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The free radial forearm flap with and without bone for closure of large palatal fistulae

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Summary—Three cases of palatal fistulae closed by microvascular transfer of radial forearm flaps are presented. Vascularised bone was included in one flap and all operations were free of complications.

Facial scarring is minimal and the secondary deformity in the arm has not been significant.

It is suggested that this procedure presents fewer difficulties than other techniques for treating the large palatal fistula and may prevent the collapse of the alveolar arch which follows the scarring associated with closure by local tissue.

The closure of wide, complete congenital palatal clefts is often difficult and occasionally anterior fistulae are unavoidable. The scarring from repeated surgery in such cases contributes to the collapse of the alveolar arch, so that the use of an obturator in combination with closure of the soft palate has been advocated even as a primary procedure.

Avoidance of an obturator is preferable and soft tissue cover is necessary to allow bone grafting of the alveolar cleft. Many distant tissue transfers have been used in operations to close palatal clefts but the results of such procedures have been variable and the operations have involved considerable patient inconvenience.

The radial forearm flap has achieved wide acceptance in head and neck reconstruction and has a pedicle with vessels of length and diameter which allows its easy use in children. Three cases of its use in difficult palatal fistulae are reported.

Technique

The free radial forearm (Chinese) flap has been well described by Song *et al.* (1982) and Soutar *et al.* (1983). It is a fasciocutaneous flap based on the radial artery and drained by both the superficial veins and the venae comitantes of the radial artery. For intraoral reconstruction the distal thin, relatively hairless skin should be used and a segment of radius at the attachment of pronator quadratus and flexor pollicis longus may be taken (Soutar *et al.*, 1983).

If the lip repair requires revision, the lip is opened thus improving access to the palate and alveolar margin. Local turnover mucoperiosteal flaps can be elevated from the edges of the fistula to create a nasal lining but if this tissue is inadequate, the radial flap may be turned on itself to line both nasal and oral cavities.

A buccal mucosal flap is lifted and used to cover the pedicle as it passes through the cleft to the cheek. By blunt dissection, a submucosal tunnel is made through the cheek to the facial vessels which can be exposed by a vertical incision just above the mandible, or by a transverse incision in the submandibular region. If the patient is over 8 years and there is an alveolar cleft, mucoperiosteal flaps can be elevated from the edges of the cleft to receive an accompanying block of vascularised radius.

Case reports

Case 1

A 13-year-old boy with a bilateral cleft lip and palate had initial lip closure at 3 months, followed by an attempted closure of the soft and hard palate at 18 months; the anterior palate repair subsequently dehisced, leaving a large palatal defect. Despite the use of a dental obturator, speech was inadequate, requiring a pharyngoplasty at the age of 5 years.

On presentation, he had a fistula in the anterior palate measuring 2 × 2.5 cm (Fig. 1) associated with bilateral alveolar clefts, the left approximately 1 cm wide. The residual palatal mucosa adjacent to the defect measured 8 mm on each side. The soft palate was intact and mobile and a pharyngoplasty was *in situ*.

At operation, a two-layer closure of the fistula was performed. The nasal layer was first closed using turnover

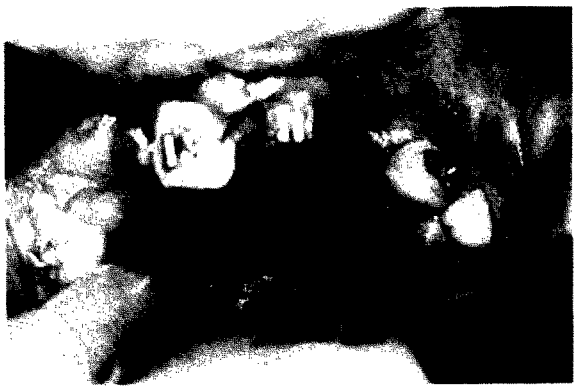

Fig. 1

Figure 1—*Case 1.* Preoperative anterior palatal fistula (2 × 2.5 cm).

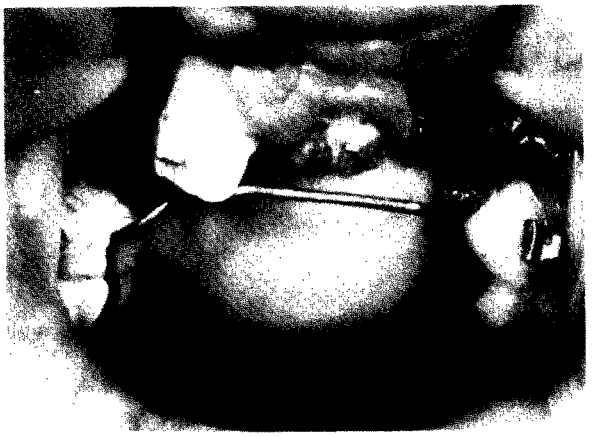

Fig. 2

Figure 2—*Case 1.* Six months later, able to wear the dental splint.

flaps from all four sides of the defect including the premaxilla. The alveolar cleft was closed with local flaps and an additional flap from the lateral labial sulcus was elevated to cover the flap pedicle later. The resultant oral mucosal defect was 4 × 6 cm.

A radial artery forearm flap of appropriate size was elevated from the left forearm with a vascular pedicle of 9 cm. The radial artery was reconstituted with a graft obtained from an adjacent vein. The donor site was partially closed directly and a small split skin graft was applied to the residual defect.

The flap was then sutured to the palatal defect commencing posteriorly and the pedicle was brought through the alveolar cleft and covered with the buccal flap. The pedicle was then tunnelled subcutaneously through the cheek to the previously prepared facial vessels, and end-to-end anastomoses performed. Prompt perfusion of the flap occurred following release of clamps.

The postoperative course was uncomplicated. Although the flap was slightly bulky, the patient was able to wear his normal dental splinting (Fig. 2) and was pleased with the result—preferring the flap to his previous obturator.

After 5 months, the flap was lifted and the alveolar cleft grafted with iliac bone chips. Healing proceeded uneventfully.

Case 2

A 32-year-old woman with a bilateral cleft lip and palate, who had had the premaxilla excised in childhood and had undergone several procedures, presented with a large palatal fistula, flattening of the mid-face and lack of nasal support. She wore an obturator augmented anteriorly to correct the maxillary defect.

The alveolar gap was 3 cm and the palatal fistula was 3 cm wide and 3.5 cm long (Fig. 3); less than 1 cm of heavily scarred palate surrounded the defect.

At operation the lip scar was excised to provide access and small turnover flaps lifted from the margins of the defect to provide some nasal lining. The buccal surface of the alveolus on either side of the cleft was dissected free to provide pockets for bone grafting.

The radial flap raised was 4 cm wide and 8 cm long and included a segment of radius 4 cm long and 0.25 cm wide; the pedicle was 9 cm long.

Closure of the nasal lining was achieved by suturing the forearm flap (with skin superiorly) to the turnover flaps posteriorly, and by incising the skin of the flap transversely at the anterior limit of the fistula to allow the buccal mucous membrane to be sutured to the flap.

The bone graft was then placed across the alveolar defect and fixed with Kirschner wires (Fig. 4).

The remaining forearm flap was folded around the bone graft and sutured into the oral defect (Fig. 5).

The pedicle was tunnelled submucosally through the cheek and the vessels anastomosed end to end to the facial vessels in the submandibular region.

The patient made an uneventful recovery and wears a denture comfortably. There has been improvement in the hypernasality of her speech and the bone graft has provided the necessary bulk to improve her profile.

Case 3

A 6-year-old boy presented with a large anterior palatal fistula following breakdown of the palatal repair performed when he was 18 months old (Fig. 6).

Local tissues were inadequate for closure of the fistula and accordingly a radial forearm flap was planned.

Local turnover flaps provided nasal lining for the palatal and alveolar cleft and an oral defect measuring 4 cm in length and 2 cm in width resulted. An appropriate radial forearm flap was transferred and sutured to the defect with the pedicle covered by a narrow strip of flap skin threaded through the alveolar cleft. The pedicle was passed through a tunnel prepared by blunt dissection in

Fig. 3

Fig. 4

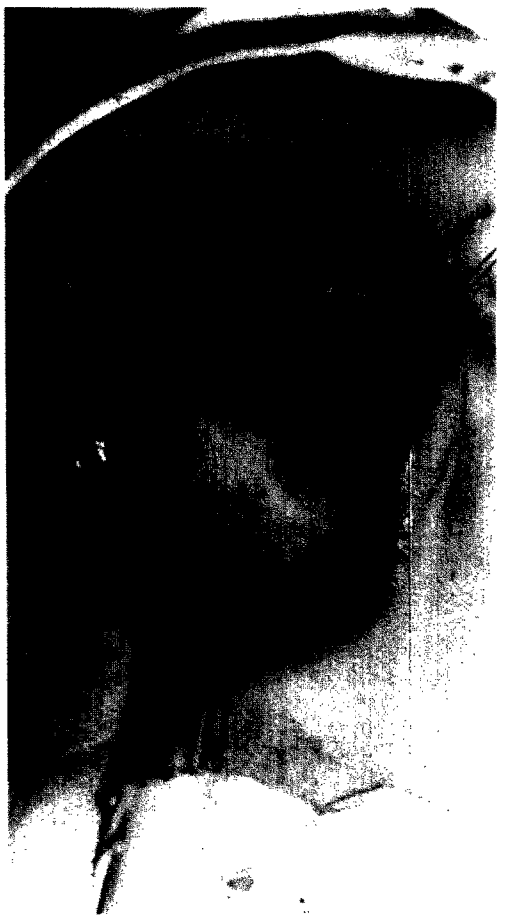

Fig. 5

Figure 3—*Case 2.* 3 × 3.5 cm anterior palatal fistula with 3 cm alveolar defect. Figure 4—*Case 2.* Bone graft in position with oral layer of radial skin flap elevated ready to wrap around the graft. Figure 5—*Case 2.* Oral layer of flap in position—lip ready for resuturing.

the cheek and an end-to-end anastomosis performed to the facial vessels just above the mandible (Fig. 7). Healing proceeded without complications (Fig. 8).

Discussion

Many techniques have been described for closing palatal fistulae that are too large for the use of local tissue. Thiersch (1868) described full thickness cheek and nasolabial flaps based inferiorly for repair of palatal fistulae. This procedure was extended by Esser (1918) and reaffirmed by Wallace (1966) for large palatal defects. Georgiade *et al.* (1969) preferred a superiorly based nasolabial flap for its greater width and less chance of causing ectropion although the tip may be hair-bearing.

Forehead flaps and tube pedicles of various types have been used and always have been multi-staged procedures associated with considerable scarring and patient morbidity.

Intraoral tissues can sometimes be used. Flaps from the dorsum of the tongue have been described by Guerrero-Santos and Altamirano in 1966, and Pigott *et al.* (1984) described an 85% success rate with this technique, including three children less than 3 years old. Carlesso *et al.* in 1980 presented five cases of hemi-tongue flaps used in children aged 4 to 13 years; all these procedures were

Fig. 6

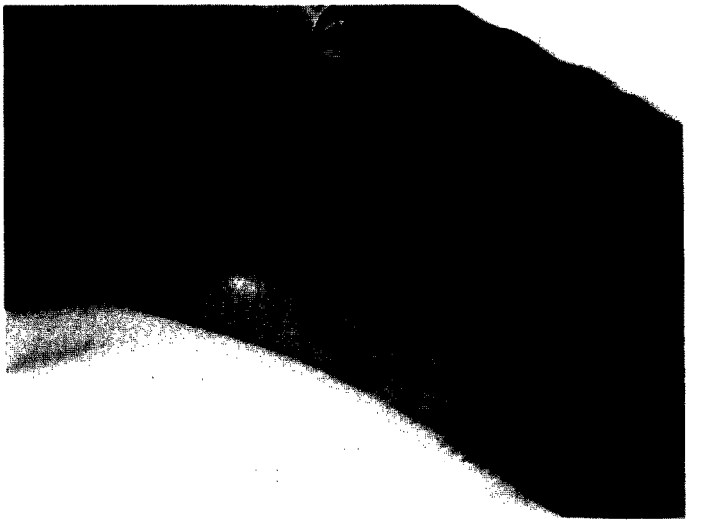

Fig. 7

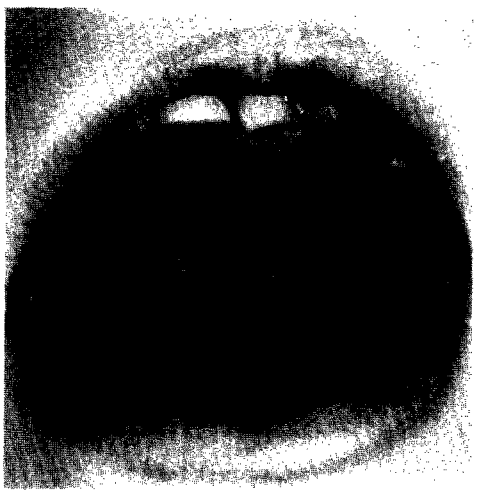

Fig. 8

Figure 6—*Case 3*. Palatal fistula 4 cm × 2 cm. Figure 7—*Case 3*. The exposure necessary for microvascular anastomoses.
Figure 8—*Case 3*. Flap well healed 1 month postoperatively.

eventually successful but were associated with considerable morbidity.

Wilflingseder (1974) has described a one-stage closure involving bilateral posteriorly based buccal mucosal flaps. One flap is used for nasal lining and the other turned over for oral cover. These flaps are not suitable for wide defects and when the flap is long it is not well vascularised.

Correa Chem and Franciosi in 1983 reported the use of the dorsalis pedis free flap to close palatal fistulae in three patients. Complete closure was obtained in two patients, and the third patient had a residual 3 mm fistula for which no further treatment was sought.

We have shown that the radial forearm flap can be easily transferred to close palatal defects in children as young as 6 years. The flap is not too bulky for the mouth and the facial scarring following the microvascular anastomoses is minimal. A bone segment can be transferred with the flap when required.

If closure of wide palatal clefts or fistulae by local tissues is likely to interfere with the alveolar arch, then closure of the posterior palate and the use of an obturator until a flap transfer can be performed may be indicated.

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