Buccinator Musculomucosal Flap
Applications in Intraoral Reconstruction
Greg R. Licameli, MD; Robert Dolan, MD

Objective: To evaluate the use of the buccinator musculomucosal flap in the reconstruction of defects of the oral cavity and oropharynx.

Design: Prospective case series of 8 patients during a 1-year period with an average follow-up of 1 year. Six anatomical dissections were performed on 3 fresh cadaver heads to investigate the neurovascular supply to the flap.

Setting: Academic tertiary referral medical center.

Results: The buccinator musculomucosal flap was used in the reconstruction of 8 defects of the oral cavity, retromolar trigone, and soft palate. There was 1 partial flap necrosis that occurred in a patient who had previously received radiation therapy and who healed secondarily without sequelae. No patient experienced difficulties with mastication or oral competence. All patients reported light single-point touch sensation over the flap 2 weeks after surgery. Cadaveric dissections using latex or india ink injections demonstrated the posterior neurovascular supply from the buccal artery, a branch of the internal maxillary artery, and the buccal nerve, a branch of the mandibular nerve.

Conclusions: The buccinator musculomucosal flap is a dependable local sensate flap with a well-defined neurovascular pedicle that can be used in a variety of intraoral reconstructions obviating the need for distal tissue harvest.


P O S T E R I O R L Y B A S E D buccinator musculomucosal flaps (BMFs) are useful for oral cavity reconstruction, yet have received little attention in the otolaryngologic literature. In the past, these flaps were used primarily for reconstruction of cleft palate defects. The application of this flap to common defects of the posterior oral cavity after cancer resection has not been reported. The BMF provides sensate coverage for a variety of posterior oral cavity and oropharyngeal defects, and we have used it for reconstruction of defects involving the retromolar trigone, soft palate, and posterior floor of mouth. We present this clinical experience and results of cadaveric dissections to demonstrate the anatomical basis and clinical applications of the BMF.

REPORT OF CASES

CASE 1

A 65-year-old man who received prior radiation therapy for a T2 SCC of the tongue presented 9 months after a wide local excision of a T1, N0 SCC of the left retromolar trigone. The defect was allowed to heal secondarily. A recurrent 1×2-cm lesion was noted within the prior surgical field. Wide excision of this lesion included excision of the periosteum of the ascending mandibular ramus and the subsequent defect measured 2×3 cm with exposed bone.

A BMF was raised intraorally and rotated on its posterior neurovascular pedicle into the defect. The flap was secured with slow absorbing sutures and the donor site was closed primarily. The patient was discharged home on postoperative day 1 on a soft solid diet. The distal tip (3 mm) of the flap underwent necrosis, but the resulting defect healed uneventfully by secondary intention after debridement. Light touch perception was demonstrated over the flap at the 2-week clinic follow-up. At 1 year of follow-up the patient was free of disease.

CASE 2

A 62-year-old man presented with T1, N0 SCC of the left soft palate and anterior tonsillar pillar. On direct laryngoscopy the le-
MATERIALS AND METHODS

Clinical cases were obtained prospectively from the Otolaryngology–Head and Neck Surgery Service at the Veterans Affairs Hospital, Boston, Mass, from January 1994 to June 1995. Eight patients were selected based on the defect anticipated after surgical excision. Seven of the patients were men and 1 was a woman, with an average age of 66 years. All patients were staged before excision as having a T1, N0, M0 or T2, N0, M0 squamous cell carcinoma (SCC) involving the soft palate (2 patients), retromolar trigone (5 patients), or floor of mouth (1 patient) (Table). The smallest defect measured 2.5×3 cm, and the largest defect was 3×5 cm. Three patients had prior oral cavity carcinoma; 2 in the same site as the resection and 1 with a history of multiple small SCCs of the tongue previously excised before presenting with a separate palate lesion. All patients were followed up for a minimum of 1 year after surgery.

Six anatomical dissections were performed on 3 fresh cadaver heads to develop a reliable technique of flap harvest and to investigate the vascular territory of the main posterior arterial feeder. The vascular supply was defined by contrast injection: 1 cadaver was injected with India ink in the internal maxillary arteries and 2 were injected with latex in the carotid arteries and internal jugular veins. India ink was injected into the distal internal maxillary artery after ligating the branches between the point of injection and the buccal artery, thus allowing the ink to enter only the buccal artery. A 10-mL syringe with an 18-gauge angiocatheter was inserted into the internal maxillary artery and secured with a crimping silk suture, and the ink was injected under steady continuous pressure for approximately 15 seconds. Dissections of the buccinator muscle and overlying mucosa were performed via an intraoral approach through a median mandibulotomy.

SURGICAL TECHNIQUE

The tumor is excised and the defect is sized (Figure 1 and Figure 2). Stensen duct is identified and the superior margin of the flap is outlined, keeping at least 3 mm inferior to the duct papilla (Figure 3). The anterior limit of the flap is 1 cm behind the oral commissure. The maximal graft size possible is 4 cm in a superior-inferior direction and 7 cm in an anteroposterior direction.

The buccal mucosa and the buccinator muscle are incised to the level of the buccopharyngeal fascia, working in an anterior to posterior direction. A loose areolar plane exists between the buccinator muscle and the buccopharyngeal fascia, facilitating the elevation of the flap with blunt dissection. The buccopharyngeal fascia should be preserved for 2 reasons: to prevent buccal fat pad herniation into the field of dissection and to avoid injury to branches of the facial nerve. Small branches from the facial artery may require ligation as may anterior venous tributaries from the pterygoid plexus. The buccal artery, accompanying vein, and buccal nerve arise laterally at the posteroinferior aspect of the buccinator muscle. The pedicle may be isolated to create an island flap to facilitate rotation, but this is not usually necessary. The flap is then transferred into the defect and secured with long-lasting absorbable sutures, and the donor site is closed primarily (Figure 4 and Figure 5).

RESULTS

Eight patients underwent primary tumor excision of soft palate, retromolar trigone, or floor of mouth lesions with the defect closed using the BMF. There were no tumor recurrences and no problems with mastication, oral continence, or facial nerve function. All patients demonstrated touch perception over their flap 2 weeks after surgery. This was evaluated by light touch with a tongue depressor over the mucosa of the transposed flap. There was 1 partial flap necrosis (the distal 3 mm in case 1) that was allowed to heal secondarily without sequelae.

The basic anatomy of this area has been described by Hollinshead and others. Through our cadaver dissections, we were able to outline the limits of the vascular territory of the buccal artery, investigate the incorporation of the buccal nerve with the flap, and define the

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Figure 1. Intraoral view of a left retromolar trigone lesion. P indicates palate; t, tongue; and asterisk, retromolar trigone tumor.
amount of tissue that could be harvested. The buccal artery, a branch of the internal maxillary artery, originates near the lateral aspect of the lateral pterygoid muscle entering the posterior aspect of the buccinator muscle. This was demonstrated clearly with both latex and india ink injections, the latter resulting in extensive staining of the mucosa over the buccinator muscle as well as the mucosa of the superior alveolar ridge and lateral soft palate (Figure 6). The buccal nerve, a branch of the mandibular nerve, travels with this artery (Figure 7 and Figure 8). The buccal nerve provides sensory innervation to the mucosa of the cheek. A rich venous drainage system is composed of the internal maxillary vein and pterygoid plexus posteriorly and from facial vein tributaries anteriorly.

COMMENT

We investigated the use of the posteriorly based BMF and found that it is a reliable, easily harvested local flap, useful for reconstruction of lesions involving the floor of mouth, retromolar trigone, and soft palate. It obviates the need for an intraoral bolster or harvesting of tissue beyond the oral cavity. Our cadaveric studies demonstrated the consistent isolation of the buccal artery, and the india ink injections demonstrated the generous blood supply from this artery to the overlying cheek mucosa. The buccal nerve is adjacent to the buccal artery and is easily included with the flap to maintain sensation to the overlying mucosa. The BMF was raised within 30 minutes without the use of magnification in all cases, minimizing total intraoperative time.

There was only 1 partial flap failure (case 1) in a patient with a prior resection in the same area as well as prior radiation therapy; however, it was inconsequential and was treated conservatively. While this flap can be used in previously irradiated fields, the risk of partial loss may be higher. In addition, external carotid artery resection or thrombosis may also jeopardize the viability of this flap. All the donor sites were closed primarily leaving no raw surfaces, and there were no adverse effects secondary to harvesting the muscle, particularly with
Buccal mucosa was first used to repair septal perforations and palatal fistulas. As experience was gained with the use of local random buccal mucosal flaps for closure of intraoral defects, the incorporation of the underlying buccinator muscle was described. Sasaki et al outlined the use of a cheek island flap for reconstruction of cervical esophageal strictures that was based on the facial artery and vein. Subsequently, Maeda et al described posteriorly based cheek mucosal flaps for lengthening of the palate. The anatomical basis for this flap was illustrated by Bozola et al, who used it for palatal clefts and for 1 case of palatal carcinoma. They noted that the main blood supply to the flap was based posteriorly on the buccal artery; however, no attempt was made to isolate the pedicle and island the flap. Carstens et al have reported that the dominant blood supply is anterior from the facial artery. All flaps used in our series were supplied posteriorly as harvested; however, based on our clinical observations, cadaveric studies, and review of the literature, we believe that this flap is adequately supplied from either source alone.

We noted that the vascular anatomy seen in both our cadaveric and surgical patients agrees with descriptions presented in prior studies. However, the proximity of the buccal nerve to the buccal artery and its incorporation into the flap has been neglected. Our patients, when tested over the area of reconstruction in the early postoperative period, reported fine-touch perception, and this may aid in oral rehabilitation.

The BMF has several advantages over other options that have been used in the reconstruction of oral cavity defects. Healing by secondary intention may risk contracture at the site with possible soft palate dysfunction. Skin grafts may not adhere to exposed bone and involve placement of a bolster that may be technically difficult in this area. Tongue flaps usually require 2 stages, and speech and swallowing may be adversely affected. The nasolabial flap requires an external excision and may not reach the retromolar trigone. Regional flaps, such as the temporalis muscle flap, or free flaps such as the radial forearm, involve extensive extraoral dissection and are better reserved for larger defects.

The anatomy of the BMF is reliable and consistent. It provides similarly textured sensate tissue for reconstruction in the oral cavity. It can be harvested quickly without morbidity, and the donor site can be closed primarily with excellent cosmesis and function. A significant advantage is the inclusion of the buccal nerve with the vascular pedicle, allowing the flap to be sensate. This versatile local flap should be considered for reconstruction of defects of the floor of mouth, retromolar trigone, and soft palate.

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Corresponding author: Greg R. Licameli, MD, Department of Otolaryngology–Head and Neck Surgery, University of Illinois at Chicago, 1855 W Taylor St, Chicago, IL 60612.

REFERENCES