understand the difficulty in comparing these outcomes due to differing methodologies. Additionally, most of the scales are subjective, using categorical variables.

Importantly, facial symmetry is uncommon in most people. Therefore, we should not expect total symmetry in cleft patients postsurgery. The benefit was clear, as the asymmetry observed in most patients was less than 3 mm (perhaps the most common pattern of the general population). Based on these observations, 90.63% of patients operated on could be considered "normal," as the asymmetry is minor (<3 mm; Figs. 5–10).

However, adulthood outcomes are necessary to confirm our findings; functional outcomes are challenging to evaluate in children, even with validated scales for nasal function.

Table 4. Comparison of Current Methods Based on Rates of Nasal Asymmetry after Primary Cleft Rhinoplasty in Unilateral Cleft Lip and Palate Patients

Study	Nasal Revision %	Follow-up (y)
Yao and Mulliken[14]*	65%	20
Salyer[15]†	35%	5
Kane[14]*	30%–40%	15
Rossell[13]†	56%	7–10

*These studies did not report differences between minor or major revisions.
†Minor secondary revisions.

Airway obstruction is common in unilateral cleft lip and palate patients. Nasal function impairment may be associated with the septal deviation or turbinate component; therefore, functional outcomes should be carefully interpreted in these patients. Additionally, the nasal function should be evaluated more objectively through rhinomanometry, even when measuring at an early age is challenging.

Significant relapse of the nasal deformity has been described using various techniques, even presurgical orthopedics in combination with postoperative conformers.[17–19] To address nasal relapse, some authors[17] have proposed nostril overcorrection in combination with nasal stents. However, the overcorrection is sometimes persistent, making it difficult to correct this secondary deformity. In contrast, 56.26% of our cases preserving soft tissues required minor correction that was easily performed (the degree of asymmetry was <3 mm). This undesirable outcome has been studied mainly short term. Only some studies have analyzed this problem long term. Our follow-up was performed during the mixed dentition period (approximately 9 years old). We did not observe nose relapse in our comparison (at the 1-year versus 7-years-or-more follow-up; Table 2). The same findings were observed in our previous study.[12]

We observed a low rate of complications: granulomas, vestibular scar contracture, pinched nose, and synechiae (Table 3). Granuloma was the most common complication and was associated with transcutaneous stitches. All granulomas resolved spontaneously. The most serious complications include vestibular scar contractures and synechiae because they may affect nasal function. Synechiae were associated with the extended vestibular incisions used in this method. We observed two cases of partial nasal synechia requiring surgical correction (scar release and Z-plasty). The use of postoperative nasal conformers for at least 6 months is mandatory to prevent this complication. Lastly, the pinched nose was another nondesirable outcome due to a lack of structural support of the nose after medial advancement of the alar cartilage and was observed in four cases. Conservative displacement of the alar cartilage is recommended to prevent this complication. All cases were minor forms and later improved after suture resorption.

Based on these findings and our personal experience over 30 years, common conceptions may be debunked.

1. Nostril symmetry can only be achieved by using presurgical orthopedics.

Different publications have demonstrated nostril symmetry using only surgery.[12,13]

2. Postoperative nasal conformers improve nasal aesthetics.

These devices only prevent scar contractures but do not improve surgical outcomes, as we observed in our recent study.[13]

3. Nose deformity relapse appears over time, and secondary cleft rhinoplasty is always required.

Based on this study, 34.37% of cases did not require secondary correction because of the total symmetry obtained (observed after long-term follow-up).

4. Maxillary arch alignment can be obtained only by using orthopedic plates.

Based on our previous publications, alveolar cleft borders and maxillary occlusion can be obtained by muscular action. Repaired labial muscles represent the best orthopedic mechanism, as it is more physiological.[12] (This statement is not based on the present study. Our previous study used the scientific method to measure outcomes to improve the maxillary arch without orthopedics.)

Finally, limitations exist in this study, including a small number of patients and the retrospective and observational nature of the research with potential roles of the confounding variables on the observed outcomes. Additionally, it is essential to note that we are not measuring the entire nasal anatomy. As the outcomes are related to the nostril anatomy, we cannot draw conclusions on nasal symmetry. "Nostril symmetry" is more appropriate.

CONCLUSION

The proposed primary cleft rhinoplasty is an alternative approach to improve nasal appearance in patients with complete unilateral cleft lip and palate.

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DISCLOSURE

The authors have no financial interest to declare in relation to the content of this article.

PATIENT CONSENT

Parents or guardians provided written consent for the use of patients' images.

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