

Scope of Bipaddled Pectoralis major myocutaneous flap in the era of free flap

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Abstract

Background: Oral cavity malignancies present at locally advanced stage in our set up, requiring extensive resection and complex reconstruction. Free flap is the ideal method for reconstruction, which may not be available in a remote or resource-constrained facility. The alternative is the use of bipaddle Pectoralis major myocutaneous flap (PMMC).

Aim: To assess the outcomes of bipaddle PMMC flap in reconstruction of locally advanced carcinoma oral cavity.

Materials and Methods: We present a series of patients who underwent reconstruction of oromandibular defects with a bipaddled PMMC flap. The data pertaining to patients with carcinoma oral cavity who were selected to undergo bipaddled PMMC flap reconstruction in our department between July 2022 to July 2024 was collected and analysed.

Results: Of the 34 patients, there were 33 male and 1 female patient. The median age group was 49 years. Average size of the bipaddled PMMC flap was 12X5cm. Ten patients underwent oral commissure reconstruction along with oromandibular reconstruction. Most common complication was neck wound surgical site infection in 10 patients, followed by complete loss of PMMC flap in 2 patients which was treated with contralateral PMMC flap. Successful outcomes after bipaddle PMMC flap was 32(94%).

Conclusion: Bipaddled PMMC flap remains the workhorse of head and neck reconstruction. In full thickness defects bipaddled PMMC flap remains an alternative to free flap reconstruction in resource-limited countries like India. Owing to its versatility, definite vascular supply, and an easy learning curve, bipaddled PMMC flap remains a favoured choice for reconstruction of oromandibular defects.

Keywords: PMMC, Bipaddled, reconstruction, Oral cavity malignancy, full thickness defects.

Introduction

Oral cavity malignancies account for 25% of all cancers in India^[1]. Cancer of the oral cavity continues to be a devastating disease in the Indian subcontinent. Locally-advanced oral malignancy requires multidisciplinary approach and selection of the most appropriate reconstruction technique for good outcome. Reconstruction of complex and full thickness defects of oral cavity following resection of oral cavity cancer is a challenge in terms of balancing cosmetic and functional outcomes. The ideal method of reconstruction is by free flap. In a country like India, with an enormous caseload and limited infrastructure, an alternative is pectoralis major myocutaneous flap (PMMC) which has an easy learning curve and is cost-effective, compared to the more expensive, time

consuming, technically demanding and steep learning curve for free tissue transfer. PMMC flap can be used to cover both inner and outer linings for full-thickness defects in oral cavity malignancies^[2].

The skin paddle of the PMMC was originally used to form the lining of the oral cavity defect and another pedicled flap, most often deltopectoral flap, was used to form the skin cover for a through-and-through defect. Ariyan had designed two skin paddles to be used for intraoral and extraoral lining for full-thickness defects of carcinoma oral cavity^[3]. The flap can be folded or bipaddle to achieve the same purpose. The purpose of study the study is to evaluate the bipaddle PMMC flap reliability, operative technique, and outcome in reconstruction of oral cavity malignancy surgery in the era of microvascular surgery. We

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present our experience with the use of the bipaddle PMMC for reconstruction of oral cavity malignancy defects where two flap can be avoided and hence its complications and morbidity.



Figure 1. Oral malignancy involving skin

Materials and Methods

This was a single centre retrospective observational study carried out in the Department of Surgical Oncology, Karnataka Medical College and Research Institute (KMCR) Hubballi Karnataka, India from July 2022 to July 2024. A total 34 cases were included, all of them underwent composite resection and reconstructed using bipaddle PMMC flap. Patients who presented with ulcer/swelling in the oral cavity, evaluated with biopsy and contrast-enhanced computed tomography (CECT) oral cavity and neck. The tumours were staged in accordance with TNM criteria AJCC 8th edition. The tumour infiltrating the skin, either clinically suspicious (puckering, dimpling) or obvious (ulceration) (stage 4) were selected to undergo composite resection and reconstruction with bipaddle PMMC flap. Data pertaining to patient particulars, diagnosis, stage of the disease and dimensions of the flap were collected. Postoperatively, the flap was monitored for viability and complications. Low molecular weight heparin (LMWH) and IV antibiotics were given.

The patient lies in supine position with neck extended and turned to opposite side. Type 2 modified radical neck dissection was done, wide local excision of primary lesion with hemimandibulectomy was done, sternocleidomastoid muscle was removed in all cases to accommodate pectoral muscle flap. After primary resection defect size was measured.

The clavicle, ipsilateral sternal border, xiphoid are identified and marked. The size of the skin paddle was marked including nipple areola complex. Vascular pedicle was marked using a vertical line from midpoint of clavicle drawn to intersect the line joining suprasternal notch and ipsilateral acromial process.

Maximum bulk of the muscle was harvested in all cases as it contains more myocutaneous perforators and helps in better healing. Superiorly, subcutaneous flap is raised up to clavicle, and PMMC flap along with overlying skin paddle was raised along the vascular pedicle. Flap skin and pectoral muscle was sutured with 2-0 polygalactin to prevent shearing of muscle and subcutaneous layer. During flap elevation, pectoral branch of thoracoacromial pedicle was identified and preserved carefully. Lateral pectoral nerve was divided by scissors. Flap was tunnelled into the neck over the clavicle, with tunnel width of minimum 4 finger breadth.

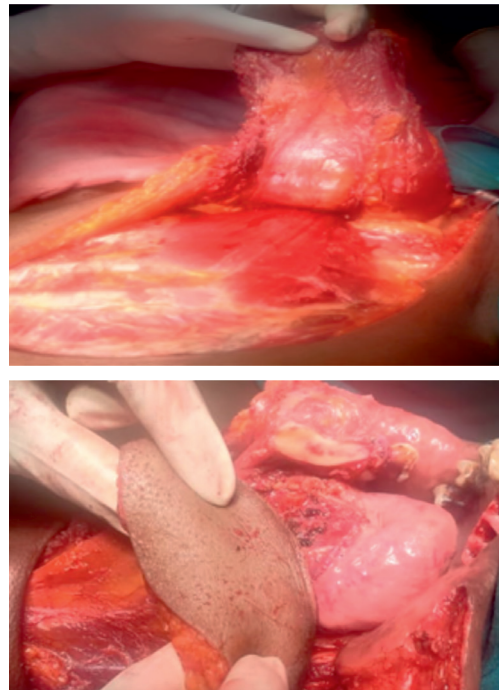


Figure 2. PMMC flap

The lateral portion of the flap formed the intraoral lining and medial portion formed the skin cover. Flap inset was started at the posterior margin of the oral cavity defect using 2-0 polygalactin followed by inferior and superior borders up till commissure. The intervening portion of the two skin paddle was de-epithelized to allow for folding of the flap. In cases where commissure was involved, a neo commissure was created by inseting the cut ends of the upper and lower lips on to matching semicircular de-epithelized areas on the flap. External flap was sutured to facial skin with 3-0 nylon. Suction drain was placed in neck (no.14) and donor area (no.16), and incisions were

closed. Postoperatively, the patients were treated with IV antibiotics, analgesics. Flap monitoring (vascularity) was done 6th hourly for first 48 hours and 12th hourly for next 3-7 days.



Figure 3. Pod -7 PMMC donor and recipient area

Results

Table 1: Age distribution

Age	Years
Minimum	35
Maximum	75
Average	49

Table 2: Gender distribution

Gender	Number	Percentage
Male	33	97
Female	1	3

Total number of patients included in our study were 34. The median age group was 49 years, with a minimum age of 35 years and maximum of 75 years. Among 34 patients, 33 (97%) were males and 1 (3%) female. Of these, 23 (67%) patients were residents of urban areas and 11 (33%) from rural areas.

Table 3: ECOG performance status

Trismus	Number	%
1	11	33
2	23	67

Table 4: Trismus grade

ECOG grade	Numbers	%
1	25	73
2	9	27

ECOG performance of grade 1 was noted in 25 (74%) patients and grade 2 in 9 (26%) patients. Eleven (33%) patients had grade 1 trismus and 23 (77%) had grade 2.

Table 5: Comorbidities

Comorbidities	Number	%
Present	11	33
Absent	23	67

Table 6: Lymph node status

Nodes	Numbers	%
N0	1	3%
N1	24	71%
N2	9	26%

Eleven (33%) patients also had comorbidities. The histology in all patients was of squamous cell carcinoma, and the most common subsite involved was buccal mucosa with involvement of skin. All 34 patients presented with T4 lesions. The most frequent nodal status was N1 in 24 (71%) patients, followed by N2 in 9 (26%) and N0 in 1 patient.

All patients underwent comprehensive neck dissection type 2 with en-bloc excision of the tumour with hemimandibulectomy. Defect was measured and reconstructed in the same sitting with ipsilateral bipaddle PMMC flap.

Table 7: Flap characteristics

Flap size	Cm	Sq.cm
Maximum	17*7	105
Minimum	9*4	36

Table 8: Hospital stay

Hospital stay(days)	Numbers
<10	23
10 TO 20	8
>20	3
Average- 9days	

The flap size was measured based on oromandibular defect and the flap was marked with a horizontally-oriented ellipse. Average flap size harvested was 12 x 5 cm, with the largest and smallest flap sizes being 17x7cm and 9x4cm respectively. Maximum area of defect covered was 105cm² and minimum 36cm². A total of 10 patients required oral commissure reconstruction, along with oromandibular reconstruction.

In our study, skin paddle loss was noted in 5 (14%) patients, partial necrosis in 3 (8%) patients, and complete loss of PMMC flap in 2 (5%) patients which was treated with contralateral PMMC flap. In our study, successful outcomes after bipaddle pectoralis major myocutaneous flap was noted in 32 (94%) patients.

Postoperatively, all patients were monitored in ICU, with elective ventilation for 24 hours. The mean duration of hospital stay was 9 days, ranging from 5-24 days. Ryles tube feeding was started after extubation and regular monitoring of flap was done. Oral feeds were started after complete wound healing. All patients received adjuvant radiation therapy.



Figure 4. Healed outer skin paddle and mucosal paddle



Figure 5. Post CT and RT, PMMC flap after 1

Table 9: List of Complications

Complications	Numbers	Percentage
Neck wound SSI	10	29%
Skin paddle loss	5	14%
Partial necrosis	3	8%
Complete loss	2	5%
Intraoral wound dehiscence	2	5%
Drooling of saliva	2	5%
Chyle leak	1	3%
Parotid fistula	1	3%

Complications were divided into two groups, flap-related and unrelated to flap. Flap-related complications included intraoral dehiscence in 2 (5%) patients, treated with conservative management. Skin paddle loss was noted in 5 (14%) patients, followed by partial flap necrosis in 3 (8%) patients, treated with debridement and secondary suturing, and one patient was treated with ipsilateral forehead flap. Total flap

necrosis was noted in 2 (5%) patients, which was treated with debridement and contralateral PMMC flap reconstruction. Drooling of saliva following commissure reconstruction was noted in 2 (5%) patients.

Complications unrelated to flap were surgical site infection of neck in 10 (29%) patients treated with drainage procedure, wound care and IV antibiotics. One (3%) patient presented with parotid fistula and 1 (3%) patient with chyle leak treated with conservative management.

Discussion

Pectoralis major myocutaneous flap for head and neck reconstruction was first introduced by Ariyan in 1979^[4]. Although the ideal method for reconstruction of oromandibular surgical defects is with free tissue transfer^[5]. PMMC flap still finds utility across the world as a reconstruction option in both primary and salvage settings in free flap necrosis.

The free flap is the gold standard method of reconstruction. The advantages of free flaps includes lack of bulk, good cosmesis, and malleability of using other flaps^[6]. Free flap is associated with a higher learning curve, higher cost and increased anaesthesia time and need for specialised equipments. Increased anaesthesia time in locally-advanced malignancies puts the patients at a risk of intraoperative and postoperative complications^[7].

The main advantage of PMMC flap which makes it popular amongst surgeons treating oral cancer is short learning curve^[8]. Since the introduction of the flap, the harvesting technique has remained constant with very few modifications. It offers the advantages of being close to the head and neck region, carries good vascularity and bulk, reaches up to midface. It causes minimal donor site morbidity^[9,10]. Use of this PMMC flap as a bipaddle flap became popular in developing countries with a high burden of oral malignancy because of need to provide inner and outer lining for through-and-through defects of the oral cavity. Majority of oral cancer patients in India present with locally-advanced disease, making this technique particularly useful for single stage reconstruction.

Table 10: Comparison of Flap outcomes

Study	Total no.	Successful outcome	%	Flap loss
Sahu et al ⁽¹¹⁾	12	12	100	0
Bhola et al ⁽¹³⁾	62	62	100	0
Ahmed et al ⁽¹⁴⁾	47	46	97	1
Bhathana and karavana et al ⁽¹²⁾	53	50	94	3
Our study	34	32	94	2

A literature review showed that there were studies elaborating on experience with bipaddle PMMC flap. Sahu et al^[11] studied 12 patients over 18 months, and the results were as follows: with overall flap-related complications in 25% patients, with no flap loss and an average hospital stay of 18.5 days. Bhatena and Kavarana^[12] studied 53 patients with successful bipaddle PMMC flap reconstruction in 50 (94)% patients. In their study a total loss of flap was noted in 3 patients (6%), and fistulas in 4 cases (8%).

Bhola et al^[13] studied in 62 patients and the most common complication was wound dehiscence in 19.28% of patients, with no complete flap loss. In a study by Ahmed et al^[14] there were 15 minor complications in a case series of 47 patients, and one complete flap loss which was treated with folded forehead flap. In a series of 12 cases by Weaver et al, 4 cases developed differential necrosis.^[15] Reconstruction of commissure by inserting the upper and lower lip on to the semicircular de-epithelized areas of flap, matching the thickness of the lip, is a modification of the technique described by Pai et al.^[16]

Conclusion

Bipaddled PMMC flap has been used successfully in patients for reconstruction of oromandibular defect after resection of oral malignancy. It provides a large bulk of vascularised muscle and skin paddle. Both mucosal and skin linings are covered in single flap. The main complications noted were wound dehiscence and partial necrosis and these were managed conservatively or with minor procedures. Its versatility, definite vascular supply, and an easy learning curve makes the PMMC flap a favoured option for reconstruction of oromandibular defects.

Recommendations

We would like to recommend bipaddle pectoralis major myocutaneous flap as a first choice of reconstruction of oral malignancy involving skin as it is a locoregional flap, has an easy learning curve, good outcome with less morbidity. Donor site morbidity and complications related to free flap can be avoided.

References

- Mohan P, Richardson A, Potter JD, Coope P, Paterson M. Opportunistic Screening of Oral Potentially Malignant Disorders: A Public Health Need for India. *JCO Glob Oncol*. 2020 May;6:688-696. doi: 10.1200/JGO.19.00350.
- Sharma S, Murty PS, Hazarika P, Nayak DR, Sharma S. The indications and complications of pectoralis major myocutaneous flap reconstruction in head and neck surgery-our experience. *Indian J Otolaryngol Head Neck Surg*. 1998 Oct;50(4):362-7. doi: 10.1007/BF03000688. PMID: 23119459; PMCID: PMC3451418.
- Ariyan S. Further experiences with the pectoralis major myocutaneous flap for the immediate repair of defects from excisions of head and neck cancers. *Plast Reconstr Surg*. 1979 Nov;64(5):605-12.
- Ariyan S. The pectoralis major myocutaneous flap. A versatile flap for reconstruction in the head and neck. *Plast Reconstr Surg*. 1979 Jan;63(1):73-81. doi: 10.1097/00006534-197901000-00012
- Liu M, Liu W, Yang X, Guo H, Peng H. Pectoralis Major Myocutaneous Flap for Head and Neck Defects in the Era of Free Flaps: Harvesting Technique and Indications. *Sci Rep*. 2017 Apr 7;7:46256. doi: 10.1038/srep46256.
- Boyd JB, Morris S, Rosen IB, Gullane P, Rotstein L, Freeman JL. The through-and-through oromandibular defect: rationale for aggressive reconstruction. *Plast Reconstr Surg*. 1994 Jan;93(1):44-53. doi: 10.1097/00006534-199401000-00007
- Smeele LE, Goldstein D, Tsai V, Gullane PJ, Neligan P, Brown DH, Irish JC. Morbidity and cost differences between free flap reconstruction and pedicled flap reconstruction in oral and oropharyngeal cancer: Matched control study. *J Otolaryngol*. 2006 Apr;35(2):102-7. doi: 10.2310/7070.2005.5001.
- McLean JN, Carlson GW, Losken A. The pectoralis major myocutaneous flap revisited: a reliable technique for head and neck reconstruction. *Ann Plast Surg*. 2010 May;64(5):570-3. doi: 10.1097/SAP.0b013e3181c51f4a.
- Liu R, Gullane P, Brown D, Irish J. Pectoralis major myocutaneous pedicled flap in head and neck reconstruction: retrospective review of indications and results in 244 consecutive cases at the Toronto General Hospital. *J Otolaryngol*. 2001 Feb;30(1):34-40. doi: 10.2310/7070.2001.21011.
- Kerawala CJ, Sun J, Zhang ZY, Guoyu Z. The pectoralis major myocutaneous flap: Is the subclavicular route safe? *Head Neck*. 2001 Oct;23(10):879-84. doi: 10.1002/hed.1127.
- Sahu PK, Kumar S. Bipaddle Pectoralis Major Myocutaneous Flap for Single Stage Reconstruction of Oromandibular Defects. *Indian J Otolaryngol Head Neck Surg*. 2020 Mar;72(1):44-48. doi: 10.1007/s12070-019-01731-w.
- Bhatena HM, Kavarana NM. The folded, bipaddled pectoralis major composite flap in oral cancer reconstruction. *Br J Plast Surg*. 1989 Jul;42(4):441-6. doi: 10.1016/0007-1226(89)90011-8.
- Bhola N, Jadhav A, Borle R, Khemka G, Kumar S, Shrivastava H. Is there still a role for bilobed/bipaddled pectoralis major myocutaneous flap for single-stage immediate reconstruction of post ablative oncologic full-thickness defects of the cheek? *Oral Maxillofac Surg*. 2015 Jun;19(2):125-31. doi: 10.1007/s10006-014-0458-1.
- Ahmad QG, Navadgi S, Agarwal R, Kanhere H, Shetty KP, Prasad R. Bipaddle pectoralis major myocutaneous flap in reconstructing full thickness defects of cheek: a review of 47 cases. *J Plast Reconstr Aesthet Surg*. 2006;59(2):166-73. doi: 10.1016/j.bjps.2005.07.008.
- Sahu PK, Kumar S. Bipaddle Pectoralis Major Myocutaneous Flap for Single Stage Reconstruction of Oromandibular Defects. *Indian J Otolaryngol Head Neck Surg*. 2020 Mar;72(1):44-48. doi: 10.1007/s12070-019-01731-w.
- Chaturvedi P, Joshi P. Partial Bipaddling of Pectoralis major myocutaneous flap in full thickness cheek defects involving lip commissure : a novel technique. September 2013. *International Journal of Head and Neck Surgery* 4(3):113-114. DOI:10.5005/jp-journals-10001-1155.

Conflict of interest: Nil

Source of funding: Nil

Date received: Sep 24, 2024

Date accepted: Dec 11, 2024