

Pectoralis major myocutaneous flap in head and neck reconstruction: An experience in 100 consecutive cases

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ABSTRACT

Background: The pectoralis major myocutaneous (PMMC) flap has been used as a versatile and reliable flap since its first description by Ariyan in 1979. In India head and neck cancer patients usually present in the advanced stage making PMMC flap a viable option for reconstruction. Although free flap using microvascular technique is the standard of care, its use is limited by the availability of expertise and resources in developing world. The aim of this study is to identify the outcomes associated with PMMC flap reconstruction. **Patients and Methods:** After ethical approval we retrospectively analyzed 100 PMMC flap at a tertiary care hospital from 2006 to 2013. A total of 137 PMMC flap reconstructions were performed out of which follow-up data of 100 cases were available in our record. **Results:** A total of 100 patients were reviewed of these 86% were of oral cavity and oropharyngeal lesions, 8% were of hypopharyngeal, 3% were of laryngeal malignancies and 3 cases were of salivary gland tumor. Most tumors (83%) were advanced (T3 or T4 lesion). 95 PMMC flap reconstruction were done as a primary procedure, and 5 were salvage procedure. PMMC flap was used to cover mucosal defect in 84 patients, skin defects in 10 patient and both in 6 patients. Overall flap related complications were 40% with a major complication in 10% and minor complications in 30%. No total flap loss occurred in any patient, major flap occurred in 6% and minor flap loss in 12%. In minor flap loss patients, necrotic changes were mostly limited to skin. Orocutaneous and pharyngocutaneous fistula developed in 12 patients. 10% patients required re-surgery after developing various flap related complications Pleural empyema developed in 3 patients. Other minor complications such as neck skin dehiscence and intra-oral flap dehiscence developed in 26 patients. **Conclusion:** PMMC flap is a versatile flap with an excellent reach to face oral cavity and neck region. With limited expertise and resources, it is still a workhorse flap in head and neck reconstruction.

Key words: Head and neck cancers, head and neck reconstruction, pectoralis major myocutaneous flap, pedicled flap

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INTRODUCTION

Reconstruction following head and neck cancer surgery is a daunting task. Microvascular free flap reconstructions are now considered as the gold standard for this purpose, however, they need considerable resources and training.^[1] Pectoralis major myocutaneous (PMMC) flap

owing to its robust vascularity and easy learning curve for surgeons, is still a workhorse at centers with limited resources and heavy patient load.^[2] Forty years after its first description by Ariyan and with literature reporting a complication rate of 17–63% it still holds an unmatched acceptance in head and neck reconstruction.^[3–7] At our center head and neck, malignancies constitute a major chunk of cancers in the adult population with most patients presenting in advanced stages [Table 1]. PMMC flap is the principal mode of reconstruction following composite resections. It provides required bulk for a composite defect with acceptable cosmetic outcomes. We present a retrospective analysis of 100 PMMC flap reconstructions from the year 2006 to 2013.

PATIENTS AND METHODS

A total of 137 PMMC flap reconstructions were performed during the year 2006–2013, out of which follow-up data of 100 cases were available in our record. Data of 100 patients with head and neck cancers who underwent PMMC flap reconstruction during the 2006–2013 were analyzed with regard to the clinical presentation, tumor node metastasis staging, operative procedure and postoperative complication rates. Ipsilateral PMMC flap was used for reconstruction after resection of the lesion. Standard technique for harvesting the PMMC flap as described in following section was implemented.^[8]

Technique for harvesting pectoralis major myocutaneous flap

The surface markings of the vascular pedicle were made by drawing a line from the ipsilateral acromion to the xiphisternum and another line vertically from the midpoint of the clavicle to intersect the first line. Skin paddle of the flap was positioned over the pectoralis muscle along the course of the pectoral branch of the thoracoacromial artery [Figures 1-3].

During flap elevation, care was taken not to undercut the skin paddle but rather to bevel it, so as to include as many myocutaneous perforators as possible. The skin paddle was sutured to the underlying pectoralis muscle with a few sutures to minimize the risk of shearing injury to myocutaneous perforators. The dissection plane between the pectoralis minor and pectoralis major muscle with its vascular pedicle was found by dissecting the lateral border of pectoralis major muscle. Once in the plane, we could easily free the pectoralis

major with its vascular pedicle from pectoralis minor muscle. The pectoralis major muscle was divided lateral to the pedicle while keeping the pedicle in view, thereby freeing it from the humerus. A portion of the clavicular fibers of the muscle was divided to accommodate only the neurovascular pedicle and its adventitia, eliminating



Figure 1: Plan of initial excision and neck dissection



Figure 2: Surface marking of pectoralis major myocutaneous bipaddled flap

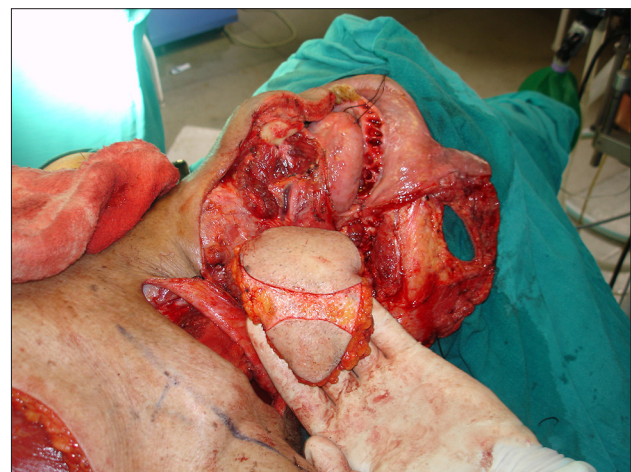


Figure 3: Harvested flap

Table 1 : Distribution of cases as per disease stage

Disease stage (TNM, AJCC-7)	Percentage of cases (n = 100)
Stage I + II	15
Stage III	30
Stage IV	55

TNM: Tumor, node, metastases, AJCC: American Joint Committee on Cancer

the supraclavicular hump. The flap was now passed into the neck through a subcutaneous tunnel created superficial to the clavicle. The tunnel was made wide enough to permit easy delivery of the flap into the neck without any compression. Suturing of the flap was accomplished with 3–0 vicryl interrupted sutures. Suction drains were placed in the neck and chest, and the wounds were closed in layers. The donor site was always closed primarily, which required extensive mobilization of fasciocutaneous flaps.^[8]

OBSERVATIONS AND RESULTS

A total of 100 cases were reviewed, of these 77 were male and 23 were females (male: female - 3.3:1). Their age ranged from 3rd to 7th decade with the majority in 4th and 5th decades. Almost all the tumors were squamous cell carcinomas (97/100), mainly located in the oral cavity (79%), oropharynx (7%), hypopharynx (8%), larynx (3%), and 3 cases of salivary gland malignancy (3%) [Table 2].

Pectoralis major myocutaneous flap reconstruction was done as a primary procedure in 95 patients, and 5 were salvage procedures (reconstruction after fistula and coverage of exposed mandibular prosthesis). PMMC flap was used to cover mucosal defect in 84 patients, skin defects in 10 patient and both in 6 patients (bipadded). We did not include osteomyocutaneous flaps in this series. Of 3 PMMC reconstructions, after laryngectomy 2 were used as tube PMMC flap to restore continuity between pharynx and esophagus.

Postoperative complications

Postoperative complications were broadly classified as flap-related complications and complications unrelated to flap. For the purpose of analysis of flap loss in the postoperative period, flap loss was classified as total or partial loss, with latter being categorized as major or minor partial flap loss. Major partial loss was defined as full thickness partial loss prolonging hospital stay or requiring surgical intervention. Minor flap loss was defined as partial thickness loss with no significant delay in hospital discharge or requiring surgical intervention.

Overall flap related complications were recorded in 40% patients, and 17% patients developed complications unrelated to flap. 48% patients had an uneventful recovery without developing any complication. One patient expired in the postoperative period [Tables 3 and 4].

Flap necrosis

In our study varying degree of flap necrosis developed in 16 (16%) patients, of these 6 (37.5%) were major partial necrosis and 10 (62.5%) patients developed minor flap

Table 2: Distribution of primary site of tumor

Primary site	Percentage of cases (n = 100)
Buccal mucosa	28
Lower alveolus	17
Floor of mouth	04
Retromolar trigone	05
Tongue	21
Mandible	04
Tonsils	02
Base of tongue	05
Hypopharynx	08
Larynx	03
Salivary gland	03

Table 3: Flap related complications

Complication	Percentage of patients
Total flap necrosis	Nil
Major partial flap necrosis	06
Minor partial flap necrosis	10
Fistula	12
Wound dehiscence	26
Hematoma	07
Infection (superficial and deep)	32

Table 4: Complications unrelated to flap

Complication	Percentage of patients
Pleural empyema	03
Chyle leak	07
Parotid fistula	03

necrosis. No case of total flap necrosis was recorded. Patients with minor flap necrosis were managed conservatively without any surgical intervention, however, out of 6 patients developing major flap necrosis, 3 (50%) required surgical debridement, followed by secondary suturing in two and skin grafting in 1 patient. Of 6 major flaps necrosis 2 occurred in patients in whom bipadded flap was used, and 3 occurred in patients who received preoperative radiotherapy. Of these 2 patients with major flap necrosis were known cases of diabetes mellitus.

Fistula

A total of, 12 (12%) patients developed fistula and out of these 3 (25%) developed in patients with major flap necrosis. These 3 patients required surgical intervention. The most common location for fistula formation was the anterior tri-pointer suture between the flap, mucoperiosteum of the cut edge of mandible and the mucosa of the floor of mouth. In our study, significant factors contributing to fistula formation were major resection, T4 primary lesion, presence of systemic disease and prior radiotherapy.

Wound dehiscence

26 (26%) patients developed suture line dehiscence. All the patients with prior radiotherapy developed varying degree of wound dehiscence. In our study, common

factors found in patients with wound dehiscence were prior radiotherapy, female gender, presence of systemic disease and resection of the mandible.

Hematoma

Varying the degree of wound hematoma was recorded in 7 (7%) patients, 4 (57%) of them required re-exploration. Three out of these 4 (75%) re-explored patients had a major resection with neck dissection as a primary procedure.

Infection

32 (32%) patients developed surgical site infection including superficial and deep surgical site infections. Of these 11 (11%) patients had infection at the donor site.

Complications unrelated to flap

13 (13%) patients developed complications unrelated to flap. Of these pleural empyema developed in 3 (23%) patients, chyle leak occurred in 7 (53.8%) and 2 (15.3%) patients had a parotid fistula.

DISCUSSION

Currently free flap reconstruction is undoubtedly the first choice for head and neck reconstruction, providing one stage restoration with lower morbidity and better cosmetic and functional results^[9] [Figure 4]. However, PMMC flap continues to be an important tool in the armamentarium of head and neck surgeon especially in centers with high patient load and limited resources. Learning curve for the procedure is shorter and younger surgeons pick up the procedure very fast. In addition, a single team could continue with the surgery thus avoiding the problem of logistics of getting two teams work together always.^[10] PMMC flap

holds a great promise not only as a method of primary reconstruction but also as a salvage procedure after free flap necrosis and in cases bearing contraindication for free flap reconstruction such as medical conditions making patient unfit for long surgery and in cases with inadequate recipient vessel jeopardizing the feasibility of microvascular anastomosis. PMMC flap can also be used in combination with free flap to cover large soft tissue defects overlying a major vessel and in patients with high risk of wound dehiscence.^[9,11]

The available literature on PMMC flap reconstruction showed varying definition of complications and the rate at which they occur. Reported complications varies from 17% to 63%.^[5-7,9] In our series, we observed a complication rate of 40% with 16% occurrence of flap necrosis. Major flap necrosis occurred in 6% with no incidence of total flap necrosis. Our results are comparable to those in the literature.^[4,6,9,12] One major advantage of PMMC flaps is survival. Even in hands of an experienced microsurgeon, total flap necrosis occur in free flap reconstructions; however, total loss of PMMC flaps is uncommon.^[11] Many factors have been associated with the occurrence of flap necrosis viz. use of electrocautery versus scalpel, preservation versus removal of the clavicular attachment of pectoralis muscle, and the presence of random portion of skin at the distal end of the flap, but their exact significance still remain elusive.^[4,6,9] In our series 4 (40%) of total partial flap, necrosis occurred in patients in whom skin paddle was extended beyond the 7th rib. Rikimaru *et al.*, pointed out that positioning the skin island just medially to the nipple, over the fourth, fifth and sixth intercostal spaces, is essential for encompassing the skin perforator vessels that arise from the intercostal branches of the internal thoracic artery. These cutaneous vessels are supplied by the pectoralis branch of the thoracoacromial artery, through open choke vessels, when the main blood flow through the internal thoracic artery is interrupted during PMMC elevation.^[13] Hence, a totally axial myocutaneous flap may be created respecting this anatomical condition. Below the seventh rib, the vascular supply for the skin comes from the cutaneous branches of the superior epigastric artery, and, therefore, when portions of skin beyond this limit are included in the flap, this creates an axial flap with a distal random portion, thereby increasing the risk of partial loss. Another pitfall, described by Cunha-Gomes *et al.*, relates to the lateral pectoralis nerve division. These authors observed that this nerve may lie parallel or oblique to the PMMC vascular pedicle. When running obliquely to the pedicle, the lateral thoracic nerve becomes taut after the flap is rotated through 180° and presses against the vascular pedicle, thus leading to PMMC vascular impairment. These authors observed this phenomenon in 30% of their cases and recommended that this nerve should be dissected and divided when the



Figure 4: Postoperative image with improved mouth opening and good cosmesis

above situation is observed.^[14] In our series, we did not study and look for this entity; hence its contribution to flap necrosis in our study is not known.

Hematoma developed in 7 (7%) patients, out of which 4 required re-exploration. Meticulous attention must be paid to hemostasis, especially to the cut edge of the pectoralis muscle paddle. During re-exploration, gentle handling of the flap is of utmost important. Rough handling may compromise vascular pedicle of the flap. Fistula occurred in 12% patients, and most of them were associated with some degree of flap necrosis. In patients with oral cavity lesions, intra-oral portion of PMMC flap stays in a contaminated environment of saliva and food debris, and this area is not easily accessible to the patient for mechanical cleaning. Second special attention must be paid to the tri-pointer suture in the anterior region between the flap, mucosa of the floor of mouth and mucoperiosteum of the cut edge of the mandible. Fistula was seen more commonly in postradiotherapy patients, in patients with extensive resection like major glossectomy and lower alveolectomy, and in patients with systemic diseases like diabetes. All fistulas healed spontaneously except in 3 (25%) patients who required surgical intervention. Like in other major surgery, infection is a major concern in PMMC flap reconstruction. The best way to prevent it is to adhere to strict asepsis.

According to our study, with overall complication rate of 40%, which is comparable to the available literature,^[3,9,12,13] PMMC flap is an excellent choice in limited resources.

CONCLUSION

To conclude, owing to its versatility, easy learning curve, and a constant vascular pedicle, PMMC flap is still one of the most favored approaches for the head and neck reconstruction with acceptable cosmetic and functional outcomes. Our experience in 100 cases has shown a low flap related complications with major flap necrosis in 6% and minor partial flap necrosis in 10%. In limited resources with heavy patient load PMMC flap is still a workhorse flap for head and neck reconstruction.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and

other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

REFERENCES

1. Blackwell KE, Buchbinder D, Biller HF, Urken ML. Reconstruction of massive defects in the head and neck: The role of simultaneous distant and regional flaps. *Head Neck* 1997;19:620-8.
2. McCrory AL, Magnuson JS. Free tissue transfer versus pedicled flap in head and neck reconstruction. *Laryngoscope* 2002;112:2161-5.
3. Ariyan S. The pectoralis major myocutaneous flap. A versatile flap for reconstruction in the head and neck. *Plast Reconstr Surg* 1979;63:73-81.
4. Milenovic A, Virag M, Uglesic V, Aljinovic-Ratkovic N. The pectoralis major flap in head and neck reconstruction: First 500 patients. *J Craniomaxillofac Surg* 2006;34:340-3.
5. Croce A, Moretti A, D'Agostino L, Neri G. Continuing validity of pectoralis major muscle flap 25 years after its first application. *Acta Otorhinolaryngol Ital* 2003;23:297-304.
6. 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;30:34-40.
7. Shah JB, Haribhakti V, Loree TR, Sutaria P. Complications of the pectoralis major myocutaneous flap in head and neck reconstruction. *Am J Surg* 1990;160:352-5.
8. Freeman JL, Walker EP, Wilson JS, Shaw HJ. The vascular anatomy of the pectoralis major myocutaneous flap. *Br J Plast Surg* 1981;34:3-10.
9. Vartanian JG, Carvalho AL, Carvalho SM, Mizobe L, Magrin J, Kowalski LP. Pectoralis major and other myofascial/myocutaneous flaps in head and neck cancer reconstruction: Experience with 437 cases at a single institution. *Head Neck* 2004;26:1018-23.
10. Talesnik A, Markowitz B, Calcatera T, Ahn C, Shaw W. Cost and outcome of osteocutaneous free-tissue transfer versus pedicled soft-tissue reconstruction for composite mandibular defects. *Plast Reconstr Surg* 1996;97:1167-78.
11. McLean JN, Carlson GW, Losken A. The pectoralis major myocutaneous flap revisited: A reliable technique for head and neck reconstruction. *Ann Plast Surg* 2010;64:570-3.
12. El-Marakby HH. The reliability of pectoralis major myocutaneous flap in head and neck reconstruction. *J Egypt Natl Canc Inst* 2006;18:41-50.
13. Rikimaru H, Kiyokawa K, Inoue Y, Tai Y. Three-dimensional anatomical vascular distribution in the pectoralis major myocutaneous flap. *Plast Reconstr Surg* 2005;115:1342-52.
14. Cunha-Gomes D, Choudhary C, Kavarana NM. Vascular compromise of the pectoralis major musculocutaneous flap in head and neck reconstruction. *Ann Plast Surg* 2003;51:450-4.

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