The Fate of Buccal Mucosal Flaps in Primary Palatal Repair

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The fate of buccal mucosal flaps used in 50 cases at the time of primary palatal repair is reviewed. It was found that in 13 cases (26 percent) the pedicle of the flap interfered with the eruption of the permanent molars and had to be divided. Nasendoscopic examination was made of the palate in 16 cases in an attempt to visualize the buccal flap. It was identified in only three cases. It is suggested that if this flap is to be used, it must be designed carefully, and that regular intraoral examination of the patients is required around the time of eruption of the permanent molars.

KEY WORDS: cleft palate, surgery, buccal flap

Many methods of palatal repair have been described to permit lengthening of the nasal layer following a pushback procedure. These include Z-plasty (Champion, 1957), split skin grafts (Dorrance and Bransfield, 1943), mucosal grafts (Webster, 1949), sliding nasal mucosa (Cronin, 1957), vomer flaps (Horton et al., 1973) palatal island flaps (Millard, 1962) and pharyngeal flaps (Dibbell et al., 1965). In 1969, Mukerji described the use of bilateral buccal mucosal flaps for the same purpose. In 1975, Kaplan proposed the use of a unilateral buccal mucosal flap to be turned in for nasal lining when the nasal mucosa has been divided following the pushback. More recently, Maeda et al. (1987) described bilateral buccal flaps to lengthen the nasal layer and cover the oral surface of the palate.

Fifty primary palatal repairs were carried out in Canniesburn Hospital between 1976 and 1979, where a unilateral buccal mucosal flap was used and follow-up has continued at least until the expected time of eruption of the first permanent molar. It was noted that in some cases the bridge segment of the flap interfered with eruption of the permanent molars and required division. The purpose of this paper is to report on the incidence of this complication. In addition, 16 cases were examined nasendoscopically in an attempt to visualize the buccal flap on the nasal surface of the palate.

MATERIALS AND METHOD

Fifty patients in whom palatal repairs were performed by a single surgeon (the second author) were examined. The data on the type of cleft repair are shown in Table 1. In eight cases a two stage palatal repair was carried out with the buccal flap at the time of hard palate closure, at about 5 years of age. In the remainder of patients with overt clefts, palatal closure was undertaken at between 6 and 15 months age. Repair was done later in patients with submucous clefts because referral was made when the children were older, following speech development.

The technique of flap design and utilization (Jackson et al., 1983) was that described by Kaplan (1975), using a flap thought to contain the lesser palatine vessels in its pedicle. It was usually about 1.5 cm wide and extended to about 1.0 to 1.5 cm from the oral commissure. It was raised on the right side of the mouth in nearly all cases and sutured into the nasal layer on three sides. Sixteen cases were examined nasendoscopically using a side-viewing flexible nasendoscope (Olympus NPF S4). Careful examination of the proximal soft palatal surface was made to identify the area of inset of the buccal flap.

Cadaver dissections were carried out on two adult cadaver heads and on two fetal heads of approximately 20-weeks gestation, in which the arterial system had previously been injected with red latex. Examination was made of the arterial supply of the buccal area in the region from which the flaps were raised and of the lesser palatine arteries.

RESULTS

Thirteen of the 50 cases (26 percent) required further surgery to divide the bridge segment of the flap. This was usually done between the ages of 6 and 10 years, during and following the time of eruption of the first permanent molars (Table 2). All operations were done under general anesthesia, on occasion together with another procedure such as lip revision. Two cases required division on more than one occasion.

In most cases the bridge of the flap was described as obstructing the eruption of the first permanent molar, and potential problems with eruption of the second and third molars were assumed (Fig. 1–3). It was also believed that the flap would interfere with dental occlusion in some cases.

Of the 16 cases that underwent nasendoscopy, six cases
TABLE 1 Distribution of Subjects by Cleft Type

<table>
<thead>
<tr>
<th>Cleft Type</th>
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<tr>
<td>Complete unilateral cleft lip and palate</td>
<td>19</td>
</tr>
<tr>
<td>Complete bilateral cleft lip and palate</td>
<td>6</td>
</tr>
<tr>
<td>Cleft—hard and soft palate</td>
<td>7</td>
</tr>
<tr>
<td>Cleft—soft palate only</td>
<td>7</td>
</tr>
<tr>
<td>Submucous cleft palate</td>
<td>11</td>
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<tr>
<td>Total</td>
<td>50</td>
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required flap division. In only three cases was the flap positively or probably identified at least in part. Two of these cases required flap division. In another three cases, the impression was that a portion had been seen. In the remaining 10, no distinction could be made between the flap and surrounding tissues.

Cadaver and fetal dissections showed the lesser palatine vessels to be small and distributed to the junction of the hard and soft palate and to the maxillary tuberosity area. It appears unlikely that they would be able to supply a buccal flap where the pedicle lies posterolateral to this area. The facial artery ramifies over the cheek area as it courses upward and medially toward the nose. A buccal flap cuts across this facial arterial system. Interestingly, in one fetal specimen a flap was elevated that contained a buccal branch from the maxillary artery; therefore in the clinical situation, if a flap was raised with this artery at its base, it would be of axial pattern. However, these preliminary investigations suggest that the flap is often of random pattern.

**DISCUSSION**

Buccal flaps have been used in palatal repairs to provide the following advantages: (1) nasal layer lengthening; (2) reconstruction of a poor nasal layer repair; and (3) levator muscle sling reattachment on the hard palate. This report further describes the complications of impaired molar eruption using this flap in palatal repair. The problems encountered by some of our younger patients occurred in spite of the fact that design of the flap was made to ensure that the pedicle was placed posterolateral to the maxillary tuberosity.

It is interesting to consider why, after a number of years had elapsed, the pedicle came to overlie the posterior portion of the alveolus. Presumably this condition results from growth of the maxilla at the approximate age of 6 years, when permanent molars begin to erupt. The alveolar bone grows posteriorly to accommodate the extra teeth, and as a result the posterior portion of the upper alveolus came to lie behind the bridge segment of the flap.

No report of this complication has appeared in the English-speaking literature to the authors’ knowledge, but the technique was used many years ago in Germany and abandoned for this reason (Reichert, 1977).

It is our opinion that increased experience with the method and careful placement of the base of the flap can minimize this complication. Kaplan (1975) has also described raising the flap with the base in the alveolar sulcus, but this would seem—if anything—to increase the likelihood of the problems occurring when the permanent dentition erupts. It must be stated that many of the flaps were used prior to discussion with Reichert in which he mentioned the complication. Only after that discussion was the flap more carefully designed.

The results of nasendoscopic examination are difficult to interpret. It is possible that in some cases the flap has become so well incorporated into the nasal layer of the palate that it is not identifiable separately. Scarring seen on the nasal floor where the flap would originally have been inset was an occasional feature. It may be that in some cases a portion of the buccal flap does not survive. Apart from

TABLE 2 Age at Division of Flap Pedicle

<table>
<thead>
<tr>
<th>Age (Years)</th>
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<tr>
<td>3</td>
<td>1</td>
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<tr>
<td>9</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td>2</td>
</tr>
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FIGURE 1 Instrument inserted beneath bridge segment of flap prior to division (8 years of age). The flap was covering the first permanent molar.

FIGURE 2 Undivided bridge segment of the buccal flap (age 9 years). One episode of inflammation had been recorded associated with the bridge segment.
FIGURE 3 Undivided buccal flap in an 18-year-old patient. The bridge segment could interfere with the eruption of the third permanent molar and might require division.

Possible constriction and kinking of the pedicle as it passes through the palate, the cadaveric and fetal dissections would suggest that flap failure could result from inadequate blood supply. However, buccal flaps of similar design have been used to close palatal defects following malignant tumor resection. Because these flaps have resurfaced the oral layer of the defect, it has been possible to observe them. It is unusual to see evidence of flap necrosis, although initially there may be considerable venous congestion.

It must also be recognized that, in the standard palatal repair using this technique, a fistula at the junction of the hard and soft palate was found in only a few cases. If necrosis of the buccal flap was common, this would be expected to have occurred in more cases.

Nasal layer lengthening remains a controversial subject. Many surgeons leave the nasal mucosa intact (Trier, 1985; Borchgrevink, 1986). Data are not available in a sufficiently large series to allow a definitive assessment of the advantages of nasal layer lengthening. However, if a buccal flap is considered advantageous by the surgeon and is used at the time of palatal repair, care should be taken to ensure that the bridge segment is kept clear of the posterior aspect of the upper alveolus. These patients subsequently require regular intraoral examination and panoramic roentgenograms of permanent molar eruption. If the flap pedicle is covering the partially erupted molars, prompt steps should be taken to divide it.

In our hands a buccal flap does allow appreciable nasal layer lengthening that, it is hoped, will increase the probability of normal speech development, although we have no objective evidence to support this contention at the present time. In narrow clefts in which there is no difficulty in approximating the nasal layer posterior to the palatal shelf, a buccal flap is unnecessary. In wide clefts the approximation of the nasal mucosa may be problematic, and the buccal flap could provide a convenient solution.

REFERENCES


Commentary

Ever since the concept of the “palatal pushback” in the repair of cleft palate was introduced more than a half century ago, many surgeons have believed that severing the nasal mucosa at the junction of the hard and soft palate was essential to maximize the lengthening effect of the procedure. However, there have always been concerns that spontaneous healing by “secondary intention” of the raw “unsatisfied” area left behind on the nasal surface would nullify the benefit of the pushback.

Over the years a variety of procedures have been proposed to provide an epithelial cover for the raw nasal surface. The authors (Freedlander and Jackson) have described several of them. Some of these techniques have proven to be ineffective or have had complications or disadvantages that have caused them to be abandoned. The report by Freedlander and Jackson describes the use of mucosal flaps from the cheeks. The cheeks provide a natural source for surfacing the nasal layer of the palate, but buccal flaps have not been widely accepted. As pointed out by Freedlander and Jackson, buccal flaps have usually been reserved for special situations.

Although buccal flaps may not be used with frequency in
association with palatal repair, the report by Freedlander and Jackson is a valuable one. They have suggested placing the pedicle of the flap as far posteriorly as possible, being aware that the eruption of the molar might be impeded. If the need arises, the flap pedicle can be severed to expose the molars. The severing of the flap pedicle is not a major procedure and by itself should not be a contraindication to the use of buccal flaps. I suspect that this problem was not the sole reason that the German surgeons abandoned this procedure.

Another valuable aspect to this report is the long-term follow-up of the patients, which is often so sorely lacking in the literature and in clinical practice. The authors are to be commended for reviewing their results diligently, for using state-of-the-art techniques (such as nasopharyngoscopy), and for the minimum 8-year postsurgical follow-up. They have observed that the flaps blend well with the surrounding nasal mucosa, and this is not surprising. These flaps are sturdy, and there is no reason to assume that they might slough either partially or totally.

In recent years the emphasis in the literature has shifted and new concepts have emerged, such as the formation of the levator sling and the timing of palatal repair. Nevertheless, there are many surgeons who still believe that the palatal pushback in one form or another is essential in the repair of all or some cleft palates. The authors have provided useful data in assessing one approach to palatal lengthening.

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