A Technical Modification of the Submental Flap for Reconstruction of Verrucous Lesions of the Oral Cavity

Arvind Krishnamurthy

Received: 25 March 2013 / Accepted: 24 April 2013 / Published online: 5 May 2013
© Indian Association of Surgical Oncology 2013

Introduction

The submental flap has been a reliable and versatile flap for head and neck reconstruction. It was first described by Martin in 1993 [1]. Over the past two decades, the flap has been extensively used for reconstruction of skin and soft tissue defects in head and neck oncology. The increasing popularity of the flap was a bit tempered following concerns about the compromised oncological safety while harvesting the flap. There are however no such concerns when the submental flap is used in the management of verrucous lesions of the oral cavity following a per-oral excision. The use of the submental flap for this common problem in the Indian sub continent has not been addressed in literature. We share our experience of a technical modification of the traditional submental islanded flap for reconstruction of verrucous lesions of the oral cavity following ablative surgery.

Surgical Technique of Flap Harvest of the Submental Flap

An ellipse of skin is marked in the submental area across the midline, with the patient in the supine position and the head extended under general anesthesia. The length of the flap is designed such that it corresponds to the size of the recipient defect (Fig. 1a,b). The length can extend from the angle of one mandible to the other if deemed necessary. The maximal width of the flap is determined by a pinch test so as to achieve a primary closure of the donor site. The upper limit of the incision is made 1.5–2 cm below the mandible in the midline and 4 cm below the angles of the mandible on both

sides, thereby safeguarding the marginal mandibular nerve (Fig. 2a). The harvesting of the flap begins from the contra lateral side of the pedicle in the subplatysmal plane. Care should be taken to identify and dissect the submental vascular pedicle as the dissection reaches the midline. The dissection then cautiously proceeds to allow incorporation of the ipsilateral anterior belly of the digastric muscle so as to safeguard the musculocutaneous perforator vessels emanating from the submental artery (Fig. 2b). The number of perforators usually ranges from one to four, one of which is the dominant perforator artery [2]. Inadvertent injury to the dominant perforator can potentially jeopardize the vascularity of the otherwise robust flap.

The classical description of the islanded submental flap necessitated a release of the facial artery and vein over the antegonial notch to allow for a maximal arc of rotation. The submandibular salivary gland was deliberately removed in order to avoid unwanted bulk and to facilitate pivoting. Deepithelialization of the interposed tunneled portion of the skin flap with maintenance of the subdermal plexus further facilitates the in setting.

In our **modified technique**, the facial artery and vein over the antegonial notch is **preserved** along with the ipsilateral submandibular gland in an attempt to enhance the vascularity of the flap (Fig. 2b). The arc of rotation, although restricted, is usually adequate to permit the tip of the flap to reach up to the level of the retromolar trigone. The entire skin paddle of the flap is tunneled intra orally, lateral to the mandible, avoiding deepithelialization. The flap is then appropriately aligned and sutured to cover the recipient defect (Fig. 3). The donor site defect is primarily closed. We have successfully used this technique in three patients with verrucous lesions involving the buccal mucosa and the adjoining gingivo-buccal sulcus. (2 verrucous hyperplasias and one verrucous carcinoma) All patients are initially started on nasogastric tube feedings. Oral feeds are

A. Krishnamurthy (✉)
Surgical Oncology, Cancer Institute (WIA), 36, Sardar Patel Road,
Adyar, Chennai 600020, India
e-mail: drarvindkrishnamurthy@yahoo.co.in

Fig. 1 **a** Pre-operative intra-oral clinical photograph showing the verrucous lesion involving almost the entire left buccal mucosa, extending from the commissure to the left retromolar trigone. **b** Intra oral photograph showing the recipient defect following wide excision

encouraged from the 3rd post operative day and are gradually enhanced to a standard diet. The patients were discharged within a week. Apart from hair growth in the flap in a male patient, there were no other functional issues associated with this procedure.

Discussion

Verrucous lesions of the oral cavity are clinically distinct lesions with varied histopathological features. The spectrum of these lesions encompasses verrucous hyperplasias, proliferative verrucous leukoplakias and verrucous carcinomas. Although the exact etiology of verrucous lesions is not well defined, chewing of tobacco, smoking and alcohol have been implicated as potential causative factors [3].

Verrucous hyperplasia is considered to be a forerunner of verrucous carcinoma; hence it is recommended that all verrucous lesions of the oral cavity be treated like verrucous carcinomas. Verrucous carcinoma is a distinct low-grade variant of squamous cell carcinoma. These tumors characteristically have a broad-based wart-like papillary appearance. These tumors differ from squamous cell carcinomas, in being slow growing, locally destructive and rarely metastatic. Verrucous carcinomas may occasionally contain foci of

invasive squamous cell carcinoma. The gingivum and the buccal mucosa are the most frequent sub sites to be involved, followed by the tongue, floor of mouth, lip, and palate.

Surgery in the form of wide excision with clear margins and an appropriate reconstruction is the accepted standard of management for all verrucous lesions [3, 4]. Various reconstructive techniques including skin grafts, regional flaps and micro vascular free flaps have been employed in the restoration of form and function following ablative surgery. The commonly used microvascular free flaps are the radial forearm and the anterior lateral thigh flaps. These flaps are technically demanding and may not be appropriate in elderly patients or patients with co morbid conditions that preclude them from being candidates for operations of long duration. A pedicled submental flap is a suitable alternative reconstructive option in such circumstances [5, 6].

The submental flap is based on the submental artery, which branches out about 5–6.5 cm from the origin of the facial artery. The course of the submental artery is variable; it is reported to run in a plane deep to the anterior belly of the digastric muscle in 70 % and superficial to it in 30 % of cases [7].

Our modification of the submental flap as described above is a robust and reliable option for reconstruction following surgery of the verrucous lesions of the oral cavity. Its reliable vascularity, minimal donor site morbidity and

Fig. 2 **a** Intra operative clinical photograph showing the marking of the submental flap to match the recipient defect. **b** Intra operative clinical photograph showing the raising of the submental flap along with the ipsilateral anterior belly of the digastrics just prior to

being tunneled, the *short black arrow* showing one of the perforator of the submental artery and the *long black arrow* pointing to depict the preservation of the facial artery and vein in the antegonial notch

Fig. 3 Intra operative clinical photograph showing the submental flap insetted to cover the mucosal defect inside the oral cavity, after being tunneled inside lateral to the mandible

relative ease of dissection and application offers a definite advantage over the other local and distant flaps. In elderly patients, the redundant skin of the anterior neck contributes to making the submental flap especially useful, providing a cosmetically appealing, well-healed and hidden donor scar [5]. The submental flap can be routed medial to the mandible to reconstruct defects involving the floor of the mouth, the base of the tongue and the tonsillar fossa [8]. Some authors have suggested a reverse submental flap based on retrograde flow through the facial vessels to achieve even greater mobility so as to reconstruct the defects following maxillectomy. This is done by dividing the facial vessels proximal to the origin of the submental vessels [9].

The contraindications to the use of the submental flap are previous neck surgeries and injury/ligation of the facial artery and vein. A clinically positive neck, especially in Level 1 cervical nodal regions, should be considered a relative contraindication from the standpoint of oncological safety, although many authors have shown it be relatively safe. Prior external beam radiotherapy to the neck, although the not an absolute contraindication for a submental flap, is known to be associated with problems in healing of the

donor-site [10]. In conclusion, our modification of the submental flap for verrucous lesions of the oral cavity makes it a more robust and oncologically safe reconstructive option and provides an attractive addition to the reconstructive armamentarium of a head and neck surgeon.

References

1. Martin D, Pascal JF, Baudet J et al (1993) The submental island flap: a new donor site. Anatomy and clinical applications as a free or pedicled flap. *Plast Reconstr Surg* 92:867–73
2. Matsui A, Lee BT, Winer JH, Laurence RG, Frangioni JV (2009) Submental perforator flap design with a near-infrared fluorescence imaging system: the relationship among number of perforators, flap perfusion, and venous drainage. *Plast Reconstr Surg* 124:1098–104
3. Devaney KO, Ferlito A, Rinaldo A, El-Naggar AK, Barnes L (2011) Verrucous carcinoma (carcinoma cuniculatum) of the head and neck: what do we know now that we did not know a decade ago? *Eur Arch Otorhinolaryngol* 268:477–80
4. Sciubba JJ, Helman JI (2013) Current management strategies for verrucous hyperkeratosis and verrucous carcinoma. *Oral Maxillofac Surg Clin North Am* 25:77–82
5. Behan FC, Rozen WM, Wilson J, Kapila S, Sizeland A, Findlay MW (2013) The cervico-submental keystone island flap for locoregional head and neck reconstruction. *J Plast Reconstr Aesthet Surg* 66:23–8
6. Paydarfar JA, Patel UA (2011) Submental island pedicled flap vs radial forearm free flap for oral reconstruction: comparison of outcomes. *Arch Otolaryngol Head Neck Surg* 137:82–7
7. Faltaous AA, Yetman RJ (1996) The submental artery flap: An anatomic study. *Plast Reconstr Surg* 97:56–62
8. Xuwei D, Jian X, Xueqin L, Xianjie Z, Jianbo Y, Wei L, Ligen M (2013) The reconstruction of head and neck defects with the submental island flap. *Head Neck Oncol* 5:19
9. Chen WL, Zhou M, Ye JT, Yang ZH, Zhang DM (2011) Maxillary functional reconstruction using a reverse facial artery-submental artery mandibular osteomuscular flap with dental implants. *J Oral Maxillofac Surg* 69:2909–14
10. Taghinia AH, Movassaghi KD, Wang AX, Pribaz JJ (2009) Reconstruction of the Upper Aerodigestive Tract with the Submental Artery Flap. *Plast Reconstr Surg* 123:562–570