A New Technique of Unilateral Cleft Lip Repair with Scarless Cupid's Bow Peaks

Hiromu Masuoka, M.D., Ph.D.

Osaka, Japan

Background: A novel technique for primary unilateral cleft lip repair with scarless Cupid's bow peaks is described. This technique focuses on the curvature of the Cupid's bow and the preservation of the minute three-dimensional structure around the cleft-side peak of the Cupid's bow, such as the cutaneous roll and white skin roll. This technique has been used in 50 consecutive unilateral cleft lip repairs by a single surgeon.

Methods: The flap from the lateral lip is expanded into a three-stair flap, including a lateral white lip flap, a cutaneous roll flap, and a quadrangular mucovermilion flap as partial flaps. The cleft-side peak of the Cupid's bow is made to form a curved peak with the cutaneous roll. The suture lines pass through the lip columellar crease, philtrum ridge, and upper lip groove. These lines are stepwise, just like W-plasty, and do not cross the peak of the Cupid's bow. Measurements were obtained from three-dimensional photographs, and a visual assessment was performed by standard photographs taken 1 year or later postoperatively with no additional surgery, except for palatoplasty.

Results: The Noordhoff point was kept as the peak of the Cupid's bow with no scar. The three-dimensional structure, including the cutaneous roll around the cleft-side peak of the Cupid's bow, was well maintained.

Conclusion: The present technique allows for the fashioning of a reliable intended peak of the Cupid's bow without scarring on its point and preserves the three-dimensional structure, including the cutaneous roll. (*Plast. Reconstr. Surg.* 148: 597, 2021.)

I n recent years, unilateral cleft lip repair has focused on not only lengthening the white lip and shaping the Cupid's bow but also various issues of interest, such as scar line arrangements, the nasal structure, and anatomical subunits.[1–4] Rotation-advancement or the triangular technique had been widely applied to ensure the symmetrical setting of both peaks of the Cupid's bow.[1,5–7] Almost all of the techniques set the cleft-side peak point of the Cupid's bow at the suture line between the lateral and medial lip on the vermilion border, except for quadrilateral flap methods[8]; however, scarring through the peak sometimes causes excessive sharpening of the peak of the Cupid's bow or collapse around the peak.

In this article, the author reports a new technique for primary cleft lip repair focusing on the formation of the natural curvature of the peak of the Cupid's bow. It also simultaneously enables the preservation of the three-dimensional structure around the cleft-side peak of the Cupid's bow: the upper lip groove; the cutaneous roll, which is the anterosuperior convexity below the upper lip groove; and the white skin roll, which is the ridge at the vermilion cutaneous junction.

PATIENTS AND METHODS

Fifty consecutive patients with unilateral cleft lip with or without cleft palate, including 32 cases of complete unilateral cleft lip (10 with the Simonart band and 22 without) and 18 cases of incomplete unilateral cleft lip, underwent this operation performed by a single surgeon (H.M.)

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

Related digital media are available in the full-text version of the article on www.PRSJournal.com.

starting in June of 2012. Twenty-nine patients were male, and 21 were female. The mean age at the time of the operation was 3.9 months (range, 2.8 to 9.0 months) (Tables 1 and 2).

Markings

The operative markings are shown in Figure 1, *above.* The stepwise sequence of landmarks and the incision lines are also illustrated in the slide presentation. (**See Figure, Supplemental Digital Content 1**, which shows the sequence of landmarks and the incision lines, *http://links.lww.com/ PRS/E579*.)

Medial Lip

Points 1, 2, and 3 are the subnasale (sn) and the cranial end of the philtrum ridges at the lip-columellar crease. Point 4 is the deepest point of the Cupid's bow (ls). Points 5 and 6 are the peak of the Cupid's bow (cphi) and its corresponding point. Points 7 and 8 are marked on the upper lip groove at the philtrum ridge and its corresponding point. Point 9 is marked approximately 1.5 mm medial to point 6 on the vermilion border. Point 10 is marked at the line perpendicular to the vermilion border on point 9, such that length of 9-10 is equal to that of 6-8. Point 11 is marked slightly to the cranial side of point 9. Point 12 is the lateral end of the medial crural footplate, and point 13 is marked slightly caudal to its corresponding point.

Lateral Lip

Point 14 is the peak of the Cupid's bow on the lateral lip (cphi′) described by Noordhoff.[9] Point 15 is marked approximately 1.5 mm medial to point 14 on the vermilion border, the same as point 9. Points 16 and 17 are marked on the upper lip groove, such that line 15-16 is perpendicular to

Table 2. Patient Demographic Data

Characteristic	Value (%)
Age at surgery, mo	
Mean ± SD	3.93 ± 1.12
Range	2.8–9.0
Age at which 3D photograph was taken, mo	
Mean ± SD	56.8 ± 15.3
Range	15–94
Age at which 2D photograph was taken, mo	
Mean ± SD	55.0 ± 15.7
Range	15–86
Secondary rhinoplasty	21/30 (70)
With modification of the shape around the cutaneous roll	2 (6.7)
With simple scar revision of the white lip	8 (26.7)
With modification of the upper lip tubercle	2 (6.7)
With simple vermilion or mucosal reduction	7 (23.3)

3D, three-dimensional; 2D, two-dimensional.

the vermilion border, and such that the length of 16-17 is equal to 10-11. Points 18 and 19 are subalare (sbal, sbal′). Points 20 and 21 are marked corresponding to points 2 and 12 as described by Fisher.[10] The lengths of 6-9 and 14-15 can be adjusted according to the quality of the residual white skin roll around points 15 and 9 for each case. As a whole, only points 9, 15, 20, and 21 are adjusted to accommodate for case-by-case variations in lip dimensions, and lines 9-11-10, 22-15-16, and 21-20-17 associated with these points are determined by these adjustments.

Vermilion

A modified quadrangular mucovermilion flap 22-23-24-25 and insertion area 26-27-28 are made so that the lines 9-26 and 15-22 are approximately 1.5 mm farther medial than those described in the previous report.[11]

Maneuvers

Key landmarks are tattooed with pyoktanin blue solution using a 27-gauge needle. The medial and lateral lips, alar base of the cleft side, columella base, and piriform rim are infiltrated with 0.5% lidocaine with epinephrine 1:100,000. Incisions are made with a scalpel through the skin and subcutaneous tissue and completed with scissors. Dissection between the philtrum skin and muscle is limited to the extent that the muscles can be properly sutured.

On the medial element, the orbicularis muscle is freed from its abnormal attachments to the septum, nose, and maxilla. The muscle fibers are divided into the pars marginalis and the pars peripheralis at the level of point 10 toward the philtrum dimple. On the lateral element, abnormal attachments of muscle to the bone along the piriform rim and the alar base are released.

Table 1. Patient Demographic Data

Characteristic	No.	3D Photograph	2D Photograph
Sex			
Male	29		
Female	21		
Cleft type			
Complete			
Left	17	15	16
Right	5	4	4
Complete plus Simonart band			
Left	5	5	5
Right	5	3	4
Incomplete			
Left	13	10	10
Right	5	4	5
Total	50	41	44

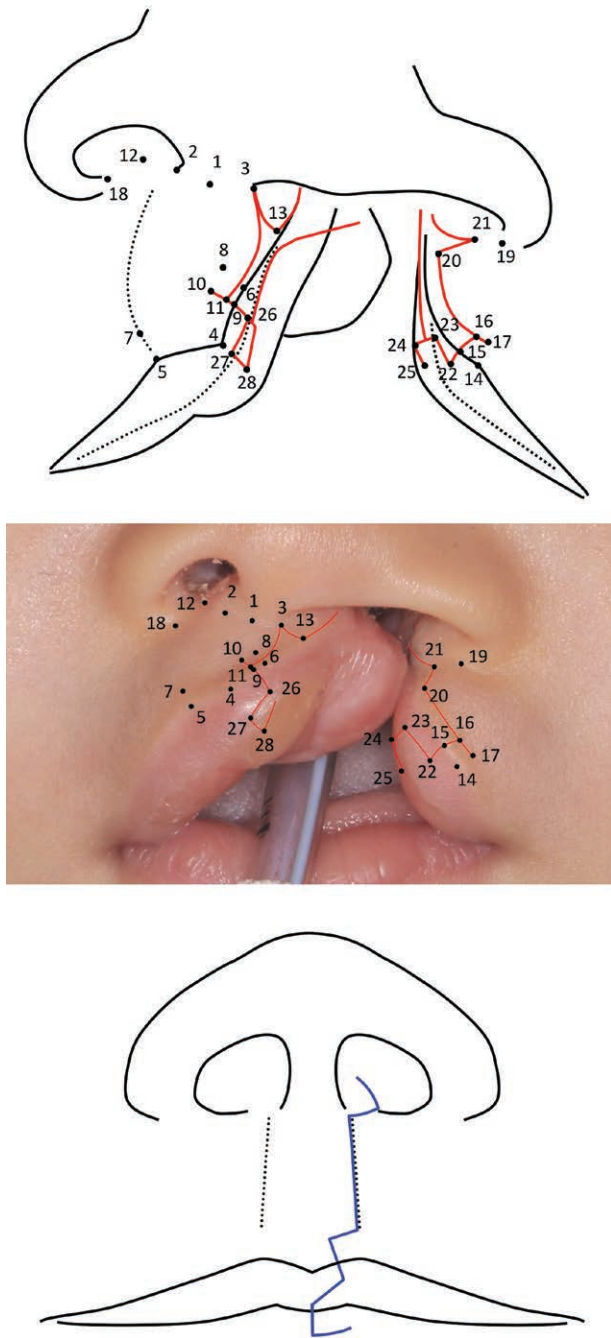3D, three-dimensional; 2D, two-dimensional.

598

Fig. 1. Schematic illustration of unilateral cleft lip repair, showing key landmarks and incision lines (*above*). The patient in the frontal view with markings and incision lines (*center*). After approximation. Note that the suture line goes across the vermilion border between the peak and the deepest point of the Cupid's bow (*below*).

The pars marginalis is separated from the pars peripheralis at line 16-17.

An intranasal incision is made along the vestibular web, and a back-cut is added to the upper end of the incision to advance the alar base anteromedially. (**See Figure, Supplemental Digital**

Content 2, which shows the intraoral and intranasal incision lines, *http://links.lww.com/PRS/E580*.) After the intranasal and oral mucosa are sutured, the pars peripheralis is sutured tightly. Buried sutures are made adjunctively. Both ends of the pars marginalis are rotated downward by suturing the superior side of the muscle belly to each other. (**See Figure, Supplemental Digital Content 3**, which shows division and sutures of the orbicularis oris muscle. Both ends of the pars marginalis are sutured with downward rotation, *http://links.lww.com/PRS/E581*.) As lines 10-11 and 17-16 are opened from 0 degrees to approximately 90 degrees and the surrounding areas are rotated to the correct position, the labial tubercle and the Noordhoff point protrude more forwardly. The quadrangular mucovermilion flap is then sutured softly to form the labial tubercle.[11]

The flap from the lateral lip is expanded into a three-stair flap, including the lateral white lip flap, cutaneous roll flap, and quadrangular mucovermilion flap as partial flaps. The cleft-side peak of the Cupid's bow is made to form a curved peak with the cutaneous roll. The upper vertical suture line corresponds to the philtrum ridge, the middle one crosses the vermilion border between the peak and the deepest point of the Cupid's bow, and the lower one passes through the midline from the caudal end of the vermilion to the mucosa. The upper horizontal suture line expresses the lip-columellar crease to the tip of the medial crural footplate along the nostril sill, and the middle is on the upper lip groove. These lines are stepwise, just like W-plasty, and do not cross the peak of the Cupid's bow (Fig. 1, *below*).

Analyses

Demographic and surgical details were obtained by reviewing the medical records. Measurements were obtained from three-dimensional photographs by a portable stereophotogrammetric device (VECTRA H1; Canfield Scientific, Inc., Fairfield, N.J.) taken 1 year or later postoperatively with no additional surgery, except for palatoplasty.

Measurement items were selected with the aim of examining whether the morphologic improvement of this method was appropriate compared to the conventional methods. The medial lip height (sn-cphi), lateral lip height (sbal-cphi), and lateral lip length (ch-cphi) were measured.[12–15] The hemi–Cupid's bow width (ls-cphi) and length from the deepest point to the scar on the vermillion border (ls-svb) were also measured (Fig. 2).

599

Fig. 2. Frontal schematic illustration with a description of the anthropometric landmarks according to Farkas and supplementary landmarks. *sn*, subnasale; *sbal*, subalare; *ch*, cheilion; *cphi*, crista philtra inferior; *ls*, labiale superius; *ulg*, upper lip groove on philtrum ridge; *svb*, scar on vermilion border.

Paired *t* tests were used to assess differences between cleft and noncleft sides for each measurement. Hedges' g statistic was used to measure the effect size for the difference between means. The ratios of the length of ls-svb to the length of ls-svb were calculated as the location of the scar on the vermilion border.

The shape of the Cupid's bow and the cutaneous roll were assessed visually by two-dimensional photographs, including frontal and worm's-eye views by digital single-lens reflex cameras. Assessments were performed by three plastic surgeons.

RESULTS

The three-dimensional photographs of 41 patients were obtained. One year had not yet elapsed since the operation in five patients, and another three were lost to follow-up before the introduction of the three-dimensional device in our institute. Another patient with a Tessier number 7 facial cleft was excluded from the evaluation. The mean postoperative period when three-dimensional photographs were taken was 52.4 months (range, 12 to 88 months) (Tables 1 and 2).

The measured values and calculated data of photogrammetry are shown in Table 3. The medial lip height on the cleft side was 0.19 mm longer than that of the noncleft side. The lateral lip height and lateral lip length on the cleft side were 1.23 mm and 1.26 mm shorter than those of the noncleft side, respectively. The hemi–Cupid's bow width was 0.03 mm longer than that of the noncleft side.

The two-dimensional photographs of 44 patients were obtained. Representative cases are shown in Figures 3 through 5. [See Video (online), which shows a rotating three-dimensional image of the same patient as in Fig. 3.] The intended peak of the Cupid's bow was maintained at the Noordhoff point except for in three patients in whom the peak was formed on the suture line. Discontinuity of the vermilion border on the suture line, probably because of technical error in tattooing or suturing, was observed in two patients. The cutaneous roll and white skin roll around the cleft-side peak of the Cupid's bow could be clearly
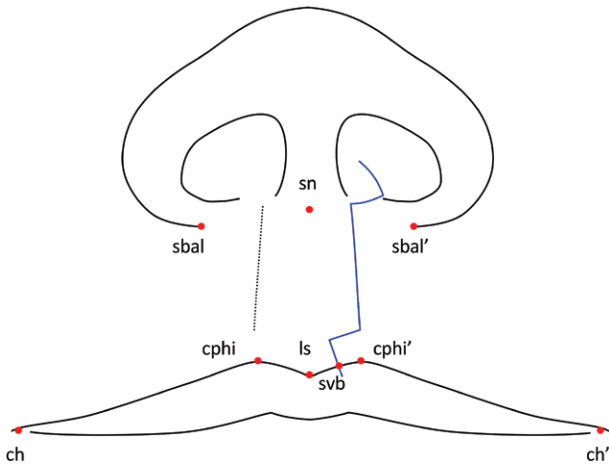
Table 3. Anthropometric Measurements*

	Mean	SD	t	p	Effect Size
Medial lip height (sn-cphi), mm					
Noncleft side	12.02	1.57			
Cleft side	12.21	1.53	1.02	0.32	0.16
Lateral lip height (sbal-cphi), mm					
Noncleft side	13.05	1.33			
Cleft side	11.81	1.29	6.89	<0.01	1.08
Lateral lip length (ch-cphi), mm					
Noncleft side	21.57	2.67			
Cleft side	20.31	2.18	4.73	<0.01	0.74
Hemi–Cupid's bow width (ls-cphi), mm					
Non–cleft side	5.64	1.01			
Cleft side	5.67	1.06	0.23	0.82	0.04
The location of the scar on the vermilion border (ls-svb, cphi′-svb), mm					
Medial (ls-svb)	3.84	0.97			
Lateral (cphi′-svb)	1.87	0.65			
Ratio of ls-svb/ls-cphi′	0.69	0.15			
Design at the time of operation					
Medial (ls-svb, 4-9)	2.59	0.37			
Lateral (cphi′-svb, 14-15)	1.44	0.26			
Ratio of ls-svb/ls-cphi′	0.65	0.09			

*n = 41 patients

600

Fig. 3. Case 1. A 3-month-old patient with complete cleft lip with the Simonart band, alveolus, and palate. Surgical markings (*above*), just after muscle and buried sutures (*center*), and 4 years postoperatively (*below*).

identified in 41 patients. In two other patients, these features were unclear, although the cutaneous roll and white skin roll on the noncleft side were as unclear as those on the cleft side. In the remaining patient, the cutaneous roll and white skin roll around the cleft-side peak of the Cupid's bow had disappeared (Table 4). The ideal timing for considering rhinoplasty (preschool age) had already passed in 30 patients, and only two required modification of the shape of the cutaneous roll or vermilion border; nine patients did not require revision surgery, including rhinoplasty (Tables 1 and 2).

DISCUSSION

We developed a modified method of the small triangular flap technique focusing on the formation of the natural curvature of the peak of the Cupid's bow. We found that three-dimensional photographs revealed the existence of a cleft-side peak of the Cupid's bow in the proper position, as planned. Furthermore, the results showed the efficient extension of the medial lip height. In contrast, the lateral lip height and lateral lip length of the cleft side were slightly shorter than those of the noncleft side. However, these values were comparable to those obtained with conventional methods.[13,14]

Fig. 4. Case 2. A 2-month-old patient with complete cleft lip and alveolus. Appearance preoperatively (*above*) and 6 years postoperatively (*below*).

To compensate for deficiencies in the philtrum length, the Millard's rotation-advancement method and its modifications are widely accepted by many cleft surgeons.[1–4] Triangular flap and small triangular flap methods also have a similar role, although the flap insertional area for lengthening the philtrum differs from that with Millard's method.[5–7,16–18] The extension effect of the triangular flap method is determined by the base width of the flap; however, this effect is theoretically restricted around the base of the triangular flap. Therefore, the cutaneous-vermilion flap under the incision line for the insertion of the triangular flap in the medial lip is strongly rotated downward, causing a bend in the vermilion border at the base of the flap, which we define as the bending effect. This bending effect causes a peak at an inappropriate position (i.e., the resulting peak moves medial to the intended peak point). Furthermore, two peaks on the cleft side are sometimes seen when the Noordhoff point is preserved laterally. [**See Figure, Supplemental Digital Content 4**, which describes the theory of the intended and unintended peaks of the Cupid's bow. (*Above*) Schematic illustration of the small triangular flap method. The peak of the Cupid's bow is intended to be on the suture line. (*Second row*) An unintended peak appears more medial than the

intended peak point. The green lines represent the most strained line. A case with an unintended peak (P') by the small triangular flap method is shown (*inset*). (*Third row*) Two peaks appear on both sides of the suture line. A case with two peaks created by a small triangular flap is shown (inset). (*Below*) Schematic illustration of the present method, *http://links.lww.com/PRS/E582*.]

Although some are of the opinion that a triangular flap induces drooping of the peak,[19] it has not yet been previously reported that the aforementioned curvature can occur at the insertion area medial to the peak. This unintended bending effect of the curvature around the peak of the Cupid's bow coincides with the lateral vermilion flaps during bilateral cleft lip repair.[20,21] [**See Figure, Supplemental Digital Content 5**, which shows a theory of the bending effects of the small triangular flap method and the present method in unilateral cleft lip repair and the expected bending effects of lateral flaps in bilateral cleft lip repair. (*Above*) A theory of an unintended bending effect with the small triangular flap method. The vermilion border in the *green circle* is affected by bending the flap. (*Below*) The bending effect works effectively at the intended peak, *http://links.lww.com/PRS/E583*.] Regarding this bending effect, the

Fig. 5. Case 3. A 3-month-old patient with incomplete cleft lip, alveolus, and palate. Appearance preoperatively (*above*) and 1 year 6 months postoperatively (*below*).

Table 4. Results of Assessments by Two-Dimensional Photographs

Characteristic	No. (%)
Incorrect peak position	3 (6.8)
Scar contracture	2 (4.5)
Discontinuity of the vermilion border	2 (4.5)
Disappearance of the cutaneous roll	1 (2.3)

Millard rotation-advancement flap method and its variants are likely to prevent these deformities because the medial lip is rotated as a whole without excessive rotation around the vermilion border,[1,2,9,22] and the appropriate curvature or angle is relatively difficult to adjust on the suture line. In the present method, there is almost no bending effect in the medial lip. In contrast, the bending effect works effectively to emphasize the peak at the Noordhoff point in the lateral lip. (**See Figure, Supplemental Digital Content 5**, *below*, which shows that the bending effect works effectively at the intended peak, *http://links.lww.com/PRS/E583*.) Furthermore, the projection effect around the peak and preservation of the cutaneous roll can be expected simultaneously. The division between the pars peripheralis and the pars marginalis of the orbicularis oris muscle and the appropriate suturing of these muscles are also important factors for successfully achieving sufficient effects.

The cutaneous roll and white skin roll of the lateral lip promptly decline on the medial side of the Noordhoff point in cleft patients[9,16]; the place where they disappear completely is usually 1 to 3 mm medial to the Noordhoff point. In the medial lip, the cutaneous roll and white skin roll are usually absent around the corresponding point of the non–cleft-side peak of the Cupid's bow. Therefore, the interruption occurs at the suture line. This interruption exists at the peak point in previous methods. Thus, the structure around the peak is disturbed. In contrast, the white skin roll continues around the peak in the present method. Careful steps have been taken to preserve the three-dimensional structure originally existing around the Cupid's bow as much as possible in the present method. The cutaneous roll flap resembles the quadrilateral flap, although it differs in range and size.[8,23] However, the conventional quadrilateral flap causes insufficiency in either the vermilion height or the width of the lateral lip of the cleft side. With the present method, the height of the vermilion is created from both that of the medial lip and the lateral lip, and the width of the lateral lip is preserved using the Noordhoff point as the peak; therefore, these structures are relatively well preserved.[11] Considering the measurement results in our study, the peak of the Cupid's bow was kept almost exactly on the Noordhoff point. Of note, however, this preservation of the point has simultaneously resulted in the slight shortage of the lateral lip length on the cleft side.[4,24] Our results also showed that the medial lip height was sufficient compared with the noncleft side; however, a shortage of 1.2 mm was seen in the lateral lip height. This distortion might be attributable to the remaining deviation of the columella on the noncleft side after primary lip repair, as the medial crura of the lower lateral cartilage have not yet been aligned. Because of the fragility of the nasal cartilage of Japanese infants, treatments for a slanting nasal tip, drooping alar rim, and misaligned medial crura of lower lateral cartilages are performed by secondary surgery at preschool age.[25]

The present technique has the advantage of reducing the number of scars around the cutaneous roll, similar to the mucovermilion quadrangular flap technique on the vermilion as described in our previous report.[11] The suture lines between the nostril floor and the midline of vermilion are stepwise, as

603

with W-plasty, and no suture line exists on the caudal side of the philtrum ridge; these facts help eliminate any impression of the congenital cleft.

The present method was able to shape the curvature of the Cupid's bow without causing a scar at the peak point and helped preserve its protruding three-dimensional structure; however, some limitations are associated with this study. First, it was impossible to detect and analyze the protrusion of the cutaneous roll because the geometry resolution of the three-dimensional camera was 0.8 mm. Therefore, the efficacy of the minute three-dimensional reconstruction remains only a theory after all, because we cannot measure the three-dimensional structures reconstructed by the present method. As a result, we were only able to present three-dimensional video findings and assessed these structures based on the obtained visual impression. Second, the results were unable to be compared properly because of the small number of cases performed by means of conventional methods by the same surgeon. Nonetheless, the technical effects based on the theory were successfully confirmed.

We reported a new technique of unilateral cleft lip repair that has achieved improvements in lip measurements comparable to several previously available methods. As several issues remain to be resolved, such as the wide Cupid's bow and shorter lateral lip on the cleft side,[24] further modification should be considered in a future study.

CONCLUSIONS

A technique of unilateral cleft lip repair that allows for the formation of a reliable intended peak of the Cupid's bow without scarring on its point while preserving the three-dimensional structure, including the cutaneous roll around the peak of the Cupid's bow, was described. This method can help create a three-dimensionally natural contour for unilateral cleft lip patients.

Hiromu Masuoka, M.D., Ph.D.
Department of Plastic and Reconstructive Surgery
Kansai Medical University
2-5-1 Shinmachi, Hirakata City
Osaka 573-1010, Japan
masuokah@hirakata.kmu.ac.jp

REFERENCES

1. Millard DR. *Cleft Craft: The Evolution of Its Surgery. Vol. 1: The Unilateral Deformity.* Boston: Little, Brown; 1976.
2. Sitzman TJ, Girotto JA, Marcus JR. Current surgical practices in cleft care: Unilateral cleft lip repair. *Plast Reconstr Surg.* 2008;121:261e–270e.
3. Stal S, Brown RH, Higuera S, et al. Fifty years of the Millard rotation-advancement: Looking back and moving forward. *Plast Reconstr Surg.* 2009;123:1364–1377.
4. Marcus JR, Allori AC, Santiago PE. Principles of cleft lip repair: Conventions, commonalities, and controversies. *Plast Reconstr Surg.* 2017;139:764e–780e.
5. Tennison CW. The repair of the unilateral cleft lip by the stencil method. *Plast Reconstr Surg (1946)* 1952;9:115–120.
6. Randall P. A triangular flap operation for the primary repair of unilateral clefts of the lip. *Plast Reconstr Surg.* 1959;23:331–347.
7. Cronin TD. A modification of the Tennison-type lip repair. *Cleft Palate J.* 1966;3:376–382.
8. LeMesurier AB. The quadrilateral Mirault flap operation for hare-lip. *Plast Reconstr Surg (1946)* 1955;6:422–433.
9. Noordhoff MS. Reconstruction of vermilion in unilateral and bilateral cleft lips. *Plast Reconstr Surg.* 1984;73:52–61.
10. Fisher DM. Unilateral cleft lip repair: An anatomical subunit approximation technique. *Plast Reconstr Surg.* 2005;116:61–71.
11. Masuoka H. A quadrangular flap technique for vermilion repair in unilateral cleft lip. *Plast Reconstr Surg Glob Open* 2017;5:e1346.
12. Farkas LG, Munro IR. Anthropometric indices of the head and face. In: *Anthropometric Facial Proportions in Medicine.* Springfield, Ill: Charles C Thomas; 1987:163–319.
13. Mulliken JB, LaBrie RA. Fourth-dimensional changes in nasolabial dimensions following rotation-advancement repair of unilateral cleft lip. *Plast Reconstr Surg.* 2012;129:491–498.
14. Tse R, Lien S. Unilateral cleft lip repair using the anatomical subunit approximation: Modifications and analysis of early results in 100 consecutive cases. *Plast Reconstr Surg.* 2015;136:119–130.
15. Knight ZL, Ganske I, Deutsch CK, Mulliken JB. The changing nasolabial dimensions following repair of unilateral cleft lip: An anthropometric study in late childhood. *Plast Reconstr Surg.* 2016;138:879e–886e.
16. Onizuka T. A new method for the primary repair of unilateral cleft lip. *Ann Plast Surg.* 1980;4:516–522.
17. Onizuka T, Ichinose M, Hosaka Y, Usui Y, Jinnai T. The contour lines of the upper lip and a revised method of cleft lip repair. *Ann Plast Surg.* 1991;27:238–252.
18. Nakajima T, Yoshimura Y. Early repair of unilateral cleft lip employing a small triangular flap method and primary nasal correction. *Br J Plast Surg.* 1993;46:616–618.
19. Nakajima T, Tamada I, Miyamoto J, Nagasao T, Hikosaka M. Straight line repair of unilateral cleft lip: New operative method based on 25 years experience. *J Plast Reconstr Aesthet Surg.* 2008;61:870–878.
20. Mulliken JB. Principles and techniques of bilateral complete cleft lip repair. *Plast Reconstr Surg.* 1985;75:477–487.
21. Millard DR. *Cleft Craft: The Evolution of Its Surgery. Vol. 2: The Bilateral Deformity.* Boston: Little, Brown; 1977.
22. Mohler LR. Unilateral cleft repair. *Plast Reconstr Surg.* 1987;80:511–516.
23. Mishra RK, Agarwal A. White roll vermilion turn down flap in primary unilateral cleft lip repair: A novel approach. *Indian J Plast Surg.* 2015;48:178–184.
24. Chou PY, Luo CC, Chen PK, Chen YR, Noordhoff MS, Lo LJ. Preoperative lip measurement in patients with complete unilateral cleft lip/palate and its comparison with norms. *J Plast Reconstr Aesthet Surg.* 2013;66:513–517.
25. Masuoka H, Kawai K, Morimoto N, Yamawaki S, Suzuki S. Open rhinoplasty using conchal cartilage during childhood to correct unilateral cleft-lip nasal deformities. *J Plast Reconstr Aesthet Surg.* 2012;65:857–863.