OPEN

ORIGINAL ARTICLE
Pediatric/Craniofacial

One-flap Palatoplasty: A Cohort Study to Evaluate a Technique for Unilateral Cleft Palate Repair

Percy Rossell-Perry, PhD, FACS*†
Omar Cotrinal-Rabanal, DDS‡
Evelyn Caceres-Nano, SLP§

Background: The 2-flap palatoplasty technique is actually the approach most commonly used in the United States for cleft palate repair. This is a one-time surgery that enables closure under minimal tension, lowering rates of subsequent fistula development. However, its primary disadvantage is potential detriment to maxillary growth (due to extent of dissection on both sides of the cleft and raw lateral surfaces). Since 2007, a surgical technique using only one mucoperiosteal flap from the noncleft side has been performed by us, reducing the extent of the surgery and its potential nondesirable effects over the palate. The purpose of this study is to evaluate the utility of this technique for unilateral cleft palate repair.
Methods: This is a retrospective, simple-blinded cohort study between 2 groups of 120 patients each with unilateral cleft palate who were operated on using the 2-flap and 1-flap techniques by the Outreach Surgical Center Program Lima from 2007 to 2012. Data collection was accomplished by physical examination to evaluate the presence or absence of a fistula and to evaluate the presence of hypernasality. Postoperative bleeding was also studied.
Results: We have observed no increase in the rate of fistulas and velopharyngeal insufficiency between these 2 studied groups ($P = 0.801$ and $P = 1.000$).
Conclusions: Use of a 1-flap technique for unilateral cleft palate repair allowed us to achieve results comparable to those of a 2-flap technique in terms of postoperative fistula development and hypernasal speech. Additional studies are required to evaluate the effect of this technique on palatal growth. *(Plast Reconstr Surg Glob Open 2015;3:e373; doi: 10.1097/GOX.0000000000000342; Published online 13 April 2015.)*

The 2-flap palatoplasty technique plus intravelar veloplasty is actually the approach most commonly used in the United States for cleft palate repair.[1] This method, described more than 45 years ago by Bardach,[2] is a one-time surgery that enables closure under minimal tension, lowering rates of subsequent fistula development. However, its primary disadvantage is potential detriment to maxillary growth (due to extent of dissection on both sides of the cleft and raw lateral surfaces), even though functional velar competence may be achieved, conferring proper resonance during speech and preventing nasal regurgitation of food or liquids.

Various studies have described the detrimental impact on palatal growth of early 1-stage cleft palate surgery via 2-flap palatoplasty.[3–5] Subsequently, strategies such as the 2-stage palatoplasty have been used

*From the *Post Graduate Studies, Faculty of Medicine, San Martin de Porres University, Lima, Peru; †Padre Tezza Clinic, Lima, Peru; ‡ARMONIZAR Foundation, Lima, Perú; and §School of Pedagogic Training of Lima, Lima, Peru.*

Received for publication November 13, 2014; accepted February 26, 2015.

DOI: 10.1097/GOX.0000000000000342

Disclosure: *The authors have no financial interest to declare in relation to the content of this article. The Article Processing Charge was paid for by the authors.*

to minimize such undesirable outcomes, despite the higher rates of fistula development and negative speech outcomes documented for these alternatives by some investigators.[6–8] Then again, the multicenter, controlled SCANDCLEFT clinical trial recently reported similar results for 1- and 2-stage techniques[9]; recently published findings of a systematic literature review indicate that scientific evidence for the superiority of a 2-stage technique (vomer flap) over a palatal flap (1-stage repair) remains inconclusive as far as impact on maxillary growth.[10]

To reduce the extent of reparative palatal surgery and related unwanted effects, we are using a surgical technique that involves just one mucoperiosteal flap (ie, 1-flap method) raised from the noncleft side. We should clarify that this approach differs from a 2-flap technique relative to hard palate dissection only. Soft palate surgical treatment is identical for both techniques. Furthermore, our procedure is not new, having recently been described as part of a related surgery (combining a buccal fat pad flap) in a small series of 3 patients.[11] Nevertheless, the merit of this combination was not proven through formal evaluation, and the cleft side was used for palatal flap elevation.

In a case report, Gillet and Clarke[12] described a hybrid technique incorporating a posterior-based flap (on cleft side) and a von Langenbeck bipedicled flap (on noncleft side). Another publication has detailed the use of one flap raised from noncleft side as a modification of the von Langenbeck technique (bipedicled flap), but this method also relies on surgical incisions at the cleft side of palate.[13]

This particular study is a long-term undertaking, encompassing a large series ($N = 240$) of cleft palate repairs performed by a single surgeon (P.R.-P.). Reported herein is the first in a 3-phase investigation examining the utility of our technique for unilateral cleft palate repair. Forthcoming reports will focus on assessing maxillary growth at 5 and 18 years.

MATERIALS AND METHODS

For this retrospective and simple-blinded study of patients diagnosed with unilateral cleft palate, subjects were stratified by reparative surgical approach (2-flap and 1-flap techniques). All data accrued between years 2007 and 2012 (Table 1). Overall, 373 patients underwent corrective surgery (2-flap technique, 197; 1-flap method, 176), with 2 groups (120 each) that qualified by completing required postoperative evaluation.

All patients were diagnosed with unilateral cleft palate, all were operated upon at 12 months of age, and all surgeries were done by the same plastic surgeon (P.R.-P.). The study protocol was approved by our Ethical Committee. Parents of each patient were informed of the nature of techniques used and granted signed consent.

Table 1. Characteristics of Patients with Unilateral Cleft Palate Surgery Stratified by Type of Palatal Index ($n = 120$)

	Group A	Group B	
	n (%)	*n* (%)	*P**
Gender			
Male	76 (63.33)	80 (66.66)	
Female	44 (36.66)	40 (33.33)	
Total	120	120	0.685
Degree of severity			
Mild (<0.2)	13 (10.83)	16 (13.33)	
Moderate (0.2–0.4)	48 (40.00)	41 (34.16)	
Severe (>0.4)	59 (49.16)	63 (52.50)	
Total	120	120	0.062

Group A, 2-flap technique; group B, 1-flap technique.
*Chi-square test.

Study Groups

Patients of groups A (2-flap procedure) and B (1-flap procedure) underwent palatoplasty plus Sommerlad intravelar veloplasty.[14] Data collected included physical examination findings of a physician checking for fistulas, and evaluations of velopharyngeal function (especially moderate or severe postoperative hypernasality), done according to Henningsson et al[15] and John et al[16] by a single speech therapist. Outcomes of surgeries were recorded as simple blinded assessments.

Surgical Outcomes

Palatal fistula, velopharyngeal insufficiency (VPI), and postoperative hemorrhage served as measures of surgical outcomes.

Palatal fistula was defined as communication (symptomatic or not) between nose and oral cavity in hard or soft palate after primary palatoplasty, excluding nasoalveolar (anterior) fistulas (types VI and VII of the Pittsburgh classification system). This outcome was evaluated at 2 years old.

Of note, alveolar clefts are not closed primarily in our program. *Velopharyngeal insufficiency* was defined as inability of velopharyngeal sphincter to produce normal speech, which for practical purposes was considered nasal escape of air with increased resonance during speech (hypernasality). Nasal resonance was assessed perceptually, using high vowels in single words and connected speech to rate hypernasality. This postsurgical outcome was evaluated before 5 years of age.

Postoperative hemorrhage was defined as significant postsurgical bleeding emanating from wound

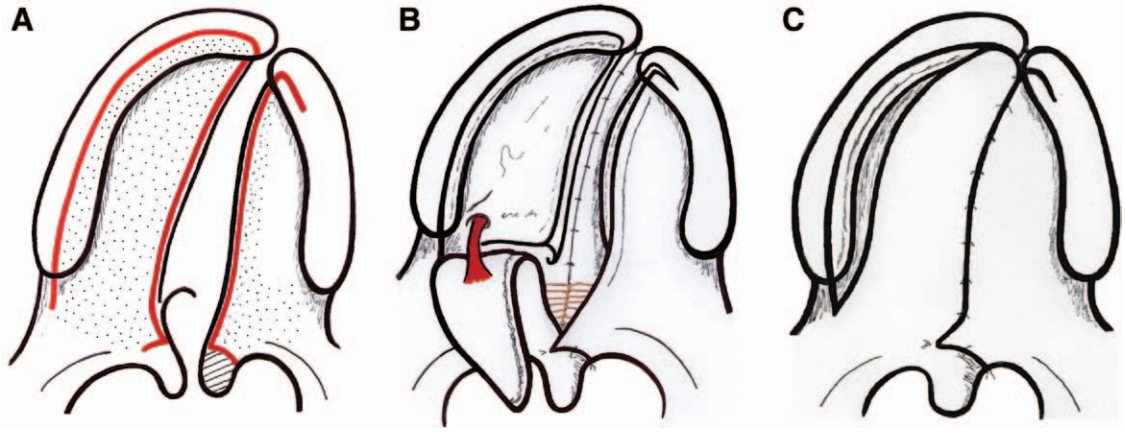

Fig. 1. The 1-flap technique for unilateral cleft palate repair. A, Surgical incisions and subperiosteal (hard palate) and submucosal (soft palate) dissection (dotted area). B, Unilateral flap elevation, muscle repair, and nasal mucosa closure. C, Oral mucosa closure leaving unilateral raw surface.

sites and requiring surgical revision. All instances were gauged according to cleft severity (based on palatal index) as follows: mild (<0.2), moderate (0.2–0.4), and severe (>0.4).[17] Palatal index is the proportion between width of cleft (cleft severity) and the sum of both palatal segment widths (tissue deficiency) measured at the junction of hard and soft palates.

Surgical Technique: One-flap Palatoplasty

With the patient in supine position and the neck extended, a Dingman mouth gag was applied and incisions were marked with methylene blue (Fig. 1). Local anesthesia, consisting of 2% lidocaine with epinephrine 1:200,000 (0.5 ml/kg), was infiltrated into palatal tissues 5–7 minutes before the start of surgery. As marked, incisions were made with a no. 15 blade.

Unilateral uvuloplasty technique was applied, retaining the larger of the 2 hemi-uvulae (ie, the smaller was excised).[18] On the side of retained hemi-uvula, a full-thickness mucosal incision was made along the cleft margin of soft palate and up to the base of this hemi-uvula, preserving uvular muscle. Mucoperiosteal flaps were devised through cautery on noncleft sides. Each incision ran along the edge of palate, over the gingiva and just medial to the line of dental eruption, as in the alveolar extension palatoplasty of Carstens[19] (Figs. 2 and 3). A 1-cm lateral extension over soft palate was needed to prevent any tension on midline closure at this level. Minor subperiosteal dissection was also required at cleft side to facilitate midline closure (Fig. 1).

A small (1-cm) incision of anterior gingival mucosa was used to ease surgical closure at anterior-most portions of the cleft (Figs. 1A and 2). In instances of severe unilateral clefting, a small relaxing incision (2 cm) was made on cleft side, in a line between gingival and palatal mucosa (Figs. 3 and 4). Severity of cleft was determined by palatal index.[17]

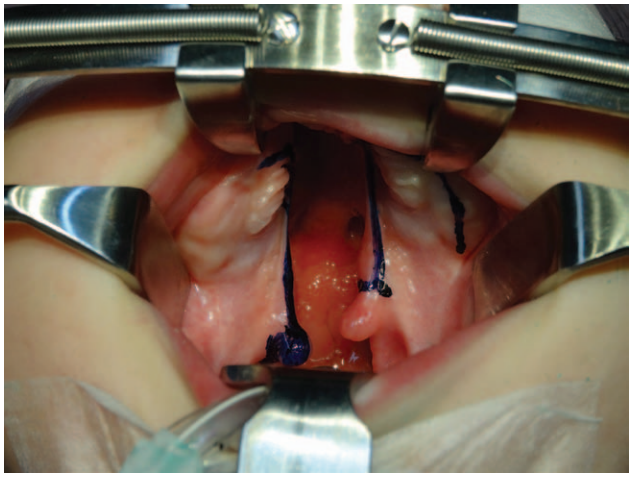

Fig. 2. The 1-flap surgical technique's markings.

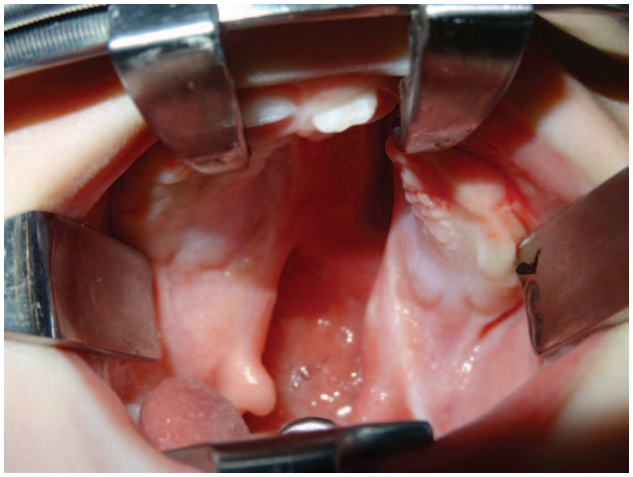

Fig. 3. Severe unilateral cleft palate.

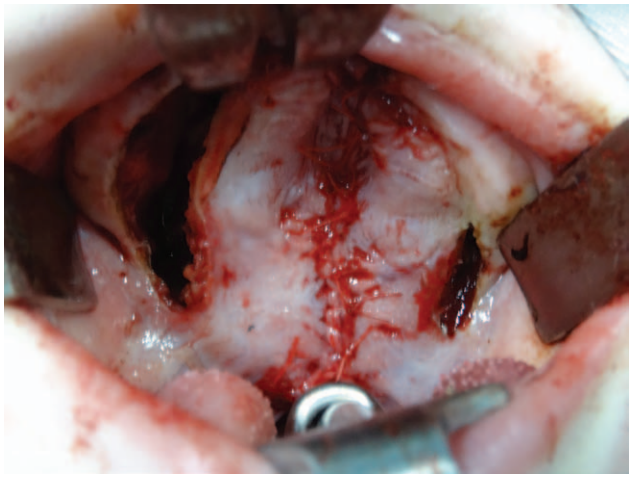

Fig. 4. Severe unilateral cleft palate repaired using 1-flap technique plus cleft side relaxing incision.

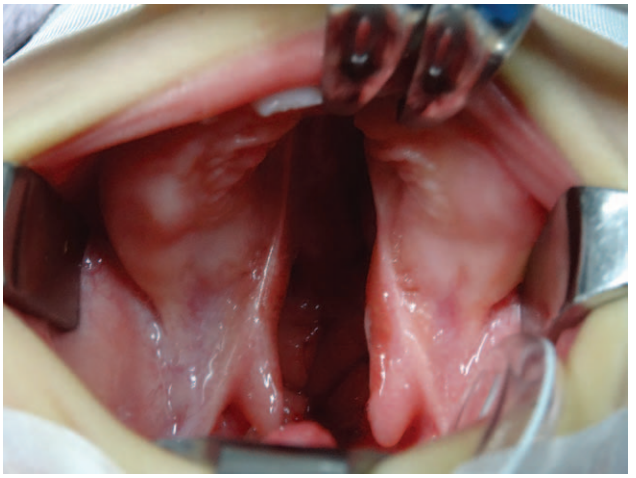

Fig. 5. Case 1: Preoperative view of moderate unilateral cleft palate (palatal index: 0.3).

The edge of each cleft was cut in continuity with uvular incisions bilaterally, leaving sufficient mucosa of vomer for nasal-side closure. Mucoperiosteal flap elevation started at the anterior-most portion of hemipalate and continued up to palatal pedicle. Thereafter, the neurovascular bundle was mobilized by blunt dissection, with firm but gentle traction to pull and further loosen it from greater palatine foramen. Surgeries concluded with muscle repairs via Sommerlad intravelar veloplasty (Fig. 1B).

At completion, mucosa was carefully closed, using absorbable 5-0 suture for border-to-border edge approximation (Figs. 5–13). All patients of group B underwent conventional 2-flap procedures, as described by Bardach.[2]

Statistical Analysis

Fisher's exact test and the 2-proportion *Z*-test were engaged to compare both surgical methods by defined outcome measures. For statistical significance, an α error ≤ 0.05 was set. All confidence intervals were expressed at 95%, and the power analysis of the study has been estimated in 80%. Standard software (SPSS v15.0; SPSS, Chicago, Ill.) was used for data analysis.

RESULTS

Patient characteristics (number and type of cleft) are presented in Table 1. The study population was normally distributed. In comparing the 2 methods of unilateral cleft palate repair, no statistically significant difference was demonstrable with respect to development of fistulas ($P = 0.801$) and moderate or severe postoperative hypernasality ($P = 1.000$) (Table 2 and Figs. 5–13).

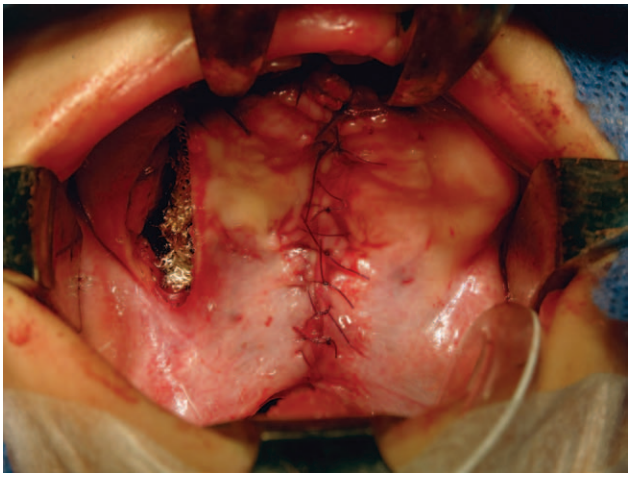

Fig. 6. Postoperative view of the repaired moderate unilateral cleft palate using the 1-flap technique.

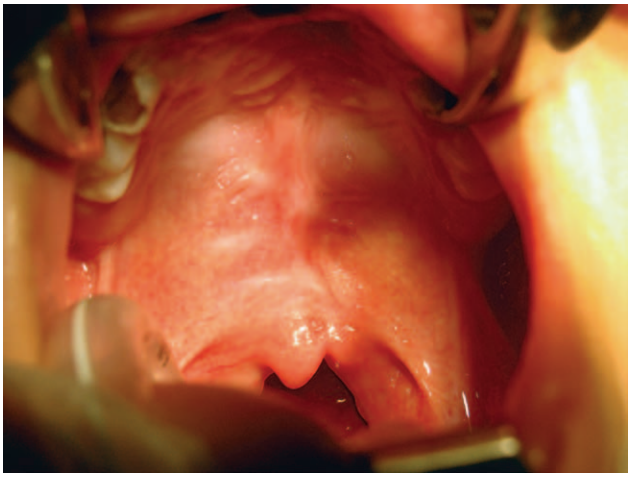

Fig. 7. Long-term postoperative view of the repaired moderate unilateral cleft palate using the 1-flap technique (4 years old).

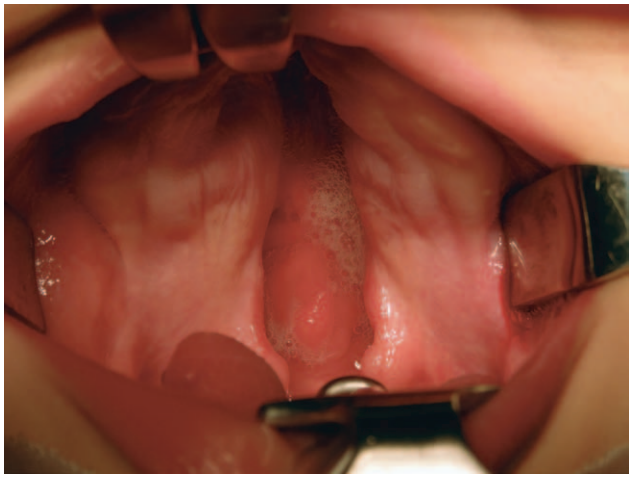

Fig. 8. Case 2: Preoperative view of moderate unilateral cleft palate (palatal index: 0.28).

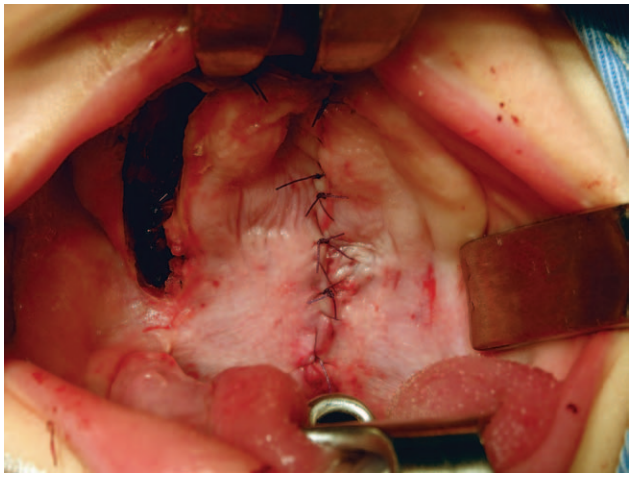

Fig. 9. Immediate postoperative view of a moderate unilateral cleft palate after using the proposed technique.

Fig. 10. Long-term postoperative view of the repaired moderate unilateral cleft palate using the 1-flap technique (5 years old).

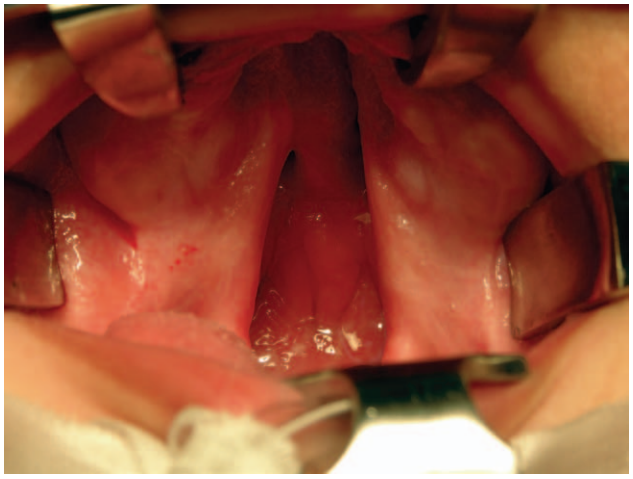

Fig. 11. Case 3: Preoperative view of moderate unilateral cleft palate (palatal index: 0.25).

Fig. 12. Postoperative view of the moderate unilateral cleft palate repaired using the 1-flap technique.

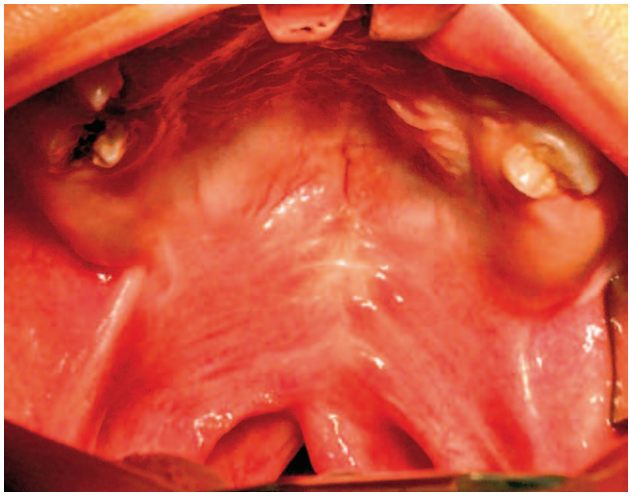

Fig. 13. Long-term postoperative view of the repaired moderate unilateral cleft palate using the 1-flap technique (2 years old).

Table 2. Comparison of 2 Methods of Unilateral Cleft Palate Repair according to the Development of Fistulas, Velopharyngeal Insufficiency, and Postoperative Bleeding (Outreach Surgical Center Program Lima 2007–2012)

	Group A	Group B		
	n (%)	*n* (%)	*P*	CL
Fistulas				
Mild	1/13 (7.69)	1/16 (6.25)		
Moderate	3/48 (6.25)	2/41 (4.87)		
Severe	6/59 (10.16)	5/63 (7.93)		
Total	9/120 (7.5)	8/120 (6.66)	0.801*	(−0.0565721, 0.0732387)
VPI				
Mild	1/13 (7.69)	2/16 (12.5)		
Moderate	3/48 (6.25)	3/41 (7.31)		
Severe	3/59 (5.08)	2/63 (3.17)		
Total	7/120 (5.83)	7/120 (5.83)	1.000*	(−0.0593034, 0.0593034)
Bleeding				
Mild	1/13 (7.69)	0/16 (0)		
Moderate	4/48 (8.33)	2/41 (4.87)		
Severe	3/59 (5.08)	2/63 (3.17)		
Total	8/120 (6.6)	4/120 (3.33)	0.375†	(−0.0216518, 0.0883185)

Group A, 2-flap technique; group B, 1-flap technique.
*Two proportion *Z*-test.
†Fisher's exact test.
VPI, velopharyngeal insufficiency.

Table 3. Comparison of 4 Surgical Techniques Used for Unilateral Cleft Palate Repair

	Surgical Techniques			
Parameters	**Two Flap**	**One Flap**	**Delayed Soft Palate Repair***	**Delayed Hard Palate Repair†**
Hard palate dissection	Increased	Intermediate	Increased	Reduced
Relaxing incisions	Bilateral	Unilateral	Required in severe forms	Not required
Surgical time	One	One	Two	Two
Rate of fistula	Low	Low‡	Increased[9,14]	Increased
VPI§	Similar	Similar	Similar	Similar
Maxillary growth disturbance	Similar[9,10]	Not studied	Similar[9,10]	Similar[9,10]

*Oslo protocol.
†Gothenburg protocol.
‡Low rate of fistula in mild and moderate cleft palates (2.5%).
§Repair of the soft palate is conventional in all techniques using radical intravelar veloplasty.[14]
VPI, velopharyngeal insufficiency.

All these fistulas were located at the middle third of the palate in both groups.

Although the absolute number of postoperative bleeding episodes was higher in group A (vs group B), the difference was not statistically significant ($P = 0.375$) (Table 2).

DISCUSSION

Using the 2-flap palatoplasty plus intravelar veloplasty muscular repositioning technique, we were able to corroborate outcomes reported by a number of other investigators.[20–22]

However, there are notable limitations to extensive surgical dissection in both segments of palate (cleft and noncleft side) at an early age, leaving raw lateral surfaces. The original illustration of Bardach shows a surgical closure without raw lateral surfaces, which is not technically feasible with wider clefts (moderate to severe palatal index).[17]

Herein, we report anatomic and functional outcomes for our 1-flap technique that are similar to those of a conventional 2-flap approach. The 2 methods did not differ significantly in terms of fistula development ($P = 0.801$) and demonstrable postoperative hypernasality (moderate or severe; $P = 1.000$). Given that age, gender, surgeon, and type of cleft were similar in both groups studied, it is fair to conclude that all surgical outcomes were directly related to 1- or 2-flap surgical technique (Table 1). Hence, good results are possible using a 1-flap procedure for unilateral cleft palate repair (Figs. 5–13).

Rates of fistula development recorded in our patients were similar to or even lower than those of other publications (0–58%).[23–25] Most postoperative

fistulas developed in patients with severe clefting (group A, 66.6%; group B, 62.5%) (Table 2), which validates use of the palatal index to establish severity of cleft palate.[17,26–28] This method allowed us to examine the relationship between severity of clefting (gauged by palatal index) and surgical outcomes.

Muzaffar et al,[29] Rohrich et al,[30] Schultz,[31] Landheer et al,[32] and Yuan et al[33] have all reported a direct association between extent of clefting (measured by width of cleft) and fistula rate. In our view, however, palatal index is a better predictor of surgical outcome than width of palatal cleft. In both groups of this study, we saw an increased number of postoperative fistulas in patients with severe unilateral cleft palate (palatal index >0.4), attributable to insufficient mucoperiosteal tissue for defect repair (Table 2).

Our data also demonstrated similar procedural efficacies in achieving anatomic and functional palatal closure, albeit with less surgical dissection necessitated by a 1-flap technique. The potentially negative impact of these procedures on facial growth awaits further study. With respect to instances of postoperative hemorrhage, the increased number of bleeding episodes recorded for group A may be related to the extensive surgical dissection required for a 2-flap technique.

Based on our experience and findings of recent studies, it seems logical that palatal fistula rates might be lower for the 2-flap technique. However, extensive dissection of hard palate is implicit in bilateral mucoperiosteal flap elevation[20]; as with the use of relaxing incisions, extensive hard palate dissection proportionately disrupts maxillary growth.[3–5] Nevertheless, recent studies have yielded similar results in this regard using techniques with limited and extensive hard palate dissection.[9,10] In addition, relaxing incisions are not necessarily avoided through use of 2-stage techniques. The latter are needed in repairs of severe clefting. In fact, increased rates of postoperative fistula have been recorded for 2-stage techniques, which frequently entail additional surgical time for fistula repair[9,14] (Table 3). Each surgery requiring subperiosteal hard palate dissection is apt to cumulatively affect facial growth. Delayed soft palate closure using a vomer flap requires hard palate dissection to allow for closure of oral mucosa. The area of required hard palate dissection is similar to that needed for a 1-flap method, but this step is performed twice (once at each stage). The delayed hard palate method requires less dissection of hard palate to locate the vomer flap 6 months after the soft palate closure. However, the hard palate cleft is closed in 1 layer (vomer flap), so the fistula rate is increased (Table 3). We use this technique for severe unilateral cleft palate repair, given the high rate of fistula in this setting, regardless of surgical method.

In this study, we observed similar results with respect to development of both palatal fistulas and velopharyngeal insufficiency using a surgical technique with more limited surgical dissection (ie, a 1-flap method) (Table 3). The primary advantage of the 1-flap technique is a limited dissection over the noncleft palatal segment, affording a low rate of palatal fistula for one-time surgery.

CONCLUSIONS

Use of a 1-flap technique for unilateral cleft palate repair allowed us to achieve results comparable to those of a 2-flap technique in terms of postoperative fistula development and hypernasal speech. Ultimately, less surgical dissection was required for similar outcomes. This method has yet to be evaluated in patients with bilateral or isolated cleft palates, assessing its impact on palatal growth.

Percy Rossell-Perry, PhD, FACS
Schell Street, No 120
No 120, Apartment 1503
Miraflores, Lima 18, Peru
E-mail: prossellperry@gmail.com

ACKNOWLEDGMENTS

We thank Dr. Paul Rottler, William Schneider, and Engineer Armando Barrientos for their assistance with the article revision and biostatistics.

REFERENCES

1. Katzel EB, Basile P, Koltz PF, et al. Current surgical practices in cleft care: cleft palate repair techniques and postoperative care. *Plast Reconstr Surg.* 2009;124:899–906.
2. Bardach J. Two flap palatoplasty: Bardach's technique. *Oper Tech Plast Reconstr Surg.* 1995;2:211–214.
3. Liao YF, Yang IY, Wang R, et al. Two-stage palate repair with delayed hard palate closure is related to favorable maxillary growth in unilateral cleft lip and palate. *Plast Reconstr Surg.* 2010;125:1503–1510.
4. Liao YF, Mars M. Long-term effects of palate repair on craniofacial morphology in patients with unilateral cleft lip and palate. *Cleft Palate Craniofac J.* 2005;42:594–600.
5. Liao YF, Cole TJ, Mars M. Hard palate repair timing and facial growth in unilateral cleft lip and palate: a longitudinal study. *Cleft Palate Craniofac J.* 2006;43:547–556.
6. Stein S, Dunsche A, Gellrich NC, et al. One- or two-stage palate closure in patients with unilateral cleft lip and palate: comparing cephalometric and occlusal outcomes. *Cleft Palate Craniofac J.* 2007;44:13–22.
7. Hathaway R, Daskalogiannakis J, Mercado A, et al. The Americleft study: an inter-center study of treatment outcomes for patients with unilateral cleft lip and palate part 2. Dental arch relationships. *Cleft Palate Craniofac J.* 2011;48:244–251.
8. Noordhoff MS, Kuo J, Wang F, et al. Development of articulation before delayed hard-palate closure in children with cleft palate: a cross-sectional study. *Plast Reconstr Surg.* 1987;80:518–524.

9. Scandcleft Randomized Trials. *CLEFT 2013 10th International Congress of Cleft Lip and Palate and related Craniofacial Anomalies*. May 8, 2013, Orlando, Fla.
10. Lee YH, Liao YF. Hard palate-repair technique and facial growth in patients with cleft lip and palate: a systematic review. *Br J Oral Maxillofac Surg*. 2013;51:851–857.
11. Kim CS, Park MC, Park DH. Clinical experience of buccal fat pad pedicled flap for denuded area in palatoplasty. *J Korean Soc Plast Reconstr Surg*. 2010;37:31–36.
12. Gillett DA, Clarke HM. The hybrid palatoplasty: a preliminary report. *Can J Plast Surg*. 1996;4:157–160.
13. Fudalej PS, Katsaros C, Dudkiewicz Z, et al. Cephalometric outcome of two types of palatoplasty in complete unilateral cleft lip and palate. *Br J Oral Maxillofac Surg*. 2013;51:144–148.
14. Sommerlad B. A technique for cleft palate repair. *Plast Reconstr Surg*. 2003;112:1542–1548.
15. Henningsson G, Kuehn DP, Sell D, et al; Speech Parameters Group. Universal parameters for reporting speech outcomes in individuals with cleft palate. *Cleft Palate Craniofac J*. 2008;45:1–17.
16. John A, Sell D, Sweeney T, et al. The cleft audit protocol for speech-augmented: a validated and reliable measure for auditing cleft speech. *Cleft Palate Craniofac J*. 2006;43:272–288.
17. Rossell-Perry P, Caceres Nano E, Gavino-Gutierrez AM. Association between palatal index and cleft palate repair outcomes in patients with complete unilateral cleft lip and palate. *JAMA Facial Plast Surg*. 2014;16:206–210.
18. Rossell-Perry P, Navarro-Gasparetto C, Caceres-Nano E, et al. A prospective, randomized, double-blind clinical trial study to evaluate a method for uvular repair during primary palatoplasty. *J Plast Surg Hand Surg*. 2014;48:132–135.
19. Carstens MH. Sequential cleft management with the sliding sulcus technique and alveolar extension palatoplasty. *J Craniofac Surg*. 1999;10:503–518.
20. Salyer KE, Sng KW, Sperry EE. Two-flap palatoplasty: 20-year experience and evolution of surgical technique. *Plast Reconstr Surg*. 2006;118:193–204.
21. Liau JY, Sadove AM, van Aalst JA. An evidence-based approach to cleft palate repair. *Plast Reconstr Surg*. 2010;126:2216–2221.
22. Chepla KJ, Gosain AK. Evidence-based medicine: cleft palate. *Plast Reconstr Surg*. 2013;132:1644–1648.
23. Cohen SR, Kalinowski J, LaRossa D, et al. Cleft palate fistulas: a multivariate statistical analysis of prevalence, etiology, and surgical management. *Plast Reconstr Surg*. 1991;87:1041–1047.
24. Bekerecioglu M, Isik D, Bulut O. Comparison of the rate of palatal fistulation after two-flap and four-flap palatoplasty. *Scand J Plast Reconstr Surg Hand Surg*. 2005;39:287–289.
25. Bindingnavele VK, Bresnick SD, Urata MM, et al. Superior results using the islandized hemipalatal flap in palatoplasty: experience with 500 cases. *Plast Reconstr Surg*. 2008;122:232–239.
26. Rossell-Perry P. *Book of abstracts. Presented at the 10th International Congress on Cleft Lip and Palate and Related Craniofacial Anomalies*. September 6, 2005, Durban, South Africa.
27. Rossell-Perry P. New classification of cleft lip and palate's severity. *Acta Medica Peruana*. 2006;23:59–66.
28. Rossell-Perry P. New diagram for cleft lip and palate description: the clock diagram. *Cleft Palate Craniofac J*. 2009;46:305–313.
29. Muzaffar AR, Byrd HS, Rohrich RJ, et al. Incidence of cleft palate fistula: an institutional experience with two-stage palatal repair. *Plast Reconstr Surg*. 2001;108:1515–1518.
30. Rohrich RJ, Rowsell AR, Johns DF, et al. Timing of hard palatal closure: a critical long-term analysis. *Plast Reconstr Surg*. 1996;98:236–246.
31. Schultz RC. Management and timing of cleft palate fistula repair. *Plast Reconstr Surg*. 1986;78:739–747.
32. Landheer JA, Breugem CC, van der Molen AB. Fistula incidence and predictors of fistula occurrence after cleft palate repair: two-stage closure versus one-stage closure. *Cleft Palate Craniofac J*. 2010;47:623–630.
33. Yuan N, Dorafshar AH, Follmar KE, et al. Effects of cleft width and veau type on rates of palatal fistula and velopharyngeal insufficiency after cleft palate repair. *Plastic Reconstr Surg*. 2012;130:S1–S23.