World Journal Of ENT & Head-Neck Surgery
(WJEHNS)

www.wjehns.com

PMMC FLAP FOR HEAD & NECK RECONSTRUCTION –A TERTIARY CARE CENTRE EXPERIENCE

Dr Nandhini MK*[1], Dr Somnath Saha[2]

[1] Post Graduate Trainee, Department of ENT, Head & Neck Surgery, Calcutta National Medical College & Hospital, Kolkata.
[2] Professor & Head, Department of ENT, Head & Neck Surgery, Calcutta National Medical College & Hospital, Kolkata.
*Correspondence:
Dr Nandhini MK
Email: yadielnan@gmail.com

Abstract:
Objectives: The Pectoralis Major Myocutaneous (PMMC)Flap is a reliable regional flap for reconstruction in head and neck malignancies. The study is about our experience with PMMC flap reconstruction at our institution.
Materials: We studied 9 cases of Head and neck malignancies where resection was possible and needed reconstruction. The study was conducted in the department of ENT, Head & Neck surgery at Calcutta National Medical College & Hospital, Kolkata, over a period of 12 months, February 2019 to January 2020.
Result: Majority of the patients presented at locally advanced stage of the disease (67%) with male: female ratio of 2:1, mainly in their 5th -6th decades of life. All our patients had SCC of the oral cavity, under the subsets of buccal mucosa, lower alveolus, tongue and floor of muth(FOM) in the decreasing order. Main complication met was orocutaneous fistula (22%) followed by skin/partial flap necrosis and wound infection (11% each). One patient had recurrence.
Conclusion: PMMC flap is still a first choice for reconstruction of head and neck malignancies, in places with limited resource and expertise.

Keywords: Head and neck reconstruction, head and neck malignancies, Pectoralis major myocutaneous flap,

Introduction:

More than 50% of head and neck malignancies in the world occurs in Asia, especially India. Head and neck cancers accounts for 30% of cancers in India, where 60 – 80% patients present at advanced stages requiring a composite resection[1]. The cancers ranging from carcinoma lower and upper alveolus, buccal mucosa, tongue, floor of mouth, gingivobuccal sulcus and mandible etc. The most common histological variant is squamous cell carcinoma[2] . According to the statistics, in 2018, globally the number of new cases of lip and oral cavity cancer is 3,54,864 and the number of deaths in the same year is 1,77,384 [3]. The gold standard for reconstruction in head and neck cancers is microvascular free flap, which requires resources and expertise. In advanced cases where composite resection is required the principal mode of reconstruction is the PMMC flap. We present a prospective analysis of 9 cases of PMMC flap reconstruction done at our institution.

Materials & Methods:

A total of 9 cases of PMMC flap reconstructions were done over a period of 12 months, February 2019 to January 2020, at the Department of ENT, Head & Neck Surgery, CNMCH, Kolkata. After a detailed clinical history, examination and relevant investigations, the cancers were staged and operated respectively and reconstruction was made with ipsilateral PMMC flap. Procedures were performed as per standard protocol. Informed consents were obtained from all the patients. Patients who underwent primary closure and reconstructed with other flaps were excluded from the study.

Technique of harvesting PMMC flap:

- The surface marking of the vascular pedicle was made by drawing a line from the ipsilateral acromion to the xiphisternum and another line vertically from the midpoint of clavicle intersecting the first line (Ariyan Line).


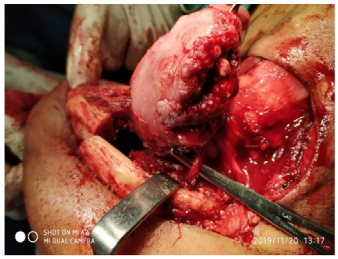

Figure.1, a. Shows T4a staged carcinoma of tongue; b. Resection of primary

A skin island was positioned over the pectoralis muscle along the course of this vascular pedicle.

- The skin island of appropriate size was designed as an ellipse with a transverse axis over the 5th rib medial to the nipple or in the inframammary fold.
- The skin and breast tissue above the skin island was widely elevated from the pectoralis major muscle upto the clavicle (Fig.2)

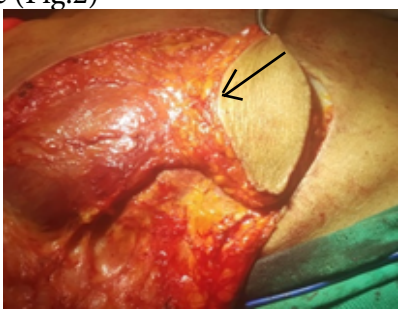

Figure 2: Skin island (arrow) of PMMC flap

- Then skin island was incised in a beveling fashion to incise as many myocutaneous perforators as possible and elevated cephalad in the retropectoral area between the pectoralis major and minor muscle plane, along the lateral border of the pectoralis major muscle. Pectoral branch identified on the undersurface and keeping it in view further division of the flap was done (Fig. 3)

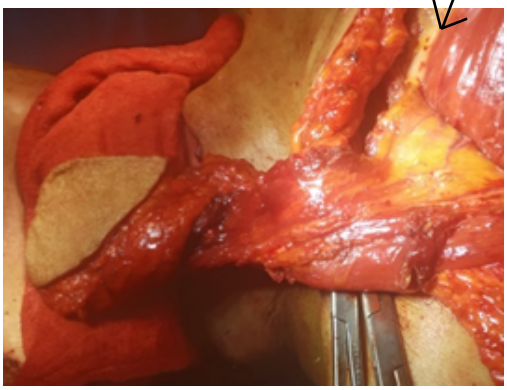

Figure 3: Elevation of PMMC flap with the identification of the pectoral branch of thoracoacromial.a on the undersurface (arrow)

In case of osteomyocutaneous flap, usually 5th rib is chosen and dissected out by dividing the intercostal muscles and gently dissecting away the pleura from the undersurface of the rib. Rib was then divided using rib cutters as per the defect.

- The humeral and sternal attachments were divided for transposition into the neck and clavicular attachments and medial and lateral pectoral nerve were divided for adequate arc of rotation and to avoid supraclavicular hump.
- The flap was then mobilized into the neck, forming a tunnel at the subplatysmal plane above the clavicle without any compression (Fig.4)

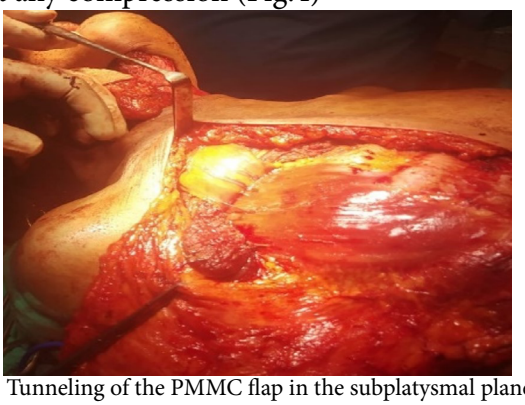

Figure 4 . Tunneling of the PMMC flap in the subplatysmal plane above clavicle, seen under the retractor

- Then with 3.0 vicryl the flap was sutured with the defect (Fig.5).

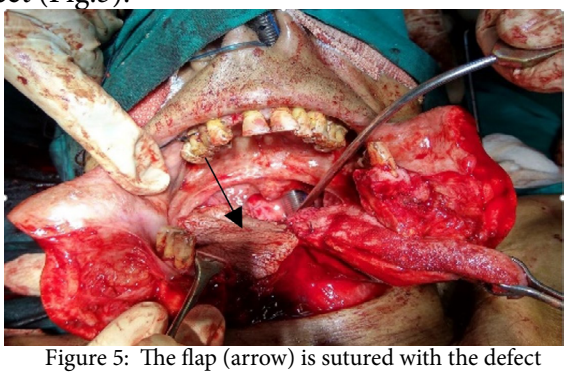

Figure 5: The flap (arrow) is sutured with the defect

- Suction drains placed and wound closed in layers. Donor site closed primarily (Fig.6)

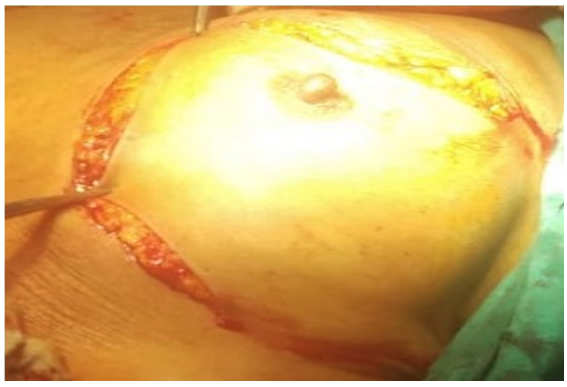

Figure 6: Primary closure of the donor site

In the post-operative period patients were evaluated for graft uptake and complications. All the cases were analyzed with regards to age, sex, site, stage, result and complication. The data was compiled and analyzed with the latest IBM SPSS ver.26.0 software for descriptive statistics.

Observation & Results:

A total of 9 case was analyzed, of which 6 were male and 3 were female with a male: female ratio of 2:1. The age ranged from 38 to 70 years with the majority falling in the 5th & 6th decades. All the patients in our series had squamous cell carcinoma of the oral cavity, with majority under the subset buccal mucosa making up to 44%, followed by lower alveolus and tongue making up to 22% each.

Table 1: Patient's Demographic details (n=9).

Mean Age (years)	**54 (Range: 38-70)**	
Sex	No. of patients	Percentage
Male	6	67%
Female	3	33%
Primary Site	No. of patients	Percentage
Buccal Mucosa	4	44%
Lower Alveolus	2	22%
Tongue	2	22%
Floor of Mouth	1	11%

One patient had carcinoma of floor of mouth (Table 1).

Out of 9, 6 patients had moderately advanced disease (Fig.7) with varying involvement of the gingivobuccal sulcus, retromolar trigone, mandible and skin.

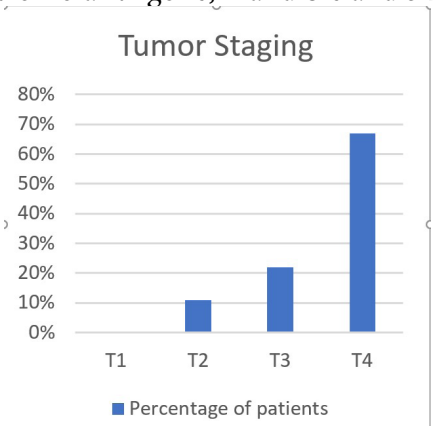

Figure 7: showing distribution of patients of diferent stages.

All patient underwent wide local excision of the primary tumor with modified radical neck dissection. 5 patients underwent segmental/hemi mandibulectomy along with the primary resection.

All the patients underwent ipsilateral PMMC flap reconstruction including one osteomyocutaneous flap. The average duration of the hospital stay was 12 days (7-40 days).

During the perioperative period the most common complaints were pain followed by trismus and dysphagia. Of the 9 flaps, 3 had complete uptake of flap and the rest had complications but without total flap failure.

Among the complications met which were all flap related, orocutaneous fistula was the commonest followed by skin/partial flap necrosis and wound infection (Table 2)

One patient had recurrence of the primary after a period of 6 months. All the complications were managed conservatively.

Table 2: Post-Operative Complications:

Complication	No. of Patients
Skin Flap necrosis	1
Partial Flap Necrosis	1
Wound Infection	1
Orocutaneous Fistula	2
Total Flap Failure	0
Recurrence	1

Discussion:

India has a high mortality rate in Head and Neck cancers due to its late presentation[4]. Majority of the patients in our series (67%) was in locally advanced stage. This leads to a composite resection and therefore requirement of reconstruction. In reconstruction the selection of flaps is according to the reliability in providing coverage, restoring contour and function, without compromising the primary aim of adequate tumor resection.

The use of muscle as a flap requires movement of a part or all of the muscle, without interrupting its circulation. A precise knowledge of vascular anatomy of the muscles to be utilized is essential. The well-established Mathes and Nahai classification of vascular anatomy of muscles is used for this purpose. Accordingly, the five patterns are: Type 1-One vascular pedicle; Type 2-dominant pedicle(s) and minor pedicle(s); Type 3- two dominant pedicles; Type 4- Segmental vascular pedicles; Type 5-One dominant pedicle and secondary segmental pedicles. PMMC flap was first described by Stephen Aryan in 1979[5].

Surgical Anatomy:
Pectoralis major muscle originates from the medial half of clavicle, medial part of sternum and first 6 ribs and inserts on the lateral lip of the bicipital groove of the humerus. It falls under type 5 pattern, the dominant vascular pedicle being pectoral branch of thoracoacromial artery, which is a branch of subclavian artery, and the segmental secondary pedicles being perforators of internal mammary artery from 1st to 6th intercostal spaces. So, the entire muscle would survive elevation on either vascular system. The arc of rotation is wide which is oblique from the lateral end of clavicle to the xiphoid process and so it is a flap of choice for composite defects of lower face and oral cavity. The skin territory is located between the nipple and the sternum over the 5th- 6th ribs. A variation of the PMMC flap by placing the skin unit more distally in the inframammary crease increases the arc of rotation. The vascular communication between the muscle and the periosteum of the fifth and sixth ribs allows the elevation of vascularized rib for mandibular reconstruction.
Causes of failure:
The main morbidity of any flap is failure. As with any other procedure, the error in judgement, technique and concurrent illness plays a vital role. The causes of flap failure are due to planning errors, technical errors and post-operative errors. Planning errors include, inadequacy in design, not considering vasculature in previously operated or irradiated patient and not considering arc of rotation in obese patient. The flap of choice and alternatives should be determined preoperatively. Technical errors include, inappropriate harvesting of flap and aligning the flap to the donor site, incorrect pedicle division, inadequate tunneling, increased tension, bleeding and inadequate debridement leaving nonviable tissue leading to flap failure. Post-operative care errors include, positioning with pressure, tight dressing compromising circulation, improper drain, perioperative antibiotics and immobilization.
Complications:
The drawback of PMMC flap is the higher complication rate as seen in the study done by El-Marakby[6]. The study done by S.Sen et al shows that the success rate of PMMC flap in terms of achieving treatment goals is higher in spite of the increased complication rates[7]. Wei Wei et al in his study says that the complication rates of PMMC flap in primary reconstruction is lesser than that of secondary reconstruction but has a similar survival prognosis[8]. Our study had orocutaneous fistula (22%) as the most common complication, which was managed conservatively.
Skin/partial flap necrosis and wound infection was seen in around 11% of patients respectively, which coincides with the studies done by Atanu Bhanja et al and Anehosur et al[9,10]. The loss of adduction and medial rotation was well tolerated by patients in our study as no patient had major complaint of dysfunction. The chest wall cosmesis was also acceptable (Fig.8).

Figure 8: Acceptable chest wall cosmesis, 2 months post operatively.

Although majority of the patients presented at the late stage and had consecutive post-op complications, the functional and cosmetic outcome was satisfactory.
Despite the drawbacks, due to the ease of technique; the bulkiness leading to the usage in advanced cases; as a salvage flap in free flap failures, recurrences and laryngectomy post irradiation, PMMC is considered a versatile flap[11-16].

Conclusion:

In the age of microvascular free flap transfer, PMMC flap is still the first choice for head and neck reconstruction, at places with less expertise and facilities. In head and neck cancers constituting complex functional and aesthetic reconstruction, PMMC flap gives a favorable outcome. Due to its ease, reliability and less complications it is the workhouse flap in places with increased patient load. According to our experience which has shown a low rate of complication, PMMC flap is an excellent choice in head & neck reconstruction.
Conflict of Interest: None
Ethical clearance: Passed by Ethics committee, Calcutta national medical college, Kolkata.

References:
1. Kulkarni MR. Head and Neck Cancer Burden in India. Int J Head and Neck Surg 2013;4(1):29-35.
2. https://www.nccn.org/professionals/physician_gls/pdf/head-and-neck_blocks.pdf.
3. https://gco.iarc.fr/today/data/factsheets/cancers/1-Lip-oral-cavity-fact-sheet.pdf.
4. Agarwal S, Agarwal S, Grover M (2015) Influence of Socio-economic Factors on the Late Presentation of Head and Neck Cancers. J Otolaryng Head Neck Surg 1: 001.
5. Ariyan S. The pectoralis major myocutaneous flap. A versatile flap for reconstruction in the head and neck. Plast Reconstr Surg. 1979; 63: 78-81.
6. El-Marakby H.H. The reliability of pectoralis major myocutaneous flap in head and neck reconstruction. J Egypt Natl Cancer Inst. 2006;18:41–50.
7. Sen.S, Gajagowni J.G, Pandey .J.K, Dasgupta.P, Sahni.A, Gupta.S, MP.S, Ravi.B. Effectiveness of pectoralis major myocutaneous flap in the surgical management of oral cancer: A retrospective study. Journal of Stomatology, Oral and Maxillofacial Surgery 2019; 120(1):21-27.
8. Wei W, Qiu Y, Fang Q, Jia Y. Pectoralis major myocutaneous flap in salvage reconstruction following free flap failure in head and neck cancer surgery. J Int Med Res. 2019;47(1):76–83. doi:10.1177/0300060518795530.
9. Bhanja A, D'Souza DS, Roy C, Poddar RN. Reliability of the pectoralis major myocutaneous flap in reconstructive oral cancer surgery in developing countries: Our experience. Med J Armed Forces India. 2016;72(Suppl 1):S1–S7. doi:10.1016/j.mjafi.2016.02.013.
10. Anehosur V, Dikhit PS, Nagraj N, Jayade B, Kumar N. PMMC Flap Revisited and its Clinical Outcome in 150 Patients. Journal of Maxillofacial and Oral Surgery. 2020 Mar;19(1):26-31. DOI: 10.1007/s12663-019-01228-7.
11. Pradhan P, Samal S, Preetam C, Samal DK, Parida PK. Pectoralis Major Myocutaneous Flap Reconstruction for the Mandibular Defects in Advanced Oral Cavity Malignancies: A Retrospective Study of 30 Cases. Indian J Otolaryngol Head Neck Surg. 2018;70(3):415–420. doi:10.1007/s12070-018-1429-x.
12. Shah gunjan hemant, misra gyanendra, meena asha. Pectoralis Major Myocutaneous Flap in Head and Neck Reconstruction:An institute Experience in 200 Consecutive Cases: Pectoralis Major Myocutaneous Flap in Head and Neck Reconstruction. National Journal of Integrated Research in Medicine. 10, 4 (Sep. 2019), 66-69.
13. Okoturo E. Regional Myocutaneous Flaps for Head and Neck Reconstruction: Experience of a Head and Neck Cancer Unit. Niger J Surg. 2015;21(2):85–90. doi:10.4103/1117-6806.162568.
14. Metgudmath RB, Metgudmath AR, Metgudmath VV, Roy B, Das AT. Versatility of pectoralis major myocutaneous flap in oncosurgery and its role in developing countries. Indian J Otolaryngol Head Neck Surg. 2013;65(Suppl 1):80–84. doi:10.1007/s12070-012-0535-4.
15. Pancholi M, Sharma S, Desai SM, Agrawal D. Crossed pectoralis major myocutaneous flap for recurrent oral cavity cancers. Ann Maxillofac Surg. 2016;6(2):219–222. doi:10.4103/2231-0746.200320.
16. Hariharan, N.C., Sugumar, M. & Muthukumar, R. Pectoralis Major Myocutaneous/Myofascial Flap and Split Skin Grafting for Repair of Post Laryngectomy Pharyngo Cutaneous Fistula: An Undemanding and a Reliable Solution. Indian J Otolaryngol Head Neck Surg 71, 305–311 (2019). https://doi.org/10.1007/s12070-018-1288-5.