

Original Research Article

Tongue flap- a good choice for intraoral reconstruction after marginal mandibulectomy: a single institution retrospective study of 27 cases

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ABSTRACT

Background: Marginal mandibulectomy with wide excision of the primary tumour in the treatment of the oral cavity squamous cell cancers preserves the form and function of the mandible, without compromise in obtaining oncologically safe margins. Of the various methods of reconstruction of the composite intraoral tissue defect, tongue flaps offer an easy and effective method of reconstruction.

Methods: We have collected the records of 27 patients who underwent marginal mandibulectomy and tongue flap reconstruction in the last 6 years from the cancer department master case sheets, operative records and follow up records. The information on the immediate and long term complications were obtained from the records and functional outcomes of patients were recorded at the time of last follow up and analysed. All the 27 patients had horizontal marginal mandibulectomy with an anteriorly or posteriorly based tongue flap reconstruction.

Results: The most common early postoperative complication was infection around the flap site that occurred in 18.5% of patients. The other complications including haemorrhage, flap dehiscence occurred in few patients which were managed effectively. There was no incidence of major flap necrosis. Speech and swallowing difficulty was encountered in 18.5% and 14.8% of patients respectively. The long term complications were managed conservatively with speech and swallowing therapy.

Conclusions: In our experience, tongue is an excellent donor site for intraoral soft tissue reconstruction, providing an analogous tissue for reconstruction. The technique is simple with acceptable rates of immediate and long term complications and with good functional outcomes.

Keywords: Marginal, Mandibulectomy, Tongue flap

INTRODUCTION

Oral squamous cell cancers (OSCC) has a very high incidence in India.¹ Surgery is the treatment of choice for majority of patients. Nevertheless, this modality of treatment results in significant functional morbidity and cosmetic defects, further worsened by additional adjuvant treatment with radiation.² OSCC have the tendency to invade the mandible, which is in close proximity to all sub sites of the oral cavity. The traditional belief of the spread of OSCC along the periosteal lymphatics

mandated the performance of either a segmental mandibulectomy or hemimandibulectomy to achieve radical clearance in patients with invasion of the mandible. Subsequently, it was proposed that the spread of the cancer cells was through the regional lymphatics, which led to the era of conservative marginal mandibulectomy, preserving the form and function of the mandible.³⁻⁵ Mandibular continuity is required for the functions of maintaining airway, swallowing and articulation.⁶ In our centre marginal mandibulectomies have been performed for lesions close to the mandible

and lesions causing superficial erosions of the mandible, to obtain oncological safe margins for the primary tumour. The resulting composite tissue defects were reconstructed using various methods including free flaps, local advancement flaps, tongue flaps, split skin graft, masseteric flap and forehead flap.⁷ Tongue flaps were used in the majority of our cases with the goal of achieving replacement with a similar type of tissue using the simplest technique. Tongue flaps have the advantage of central location, rich vascular supply and low morbidity.⁸ Almost half of the tongue can be mobilised without compromise in mastication, swallowing and articulation.⁹

In this study, we describe our experience with tongue flap reconstruction after marginal mandibulectomy for intra oral squamous cell cancers and the functional outcomes in patients following the surgery.

METHODS

This is a retrospective study conducted in the Cancer Department of Government Royapettah Hospital affiliated to Kilpauk Medical College in Chennai. Data regarding the patients’ demographics, stage of disease, type of surgery, pathology reports, postoperative management, adjuvant treatment and follow up details of the patients who underwent marginal mandibulectomy and tongue flap reconstruction during the period from the 1st of January 2012 to 31st of December 2017 were recorded from the operative records, the Cancer Department Master case sheets and follow up registers. All the patients were called for follow up and the details of morbidity were recorded. Speech and articulation were assessed by the speech therapist. The articulation difficulty was graded using the articulation scale (Table 1) from 0-6. The patients who had a recurrence, second surgery, lost follow up and who died of disease or other causes are excluded from this study. A literature search was made online from PUBMED and Google Scholar using keywords “tongue flap reconstruction”, “marginal mandibulectomy” in head and neck cancers and all relevant articles have been reviewed and cited.

Table 1: Articulation scale.

6	Within normal limits
5	Mild-slight distortion and imprecision of consonants only
4	Mild to moderate-all consonants targeted
3	Moderate-at least 2 consonants placements acoustically distant from the target, e.g. k=t, s =th, ch=t
2	Moderate to marked-consonants and vowels both affected
1	Marked-uses adaptative compensatory articulations for all lingual consonants
0	Severe-does not use effective compensatory articulation

The ethical committee of our institution approved the retrospective study. Consent was obtained from all the patients during the follow-up visit to include them in the study.

Chi-square test was used to analyse the significance of the association between two variables.

RESULTS

From January 2012 to December 2017, tongue flaps were used in 27 patients for the reconstruction of intra oral defects resulting from resection of the primary tumour along with marginal mandibulectomy. 15 patients were male and 12 were female. Of the 27 patients, 22 had their primary tumour located in the buccal mucosa, 3 with lower alveolus fwe1\carcinoma, 1 with the floor of mouth cancer and 1 had the primary located in the retromolar trigone. Majority of our patients presented with T2 primary tumour (n=16), 4 with T1, 4 with T3 and 3 patients had tumour invasion of the mandible (T4a) amenable for marginal mandibulectomy. In 9 patients the flap was based anteriorly, posterior based in 18 patients. The patient characters are listed in Table 2.

Table 2: Patient characteristics (n=27).

Characteristics	N
Stage	
T1	4
T2	16
T3	4
T4a	3
Gender	
Male	15
Female	12
Site	
Buccal mucosa	22
Lower alveolus	3
Floor of mouth	1
Retromolar trigone	1
Tongue flap	
Anterior based	9
Posterior based	18

In four patients split skin graft was used additionally to cover larger defects where tongue flap alone was inadequate. Postoperative radiation therapy was given to 12 patients, 7 had T3/T4a tumours and 3 patients had close surgical margins <5 mm, 2 patients had pN2b disease. The radiation dose ranged from 46-54 Gy and the median dose was 50 Gy. In all patients, horizontal marginal mandibulectomy was performed removing the alveolar process of the mandible with a minimum vertical height of 1 cm of mandible remaining, except for one patient with a lesion in RMT, where the anterior portion of the ramus of the mandible was resected. 24 patients underwent some form of neck dissection at the time of primary surgery.

The follow up period ranged from 9 months to 70 months. The age of the patients ranged from 31 to 75 years (mean age– 50.56 years). The early complications which occurred in less than one month of surgery were recorded from the master case sheets. The most common complication was surgical site infection in 5 patients (18.52%) and all were managed conservatively with antibiotics (oral/intravenous) and frequent oral toileting. The other complications included haemorrhage from the flap requiring intervention in 2 (7.41%) patients, the bleeding vessel was identified and ligated. Flap dehiscence was seen in 4 patients (14.82%) and 2 required re-suturing and 2 were managed conservatively.

Table 3: Grading and incidence of postoperative trismus in our patients.

Trismus grade	Mouth opening (mm)	Number of patients	Number of patients received RT
0	>35	14	5
1	26-35	6	3
2	16-25	5	4
3	<15	2	2

Trismus was graded from 0-3, 5 patients has grade 2 and 2 patients had grade 3 trismus causing significant morbidity. The incidence of trismus was found to be significantly associated with post-operative irradiation ($p=0.001$). The incidence of trismus and number of patients who received radiation are listed in Table 3.

The articulation difficulty graded using the articulation scale showed that 5 (18.52%) patients had moderate to severe and severe articulation defects. The patients were given speech therapy and training was given to improve the articulating ability.

Swallowing difficulty was assessed subjectively at the time of follow up. Difficulty in swallowing solid foods, semi-solids and liquids were assessed. Patients having difficulty in swallowing liquids were considered to have severe swallowing difficulty.

The other causes of dysphagia were ruled out in the patients with severe swallowing defects with endoscopic evaluation of the upper gastro intestinal tract. 4 (14.81%) patients had severe swallowing difficulty. Swallowing difficulty was found to be significantly associated with post-operative radiation ($p=0.01$). Swallowing therapy was given to all patients at the time of follow up.

DISCUSSION

OSCC is one of the most common cancers among men in India. There are multiple modalities of treatment of OSCC including surgery, radiotherapy, chemotherapy and biotherapy given alone or in combination. However, surgery is still the preferred primary treatment modality

for the majority of patients, in which a tumour is removed en bloc with a margin of normal tissue. Inside the oral cavity, the structures are closely packed around the mandible making it more prone for invasion by OSCC arising from any sub site of the oral cavity. Marginal mandibulectomy is a conservative resection of the mandible for the excision of head and neck cancer abutting the mandible or the superficially eroding mandible to maintain continuity of the mandible, cosmesis and an adequate margin.¹⁰ This technique satisfies both oncological resection and functional preservation.¹¹ Marginal mandibulectomy results in a composite tissue defect that needs reconstruction. The defects should be replaced with tissues which have the best anatomical, histological and functional similarities.

Reconstruction of intraoral defects with tongue flaps was first described 100 years ago, initially by Eiselsberg and soon after by Lexer in 1909. Since then tongue flaps have been extensively used for reconstruction of various intraoral defects.^{12,13} The rich vascularity, close similarity to adjacent tissues and versatility of tongue flaps encouraged surgeons to use tongue flaps for the reconstruction of intraoral defects. Furthermore, harvesting and reconstruction with tongue flap is technically simple and can be done by any practising oral and maxillofacial surgeon, unlike distant and microvascular free flaps, which demands special training and technical expertise.¹⁴ Tongue flaps are extremely versatile flaps which can be used for the reconstruction of congenital, traumatic or postoperative defects in the oral, perioral and pharyngeal defects. Various types of tongue flaps can be used to reconstruct defects of the lip, commissure, buccal mucosa, floor of mouth, alveolar process, retromolar trigone, palate and pharyngeal defects.¹⁵ Tongue flap can be a local advancement flap a pedicled flap or a sliding and island flaps. The flap can be dorsally based, ventrally based or lateral flaps. While using a pedicled tongue flap the reconstruction is done in two stages.¹⁶ In the first stage the flap is harvested and sutured to the defect and in the second stage, division of the pedicle is done after 14 to 21 days of primary surgery to allow adequate neovascularisation of the flap and returned to the donor site to close the wedge defect in the tongue and increase the muscle bulk of the residual tongue to reduce post-operative deformity and dysfunction.¹⁷

In our centre, all the reconstructions were done in a single stage. For anteriorly based flaps the tongue was mobilised from the lateral border for a thickness of 1-1.5 cm and sometimes divided in the midline raphe for extra mobilisation of the flap. The flap was placed over the defect covering the raw area over floor of mouth, mandible and buccal mucosa in a majority of cases. For larger defects split thickness skin grafts were used to cover the remaining area. The posteriorly based tongue flaps were raised as ventrally based flaps and advanced over the defect and sutured. In our series, for 5 patients the entire hemi tongue was mobilised for reconstruction.

Flaps were raised with a thickness of approximately 1 cm.



Figure 1 (A and B): Postoperative images of two patients showing reconstruction with anteriorly based tongue flap covering the floor of mouth and mandible on the right side.

The tongue is an extremely vascular, versatile structure and complications following surgery are less. The early postoperative complications include pain, swelling, infection, bleeding, haematoma, and temporary loss of tongue sensation.¹⁴ In our patients, 5 patients had infection in the oral cavity around the flap. Infections were effectively managed with intravenous and oral antibiotics and frequent oral cleaning. 2 patients had haemorrhage from the flap which required intervention by ligation of the actively bleeding vessel. Flap dehiscence was encountered in 4 patients, 2 of them were managed conservatively and in the other 2 patients flap edges were freshened and re-sutured to the defect. There was no flap necrosis in our series. All these complications were minor were managed without any additional morbidity.

The major concern after tongue flap reconstruction was the difficulty in speech, swallowing and the structural deformity of the tongue. In a study by McConnel et al he compared the functional outcomes of tongue flap reconstruction to other flaps including free flaps in oropharyngeal reconstruction and found that there was no significant difference in speech and swallowing between the two groups.¹⁸ Johnson et al in his study showed that speech and articulation will not be compromised until the mobility of the tip of the tongue is maintained.¹⁹ In our series 5 patients had moderate to severe and severe articulation difficulty. All the patients were given speech therapy starting one month after surgery and regularly thereafter. Even patients with severe articulation difficulty manage to speak meaningful words. The overall speech and articulation difficulty ranged from 11% to 43% in various studies and most of the studies reported >90% improvement in speech following speech therapy. Some degree of donor site deformity occurs in all patients but the tongue recontours itself to an acceptable level. Recontouring can be done with a scalpel, radiofrequency surgery or laser but is seldom needed. As long as the mobility of the tip of the tongue is maintained there is no significant impairment in speech.¹⁹

There is no significant difficulty in swallowing as long as the circumvallate papillae and posterior third of tongue are preserved.²⁰ In our study, 4 patients had difficulty in swallowing even liquid foods. All these patients had postoperative irradiation. 3 patients had improvement in swallowing after therapy and proper training in further follow up. Video fluoroscopy can be used to assess the swallowing in patients after tongue surgery. The oral, pharyngeal and oesophageal transit times are calculated for foods of different consistencies and recorded.

Trismus is a common residual morbidity in oral cancer patients treated with surgery or radiotherapy. In a retrospective study by Joakim et al the incidence of trismus in patients with head and neck cancer after surgery and radiotherapy was 42%, 29 out of 69 patients had maximum interincisal opening (MIO) <35 mm.²¹ Various studies have showed that 30% - 47% of these patients have trismus before surgery, 65% - 71% have trismus at discharge from hospital and in 54% - 79% of patients at the end of 6 months.²² Radiation induced muscle fibrosis usually precipitates trismus. Studies have demonstrated that the probability of trismus is increased 25.4% by conventional radiation, 5% by IMRT and 30.7% by CCRT.²³ In our study, 25.9% of patients (n=7) had grade 2 and 3 trismus at the time of last follow up. The patients were treated with mouth opening exercises with a stack of sticks and Heister mouth gag.

The morbidity was assessed only at the time of last follow-up visit of the patients. The presence of speech, swallowing difficulties and trismus in the early postoperative period was not recorded. However, the overall complication rates and morbidity in our patients are similar to the previous studies.

CONCLUSION

In the era of free flaps, tongue flap is still an excellent choice for intra oral soft tissue reconstruction. The rich vascularity, mobility and versatility of tongue facilitate its use in reconstruction of various intra oral soft tissue defects. In our series, the overall complication rates and the long term morbidity after tongue flap reconstruction were comparable to other studies. Tongue flap is proven to be a good choice for reconstruction after marginal mandibulectomy for oral cavity squamous cell carcinoma with an acceptable rate of morbidity and very good functional outcomes.

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