Pectoralis Major Myocutaneous Flap Reconstruction for the Mandibular Defects in Advanced Oral Cavity Malignancies: A Retrospective Study of 30 Cases

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Abstract To evaluate the utility of the pectoralis major myocutaneous (PMMC) flap for the reconstruction of the mandible in advanced oral cavity malignancies in the Indian population. It was a retrospective study contained 30 patients with advanced oral cancer from July 2012 to August 2016. The PMMC reconstruction was done in all the patients to repair the bony defects in segmental/hemi mandibulectomy. The patients were followed up for a mean period of 6 months in the postoperative period and the utility of the PMMC flaps were evaluated. The mean age of the patients was 45 years (range 30–63 years). The average Karnofsky performance status score was 70 and majority of the patients had history of chronic medical illness. Of the 30 PMMC flaps, partial necrosis of the skin was noticed 2 (6.66%) patients. Orocutaneous fistula was detected in 2 (6.66%) patient and 3 (10%) patients presented with wound dehiscent in the immediate postoperative period. 3 (10%) patients had recurrence of the disease. PMMC flap can be a reliable option for advanced oral malignancies, especially in patients with poor status with the coexisting chronic illness. Due to the presence of a definite vascular pedicle, ease of harvesting the flap, quick surgical procedure, and the minimal postoperative morbidities, it can be considered as a valid alternative to the free flap to repair the bony defect, especially in patients with low socioeconomic corridor like India.

Keywords Oral malignancy · Pectoralis major myocutaneous flap · Outcome

Introduction

Oral cavity cancer is the most common among the malignancies affecting the head and neck region and later is considered as the leading cause of death in India. About 7% of the death in male and 4% death in female are reported because of the oral cancers annually [1, 2]. It could be due to addiction of the tobacco specially in chewing/keeping it in the gingivobuccal sulcus. Being an apex center in the eastern zone of India, most of our the patients present at an advanced stage of the disease which later becomes a surgical challenge for the soft tissue reconstruction. The low economic condition, nutritional status of the patients, and the preexisting comorbidities are the main determining factors for the mode of the soft tissue reconstruction in these patients. Although free flaps have been used predominantly in the past decades for the soft tissue reconstruction, still PMMC flap can be a reliable option for oral malignancies, especially for the patients with low socioeconomic corridor with the coexisting chronic comorbidities [3–5]. Again, the reconstruction of the free flaps is always a lengthy procedure as compared to the pedicle flaps which makes it difficult to overcome the huge patient load of oral malignancies. The use of PMMC flap was first described by Ariyan [6] in 1979 for the primary reconstruction of the oncological defect and also for the salvage surgery in recurrent oral cancers [7]. Being a bulky flap, it is often considered unsuitable for early oral cancers where free flaps are preferred as the standard mode of soft tissue reconstruction. Instead, PMMC can be effectively used for advanced oral cancers (stage IV

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disease) to repair the bony defect. Again, due to the presence of a definite vascular pedicle, ease of harvesting the flap and the minimal postoperative morbidities, PMMC flap is often considered as a valid alternative to the free flap to repair the oral defect [8, 9]. Here we have shared our experience of PMMC flap reconstruction in 30 patients of advanced oral malignancies with the coexisting chronic medical illness.

Materials and Methods

It is a retrospective study containing 30 patients with advanced squamous cell carcinoma of the oral cavity from July 2012 to August 2016 in a tertiary care referral hospital. Both clinical and radiological assessments were undertaken in all patients prior to surgery. Almost all of the patients presented with a low performance status (Karnofsky performance status score, less than 70) with or without associated chronic illness. Contrast enhanced CT scan was advised to look for involvement of the mandibular cortex. All the patients had undergone routine X-ray chest and ultrasonography of abdomen to rule out the distant metastasis. Patients with stage IV disease (T4, N0/N1/N2, and M0) of the gingivobuccal complex/floor of mouth with coexisting co-morbidities and poor performance status (“Appendix” section) were included in the study. The TMN staging has been shown in Table 1. Contralateral involvement of the mandibles were excluded from the study.

Surgical Procedure (Fig. 1)

Written informed consent was taken from each patient prior to the surgery. All the patients were operated under general anesthesia with the nasotracheal tube. Surgeries were performed by a same multidisciplinary team (MDT) in the same hospital who had been trained with the surgical skill and flap

reconstruction. The operative technique used was essentially the same as that described originally by Ariyan [6] appropriately modified in the manner described by Schuller [10]. Patients were discharged after removal of the drain, mostly after 48 h and were allowed to visit the oncology clinic after 5 days for the stitch removal and afterward at the end of 1 month and thereafter at the end of 6 months in the post-operative period. In the each postoperative period, patients were evaluated for the graft uptake rate and the major and minor complications. Major flap complications were defined as tissue loss or wound healing problems that required an additional operative intervention. Minor flap complications included tissue loss, wound dehiscence, or fistula that could be managed with conservative wound care including bedside debridement and antibiotics.

Results

Of 30 patients included in the study, 22 were male and 08 were females. The age of the patients was ranged from 30 to 63 years (mean age 45 ± 10.00 years). The demographic profile and patients' data have been demonstrated in Table 2. Of the 30 patients, 18 patients (60%), were smokers and 16 (53.33%) had a history of chronic tobacco chewing and 10 (33%) patients were addicted to both tobacco chewing and smoking. The average Karnofsky performance status score was 70. Out of 30 patients, 12 patients were affected with chronic diabetes mellitus, 6 patients with chronic obstructive lung disease, and 4

Table 1 TNM classification of 30 patients that underwent mandibulectomy

Clinical staging	N (%)
T stage	
T4	30 (100)
T3	00
N stage	
N0	06 (20)
N1	21 (70)
N2	03 (10)
M stage	
M0	30

Table 2 Description of the demographic data in the study population (n = 30)

	Value (no. of patients)	Range
Sex		
Male	22	–
Female	08	–
Mean age of patients (years)	45	30–63
Mean duration of the disease (months)	02	01–05
Mean duration of follow-up (months)	06	5–9
Smoking		
Yes	18 (60%)	
No	12 (40%)	
Alcohol		
Yes	11 (36.33%)	
No	19 (63.33%)	
Primary sites		
Gingivobuccal complex	22 (73.33%)	
Retromolar trigone	05 (16.66%)	
Floor of mouth + gingiva	03 (10.00%)

Fig. 1 **a** Shows the Stage IV oral cancer arising from the gingivobuccal complex, involving the overlying skin of left cheek. **b** Demonstrates the harvest of the PMMC flap and deltopectoral flap for the closure of both the mandibular and the skin defect.

c Photograph demonstrates the final closure of both the flaps to the recipient sites

patients with the history of pulmonary Tuberculosis at the initial presentation. Gingivobuccal complex was found to be involved in 22 (73.33%) patients, retromolar trigone in 5 (16.66%) of patients and gingival malignancy extending to the floor of the mouth was found in 03 (10.00%) patients. Overlying skin was involved in 5 patients. The mean duration of the disease was 2 months (range 01–05 months). The most common complaint was pain which was encountered in 11 patients followed by trismus in 7 patients. Dysphasia was the universal complaint found in almost all the patients. Cortical bone of the mandible was found to be involved in 30 patients, which was confirmed by radiology in the preoperative period. In the mandible, the body was found to be affected in 23 (76.66%) cases and in 7 (23.33%) patients, both the body and ramus of the mandible were involved (Table 3). All have undergone wide local excision of the primary tumour with radical/modified radical neck dissection. Segmental/hemi mandibulectomy was done in total 30 patients due to the involvement of the cortical bone of the mandible. PMMC flap has been used in all the patients to reconstruct the bony mandibular defect.

Table 3 Classification of mandibular defects according to CRBS (Condyle, Ramus, Body, Symphysis) scoring system in 30 patients that underwent mandibulectomy

Defect	No. (%)
Body	23 (76.66)
Body, ramus	07 (23.33)

The mean duration of the surgical procedure, including the flap reconstruction was approximately 5 h and 45 min (range 5.0–6.5 h). The average duration of the hospital stay was approximately 7 days (range 3–23 days). Ryle's tube feeding was started after 24 h after surgery in almost all of the patients and the average duration of the Ryle's tube feeding was approximately 8 days (range 6–12 days). Of the 30 flaps, partial necrosis of the skin was found in 2 (6.66%) patients and in none of the patient had complete flap failure in the postoperative period (Table 4). Orocutaneous fistula was detected in 2 (6.66%) patients and 3 (10%) patients presented with wound dehiscence in the immediate postoperative period. Both of the complications have been successfully managed with aseptic wound care and none of the patients required surgical intervention in the postoperative period. No major complications had been detected in the intraoperative or postoperative period in any of the patients. Both PMMC and Deltopectoral flap (DP) reconstruction were required in 5 (20%) of the patients because of the involvement of the skin over the cheek. Deviation of the angle of mouth due to the ipsilateral

Table 4 Postoperative complications in 30 patients that underwent mandibulectomy

Complication	No. (%)
Partial skin necrosis	2 (06.66)
Wound dehiscence	3 (10.00)
Oro-cutaneous fistula	2 (06.66)

marginal mandibular nerve palsy was noticed in 9 patients during the postoperative period. The final histopathological report came as squamous cell carcinoma with variable degree of differentiation in all the patients. Of the 30 patients, 27 patients were diagnosed as stage IV disease with significant involvement of cortical bone of the mandible and 03 patients presented with downstaging of the tumour (Stage III) in the final histopathological diagnosis due to the absence of cortical involvement. Lymphovascular invasion is seen in 6 patients, perineural invasion in 2 patients, and 4 patients had extracapsular spread of tumour in the final histopathological report. Radiotherapy was advised to all the patients in the postoperative period and 12 patients required concurrent chemoradiation due to the extensive lymphovascular and extracapsular spread of the disease. The average follow-up period was 6 months (range 5–9 months), of them only 3 (10%) patients had recurrence of the disease (one at the primary site and 2 in the neck). One had undergone revision surgery and palliative chemoradiation was offered to all the patients with recurrent disease.

Discussion

Although PMMC flap reconstruction has been described a long time ago by Ariyan [10], its role cannot be denied in spite of the universal use of the free flaps in the past decade [11–13]. It's because of the ease of harvesting the flap with the abundant availability of both the skin and soft tissue for the reconstruction of a large defect in the oral cavity [14–17]. Again, due to its close proximity to the primary tumour site and a definitive vascular pedicle, PMMC flap can be a standard pedicle flap for head neck malignancies. Being bulky, it can be preferred in advanced oral cancers where there requires larger tissue transfer to reconstruct a defect. As described in the present study, PMMC flap has been successfully utilized to reconstruct the mandibular defects in advanced oral cavity cancers. All the patients underwent segmental/hemimandibulectomy due to the involvement of the cortical bone where the bulk of the PMMC flap was utilized to provide good functional and cosmetic outcomes. Although ossiointerposed free flaps are thought to be a better option in reconstructing the mandibular defects, its use is limited in elderly patients with significant comorbidities anticipating a poor graft uptake rate. All have undergone single stage excision of the tumour, including segmental/hemimandibulectomy and PMMC flap was used in each case where free flap reconstruction was relatively contraindicated. Considering the time for reconstruction of the flap, PMMC is relatively a quicker in contrast to the free flaps. Again, having been associated with a definite vascular pedicle, the probability

of flap survival is higher in case of PMMC flap reconstruction and later rarely requires intensive care monitoring in the postoperative period in contrast to the free flaps. As observed in our study, only 2 patients required intensive care monitoring for overnight in the postoperative period.

Again, later reduces the extra financial burden to the patients, especially in a developing country like India, where reconstruction with the PMMC flap can be a better option to overcome the huge patient load coming from a low socioeconomic background. With respect of the flap survival, PMMC flap is found to be associated with nearly 100% flap uptake rate excepting some minor complications as observed in our study, only 3 patients had skin necrosis which did not require surgical intervention as supported by similar studies [14, 18]. With the coexisting chronic comorbidities, the free fibular flap is relatively contraindicated where PMMC flap is often considered as a flap for patients affected with advanced oral cavity malignancy and often called as “work horse” of the head and the neck reconstruction [19]. In considering the oncological safety of the PMMC flap reconstruction, it has the satisfactory oncological outcome [20] as obtained in the present study. In contrast to the free flap, PMMC reconstruction is very simple and easy to harvest and does not require the expertise microvascular team to harvest the flap, which has made it a popular flap in the head neck reconstruction.

However, it is not free from its morbidities in the form of difficulty in articulation and the fullness of the PMMC flap preventing the complete occlusion of the jaws. Although, almost all have some degree of articulation defect in the postoperative period, later has been significantly reduced after the radiotherapy due to atrophy of the muscle. Due to the good volume of the flap, the PMMC flap is found to maintain the contour and hence the cosmesis of the cheek in the postoperative period even after the radiation therapy. Hair growth in the oral cavity can be a problem in the postoperative period, although mucosalization occurs in the course of time in the majority of the patients. In the current study, no significant morbidity related to it was detected and only 3 patients had undergone depilation. In a short period of 06 months of follow-up, the recurrence of disease was found in 3 patients. Considering the fact that almost all of the patients had stage IV disease at the initial presentation with significant comorbidity, the obtained results were seem to be satisfactory.

Limitation of the Study

It is a retrospective study with small sample size with a short follow-up period. The purpose of the study was to highlight the efficacy and oncological outcome of the PMMC flap in advanced oral cancers, especially in patient

with poor performance status with chronic comorbid illness.

Conclusion

Although free flaps have been used predominantly in the past decades for the soft tissue reconstruction, still PMMC flap can be a reliable option for oral malignancies, especially for the patients poor Karnofsky performance with the coexisting chronic illness. Being a bulky flap, PMMC can be effectively used for advanced oral cancers (stage IV disease) to repair the large bony defect. Due to the presence of a definite vascular pedicle, ease of harvesting the flap and the minimal postoperative morbidities, PMMC flap is often considered as a valid alternative to the free flap to repair the oral defect. Being a quicker procedure, PMMC flap reconstruction is mostly considered as a valid alternative to overcome the huge patient load of oral malignancies in patients with low socioeconomic corridor like India.

Compliance with Ethical Standards

Conflict of interest There are no conflict of interest among the authors.

Ethical Standards All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed Consent Written informed consent has been taken from each patient prior to the surgery and same has been informed to the institute reviewer board. No part of the body has been demonstrated in the case report without the permission of the concerned patient.

Appendix: Karnofsky Performance Status Score

The Karnofsky score measures patient performance of activities of daily living.

Karnofsky scores at the time of tumour diagnosis have the best survival and quality of life over the course of their illness.

100—Normal, no evidence of disease.

90—Able to perform normal activity with only minor symptoms.

80—Normal activity with effort, some symptoms.

70—Able to care for self but unable to do normal activities.

60—Requires occasional assistance, cares for most needs.

50—Requires considerable assistance.

40—Disabled, requires special assistance.

30—Severely disabled.

20—Very sick, requires active supportive treatment.

10—Moribund.

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