

Closure of Complicated Palatal Fistula with Facial Artery Musculomucosal Flap

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Background: Palatal fistulas occur most commonly as a complication of cleft palate surgery. Treatment of these fistulas, especially when they are wide and scarred, is a challenge for both patients and plastic surgeons, with a high rate of recurrence.

Methods: The authors have operated on 22 cases of wide, scarred, recurrent palatal fistula with the use of the facial artery musculomucosal flap, first introduced by Pribaz et al. in 1992. The patients were operated on from March of 2001 to December of 2002 and ranged in age from 2 to 21 years. This flap is axial, centered over the facial artery, and can be raised inferiorly based or superiorly based. All of these patients with cleft palate had been operated on before. In one case, because of a very wide fistula, a bilateral facial artery musculomucosal flap was used.

Results: There were two cases of partial necrosis and one case of complete failure, probably caused by twisting of the whole pedicle. The nasal lining was made using turndown flaps of the fistula margin. Because of hanging the base of the flap (inferiorly based) and producing bite block during mastication, the pedicle had to be divided and the flap inset secondarily 1 month later.

Conclusions: The facial artery musculomucosal flap is an alternative for closing the scarred, wide, recurrent fistula, and is associated with a high rate of success. The flap

should be included among the techniques of any plastic surgeon who performs palatal surgery. (*Plast. Reconstr. Surg.* 116: 381, 2005.)

Reconstruction of midfacial defects has been performed by nasolabial flaps, and buccal flaps have been used for reconstruction of midfacial defects. This has been performed using a myriad of different techniques in reconstruction of defects resulting after excision of tumor; cleft palate; oronasal fistulas; and alveolar, floor of the mouth, and vermilion loss.^{1,2} By combining the principles of nasolabial and buccal mucosal flaps, an axial myomucosal flap on the facial artery has been designed by Pribaz et al.³

Bozola et al.⁴ described the first axial buccal myomucosal flap based on the buccal artery (a branch of the facial artery and, according to Pribaz, a branch of the internal maxillary artery) for reconstruction of oral cavity defects. There are advantages of Pribaz et al.'s facial artery musculomucosal flap over flaps on the buccal artery that make it more versatile. The facial artery musculomucosal flap consists of mucosa, submucosa, a small amount of buccinator muscle, and part of the orbicularis muscle and facial artery and veins.

ANATOMY

The buccinator muscle is a wide, flat, quadrangular muscle; its medial surface is covered by the oral mucosa. The buccinator is consid-

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ered part of the sphincteric muscle complex used for sucking, whistling, propelling food, and voiding the oral cavity. The blood supply of this muscle is from the buccal artery and small branches from the alveolar artery.⁵

The facial artery, a branch of the external carotid artery, enters the face from the lower border of the mandible at the anterior border of the masseter muscle. It has a tortuous course and runs upward and forward lateral to the mouth commissure. It is superficial to the buccinator. It gives multiple perforators to the cheek and superior labial artery, and from this point it takes the name angular artery.

Technique

This flap (facial artery musculomucosal) can be based superiorly (retrograde flow) or inferiorly (orthograde flow) and should be centered over the facial artery with an oblique orientation, from the retromolar trigone to the level of the labial sulcus (ipsilateral) near the alar margin.

The width of the flap is 1.5 to 2 cm and anterior to Stenson's ducts. The length of the

flap can be tailored proportional to the site of defect and can be developed to 8 to 9 cm.

Raising the flap begins at the distal end, with an incision through the mucosa and buccinator. The facial artery is identified and ligated. The flap should include a minimum overlying buccinator muscle and orbicularis oris. It can have a superior or an inferior pedicle with a mucosal pedicle base or it can be an island flap if there is a reasonable soft-tissue base to ensure sufficient venous drainage. The donor-site defect should be closed in two layers.

The superiorly based facial artery musculomucosal flap can be used to close palatal fistulas located anterior and the inferiorly based facial artery musculomucosal flap should be used to close the fistula located midcentrally and the soft palate. The most common indication for the facial artery musculomucosal flap is to close the palatal fistulas, especially wide, scarred, recurrent fistulas. If there is intact dentition, an inferiorly based flap should be used, coming from behind the maxillary arch. In these cases, division and inseting of the flap in a second session will probably be required.

TABLE I

Sex, Age, Diagnosis, and Procedure of Closure of Complicated Palatal Fistula with the Facial Artery Musculomucosal Flap in 21 Patients

Patient	Sex	Age (yr)	Diagnosis	Procedure	FAMM Flap	
					Superiorly Based	Inferiorly Based
1	F	3	Palatal fistula (17 × 12 mm)	Local flap + FAMM	+	
2	F	4	Palatal fistula	Local flap + FAMM	+	
3	F	8	Palatal fistula (40 × 30 mm)	Local flap + FAMM		+
4	F	11	Palatal fistula (22 × 15 mm)	Local flap + FAMM		+
5	F	14	Palatal fistula oronasal fistula	Local flap + FAMM		+
6	F	20	Palatal fistula (third recurrence)	Local flap + FAMM		+
7	M	2.5	Palatal fistula (25 × 15 mm)	Local flap + FAMM		+
8	M	3	Palatal fistula (12 × 12 mm)	Local flap + FAMM	+	
9	M	3	Palatal fistula (15 × 16 mm)	Local flap + FAMM		+
10	M	3	Palatal fistula (30 × 20 mm)	Local flap + FAMM		+
11	M	5	Palatal fistula (third recurrence) (15 × 15 mm)	Local flap + FAMM Arch bar	+	
12	M	6	Palatal fistula (2 fistulas) (20 × 15 mm) (4 × 5 mm)	Local flap + FAMM		+
13	M	6	Palatal fistula	Local flap + FAMM	+	
14	M	7	Palatal fistula (15 × 15 mm)	Local flap + FAMM		+
15	M	8	Palatal fistula (third recurrence)	Local flap + FAMM		+
16	M	9	Palatal fistula (2 fistulas) (25 × 15 mm)	Local flap + FAMM	+	
17	M	15	Palatal fistula (50 × 20 mm)	Local flap + FAMM		++
18	M	16	Palatal fistula (40 × 20 mm)	Local flap + FAMM		+
19	M	17	Palatal fistula (30 × 20 mm)	Local flap + FAMM	+	
20	M	20	Wide palatal fistula (20 × 10 mm)	Local flap + FAMM	+	
21	M	21	Palatal fistula (20 × 10 mm)	Local flap + FAMM		+
					8	14

F, female; M, male; FAMM, facial artery musculomucosal; ++, bilateral flap; +, unilateral flap.

TABLE II
Outcome of Closure of Complicated Palatal Fistula with the Facial Artery Musculomucosal Flap in 21 Patients

Patient	Sex	Age (yr)	Coverage of Fistula	Omission of Regurgitation	Improvement of Speech
1	F	3	Partial	Partial	Little
2	F	4	+	+	+
3	F	8	+	+	Little
4	F	11	+	+	Little
5	F	14	Total failure	-	-
6	F	20	Partial	Partial	-
7	M	2.5	+	+	Not yet determined
8	M	3	+	+	+
9	M	3	+	+	+
10	M	3	+	+	+
11	M	5	+	+	+
12	M	6	+	Partial	+
13	M	6	+	+	+
14	M	7	+	Partial	+
15	M	8	+	+	Little
16	M	9	+	+	+
17	M	15	+(2 FAMM)	+	Little
18	M	16	+	+	Little
19	M	17	+	+	Little
20	M	20	+	+	-
21	M	21	+	+	-

+, positive; -, negative; F, female; M, male; FAMM, facial artery musculomucosal.

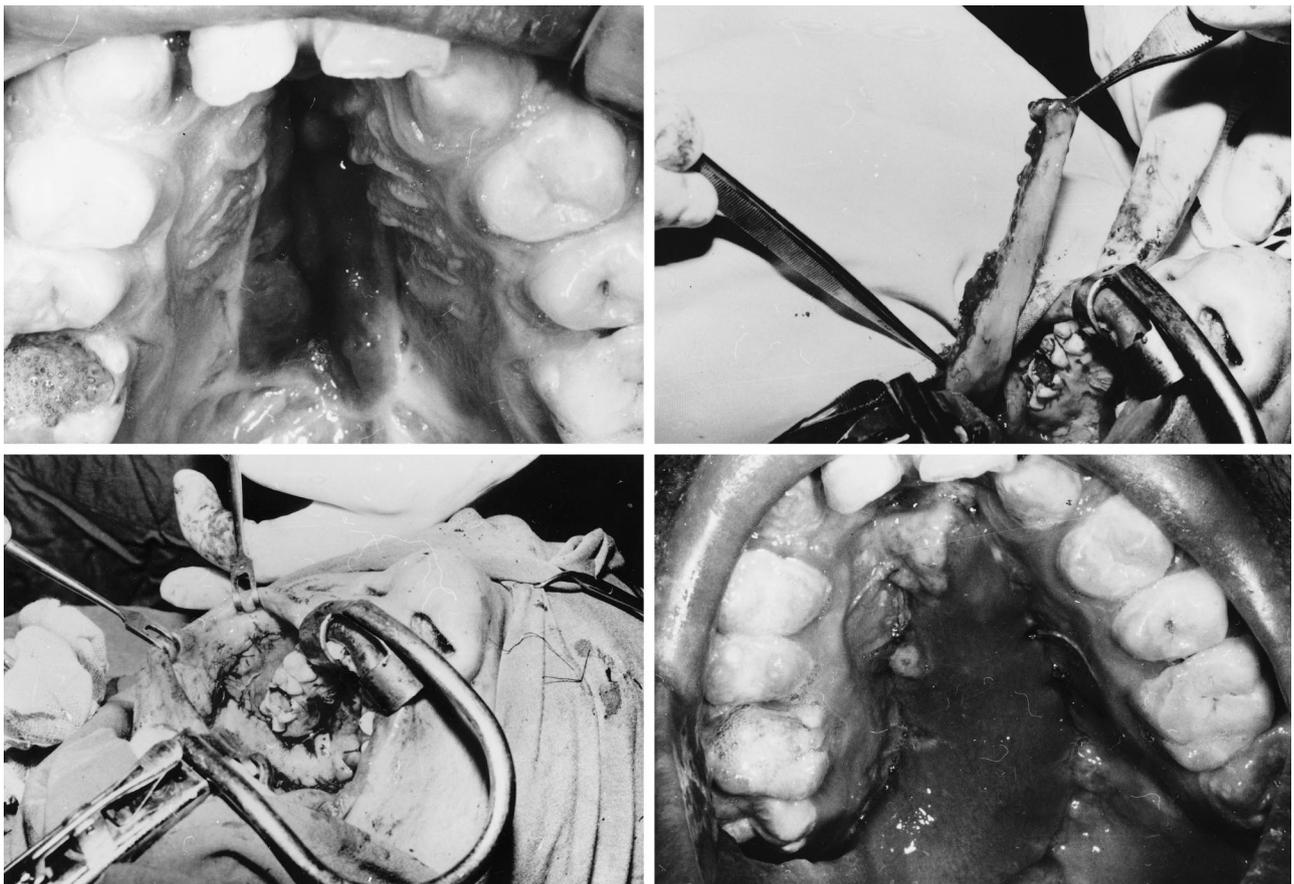


FIG. 1. (Above, left) A 16-year-old boy with bilateral cleft lip–cleft palate. The lip and palate were closed in infancy, resulting in a wide and long fistula. (Above, right) A right inferiorly based facial artery musculomucosal flap was raised. (Below, left) The donor site was closed in two layers. (Below, right) Closure with local turndown flaps and coverage with a facial artery musculomucosal flap.

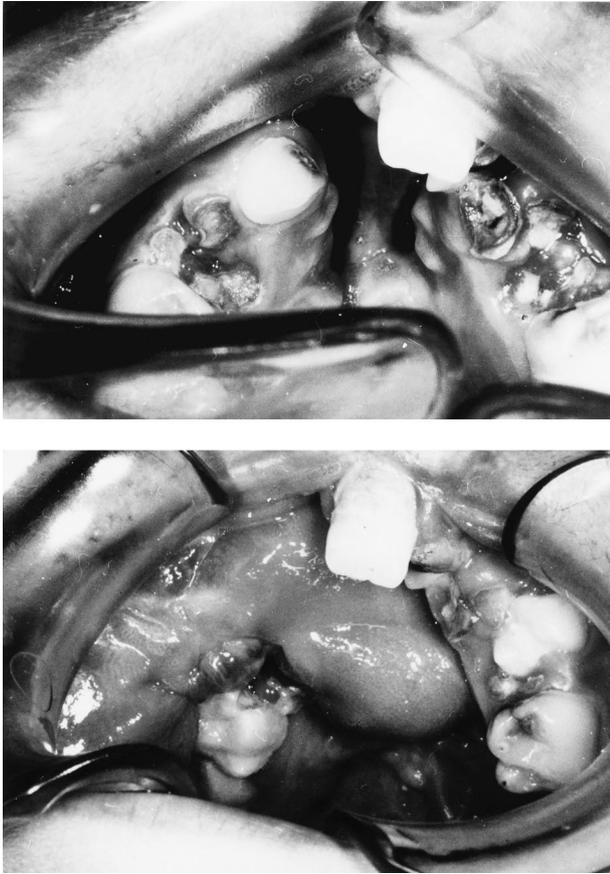


FIG. 2. (Above) A 9-year-old boy with a history of bilateral cleft lip–cleft palate with two anterior fistulas that persisted despite palatoplasty. (Below) A right superiorly based facial artery musculomucosal flap provides cover, and turn-down flaps are used as a nasal layer.

Because the flap is developed very long, it can be folded (providing nasal lining and oral coverage) or folded back on itself to increase the width of the flap. The illustrative description of the technique has been explained in full in 1992 by Pribaz et al.³

PATIENTS AND METHODS

Twenty-two patients (17 male patients and five female patients) between the ages of 2.5 and 21 years presented to us with recurrent, scarred and, in some cases, wide palatal fistulas between March of 2001 and December of 2002. After examination of the fistulas, it became clear to us that they could not be closed with traditional procedures and flaps. Therefore, we decided to close the fistulas with facial artery musculomucosal flaps.

The reason we had a large number of cases in a relatively short period of time is that our center is a center for cleft lip–cleft palate. Most of these patients had been referred from other

hospitals and the remainder were the result of palatoplasty at our center.

The patients were operated on under endotracheal intubation general anesthesia. The course of the facial artery was identified with a Doppler sonographic probe as far as possible. First, we raised the flap (superiorly based in nine cases and inferiorly based in 14 cases) distally and then developed proximally toward the pedicle of the flap. A list of patients, pathologic findings, and procedures is given in Tables I and II. It should become clear that the flap is centered over the artery throughout its course. The donor area was closed in two layers. After raising the flap as long as possible to reach the palatal defect without any tension and to ensure flap viability, we made the lining with local turn-down flaps; after that, the facial artery musculomucosal flap was inset over the nasal layer with late absorbable sutures (Vicryl, Ethicon, Inc., Somerville, N.J.).

The longest facial artery musculomucosal flap we used was 11 cm. In one case, we used a bilateral inferiorly based facial artery musculomucosal flap because of a long and wide fistula. In patients with intact maxillary dentition and obligatory use of an inferiorly based flap, we had to divide the flap in approximately 50 to 70 percent of cases because of hanging the flap and bite block and inset the flap secondarily. Sample photographs of patients are presented in Figures 1 through 3.

RESULTS

The results were subjectively assessed at each patient examination in the postoperative period to assess the anatomical separation of the nasal cavity from the oral cavity and improvement of the patient's speech by a speech therapist. All flaps except three survived totally. There were two instances of partial necrosis and one total failure, probably because the flap was not centered over the artery and did not include the artery in the flap for at least some of its length.

The overall results have been very satisfactory. The improvement in speech has also been good. In one case of partial necrosis, after division of the flap, the defect was closed by rotating the cut end to the distal part. In two cases, the operations undertaken before the facial artery musculomucosal flap were palatoplasty with pharyngeal flap in one and pharyngeal flap for closure of fistula in another.

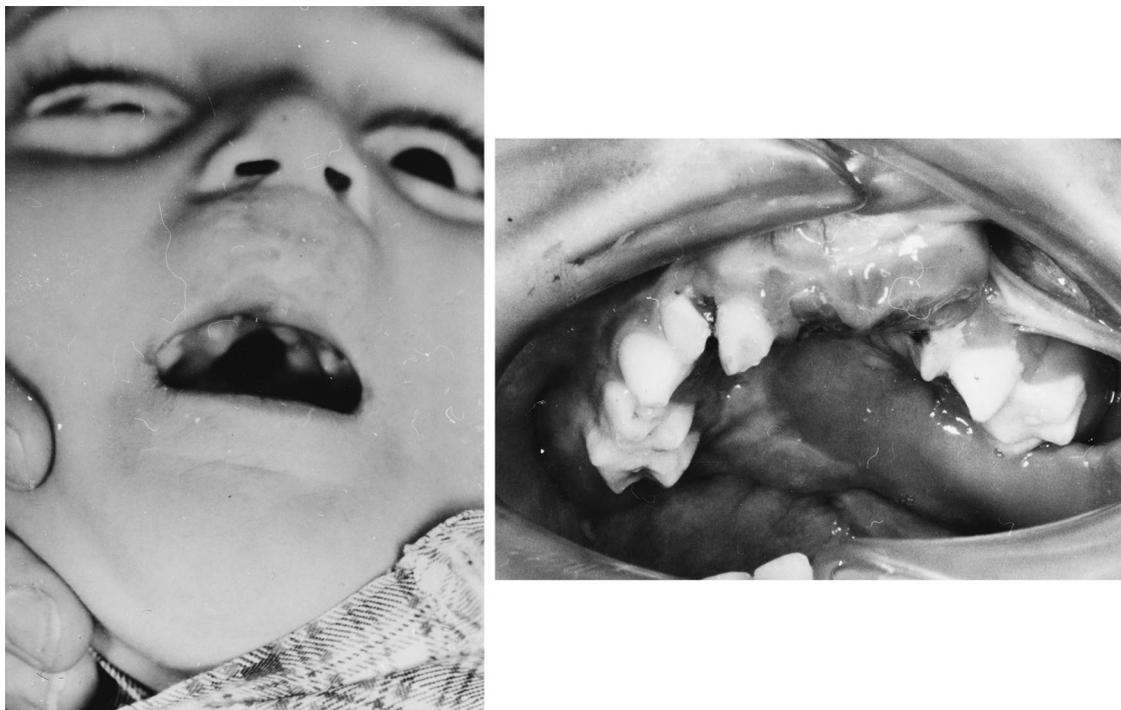


FIG. 3. (Above) A 7-year-old-boy with a history of bilateral cleft lip–cleft palate that resulted in an anterior fistula after palatal surgery. (Below) The fistula is closed with turn-down flaps as a nasal layer and a left inferiorly based facial artery musculomucosal flap as coverage.

DISCUSSION

To close palatal fistulas, especially wide, scarred, recurrent fistulas, a suitable surgical procedure with predictable results must be carried out at an appropriate age. Precise dissection and release of tissues during palatoplasty and closure of the cleft palate in three layers without tension can prevent many postpalatoplasty fistulas or at least make the fistulas smaller. What then should be done for closure of such fistulas in cleft palate patients who have not gained the benefit of primary palatal surgery? Is suitable and successful correction still possible? Can we close the fistulas in a single session? As Pribaz et al. believe, we have succeeded in closing these fistulas with the facial artery musculomucosal flap. There is no morbidity or complication associated with closure of the donor site except for some initial tightness that improves later.

Because the branches of the facial nerve are preserved and deep, there is no weakness of facial expression muscles. The complete loss of flap in one case was probably caused by whole pedicle thrombosis, and the partial necrosis observed in two other patients might have been caused by failure to center the flap over

the artery along its entire course. It is important to ensure that the flap remains axial without twisting or spasm of the pedicle.

CONCLUSIONS

The results of our cases suggest that the facial artery musculomucosal flap is a reliable and useful procedure and can be used as a worthy alternative for the closure of wide, scarred, recurrent palatal fistulas.

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