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Alar Base Flap and Suspending Suture: A Strategy to Restore Symmetry to the Nasal Alar Contour in Primary Cleft-Lip Rhinoplasty

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Objective: **Patients presenting with cleft-lip deformity usually present with a characteristic nasal deformity. We describe the mechanism and contribution of different surgical techniques to restore alar symmetry in primary cleft-lip rhinoplasty.** ***Study Design:*** **We evaluate surgical results using a retrospective, randomized, blinded surgical grading system. We describe a surgical technique designed to restore nasal symmetry in patients undergoing primary cleft-lip rhinoplasty. Patients were selected retrospectively.** ***Methods:*** **A series of patients were identified with nasal asymmetry associated with cleft-lip deformity. All patients underwent cleft-lip repair with concurrent primary cleft-lip rhinoplasty. Patients who underwent alar base flap suspending suture (ABF-SS) were grouped and selected consecutively after a modification in the senior author's surgical technique. A control group was matched for age, sex, and cleft characteristics. Primary rhinoplasty was carried out concurrently for both study groups while undergoing unilateral cleft-lip repair. The control group did not undergo the described ABF-SS technique. All patients were operated on by the same surgeon over a period of 5 years. Surgical outcomes were evaluated by a panel including lay people as well as trained health care workers experienced in the critical evaluation of esthetic results after cleft-lip rhinoplasty.** ***Results:*** **Forty-six records were reviewed of patients undergoing complete unilateral cleft-lip repair. After applying strict inclusion/exclusion criteria, nine patients underwent the described ABF-SS technique. All patients in the preoperative group had a clinically and statistically comparable degree of deformity ($P > .05$). There was a clinical and statistically significant improvement in nostril size, shape, symmetry, alar base symmetry, and nasal tip/dome symmetry for patients undergoing repair with the described technique compared with the control group. No clinical or statistically significant difference was observed in the scarring scores between groups.** ***Conclusions:*** **Patients presenting with cleft-lip deformity usually present with a characteristic nasal deformity. Execution of the described surgical techniques restores nasal alar symmetry in patients undergoing concurrent primary cleft-lip rhinoplasty.** ***Key Words:*** **Unilateral, cleft, lip, rhinoplasty, suspension, suture, alar base flap.**

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INTRODUCTION

The nasal deformity associated with the unilateral cleft lip continues to present a significant challenge to general and facial plastic surgeons. As outcomes in surgical management of the cleft lip continue to improve, reconstruction of the nose has become perhaps one of the most important functional and esthetic components of surgical repair. Despite a plethora of technical approaches aimed at correcting the defect, no one procedure has been universally satisfactory in the repair of nasal deformities associated with cleft-lip abnormalities.[1]

Primary rhinoplasty at the time of unilateral cleft-lip repair has become the increasingly accepted surgical option for the care of most patients presenting with this deformity. However, complete nasal reconstruction is usually avoided because of the potential interference with nasal, septal, and midface development. Some long-term studies have found that primary rhinoplasty had no adverse long-term effects on nasal growth.[2]

The nasal deformity associated with a unilateral cleft lip is the result of the complex geometry involving both the facial skeleton as well as the changes in the surrounding soft tissues, including aberrant muscle insertion points.

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Fig. 1. Nasal characteristics associated with unilateral complete cleft-lip nasal deformity: 1) outstretched and laterally displaced alar base, 2) shortened columella, 3) long and thinned lateral crus with shortened medial crus, 4) flattening of nasal dome, 5) poor nasal tip definition and support, and 6) asymmetry of pyriform apertures secondary to maxillary hypoplasia.[3]

This nasal deformity typically exhibits the following anatomic characteristics on the cleft side (Fig. 1): 1) an outstretched and laterally displaced alar base, 2) a shortened columella, 3) a long and thinned lateral crus with a shortened medial crus, 4) flattening of the nasal dome, 5) poor nasal tip definition and support, and 6) asymmetry of the pyriform apertures secondary to maxillary hypoplasia.[3] In addition, the appearance of the nasal deformity changes over time, with nasal asymmetry peaking in the postpubertal growth stage.[4]

One of the most widely used surgical techniques for repair of the cleft lip is the Millard rotation-advancement technique, first presented in 1955 and since championed and modified by many experts in the field.[5] The basic technique involves the advancement of a mucocutaneous flap from the affected lateral lip medially to cover the cleft defect, attempting to conceal scarring along the philtral columns and nasal sill. This technique has provided widely acceptable results for lip repair.

However, despite several attempts to incorporate primary rhinoplasty into the Millard unilateral lip repair technique, several obstacles remain to the adequate restoration of nasal symmetry. Seemingly excellent initial results can change over time because of scar formation and anatomic discrepancies between the cleft and noncleft sides.[7] The lateral crus on the cleft side frequently becomes displaced and asymmetric because the scarring vectors of tension tend to distort tissues away from their intended intraoperative positioning and the direction of the advancement flap. As the incisions heal and the child grows, the nasal deformity can become accentuated. This

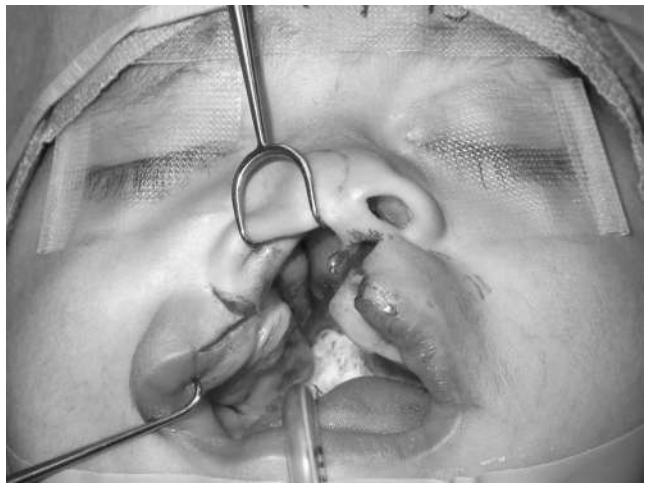

Fig. 3. Skin incisions are limited to lowermost aspect of alar crease at its junction with upper lip.

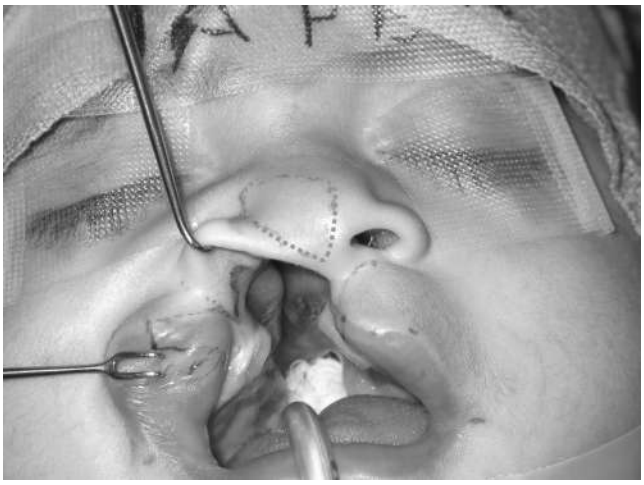

Fig. 2. Skin incisions addressing primary lip deformity remain largely unmodified from described Millard technique. Area of undermining in plane between nasal cartilages and nasal superficial musculoaponeurotic system (dashed line).

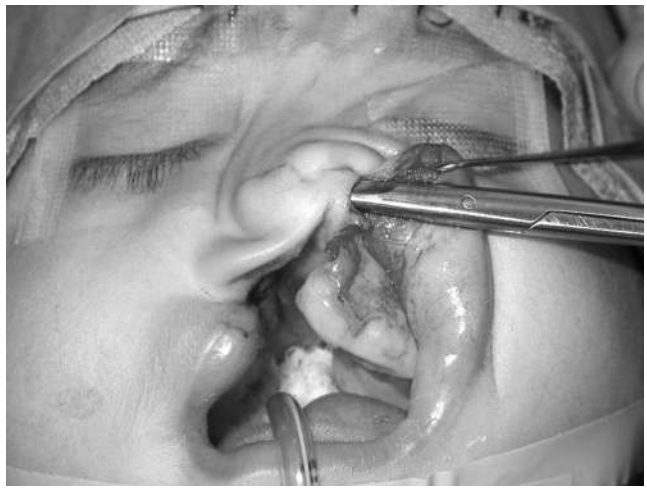

Fig. 4. Dissection of soft tissue envelope overlying nasal cartilages is carried out in closed fashion using curved strabismus scissors. Desired dissection plane is between nasal cartilages and nasal superficial musculoaponeurotic system.

Fig. 5. Vestibular skin incision is created inferiorly and laterally toward junction of alar base with upper lip.

may be caused, in part, by insufficient underlying support of the alar base. We propose to correct the void in this underlying support intraoperatively through the techniques described below. We describe a modification of the Millard rotation-advancement technique to create greater nostril symmetry and minimize long-term lateral displacement of the nasal ala on the cleft side after primary cleft-lip rhinoplasty.

These techniques were developed as a result of the constant critical observation of our own surgical outcomes, during which we identified lateralization (widening) of the alar base in patients undergoing concurrent primary rhinoplasty during cleft-lip repair. This result was documented approximately 1 to 2 years after the initial procedure, when patients presented for cleft-palate repair.

MATERIALS AND METHODS

A retrospective review was made of our experience treating patients with varying degrees of nasal asymmetry associated with unilateral cleft-lip deformity. All patients underwent cleft-lip repair with concurrent primary cleft-lip rhinoplasty.

Patients in the study group were selected consecutively over a 3 year period, after a modification in the senior author's surgical technique (U.S.H.). For the patients in the study group, the alar base flap and suspending suture (ABF-SS) technique was used. A control group was also selected from the senior author's practice, matching for age, sex, and cleft characteristics. The control group underwent primary rhinoplasty concurrently with the initial cleft-lip repair without use of the described technique (ABF-SS). All patients in the control group underwent surgical intervention before the development of the described technique.

All procedures were performed as part of an American-based humanitarian surgical team. No orthodontic or prosthodontic treatment was available preoperatively or postoperatively to either group of patients given the limited resources available in the countries where these procedures take place.

Both groups were operated on by a team led by the same surgeon (U.S.H.). Preoperative and postoperative digital photographic documentation was obtained on each patient at a distance of approximately 1 m. Frontal, lateral, and base views were available for review. Surgical results on each patient were evaluated by a panel of 10 observers. The panel was composed of both lay people (5) as well as trained health care professionals (5) experienced in the critical evaluation of esthetic results after cleft-lip rhinoplasty. The panel was blinded to the type of procedure performed and was asked to qualitatively evaluate nasal symmetry in categories including nostril size, shape, scarring, and alar symmetry. The panel was asked to focus on the nasal characteristics while ignoring the lip characteristics. They were asked to assign a numeric value in a visual analogue ordinal scale ranging from 0 to 4 (symmetric, nearly symmetric, mild deformity, moderate deformity, and severe deformity, respectively). Patients were evaluated independently, with degree of deformity assessed. Each patient was compared pre- and postoperatively (study group vs. the control group). Nonparametric statistical analysis was performed by comparing assessed degree of symmetry using Mann-Whitney analysis, thus comparing the distribution of variance both within and between each group.

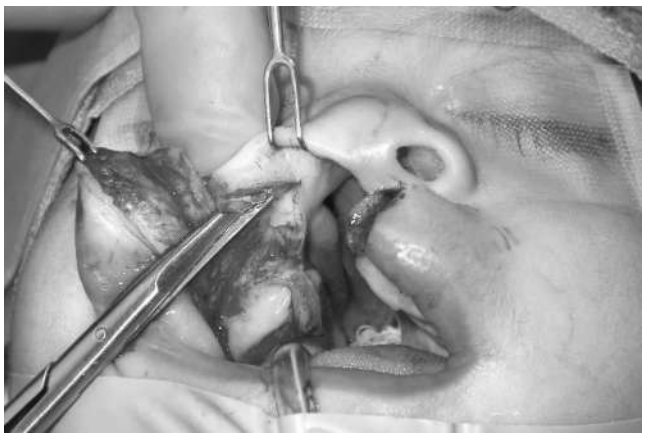

Fig. 6. Alar base flap is elevated by dissecting vestibular skin and subcutaneous tissue component of flap away from overlying alar skin, ensuring integrity of nasal crease by limiting dissection to distance of 2 mm from crease. This maneuver greatly facilitates medial advancement of alar base.

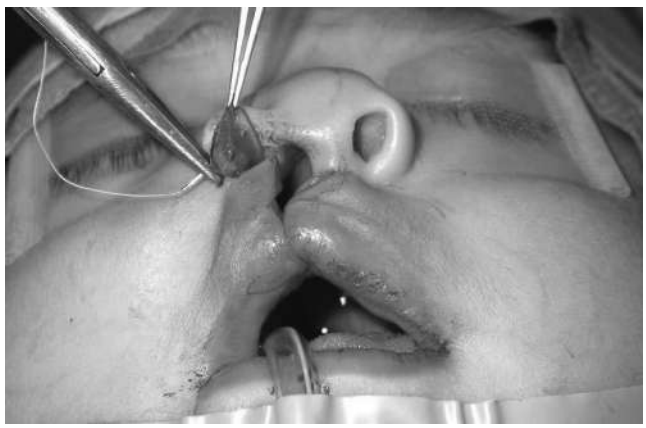

Fig. 7. Single 5–0 Vicryl suture on P-3 needle is used to secure lateral alar base region. Angle of entry of needle into lateral alar base should be in longitudinal axis of alar flap.

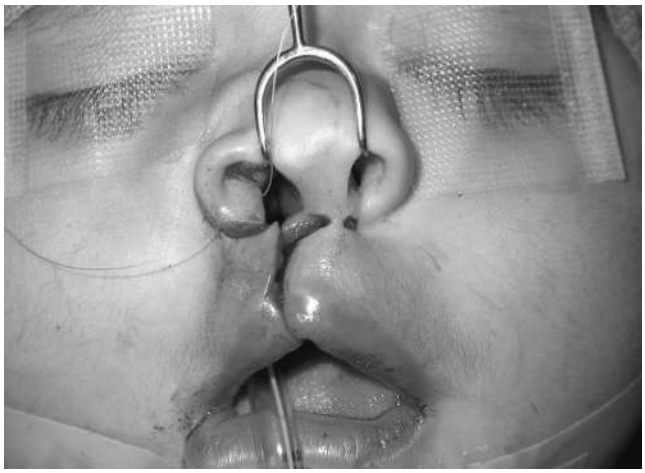

Fig. 8. Suture is then passed and secured to subcutaneous tissue at point just lateral to subnasale on noncleft side, thereby anchoring alar base to exactly desired location. This can be tailored to meet configuration of nonaffected ala that serves as intraoperative comparison template.

Only patients with unilateral complete cleft-lip deformity were included. Patients with incomplete cleft-lip deformity, bilateral clefts, inadequate pre/postoperative photodocumentation, or insufficient follow-up time to assess the described nasal characteristics were excluded from the study group. All patients had varying degrees of cleft palate, and postoperative follow-up was obtained as part of the preoperative assessment for cleft-palate correction.

Technique

The general sequence of the operative procedure is as follows: skin incisions, primary rhinoplasty (medial portion), cleft-lip flaps, and, finally, the retrograde (lateral portion) of the rhinoplasty. Primary cleft rhinoplasty refers to the procedure to correct the nasal deformity concurrently with cleft-lip repair. Its aim historically has been to free the nasal structures

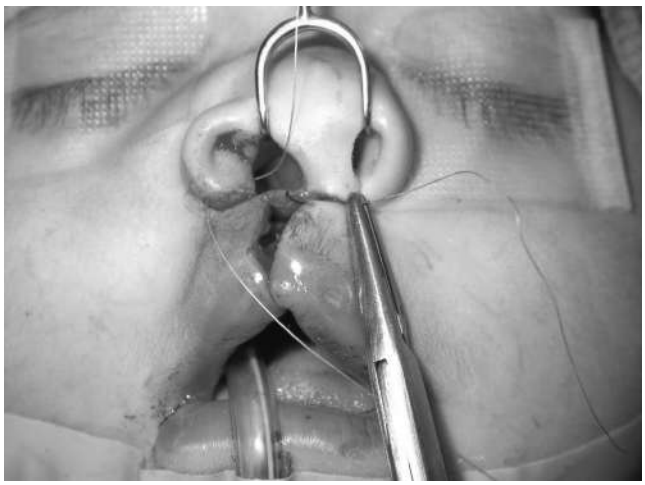

Fig. 9. As in Figure 8, suture is then passed and secured to subcutaneous tissue at point just lateral to subnasale on noncleft side, thereby anchoring alar base to exactly desired location. This can be tailored to meet configuration of nonaffected ala that serves as intraoperative comparison template.

Fig. 10. Pre- and postoperative photographs.

from the overlying cutaneous soft tissue envelope in one operative procedure.

Skin Incisions. The skin incisions addressing the primary lip deformity remain largely unmodified from the described Millard technique (Fig. 2). The initial medial approach to the nose is combined with a lateral (retrograde) approach that serves as the underlying principle for this repair. Laterally, the ABF-SS technique is based on the following steps:

- Limiting the extent of skin incisions to the lowermost aspect of the alar crease at its junction with the upper lip (Fig. 3). This limitation evolved from the observation that varying degrees of alar notching resulted secondary to the extension of the skin incision along the base of the alar crease in cephalic and medial directions. The ABF-SS technique allows ample rotation and advancement of the alar flap into a medial position based on the extensive subcutaneous dissection, obviating the need for extending the skin incision along the base of the alar crease.

Primary Rhinoplasty, Medial Portion. After the skin incisions, dissection of the soft tissue envelope overlying the nasal cartilages is carried out in a closed fashion using curved strabismus scissors (Fig. 4). The overlying soft tissues of the nose are

Fig. 11. Pre- and postoperative photographs.

TABLE I.
Patient Characteristics.

	Millard Rotation-Advancement With Primary Rhinoplasty	ABF-SS Technique With Primary Rhinoplasty
Sex		
Male	5	7
Female	4	2
Age at surgery, mo (range)	10.6 (10–13)	11.8 (3–36)
Cleft lip		
Complete (%)	9 (100)	9 (100)
Cleft palate	9 (100)	9 (100)
Average follow-up time, mo (range)	19 (9–60)	14 (6–28)
Comorbidities	n/a	n/a

ABF-SS = alar base flap and suspending suture.

dissected off from the underlying prolabium, columella, dome, and lateral crus. The dissection plane is developed superficial to the superficial musculoaponeurotic system (SMAS) layer investing the nose. The area separating the medial crura of the lower lateral cartilages is dissected, with care taken not to separate the crura from the quadrangular cartilage. The ligamentous attachments of the upper lateral and lower lateral cartilages (scroll region) as well as all other tip support mechanisms are preserved. The superior limit of the dissection is the scroll area. The lateral limit of the dissection is the posterior border of the lateral crus.

Cleft-lip Flaps. The details pertinent to our modifications in the flaps to address the cleft-lip repair are the subject of a separate paper, currently under submission. In brief, wide surgical undermining and extensive freeing of the aberrant attachments of the orbicularis oris muscle fibers and nasal soft tissue envelope is carried out beyond the borders of some previously described methods.

Primary Rhinoplasty, Lateral Portion (ABF-SS)

ALAR BASE FLAP. Dissection is carried out laterally on the cleft side, with care taken not to disrupt the alar crease, as outlined in the following steps:

- A vestibular skin incision is created inferiorly and laterally toward the junction of the alar base with the upper lip (Fig. 5). The cephalomedial border of the incision is 1 to 2 mm lateral to the posterior edge of the lateral crus on the cleft side. The incision is placed 2 to 3 mm lateral to the mucocutaneous junction in the vestibular skin area in an attempt to preserve the functionality of the alar component of the nasal valve and to prevent nasal stenosis in that region. This issue has been overlooked in some previous corrective surgical techniques, thus disrupting the integrity of the internal aspect of the lateral alar region.
- The alar flap is then elevated by dissecting the vestibular skin and subcutaneous tissue component of the flap away from the overlying alar skin, ensuring the integrity of the nasal crease by limiting the dissection to a distance of 2 mm from the crease (Fig. 6). This maneuver greatly facilitates the medial advancement of the alar base.
- By avoiding creation of incisions in the vestibular mucocutaneous junction, three goals are accomplished: 1) avoidance of alar collapse, 2) avoidance of recruitment of excess tissue into the nostril, and 3) avoidance of the introduction of vestibular mucosa into the skin flap of the reconstructed nasal sill.

SUSPENDING SUTURE. Once the dissection planes are developed, the skin flap is anchored to the subcutaneous tissue at a point just lateral to the subnasale on the noncleft side. A single 5–0 Vicryl suture on a P-3 needle (Ethicon, Inc., Somerville, NJ) is used to secure the lateral alar base region. The angle of entry of the needle into the lateral alar base should be in the longitudinal axis of the alar flap (Fig. 7). Doing so ensures that the symmetrical medialization of the alar flap is accomplished as one anatomic unit. It also provides the necessary support to maintain the alar flap suspension. This prevents future lateralization of the flap and alar base.

The suture is then passed and secured to the subcutaneous tissue at a point just lateral to the subnasale on the noncleft side, thereby anchoring the alar base to exactly the desired location (Figs. 8 and 9). This can be tailored to meet the configuration of the nonaffected ala that serves as an intraoperative comparison template. Overcorrection should be avoided by all means because this will contribute to long-term nasal stenosis. The resulting dead space overlying the alar flap is obliterated by using one to two transfixion sutures. The authors currently use 5–0 Chromic on a P-3 needle (Ethicon, Inc.). This maneuver secures the lateral crus in its medialized and anatomically correct position and also prevents future thickening of the ala secondary to cicatricial tissue formation. Finally, a 6–0 Vicryl subcutaneous inverted suture is used to position the vertex of the alar flap into the created nasal sill. Preoperative and postoperative photographs are shown in Figures 10 and 11.

RESULTS

This technique has been carried out on 46 patients with varying degrees of cleft-lip deformity (27 males and 19 females) to date during a period of 3 years. After re-

TABLE II.
Preoperative Assessment.

	Millard Repair			ABF-SS Technique			*P* Value, Mann-Whitney Rank Sum Test
	Mean	Median	Mode	Mean	Median	Mode	
Nostril size	2.80	3	3	2.87	3	3	.737
Nostril shape	2.99	3	3	2.89	3	3	.721
Nostril symmetry	2.99	3	4	3.11	3	4	.409
Alar base symmetry	3.00	3	4	3.01	3	3	.998
Nasal tip/dome symmetry	2.50	3	3	2.27	2	2	.118
Scarring	0.00	0	0	0.00	0	0	.999

ABF-SS = alar base flap and suspending suture.

TABLE III.
Postoperative Assessment.

	Millard Repair			ABF-SS Technique			*P* Value, Mann-Whitney Rank Sum Test
	Mean	Median	Mode	Mean	Median	Mode	
Nostril size	1.73	2	1	0.94	1	0	<.001
Nostril shape	2.02	2	2	1.18	1	1	<.001
Nostril symmetry	2.17	2	1	1.29	1	1	<.001
Alar base symmetry	1.59	2	2	1.06	1	0	.004
Nasal tip/dome symmetry	1.48	1	1	0.83	0	0	<.001
Scarring	1.10	1	0	1.24	1	1	.242

ABF-SS = alar base flap and suspending suture.

viewing all preoperative and postoperative photodocumentation and adhering to the previously defined inclusion/exclusion criteria, a total of nine patients were selected for the study group. Patient age at the time of surgery averaged 11.8 (3–36) months. The follow-up time after surgery was 14 (6–28) months. A matched control group was also selected (Table I). All procedures were performed by the same surgeon (U.S.H.). No major complications were seen. No nasal stenosis, flap necrosis, or hypertrophic scars were seen in either group.

The panel of observers found no statistical difference in the varying degrees of deformity and nasal asymmetry among both preoperative groups. The severity scores ranged from 0 (symmetric) to 4 (severe deformity), with lower scored indicating a better esthetic appearance (Tables II and III). A significant difference was found between both postoperative groups when evaluating nostril size, nostril shape, nostril symmetry, alar base symmetry, and nasal tip/dome symmetry. Patients undergoing repair with use of the ABF-SS technique showed a statistically significant improved degree of perceived symmetry in nostril size ($P < .001$), nostril shape ($P < .001$), nostril symmetry ($P < .001$), alar base symmetry ($P = .004$), and nasal tip/dome symmetry ($P < .001$). No statistically significant difference was found when evaluating scarring between groups ($P = .24$) (Figs. 12 and 13).

DISCUSSION

We deliberately limit the extent of the primary rhinoplasty to the subcutaneous freeing of the lower lateral cartilage from the overlying skin on the medial aspect of the cleft nasal deformity and to mobilize the laterally displaced dome and lateral crus to a medial and more symmetric position. This technique avoids any circumferential rim or marginal incisions that can predispose the healing nostril to future concentric stenosis. In addition, the extent of the lateral dissection is carried out as previously described to ensure proper mobilization of the alar base and nasal symmetry.

This technique is different from previously described suspending suturing techniques by the following points[7,8]:

1. An increased extent of lateral dissection in creating the alar flap.
2. The alar base suture is positioned in a longitudinal axis.
3. Preservation of the structural integrity of the lower lateral cartilage.
4. Alar flap/crease transfixion sutures.

It is the nasal ala, and not the lip, characteristics that are the aim of this technique. This technique can be easily incorporated into the concurrent management of primary rhinoplasty in the surgical repair of unilateral cleft-lip

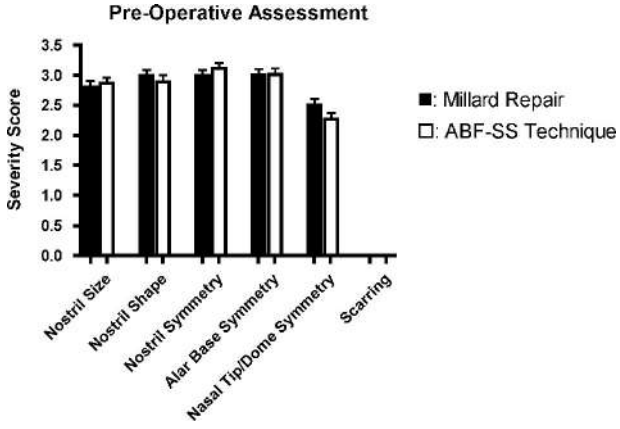

Fig. 12. Preoperative Assessment.

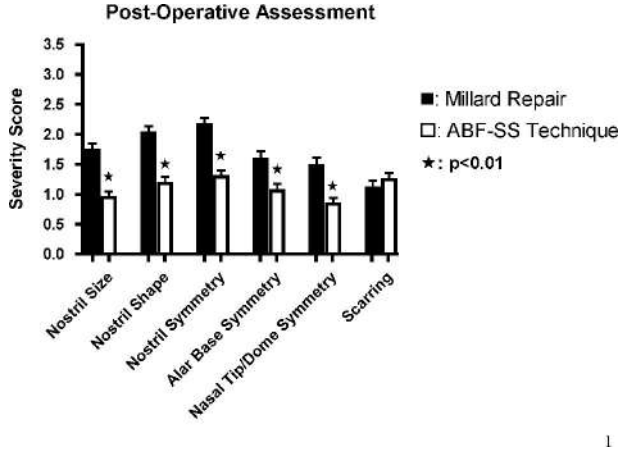

Fig. 13. Postoperative Assessment.

deformity. This technique is not aimed at obviating the need for secondary septorhinoplasty once nasal and septal development has occurred. However, by restoring the nasal symmetry while preserving the integrity of the lower lateral cartilage, this approach facilitates secondary rhinoplasty at a later stage. The results of the study display statistical and clinical superiority only for unilateral complete clefts. However, this technique can also be easily extrapolated and incorporated in the repair of the cleft-lip rhinoplasty in patients with incomplete cleft-lip deformity or isolated nasal deformity revisions.

Clearly, a certain degree of selection bias is present because the study group has been operated on by an increasingly experienced surgeon. Longer follow-up will be required to confirm these results. The control group was selected from pictures predating the development of the described technique, which inevitably increases the tendency to show the best results of the time.

If a given repair universally corrected all clinical presentations of this deformity effectively, a consensus would exist on the repair method to be used. The multiple approaches and iterations to these techniques is a testament to the complexity and variation of the underlying anatomic deformity and the surgical repair necessary to correct it.

CONCLUSION

In our experience, the described technique achieves excellent cosmetic results by recreating a naturally appearing nostril size, shape, symmetry, as well as restoring alar base symmetry and nasal dome/tip symmetry. It can be easily incorporated in the concurrent primary rhinoplasty technique in the surgical repair of the unilateral cleft-lip deformity. These improvements are appreciated by both lay people and seasoned health care personnel experienced in the critical evaluation of esthetic results after cleft-lip rhinoplasty.

It is the opinion of the authors that overly aggressive, early single-stage approaches to cleft-lip rhinoplasty may disrupt subsequent normal growth and development of the alar cartilage. We believe in the importance of limiting the scope of the initial intervention to a cartilage-sparing technique that alters the underlying cartilaginous architecture without dividing or suturing the lower lateral cartilage. We therefore choose not to perform direct cartilaginous incisions or circumferential nasal skin incisions, relying only on the ones created to address the primary lip deformity.

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