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Original article

Role of PMMC Flap Reconstruction in patients with Carcinoma Buccal Mucosa with Marginal Mandibulectomy Defects

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Abstract

Background: Marginal mandibulectomy defects in patients with oral malignancy pose a challenge to reconstructive surgeons. With the availability of varied microvascular flap options, free flap reconstruction has become a gold standard for the same. However, the PMMC flap can be reliably used for marginal mandibulectomy defects with its advantages being robust flap, ease of harvest, and economical. We wish to present our experience with the use of PMMC flaps for the reconstruction of marginal mandibulectomy defects.

Material and Methods: A retrospective study was conducted on patients operated for PMMC flap reconstruction for marginal mandibulectomy defects from January 2018 to January 2023 at a tertiary hospital in India. Patients were evaluated based on functional satisfaction, cosmetic outcome, and complications using patient data from case sheets, pre-operative, postoperative, and follow-up clinical photos.

Results: A total of 9 patients underwent PMMC flap reconstruction for marginal mandibulectomy defects. 7 patients had reconstruction of buccal mucosa defect while folded PMMC flap was done in 2 patients with associated cheek skin defect. Early complications were noted in 3 patients viz. chyle leak (1), partial necrosis of flap with wound dehiscence (1), and parotid fistula (1) which were managed conservatively. Late complications included recurrence in 2 patients who needed additional procedures. 3 patients needed adjuvant radiotherapy, none developed osteoradionecrosis.

Conclusion: PMMC flap can thus be concluded to be a robust, simple to harvest, and reliable flap for reconstruction of marginal mandibulectomy defects with satisfactory functional and cosmetic outcomes. It can also be used as a salvage flap after failed microvascular reconstruction.

Keywords: PMMC flap for reconstruction of marginal mandibulectomy defects

Introduction

Malignancy of the oral cavity is the 3rd most common after carcinoma cervix and stomach in India and other developing nations and the most common malignancy in the head and neck region. [1,2] Surgical excision, being the primary treatment, significant skin, soft tissue, and bone defects are expected, thus making reconstruction mandatory to provide functional benefit, optimize cosmetic outcomes, and promote wound healing.[1]

Similarly, the mandible plays an important role in maintaining the airway, 1st phase of swallowing, and speech articulation. With increasing knowledge on mandibular invasion and literature on oncological safety in treating selected cases of oral malignancy with wide local excision and marginal

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mandibulectomy to maintain the continuity of the mandible and thus improve the quality of life of the patient, this has been the preferred option [3, 4,5]. With the development in the field of reconstruction, there has been marked improvement in therapeutic results. One of the cornerstones of head and neck reconstructions, which is also considered to be the gold standard now, is the use of a microvascular free flap. [6]

Pectoralis major myocutaneous flap (PMMC flap), based on the thoracoacromial artery for reconstruction was introduced by Ariyan in 1979 for cardiothoracic defects,[7] much after the introduction of, microvascular free flaps for head and neck region which weren't very popular due to its limitations like inadequate infrastructure, lack of training facilities and surgical procedures requiring technical expertise, greater post-operative complications and failure rates, financial constraints especially in developing nations and associated co-morbidities in patients, advanced age, previous surgery with depleted neck vessels limit its use.[1,8]

Despite these drawbacks of microvascular free flaps, it is a preferred option for marginal mandibulectomy defect reconstruction due to the thin and pliable flap that it provides against the advantages of PMMC flap of its reliability, simplicity, cost-effectiveness, versatility, proximity to the head and neck region, robust and minimal requirement for specialized instruments and training, short operating time and large skin paddle. [1, 9]

PMMC even though is considered a workhorse flap, is not routinely utilized in marginal mandibulectomy defects due to its bulk, difficulty in the inset, compression of the pedicle, loss of gingivobuccal sulcus, dental rehabilitation problems, and functional impairment of neck and shoulder, breast asymmetry in female patients and hairy chest skin is placed intraorally in male patients. There aren't many reports in the literature on the use of PMMC flaps in the reconstruction of defects following marginal mandibulectomy. Reviews of available literature suggest that it can be reliably used in marginal mandibulectomy defect reconstruction and can also be used as a salvage flap in cases with failed microvascular reconstruction. We wish to present our experience with the use of PMMC flaps in marginal mandibulectomy defects operated from January 2018-January 2023 in a rural-based tertiary care hospital.

Material and Methods

A retrospective observational study was conducted after obtaining approval from the Institutional Ethics Committee. The study included patients who underwent marginal mandibulectomy for malignancy of the oral cavity and reconstruction with PMMC flap from January 2018- January 2023 with a minimum follow-up of 6 months. All cases of Carcinoma oral cavity, including carcinoma buccal mucosa, lower gingivobuccal sulcus, and retromolar trigone undergoing marginal mandibulectomy and reconstruction with PMMC flap were included in the study. Cases with less than six months of follow-up were excluded. The patients were evaluated based on functional satisfaction, cosmetic outcome, and complications using patient data from case sheets, pre-operative, post-operative, and follow-up clinical photographs.

As a part of preoperative evaluation, all patients underwent a CECT scan of the head and neck followed by wide local excision of the lesion and marginal mandibulectomy with PMMC flap reconstruction.

Surface markings of the vascular pedicle were made by drawing two lines, one from the ipsilateral acromion to the xiphisternum and another vertical line from the midpoint of the clavicle, intersecting the 1st line. Skin paddle was marked over the chest wall caudally-medially to the nipple, sparing the areola over the pectoralis muscle. The shape and size of the skin paddle was as per the defect, mainly elliptical. The inferior, medial, and lateral incisions were made and the cutaneous flap was raised along with the pectoralis major. During flap elevation, care was taken not to undercut the skin paddle to include the myocutaneous perforators and skin paddle anchored to the underlying muscle to avoid shearing. Dissection is between major and minor. The pectoralis major muscle was divided lateral and medial to the pedicle. A portion of the clavicular head of the muscle was divided to allow passage of the flap through the subcutaneous tunnel which was wide enough to avoid compression of the pedicle, made superficial to the clavicle. Flap inset was done and the donor site was closed primarily. [3] In patients with cheek skin and mucosa defect, the skin paddle of the PMMC flap was folded with de-epithelialisation of the intervening segment.

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Patients were evaluated for functional satisfaction for mouth opening and deglutition, cosmetic outcome, immediate and late postoperative complications, need for additional procedures, and postoperative radiotherapy.

Result

The demographic and baseline disease details of the enrolled patients are mentioned in Table 1. Most of the enrolled patients were males with well-differentiated Squamous cell carcinoma of the buccal mucosa. Right-sided carcinomas were more common.

Table 1: Demographic and baseline disease details in the study (n=9)	
Parameter assessed	*Calculated values*
Age details	
Mean age (years)	47.89 ± 7.37
Median age with range (years)	48 (37-60)
Gender distribution	
Number of males	8 (88.89%)
Number of females	1 (11.11%)
Diagnosis of enrolled patients with staging	
Well-differentiated SCC of buccal mucosa	8 (88.89%)
Verrucous carcinoma of buccal mucosa with reactive cervical lymph nodes	1 (11.11%)
Laterality of disease	
Right	6 (66.67%)
Left	3 (33.33%)

Plan of management

All but one patient underwent selective neck dissection with marginal mandibulectomy and PMMC flap. One patient underwent MRND in the study. The defect was restricted to buccal mucosa in 7 of the 9 enrolled patients (77.78%). Folded PMMC flap was done for two patients with buccal mucosa and skin defect. PMMC flap was done as a primary procedure in 8 patients, while in one patient it was done as a salvage procedure after failure of free radial artery forearm flap. The duration of reconstructive surgery ranged from 90 minutes to 150 minutes

Table 2: Details of surgical management in the study (n=9)	
Parameter assessed	*Calculated values*
Defect details	
Buccal mucosa	7 (77.78%)
Buccal mucosa with skin	2 (22.22%)
Plan of surgery	
WLE + Selective neck dissection (level I-IV) + marginal mandibulectomy + PMMC flap	8 (88.89%)
WLE + MRND + marginal mandibulectomy + PMMC flap	1 (11.11%)
Duration of surgery details	
Mean surgery duration (mins)	118.33 ± 26.46
Median surgery duration with range (mins)	120 (90-150)

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Post-operative status

The postoperative outcomes and complications are mentioned below in Table 3. Cosmesis was satisfactory in 8 of the enrolled patients. All patients had satisfactory mouth opening and 8 of the patients had satisfactory deglutition. No immediate complication was noted in 6 of the enrolled patients while no late complication was noted in 7 of the enrolled patients. 3 patients which showed immediate complications were managed conservatively. The patients with parotid fistula and partial flap necrosis with dehiscence were managed with compression dressing using an elastocrepe bandage. Three patients received postoperative radiotherapy. None of these patients developed osteoradionecrosis. Both the patients with recurrence (late complication) underwent additional procedures.

Table 3: Post-operative outcomes and complications in the study (n=9)

Parameter assessed	*Calculated values*
Cosmesis status	
Satisfactory	8 (88.89%)
Bulky	1 (11.11%)
Functional outcomes	
Mouth opening satisfactory	8 (88.89%)
Deglutition satisfactory	9(100%)
Immediate postoperative complication	
No immediate complication	6 (66.67%)
Chyle leak	1 (11.11%)
Partial flap necrosis with dehiscence	1 (11.11%)
Parotid fistula	1 (11.11%)
Late postoperative complication	
No recurrence	7 (77.78%)
Recurrence	2 (22.22%)

Discussion

Marginal mandibulectomy procedure in the treatment of intraoral cancers was first described by Greer et al in 1953. [10] The oncological safety of marginal mandibulectomy in appropriately selected patients is well described in the literature. [4, 11, 12] Segmental resections result in severe functional and cosmetic problems due to loss of mandibular arch continuity. Marginal mandibulectomy provides better functional outcomes and improves cosmesis and the need for bony reconstruction is obviated. [13]

The exposed margin of the mandible in marginal mandibulectomy defects poses a challenge for reconstruction. With the available armamentarium of microvascular flaps, they have become the gold standard for the reconstruction of marginal mandibulectomy defects as they provide a thin pliable cover. However, the PMMC flap has its place as a reconstructive option, especially in centres with high patient loads and limited infrastructure for microvascular reconstruction. The learning curve of the procedure is shorter and it doesn't require special instruments and equipment as required for microvascular reconstruction. [14] PMMC flap can also be used as a salvage procedure after microvascular flap failure or in patients where a free flap is contraindicated due to medical conditions or inadequate recipient vessel. [6]

The mean age (years) of the study sample was 47.89 ± 7.37 and the median age range in years was 48 with a gender distribution of 8 males and 1 female patient (88.89% and 11.11% respectively) which was similar to another study done by Nemade et al which reported median age as 46 years and gender distribution of 93.90% and 6.09% for male and females respectively. [3]Another study done by Tripathi et al also showed male predominance. [6]

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In our study, 8 cases were of SCC (88.89%), which was very close to the reports of Liu M et al who reported 95% cases of SCC (80 out of 84). [9]

Most cases in our study were involving buccal mucosa while 2 of them showed skin involvement, which was quite similar to the study conducted by Tripathi et al which had maximum cases of buccal mucosa (28%), followed by lower gingivobuccal sulcus (17%), while in the study conducted by Nemade et al most cases showed gingivobuccal sulcus involvement. [6, 3]

The median reconstructive surgery duration in our study was 120 mins with a range of 90 – 150 mins in our study. Excision of the malignancy and Neck dissection was performed by a separate team of surgical oncologists at our institute. Nemade et al reported the median surgery duration to be 210 mins in their study where entire surgical procedures were done by a single team. [3]

The study of literature on PMMC flap reconstruction shows a variety of complications and their occurrence rate. Immediate complications noted in 3 of the cases in our study were chyle leak (1), partial flap necrosis with wound dehiscence (1), and parotid fistula (1), making it 11.11% each, which were managed conservatively. Tripathi et al reported 53.8% of chyle leak, 15.3% parotid fistula, and wound dehiscence in 26%. [6] Nemade et al reported partial necrosis of the flap in 15.85 % of cases. [3] This supports the fact that the presence of an intact mandible doesn't compromise the vascularity of the flap. No patient had total flap necrosis in our study.

Osteoradionecrosis of the mandible is one of the important complications in patients with mandibular surgery receiving radiation. Factors such as poor dental hygiene, post-radiation dental extractions, tumour location, smoking, alcohol, and poor nutritional status are the risk factors for the development of osteoradionecrosis. [15, 16] Inadequate soft tissue coverage in patients with marginal mandibulectomy is one of the high-risk factors for osteoradionecrosis of the mandible. [17] Nemade et al reported one patient developing osteoradionecrosis out of 32 patients (39.03%) which required adjuvant radiotherapy. [3] Adjuvant radiotherapy was required in 3 patients in our series; none developed osteoradionecrosis of the mandible.

Cosmetic results in our study were satisfactory in 8 out of 9 cases. And all patients had satisfactory deglutition and 8 of the enrolled cases had satisfactory mouth opening.

Conclusion

Pectoralis major myocutaneous flap can thus be concluded to be a robust, simple, reliable, and versatile option for reconstruction with satisfactory functional and acceptable cosmetic outcomes with no significant complications related to the flap recipient and donor site in case of marginal mandibulectomy, with a short learning curve, short operative time and economical, it remains viable option especially in hospitals in a developing nation having limitations to the use of other options for reconstruction.

Figure 1. (a) Intraoperative photo showing marginal mandibulectomy defect. (b) Immediate post-operative photograph

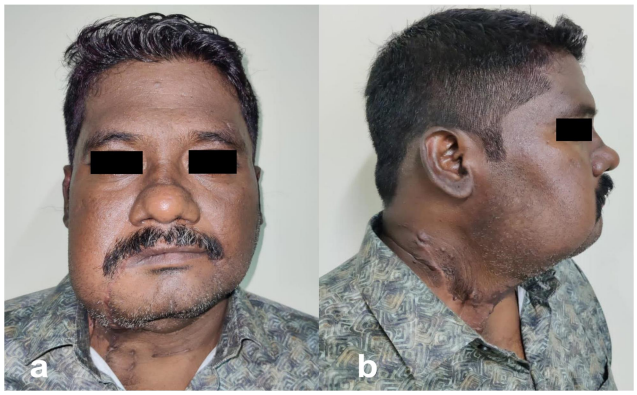

Figure 2. Postoperative one-year follow-up (a) frontal view (b) Lateral view

Figure 3. Postoperative one-year follow-up Intraoral view showing well-settled flap paddle and adequate mouth opening

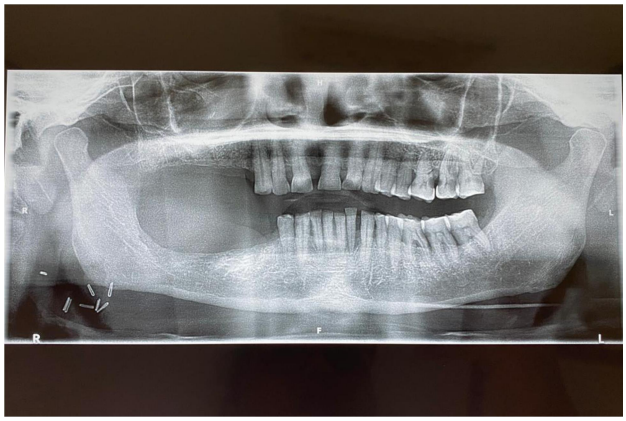

Figure 4. One-year follow-up Orthopantomogram showing healthy mandible

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