



The Folded Buccal Musculomucosal Flap for Large Palatal Fistulae in Cleft Palate

Shinji Kobayashi, MD*
Toshihiko Fukawa, DDS†
Takashi Hirakawa, DDS‡
Jiro Maegawa, MD§

Background: A palatal fistula is a common complication of cleft palate repair. Although a buccal musculomucosal flap (BMMF) is effective for fistula repair, it does have the following problems: a second operation may be required to release the pedicle on the oral side and unilateral BMMF cannot close mucosal defects of both the nasal and oral sides. A novel fistula closure method using the folded BMMF (f-BMMF) invented by the authors is presented.

Case: A 8-year-old-boy with bilateral cleft lip and palate with anencephaly. A fistula in the hard palate occurred after palatoplasty by the Furlow method, and an f-BMMF was planned. The mucosal defects of the nasal and oral sides were covered by 2 separate islands of mucosal epithelium. Finally, no reoperation was needed to remove the pedicle of the f-BMMF.

Conclusion: The f-BMMF is able to cover both sides without a raw surface and a mucosal graft even in cases of large fistula closure, although BMMF cannot usually cover both oral and nasal sides of a fistula. The advantages of this procedure are that it does not require second surgery to release the pedicle and that its distal island mucosa can be used to monitor engraftment. This proposed method seems to be an appealing alternative. (*Plast Reconstr Surg Glob Open* 2014;2:e112; doi: 10.1097/GOX.000000000000058; Published online 26 February 2014.)

A palatal fistula is a common complication of cleft palate repair. Fistula repair has a high rate of recurrence and is a difficult procedure.¹⁻³ Although local flaps around a fistula are used in the repair of relatively small fistulas,⁴⁻⁶ they can be difficult to use in the repair of a large fistula. This

is because the palatal tissue surrounding the fistula can be quite scarred and in short supply. Generally, a tongue flap is used in the repair of large fistulas,⁷⁻¹⁰ but it requires a second operation to remove the flap, and its tissue grafted onto the hard palate differs from oral mucosa.

Although a buccal musculomucosal flap (BMMF) is effective for the repair of a fistula,¹¹⁻¹⁵ it has some problems. First, it requires a second operation to cut-off the base of the BMMF in a belt shape when the BMMF is used for oral lining.¹³ Second, a unilateral BMMF cannot close the mucosal defects of both the nasal and oral sides.^{14,16} A novel fistula closure method using the folded BMMF (f-BMMF) invented by the authors is presented.

CASE REPORT

A 8-year-old-boy with bilateral cleft lip and palate with anencephaly was presented.

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.

From the *Department of Plastic and Reconstructive Surgery, Kanagawa Children's Medical Center, Yokohama, Kanagawa, Japan; †Fukawa Orthodontic Clinic, Ofuna, Kanagawa, Japan; ‡Hirakawa Orthodontic Clinic, Yokohama, Kanagawa, Japan; and §Department of Plastic and Reconstructive Surgery, Yokohama City University Hospital, Yokohama, Kanagawa, Japan.

Received for publication December 4, 2013; accepted January 2, 2014.

Copyright © 2014 The Authors. Published by Lippincott Williams & Wilkins on behalf of The American Society of Plastic Surgeons. *PRS Global Open* is a publication of the American Society of Plastic Surgeons. This is an open-access article distributed under the terms of the Creative Commons Attribution-NonCommercial-NoDerivatives 3.0 License, where it is permissible to download and share the work provided it is properly cited. The work cannot be changed in any way or used commercially.

DOI: 10.1097/GOX.000000000000058

Cheiloplasty and gingivoperiosteoplasty were performed at 6 months of age after preoperative orthodontics using the Latham appearance had been performed at 2 months. Palatoplasty by the Furlow double-opposing z-palatoplasty was finally performed to develop eating and swallowing function at 7 years. Although the width of the cleft palate at the posterior edge was 17mm, the wide cleft was closed (Fig. 1); however, the repair of a recurrent fistula was planned because a fistula (5×8mm) had occurred in the hard palate after palatoplasty. A fistula closure method using a local flap around the hard palate mucosa would have been impossible to close because the surrounding mucosa had high tension after the Furlow method. Therefore, the f-BMMF with 2 islands of mucosal epithelium was designed. Two islands of mucosal epithelium were made at the distal and proximal sides of the f-BMMF, and the other mucosal epithelium was denuded when the f-BMMF was elevated (Fig. 2). The mucosal defects of the nasal and oral sides were covered by the 2 islands of mucosal epithelium. Subsequently, the f-BMMF achieved engraftment, and the mucosal color of the distal side that covered the oral defect kept the same color as the normal oral mucosa. Finally, no reoperation to remove the pedicle of the f-BMMF was needed because the pedicle was not being bitten by the molar teeth (Fig. 3).

DISCUSSION

We have normally used the Furlow double-opposing z-palatoplasty¹⁷ for primary palatoplasty. How-

ever, when a fistula would occur in the hard palate, the tight mucosa around the fistula might make the closure of the cleft palate difficult, even if it seemed small. Generally, surgical repair of palatal fistulas can be technically difficult, most often due to the paucity of local tissue for closure or excessive scarring in the same areas as a result of the previous repair. Therefore, there have been reports of not only a local flap around the fistula⁴⁻⁶ but also a variety of methods that make use of additional tissue¹⁸⁻²² to close the defect.

As additional tissue, a tongue flap⁷⁻¹⁰ and a BMMF,¹¹⁻¹⁵ which is a pedicled flap from elsewhere in the mouth, are used. Although the tongue flap is generally used in the repair of a relatively large fistula, the drawbacks are a risk of flap separation due to tongue movement, the necessity of a second operation to remove the flap, grafting different tongue tissue from the oral mucosa onto the hard palate, and aesthetically unpleasant bulky tissue. Although a BMMF has a stable blood circulation²³ and can cover around the posterior hard palate,^{24,25} a unilateral BMMF is unable to cover both the oral and nasal sides of a fistula. One-layer closures on the oral side leave a raw surface on the nasal side that is prone to bleeding and nonhealing, with a high incidence of recurrence. Ideally, closure should be effected in 2 layers with a good nasal lining.

On the other hand, the f-BMMF, unlike the previous BMMF, can cover both the oral and nasal sides of a fistula without a raw surface and a mucosal graft,

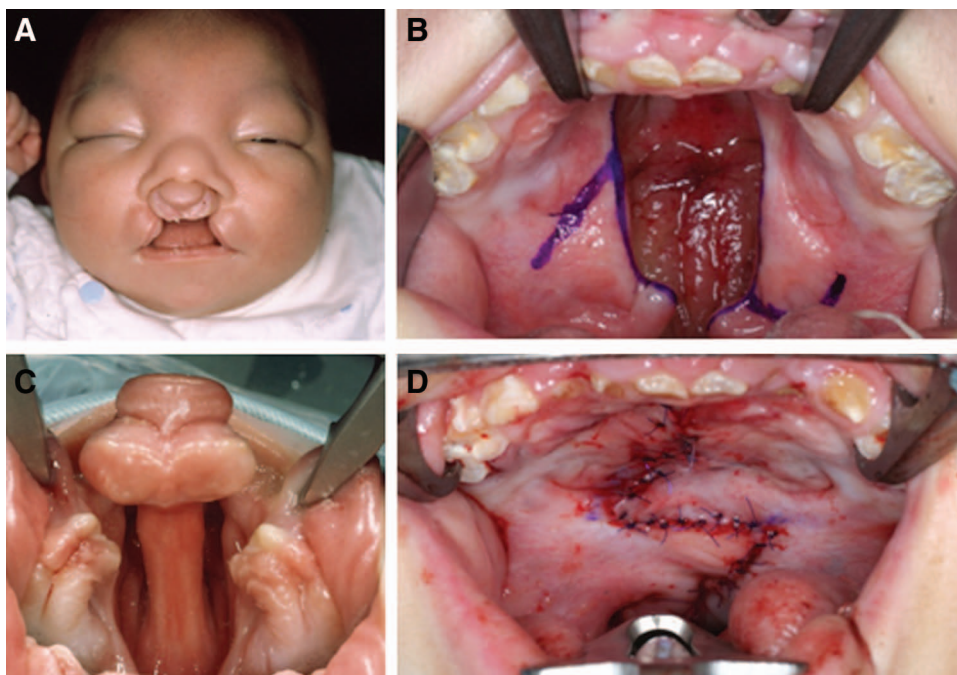


Fig. 1. A and C, A 8-year-old boy with bilateral cleft lip and palate and anencephaly; before palatoplasty by the Furlow method at 7 years of age (B); and after palatoplasty (D).

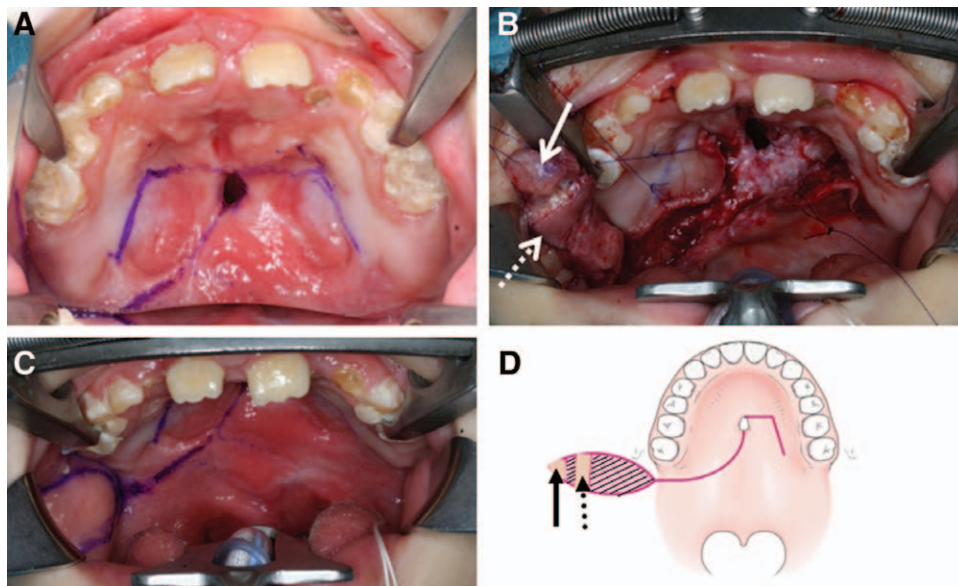


Fig. 2. A and C, f-BMMF planned for the repair of a fistula; elevation of the right f-BMMF (B), white solid arrow: distal island mucosa used on the oral side and white-dotted arrow: proximal island mucosa used on the nasal side; and illustration of the designed f-BMMF (D), black solid arrow: distal island mucosa used on the oral side and black-dotted arrow: proximal island mucosa used on the nasal side.

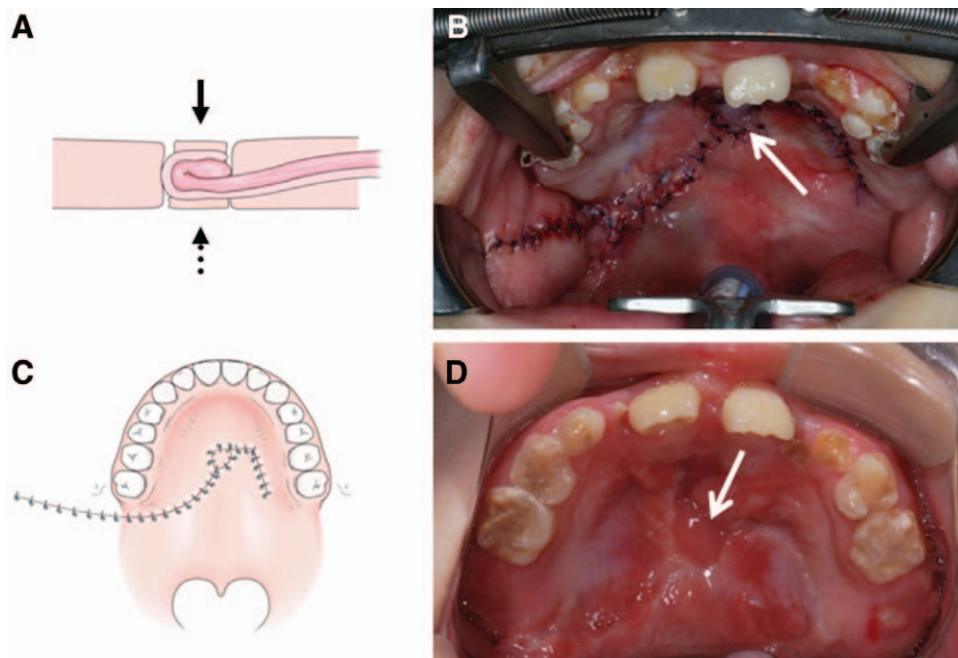


Fig. 3. A, Illustration showing coverage around the mucosal defects of the nasal and oral sides by the 2 islands of mucosal epithelium of the f-BMMF, black solid arrow: oral side and black-dotted arrow: nasal side; illustration at the end of surgery (C); end of surgery (B), white solid arrow: distal island mucosa sutured on the oral side; and oral appearance after 6 mo (D), white solid arrow: distal island mucosa sutured on the oral side.

even in cases of closure of a large fistula beyond 5 mm. The f-BMMF is sutured on the nasal side and then on the oral side after it is folded. The f-BMMF has 2 advantages. First, the donor site is completely

closed and the molar tooth does not bite the pedicle; therefore, the f-BMMF does not require a second surgery to release the pedicle of the BMMF like the previous BMMF on the oral side. Second, the distal

mucosa is sutured on the oral side; therefore, it can be used to monitor engraftment in the mouth.

The disadvantage of the f-BMMF is that it is not feasible in the anterior palate beyond the incisive foramen, which a superiorly based facial artery musculomucosal flap is able to close.^{26,27}

Although the feature of this procedure is to denude mucosal epithelium, the procedure is easy due to preservation of the buccinator, which has reliable circulation. Based on the experiments, it seems that the f-BMMF is able to close a fistula about 10 × 10 mm at 4–5 years of age. This proposed method seems to be an appealing alternative.

CONCLUSIONS

A fistula closure method using the f-BMMF was described. The mucosal defects of the nasal and oral sides were covered by 2 islands of mucosal epithelium. The advantages of this approach are that it does not require second surgery that releases the pedicle and its distal island mucosa can be used to monitor engraftment.

Shinji Kobayashi, MD

Department of Plastic and Reconstructive Surgery
Kanagawa Children's Medical Center
Mutsukawa 2-138-4
Minami-ku
Yokohama
Kanagawa 232-8555
Japan
E-mail: skobayashi@kcmc.jp

Reprints: Shinji Kobayashi, MD
Sakuragaoka 1-38-35 Hodogaya-ku
Yokohama
Kanagawa 240-0011
Japan

PATIENT CONSENT

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

REFERENCES

- Eberlinc A, Koželj V. Incidence of residual oronasal fistulas: a 20-year experience. *Cleft Palate Craniofac J.* 2012;49:643–648.
- 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.
- 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.
- Rintala A. A double, overlapping hinge flap to close palatal fistula. *Scand J Plast Reconstr Surg.* 1971;5:91–95.
- Anani RA, Aly AM. Closure of palatal fistula with local double-breasted mucoperiosteal flaps. *J Plast Reconstr Aesthet Surg.* 2012;65:e237–e240.
- Freda N, Rauso R, Curinga G, et al. Easy closure of anterior palatal fistula with local flaps. *J Craniofac Surg.* 2010;21:229–232.
- Argamaso RV. The tongue flap: placement and fixation for closure of postpalatoplasty fistulae. *Cleft Palate J.* 1990;27:402–410.
- Charan Babu HS, Bhagvandas Rai A, Nair MA, et al. Single layer closure of palatal fistula using anteriorly based dorsal tongue flap. *J Maxillofac Oral Surg.* 2009;8:199–200.
- Kim MJ, Lee JH, Choi JY, et al. Two-stage reconstruction of bilateral alveolar cleft using Y-shaped anterior-based tongue flap and iliac bone graft. *Cleft Palate Craniofac J.* 2001;38:432–437.
- Guzel MZ, Altintas F. Repair of large, anterior palatal fistulas using thin tongue flaps: long-term follow-up of 10 patients. *Ann Plast Surg.* 2000;45:109–114.
- Mukherji MM. Cheek flap for short palates. *Cleft Palate J.* 1969;6:415–420.
- Kaplan EN. Soft palate repair by levator muscle reconstruction and a buccal mucosal flap. *Plast Reconstr Surg.* 1975;56:129–136.
- Nakakita N, Maeda K, Ojimi H, et al. The modified buccal musculomucosal flap method for cleft palate surgery. *Plast Reconstr Surg.* 1991;88:421–426.
- Maeda K, Ojimi H, Utsugi R, et al. A T-shaped musculomucosal buccal flap method for cleft palate surgery. *Plast Reconstr Surg.* 1987;79:888–896.
- Jackson IT, Moreira-Gonzalez AA, Rogers A, et al. The buccal flap—a useful technique in cleft palate repair? *Cleft Palate Craniofac J.* 2004;41:144–151.
- Gupta R, Kumar S, Murarka AK, et al. Some modifications of the Furlow palatoplasty in wide clefts—a preliminary report. *Cleft Palate Craniofac J.* 2011;48:9–19.
- Furlow LT Jr. Cleft palate repair by double opposing Z-plasty. *Plast Reconstr Surg.* 1986;78:724–738.
- Honnebier MB, Johnson DS, Parsa AA, et al. Closure of palatal fistula with a local mucoperiosteal flap lined with buccal mucosal graft. *Cleft Palate Craniofac J.* 2000;37:127–129.
- Martin-Smith JD, O'Sullivan JB, Duggan L, et al. Repair of anterior cleft palate fistulae with cancellous bone graft: a simple technique that facilitates dental reconstruction. *Plast Reconstr Surg.* 2013;131:380e–387e.
- Kirschner RE, Cabiling DS, Slemp AE, et al. Repair of oronasal fistulae with acellular dermal matrices. *Plast Reconstr Surg.* 2006;118:1431–1440.
- Rohleder NH, Loeffelbein DJ, Feistl W, et al. Repair of oronasal fistulae by interposition of multilayered amniotic membrane allograft. *Plast Reconstr Surg.* 2013;132:172–181.
- Ezzat WF, Rabie H, Tarabishi M. Tragal cartilage augmentation in repair of cleft palate, a new technique and its clinical implications. *Int J Pediatr Otorhinolaryngol.* 2010;74:891–895.
- Bozola AR. The buccinator musculomucosal flap: anatomic study and clinical application. *Plast Reconstr Surg.* 1989;84:250–257.
- Abdel-Aziz M. The use of buccal flap in the closure of posterior post-palatoplasty fistula. *Int J Pediatr Otorhinolaryngol.* 2008;72:1657–1661.
- Robertson AG, McKeown DJ, Bello-Rojas G, et al. Use of buccal myomucosal flap in secondary cleft palate repair. *Plast Reconstr Surg.* 2008;122:910–917.
- Lahiri A, Richard B. Superiorly based facial artery musculomucosal flap for large anterior palatal fistulae in clefts. *Cleft Palate Craniofac J.* 2007;44:523–527.
- Dupoirieux L, Plane L, Gard C, et al. Anatomical basis and results of the facial artery musculomucosal flap for oral reconstruction. *Br J Oral Maxillofac Surg.* 1999;37:25–28.