Use of buccal myomucosal flap for palatal lengthening in cleft palate patient: Experience of 20 cases

DON VARGHESE, SHUBHARANJAN DATTA1, ANNIE VARGHESE2

Abstract

Background: The purpose of this review was to assess the effectiveness of the buccal myomucosal flap in secondary repairs of cleft palate in 20 patients. Patients and Methods: Totally, 20 patients, who underwent secondary palatoplasty between 5 years and 8 years in which a buccal myomucosal flap was used, were reviewed retrospectively. All patients had undergone at least one previous attempted repair at other institutions. Indications for the secondary repair included velopharyngeal incompetence and/or oronasal fistula. Patients were evaluated preoperatively for oronasal fistula status, velopharyngeal competence, nasal resonance, speech quality, and nasal escape. Results: The buccal myomucosal flap was used in all 20 patients, and there was marked increase in the quality of speech as well as nasal regurgitation decreased. In patients with levator dysfunction due to poor primary surgery and glottal speech the results were inconclusive. Conclusion: Palate re-repair combined with a buccal myomucosal flap, occasionally in conjunction with other techniques, is an effective method for correcting failed cleft palate repairs. Minimum donor site morbidity and complication makes the buccal flap a useful armamentarium of a cleft surgeon.

Keywords: Buccal myomucosal flap, speech quality, velopharyngeal incompetence

Introduction

The primary aim of cleft palate surgery is not only to close the cleft palate but to push back the palate by repositioning the levator muscle to ensure that normal speech is obtained.[1] Using a buccal myomucosal flap is a readily effective method for velopharyngeal closure when the cleft palate is wide.[2] Buccal musculomucosal flap is commonly used in cleft palate surgery for providing additional lining when nasal mucosa is inadequate.[3] It is an axial pattern flap which can be based either on the buccal or facial arteries. It is flexible and versatile and unlike most free flaps, provides mucosal, as opposed to skin, cover. The donor site can usually be closed primarily without causing deformity or scarring. The flap is about 5 mm thick and comprises buccal mucosa, submucosa, and buccinator muscle, with the feeding vessels and vascular plexus.[4] The technique presented has been effective, with the advantages of palatal closure without tension, good muscular reconstruction, lengthening of the nasal layer, and palatal closure without raw areas.[5] The aim of this study is to review the experience with the buccinator myomucosal flap, for clinical application in the secondary cleft cases with velopharyngeal insufficiency [Figure 1] and nasal regurgitation along with palatal fistula [Figure 2].

Patients and Methods

The treatment protocol was developed and has been strictly followed. It includes patient's general information such as family history, genetic study, and primary cleft diagnosis, surgeries performed, and follow-up.

Surgical technique

All patients had the modified push back palatoplasty using the buccal myomucosal flap. Preoperative dental impressions and radiographs were taken just before the procedure. This is standard for each primary surgery. The surgery was performed on all patients under general anesthesia using a standard protocol.

After infiltration with local anesthesia (lidocaine 0.05% plus 1:100,000 epinephrine), the Veau flaps are raised and extensively dissected from the nasal layer in the area of the soft palate. The levator musculature is then clearly exposed. The levator mechanism is then dissected completely from its anteromedial insertion onto the palate shelves. Division of the tendinous insertion of the palatopharyngeus and the fascia
of von Troltz is carried out. This allows retropositioning of the soft palate without tension. The levator musculature is gently dissected off the nasal layer, which is then devoid of any other structure. The muscles come to lie at right angles to the long axis of the palate at the base of the uvula. The greater palatine neurovascular bundle to these muscles enters from a later position; it is clearly seen and carefully preserved during the dissection. The nasal layer is accurately reconstructed with 4-0 vicryl. The levator musculature is reconstructed by being sutured together and to the nasal layer with 4-0 vicryl sutures in the midline at the base of the uvula. After that, the nasal layer of the palate is divided transversely at approximately 0.5 cm behind the palatal shelves. The oral mucosa area over the cheek is then exposed and a buccal myomucosal flap measuring between 1.5 and 2 cm wide by 2.5 cm long is then raised. The flap is elevated together with a thin layer of the buccinator muscle, which improves its blood supply. The mucosal defect is closed with 4-0 chromic catgut. It is important to avoid opening the buccal fat fascia; this prevents the herniation of fat into the oral cavity. If this occurs, repositioning of the fat pad and suture of the flap donor site is enough to solve the problem. The parotid duct should be carefully preserved, but if injured, it is of no consequence; the parotid secretion always finds a way out. A generous tunnel is created posterior to greater palatine vessels, and the buccal flap is passed through it to fill the nasal layer defect. The buccal flap is sutured in place with 4.0 vicryl. The flap must be placed with the mucosal surface facing the nasal cavity, taking care not to twist the pedicle. This technique lengthens the nasal layer by 1.5–2 cm. Subperiosteal dissection is never performed on the posterior tuberosity on the left side even if closure is difficult. To prevent growth problems, submucosal dissection only should be performed. This, however, is a rare situation. Closure of the oral layer is achieved with interrupted 4-0 vicryl mattress sutures. This is a composite closure that includes the oral and nasal layers and posteriorly the reconstructed muscles [Figure 1]. The lateral raw areas on the hard palate can always be closed directly in all clefts and also with 4.0 vicryl sutures. The patients are discharged 1-day after the surgery with examination of the palate and are seen 1-month later at the clinic unless something unforeseen occurs. Postoperatively, there is slight edema on the side from which Buccal Myo Mucosal Flap (BMMF) is taken, which subsides eventually after proper administration of antiinflammatory drugs and positioning [Figure 3].

Results

Of all the 20 cases operated, Nasal regurgitation that was marked preoperatively was reduced significantly. In four patients who had velopharyngeal insufficiency along with glottal sounds the results were marked as the regurgitation along with nasality in sounds also reduced.

Three patients had palatal fistula (mid palatine and anterior in one patient [Figure 2]) the results were marked as the regurgitation along with nasality in sounds also reduced.

Discussion

Buccal mucosal flaps have been utilized to repair a variety of defects of the nasal septum, palate, midface, orbit and conjunctiva. Modifications to improve the vascularity of the mucosal flaps were reported by Maeda et al., who also described buccal “musculomucosal” flaps for repair of cleft palate. Various techniques have been described for the creation of the buccinators musculomucosal flap, mainly based on arterial supply. The buccinators musculomucosal flap can be based posteriorly, anteriorly or superiorly.

Posteriorly based flaps

Bozola et al. first described buccal artery based posteriorly an axial musculomucosal flap. Once the Doppler ultrasound used for identification of buccal artery, at the level of the
buccopharyngeal fascia. The mucosa and the buccinators muscle are incised in the loose areolar plane, flap elevated in an anterior to posterior direction between the buccinator muscle and the buccopharyngeal fascia. To prevent the herniation of the buccal fat pad and avoids injury to branches of the facial nerve, the buccopharyngeal fascia is preserved. Small branches of the facial artery are ligated, as are anterior venous tributaries from the pterygoid plexus. The dissection proceeds posteriorly until just anterior to the pterygomandibular raphe, where the main neurovascular bundle enters the flap. The donor site is closed primarily. Care is taken that the pedicle does not interpose between the molar teeth as this may interfere with mastication. Relevant molars might need to be extracted or an island flap created; alternatively, the vascular pedicle may be divided after a delay of a few weeks. Modifications of this procedure include isolation of the pedicle to create an island flap, in order to facilitate rotation, and creation of a “buccinator myomucosal neurovascular island pedicle flap” based on the buccal artery, the buccal venous plexus and nerves innervating the muscle. The mucosa at the posterior end of the flap is divided from the underlying muscle and freed of its insertion from the pterygomandibular raphe. Then the flap is passed through a short tunnel under the pterygomandibular ligament.

Anteriorly based flap
Based anteroinferiorly on the inferior buccal branches of the facial artery the main trunk identified with a Doppler probe to establish its position. The mucosa and the buccinator muscle are incised superiorly, and the facial artery and vein ligated. The dissection continues in a plane lateral to the vessels, as the flap is raised from the front to back while branches of the facial artery are ligated.

Superiorly based flap
Zhao et al. described the superiorly based “buccinator myomucosal reversed-flow arterial island flap” based on the distal end of the facial artery and its anterior buccal branches. Course of the artery is outlined by Doppler ultrasound, and dissection starts at the inferior margin of the flap with incision of the mucosa and buccinators muscle. The facial artery is ligated inferriorly and the flap is elevated in a superior direction. The arc of rotation is centered between the oral commissure and medial canthus.

Buccal flap used in palatal repairs to provide the following advantage:[14]
- Nasal layer lengthening
- Reconstruction of poor nasal layer repair
- Levator muscle sling reattachment on the hard palate.

Buccal flaps have been used in palatal surgery for lengthening of the nasal layer, reconstruction of the poor nasal layer repair and to prevent reattachment of the levator sling on the hard palate. This flap can be raised either as a mucosal or a myomucosal flap and is usually based near the anterior pillar of the fauces.

The main reason for techniques using hard palate mucoperioseal flaps to achieve the anatomical union of the palate shelves has been to improve speech (von Langenbeck, 1861; Wardill, 1937; Dorrance and Bransfield, 1943; Furlow, 1986; Brothers et al., 1995). However, a large number of patients who undergo these surgical techniques still develop velopharyngeal insufficiency (VPI) because of the inability to reconstruct the palatal mechanism adequately to allow for normal speech. An ideal and successful palatal repair depends on soft palate myomucosal closure without tension. It should lengthen the palate and reconstruct the muscular sling to allow an efficient velopharyngeal valving action during speech, thus establishing conditions for good velopharyngeal closure. The modified palatoplasty with the buccal myomucosal flap meets all of these the buccal myomucosal flap meets all of these criteria. The muscular sling reconstruction maximizes the velar elevation and posterior closure by establishing normal levator muscle relationships. The muscles are carefully reconstructed both anatomically and functionally. It is important to note that the musculature is completely released from its atypical insertions on the posterior edges of the palate bones and to the nasal and oral attachments. The muscular sling and sphincteric mechanism can be easily reconstructed without any tension if the muscles are properly and completely detached from these structures. The innervation to the muscles is maintained because this is essential for good postoperative muscular action. In addition, the muscles are fixed securely to the nasal and oral layers when correctly repositioned. The palatal and oral layers are sutured to one another throughout the length of the cleft repair. Although the muscular reconstruction can be very effective in achieving velopharyngeal closure, it is not enough to merely lengthen the nasal mucosa. Thus, insertion of the buccal myomucosal flap complements the palate repair and prevents any possible anterior movement of the muscle sling. In the first description of the buccal mucosal flap, Mukherji (1969) stated that short soft palate is a relative term because its length is dependent on the depth of the nasopharynx.[13] He noticed that children with distances >5 mm between the soft palate and the posterior pharyngeal wall (57.1% of children with cleft in his study) were more likely to have speech problems that needed to be corrected further. His rationale for the use of the buccal flap was the possibility of lengthening the palate and to avoid surgeries such as the pharyngeal flap in small children. Ganguli (1971) reported the use of submucous cheek pedicle to lengthen the short palate.[13] Kaplan (1975) described the technique in primary palatal repair as a unilateral buccal mucosal flap to be turned in for nasal lining after the nasal mucosa division following the pushback.[14] Maeda et al. (1987) modified the initial buccal mucosal flap to a buccal myomucosal flap, including a thin layer of the buccinator muscle, in an attempt to improve
They also used bilateral buccal flaps to lengthen the nasal layer and to cover the oral surface of the palate, as Nakikita et al. (1991) also reported. Placed in a transverse cut made in the nasal layer, the buccal myomucosal flap can add an additional 1.5–2 cm to the nasal surface. That maneuver will allow an adequate contact between the soft palate and the nasopharynx (Mukherji, 1969). It is possible to completely close even the widest clefts with this technique without the need of further procedures. Because of the extensive release of the nasal and oral layers from the palatal shelves, insertion of the buccal flap and mattress sutures that include the nasal, oral, and levator muscles, the repaired palate is anatomically correct and stable. Freedlander and Jackson (1989) studied the reliability of the buccal flap over time. They showed by endoscopic examination that the buccal flap remained viable and kept its initial dimensions, lengthening the nasal layer. They hypothesized that the flap would prevent reattachment of the reconstructed levator muscle in its preoperative position because of its in terposition between the hard palate and the velar muscles (Kaplan, 1975; Freedlander and Jackson, 1989).

No major problems have been observed in the donor site of the buccal flap. The buccal mucosa is available in an adequate amount, and there is no significant danger of airway obstruction or hemorrhage. None of the complications described in the literature, such as swelling of the face, impossibility of hard palate donor site closure, infection, or stenosis of the parotid duct (Kaplan, 1975; Maeda et al., 1987; Freedlander and Jackson, 1989) were observed in our series. In our experience, the primary palatoplasty with the buccal myomucosal flap has been an extremely safe and easy operation. Occasionally, on the advice of an orthodontist, the buccal flap pedicle had to be divided at the time of eruption of the third molar. It is important to differentiate the use of the buccal mucosal flap from other flaps used to lengthen the palate, such as the Millard island flap (Millard, 1963) and the Edgerton technique for palate elongation (Edgerton, 1962). The Millard island flap consisted of the division of the nasal mucosa and placement of a palatal mucosa island flap based on the great palatine vessels. A plethora of techniques has been used in palatal repair. It is still difficult to determine how much these have really improved speech because of the variety of methods used to analyze speech and different interpretations by the evaluators. The presence of a speech-language pathologist has been extremely important in the evaluation and improvement of the speech quality.

Our approach is to repair the palate before speech development. There is a common belief that this can enhance the speech outcome and prevent the development of compensatory articulation patterns that are difficult to correct the longer they are left untreated. The optimal age for palatal repair has been the subject of a number of studies (Cosman and Falk, 1980; Dorf and Curtin, 1982; Freedlander and Jackson, 1989; Yunsa et al., 1997; Marrinan et al., 1998). The palate needs be closed prior to the onset of the phonemic development to minimize abnormal speech patterns (Dorf and Curtin, 1982). The dilemma about early repair has been how to obtain an early communicative adequacy without sacrificing orofacial growth components.

Conclusions

The buccal myomucosal flap is a dependable local sensate flap with a well-defined neurovascular pedicle that can be used in a variety of introral reconstruction obviating the need for distal tissue harvest. Secondary palate repair with the buccal myomucosal flap has been an effective technique in terms of speech outcome, VPI, and fistula occurrence. It allows palatal closure without tension; good levator muscular sling reconstruction and retropositioning; lengthening of the nasal layer; and the absence of raw areas, which may compromise facial growth. The technique, the early repair, and the surgeon’s experience are the most important variables for the good outcome that has been achieved.

References

1. Maeda K, Ojimi H, Utsugi R, Ando S. A T-shaped musculomucosal buccal flap method for cleft palate surgery. Plast Reconstr Surg 1987;79:888-96.
2. Chen GF, Zhong LP. A bilateral musculomucosal buccal flap method for cleft palate surgery. J Oral Maxillofac Surg 2003;61:1399-404.
3. Tuli P, Parashar A, Nanda V, Sharma RK. Delayed buccal fat pad herniation: An unusual complication of buccal flap in cleft surgery. Indian J Plast Surg 2009;42:104-5.
4. Van Lierop AC, Fagan JJ. Buccinator myomucosal flap: Clinical results and review of anatomy, surgical technique and applications. J Laryngol Otol 2008;122:181-7.
5. Jackson IT, Moreira-Gonzalez AA, Rogers A, Beal BJ. The buccal flap – A useful technique in cleft palate repair? Cleft Palate Craniofac J 2004;41:144-51.
6. Freedlander E, Jackson IT. The fate of buccal mucosal flaps in primary palatal repair. Cleft Palate J 1989;26:110-2.
7. Von Langenbeck B. Uranoplasty by means of raising mucoperiosteal flaps. Arch Klin Chir 1861;2:205.
8. Wardill WE. The technique of operation for cleft palate. Br J Surg 1937;25:117.
9. Dorrance GM, Bransfield JW. Cleft palate. Ann Surg 1943;117:1-27.
10. Furlow LT Jr. Cleft palate repair by double opposing Z-plasty. Plast Reconstr Surg 1986;78:724-38.
11. Brothers DB, Dalston RW, Peterson HD, Lawrence WT. Comparison of the Furlow double-opposing Z-platoplasty with the Wardill-Kilner procedure for isolated clefts of the soft palate. Plast Reconstr Surg 1995;95:969-77.
12. Mukherji MM. Cheek flap for short palates. Cleft Palate J 1969;6:415-20.
13. Ganguli AC. Lengthening the Short Palate by Submucous Pedicle Cheek Flap. Melbourne, Australia: International Plastic and Reconstructive Surgeons; 1971.
14. Kaplan EN. Soft palate repair by levator muscle reconstruction and a buccal mucosal flap. Plast Reconstr Surg 1975;56:129-36.
15. Nakakita N, Maeda K, Ojimi H, Utsugi R, Maekawa J. The modified buccal musculomucosal flap method for cleft palate surgery. Plast Reconstr Surg 1991;88:421-6.
16. Millard DR Jr. The island flap in cleft palate surgery. Surg Gynecol Obstet 1963;116:297-300.
17. Edgerton MT. Surgical lengthening of the cleft palate by dissection of the neurovascular bundle. Plast Reconstr Surg Transplant Bull 1962;29:551-60.
18. Cosman B, Falk AS. Delayed hard palate repair and speech deficiencies: A cautionary report. Cleft Palate J 1980;17:27-33.
19. Dorf DS, Curtin JW. Early cleft palate repair and speech outcome. Plast Reconstr Surg 1982;70:74-81.
20. Ysunza A, Pamplona MC, Mendoza M, García-Velasco M, Aguilar MP, Guerrero ME. Speech outcome and maxillary growth in patients with unilateral complete cleft lip/palate operated on at 6 versus 12 months of age. Plast Reconstr Surg 1998;102:675-9.
21. Marrinan EM, LaBrie RA, Mulliken JB. Velopharyngeal function in nonsyndromic cleft palate: Relevance of surgical technique, age at repair, and cleft type. Cleft Palate Craniofac J 1998;35:95-100.

How to cite this article: Varghese D, Datta S, Varghese A. Use of buccal myomucosal flap for palatal lengthening in cleft palate patient: Experience of 20 cases. Contemp Clin Dent 2015;6:S36-40.

Source of Support: Nil. Conflict of Interest: None declared.