

# The Versatility of Pectoralis Major Myocutaneous Flap in Head and Neck Reconstruction

<sup>1</sup>ABID H., <sup>2</sup>AHMAD S., <sup>3</sup>WARRAICH R.A.

<sup>1</sup>FCPS, BDS, Assistant professor, Oral & Maxillofacial Surgery Department, King Edward Medical University/ Mayo Hospital, Lahore. Add: 106 Habitat Flats, Jail Road, Shadman, Lahore, Cell No: 0322-4460957, E-mail: drhinaabid@hotmail.com

<sup>2</sup>FCPS, BDS, Assistant professor, Oral & Maxillofacial Surgery Department, The University College of Dentistry, The University of Lahore, Add: Dr Shakeel Ahmad c/o Dr Zahid, Zahid Medical Center Pasroor Road Pulaik, Sialkot city, Cell No: 0333-4866011, E-mail: Shakeel742@Yahoo.com

<sup>3</sup>FCPS, MDS, MCPS, Professor & Chairman Oral & Maxillofacial Surgery Department, King Edward Medical University/ Mayo Hospital, Lahore. Add: 223 G-III Akber's house, Johar town Lahore, Cell No: 0300-8445524, E-mail: drriazwarraich@hotmail.com

---

**Introduction:** Although different flaps can be used for facial reconstruction but Pectoralis major myocutaneous flap is still considered the workhorse for maxillofacial reconstruction because of simple procedure and high success rate, while other flaps of facial region ranging from pedicled to free flaps require greater surgical skills along with unpredictable results.

**Objective:** To find outcomes of Pectoralis major myocutaneous flap in reconstruction of middle and lower facial regions. Main outcome measures are vitality of the Pectoralis major myocutaneous flap, donor site morbidity and other complications.

**Study design:** Descriptive study.

**Place and duration of study:** Department of Oral & Maxillofacial Surgery, King Edward Medical University/ Mayo hospital Lahore, from April 2005 to June 2006.

**Patients and methods:** This study was carried out on 30 consecutive patients who require soft tissue reconstruction of middle and lower facial regions. Vitality of Pectoralis major myocutaneous flap, donor site morbidity and other complications were studied.

**Results:** In this study, the success rate of was 100%. All of the flaps were vital but 13.3% of the flaps had partial loss of flap.

**Conclusion:** Pectoralis major myocutaneous flap is a versatile flap as it can not only provide skin and mucosal cover simultaneously, but also provide adequate muscle bulk for through and through defects. It doesn't cause any hindrance in mandibular movements, even when used over mandibular reconstruction plate.

**Keywords:** Oral Reconstruction, Pectoralis major muscle, Myocutaneous flap, Axial pattern flap.

---

## Introduction

Reconstruction in the head and neck region continues to be a surgical challenge, as it requires restoration of both form and function. Soft tissue defects mostly demand both skin cover and oral lining. Through and through, extensive intra- and extra-oral high volume defects are mainly created after resection and excision of tumors.

Post-traumatic (i.e. road traffic accidents, firearm, and war injuries) and post-infective defects also require soft tissue reconstruction. All such defects are part of major workloads on maxillofacial units.

Pectoralis major myocutaneous flap accepts the challenge of reconstruction of these through and through, extensive intra and extra oral high volume defects in head and neck region.<sup>1-4</sup> It was introduced by Ariyan and has already been declared as a "Work Horse" for Maxillofacial reconstruction. Soft tissue reconstruction with this flap is a single stage procedure<sup>5</sup>. It can provide both mucosal lining and

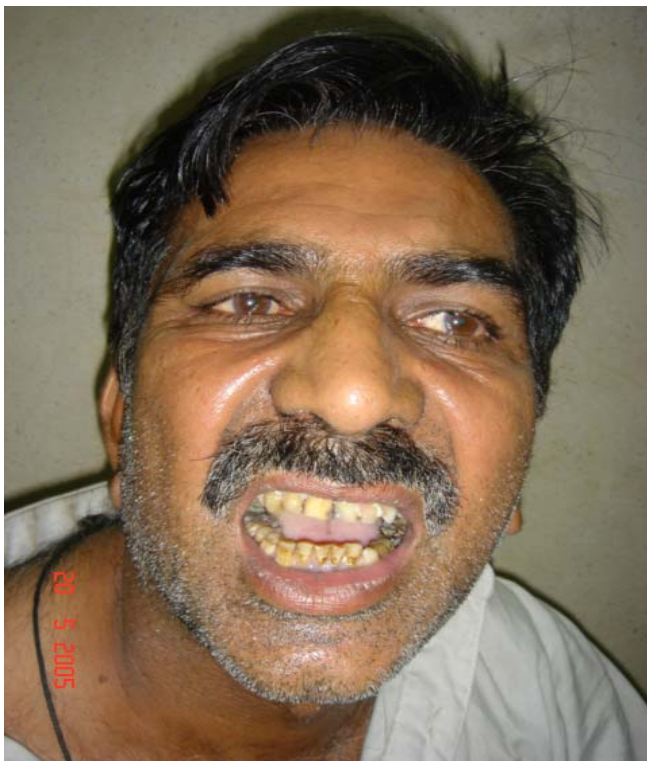
skin cover with double skin paddles<sup>6</sup> and gives bulk and pliability to the soft tissues<sup>7</sup>.

The Pectoralis major myocutaneous flap is an axial pattern flap. The pedicle of the flap is based on thoraco-acromial artery, which is a branch of axillary artery<sup>8</sup>. This myocutaneous flap can be converted into osteomyocutaneous flap by incorporating the outer cortex or part of medullary bone of the sternum along with pectoralis muscle. Fifth or sixth rib can also be harvested. Ribs and sternal portions help in mandibular and maxillary bony reconstruction<sup>9</sup> and are considered vascularized. At times, only the muscle flap can be used for intraoral<sup>10</sup> reconstruction without skin paddle.

The purpose of this study was to evaluate the out comes of this myocutaneous flaps in term of survival (failure of flap), complications (marginal necrosis, sinus fistula formation, and neck contractures.), Donor site morbidity, primary closure, chest expansion and shoulder movements.

**Patients and Methods**

This study was carried out in the department of Oral & Maxillofacial Surgery King Edward Medical University/ Mayo Hospital Lahore. 30 patients were included in this study from 1<sup>st</sup> April 2005 to 1<sup>st</sup> June 2006, out of which 21 were male and 9 were female patients with the mean age of 44 years. The sampling method was purposive. All these patients needed extensive soft tissue reconstruction for high volume and composite defects of face below the level of inferior orbital margin and zygomatic arch after trauma, infection and oncologic resection. Patients with shallow defects were not included. After taking complete history, general physical and systemic examination was done. Chests of the patients were examined for any injury, scar and contracture at the donor site along with fractures of rib cage. Specific investigations like CT-scan and MRI were done for assessment of defect before tumor resection. Color Doppler and arteriogram were sent in specific cases to evaluate patency of vascular pedicle and chest X-ray to see the deformities of chest cage. Pre-operatively the soft tissue defects were measured and marked on the pectoral region of the patients in sitting or in supine positions. Per-operatively the flap was raised and brought to the defect site and was sutured in layers to cover defect. Post-operatively the patients were kept in intensive care unit for first 24 hours after which they were shifted to the ward. Patients were discharged from the ward after 7<sup>th</sup> post operative day or when all the drains and sutures were removed.



**Fig. 1:** *Sec of left buccal Mucosa.*



**Fig.2:** *Flap markings.*



**Fig. 3:** *Reconstruction of defect.*

Postoperatively, patients were evaluated for vitality of the flap (i.e. flap color, temperature, marginal necrosis, epi-



**Fig. 4:** Donor site closure.



**Fig. 5:** Six month post op of bi-paddled pectoralis major myocutaneous flap.

dermolysis, and bleeding on pin pricking) along with other complications like suture dehiscence, infection, sinus or fis-

tula formation, neck contracture, and hair in oral cavity. Donor site morbidity was measured in terms of shoulder and arm movements.

The vitality of flap was monitored primarily with the help of clinical evaluation and above said parameters. Specific sensors like temperature probe, oxygen pressure probe and Doppler probe and more formal tests like I/V vital dyes and nuclear medicine studies are not used in this study.

The same variables which were noted upon discharge (one week post operatively) were again measured at one and three months follow up periods.



**Fig. 6:** Mucosalization of intra-oral skin paddle of same pt in fig 5.

### Results

Reconstruction was required mainly in tumor patients after ablative surgery. 25 patients (83.34%) were presented with tumors, 3 had traumatic event and 2 (6.6%) had infection of facial region. In 27 patients (90 %), single skin paddle of pectoralis major myocutaneous flap was used and in 3 patients, (10%) double skin paddles were used for reconstruction.

In 6 patients with single skin paddle, other regional flaps had to be used along with pectoralis major myocutaneous flap. In four patients forehead flap and in two patients deltopectoral flap were used to give cover at one side of through and through defect, which could not be reconstructed with bi-paddled pectoralis major myocutaneous flap. Marginal necrosis was present in 6 patients (20%) **epidermolysis** was present only in 3 patients (30%).

### Loss of Flap:

In 1<sup>st</sup> week after surgery, 4 patients (13.3%) had partial loss of flap and total flap loss was not found in any patient. Out of 4 patients with partial flap loss, 5% of partial flap loss was seen in 2 patients, 10% of partial flap loss was found in one patient and 15% of partial flap loss was seen in only one patient.

Donor site morbidity was also minimal as we did the Primary closure in 28 patients (93.3%) and split thickness skin grafts were required only in 2 patients (6.6%). **Chest expansion** and **Shoulder movements** were less than normal in 29 patients (96.6%) in 1<sup>st</sup> week after surgery. 24 patients (80%) acquired normal chest and shoulder movements in the subsequent follow up periods. **Suture dehiscence** was noted in 6 patients (20%) and **Infections** was found only in one patient (3.3%) after one week of surgery. **SINUS/ FISTULAS formation** was one of the commonest complications encountered when reconstruction was done in maxillary region. Sinus/ fistula was found in 6 patients (20%). 16 patients (53.3%) had hair in oral cavity. There was slight decrease but persistent hair growth in oral cavity. **Neck contracture** was found in 5 patients (16.6%).

**Dissuscision**

Reconstruction of facial defects is very tedious job requiring high skill and technique. We used pectoralis major myocutaneous flap with single skin paddle in 27 patients while in 3 patients, double skin paddles were used. The bi-paddled flaps were required for through and through defects to provide skin and mucosal cover at the same time. An additional flap was required in 6 out of 27 patients in single skin paddle category. The pectoralis major myocutaneous flap receives its blood supply from thoracoacromial artery, lateral thoracic artery and perforating branches from internal mammary artery and intercostal arteries.

The flap can survive if based only on thoracoacromial artery, but the lateral thoracic artery also contributes a fair share for vascular supply of the pectoralis major flap. For mandibular reconstruction, we mostly had preserved both the major and minor pedicles of the flap, as the arc of rotation for mandibular defects were relatively shorter and both pedicles could be safely included.

In case of maxillary defects, a long arc of rotation was required; therefore, we mostly based the flap on thoracoacromial artery and lateral thoracic artery was sacrificed. In most of the patients, a strip of muscle was left around the main pedicle; but in few cases, all attachments of pectoralis major muscle were sacrificed for gaining additional length of pedicle. Post-operatively, blood pressure of patients was maintained slightly at higher level to achieve good perfusion of the flap. Head ends of patients were elevated and steroids were prescribed to avoid oedema and venous congestion of the flap. Hemoglobin percentage in blood was checked.

Within 1<sup>st</sup> week postoperatively, there is decreased blood flow in the flap due to oedema, congestion and gra-

**Table 1:** Distribution of Cases by the Loss of Flap n=30.

Loss of Flap	After 1 Week		After 1 Month		After 3 Months	
	No. of pts.	%	No. of pts.	%	No. of pts.	%
No loss	26	86.6	29	96.6	30	100.0
Total loss	0	0.0	0	0	0	0.0
Partial loss	4	13.3	1	4.4	0	0.0
<b>Total</b>	<b>30</b>	<b>100.0</b>	<b>30</b>	<b>100.0</b>	<b>30</b>	<b>100.0</b>
<b>p-value</b>	<b>&lt;0.001</b>		<b>&lt;0.001</b>		-	

**Table 2:** Distribution of Cases by the Percentage Volume of Partial Flap Loss n=4.

Partial Flap Loss (%age Volume)	No. of Flaps
5%	2
10%	1
15%	1

**Table 3:** Distribution of Cases by the Single or Double Skin Paddles of Pectoralis Major Myocutaneous Flap n=30.

Skin paddles of PMMF	No. of Patients	Percentages %
Single skin paddle of PMMF	27	90.0
Double paddle of PMMF	3	10.0
<b>Total</b>	<b>30</b>	<b>100.0</b>
<b>p-value</b>	<b>&lt;0.001</b>	

vitational forces. The mild hypoxic status of the flap causes neovascularization and the vessels re-orientate along the long axis of flap. During and after 1<sup>st</sup> week of reconstruction, circulation becomes well established between the flap and wound bed. With in 3<sup>rd</sup> to 4<sup>th</sup> weeks after surgery, a

**Table 4:** Distributions of Cases by Single Skin Paddle of Pectoralis Major Used Along with Other Flaps n=30.

Names of other flaps	No. of Patients	Percentages %
Fore head flap	4	13.34
Deltpectoral flap	2	6.67
<b>Total</b>	<b>6</b>	<b>20.0</b>
<b>p-value</b>	<b>&gt;0.05</b>	

flap achieves most of its final blood circulation.

We determined the vitality of flap by many variables like color, temperature, capillary refill, bleeding on pin pricking, marginal necrosis, epidermolysis and loss of flap. In our study, 70% of the patients had normal flap color and temperature and 30% had pale flaps in the initial post operative days, both of these parameters improved with each progressive day. No flap was found cyanosed. The susceptibility of the skin paddle and margins to undergo necrosis depend upon the musculoskeletal perforating vessels. The skin paddle was stitched with the underlying pectoralis muscle and all flaps were treated very gently to avoid excessive mobility of the skin paddle and subsequent damage of the perforating vessels to skin. Marginal necrosis was observed in 6 (20%) patients. Epidermolysis 3 patients (10%) had affected the most distal parts of skin paddles in our study. It gives a good indication of the ischemia. All the flaps bleed on pin pricking.

Pectoralis major flap has such a strong and consistent vascular pedicle, it rarely undergoes into total failure unless some major event (pressure, stretch and damage to the pedicle) happens to occur preoperatively or postoperatively. Partial loss of flap was found mostly in obese and female patients where thick subcutaneous fatty tissue and fine musculo-cutaneous vascular perforators made the skin paddle more susceptible to ischemia. Bi-paddling of the flap was found directly related to the partial flap loss, marginal necrosis and suture dehiscence. Total flap failure is not seen in any case. Only 4 (13%) out of 30 patients had partial loss of flap and the skin paddle was lost up to 15%. Lacosta in 2002 and Cheema in 2003 studied on the same lines and he reported 6% total loss of flap and 20% of partial loss of flap.

The beauty of the pectoralis major myocutaneous flap is that a very big skin paddle, overlying whole of the muscle can be elevated. The skin paddle can be extended as far down as the rectus abdominal sheath. Infra-mammary and parasternal skin paddle were mostly used in this study. The infra-mammary skin paddle was considered esthetically more pleasant in female patients as it affected the breast contour minimally. Despite the fact that scars at the donor site were hidden in clothing, vertical incisions were avoided and horizontal incisions were preferred for esthetic reasons. Tunneling in the chest was undertaken for more esthetics; moreover the vertical incisions also damage the subsequent use of the deltopectoral flap. We did primary closure in 28 patients (93.3%) and split thickness skin grafting was done in only 2 patients. The skin paddles in these two patients were very large and primary closure was not possible. In all of the patients, we had preserved the anterior axillary fold for esthetics. The expansion of the chest and shoulder movements were mainly affected in all patients (96.6%) in 1<sup>st</sup> week after pectoralis major flap elevation because the stretch on the chest wall and pain due to dissection caused reduction in chest expansion. Good analgesics, intercostals blocks and physiotherapy were found beneficial in this regard. After 1 month, 24 patients (80%), and after 3 months

28 patients (93.3%) had acquired normal chest expansion and shoulder movements due to loosening of tissues with passage of time.

Suture dehiscence was dependent upon the vascular integrity of skin margins, bulkiness of the flap, presence of infections, residual tumor at the margins, condition of the tissue bed and tension on sutures. Suture dehiscence was found more in patients with marginal necrosis and tumor positive at margins. Six patients (20%) had suture dehiscence. Adequate antibiotic cover was given to all of the patients and infection rate was almost negligible (3.3%).

In our study, we had 6 patients (20%) with sinus/ fistula at 1st week after surgery and was noted especially in through and through defects. Maxillary defects were found to have more sinus and fistula formation; because we mostly sacrificed the lateral thoracic artery to gain few extra centimeters of pedicle. That is why the flaps in maxillary defects were more prone to have hypoxia, marginal necrosis, and suture dehiscence due to traction. This complication was treated by resuturing or by simple conservative approaches. Ferri and Bacchi in 1999 reported to have fistula formation in 14 out of 85 patients<sup>11</sup>.

The presence of hair in oral cavity was also a consistent complication in males with hairy chest. The number of hair follicles can decrease under salivary influence. This complication was present in most of the male patients (46.6%).

Neck contracture was present in 14 patients (46.6%), which can be hidden easily under clothing. This webbing of neck due to contracture was acceptable in patients with radical neck dissection as this contracture simulates the excised sternocleidomastoid muscle.

## Conclusion

Pectoralis major myocutaneous flap is a versatile flap and very useful reconstructive option for the defects of facial region as it can not only provide skin and mucosal cover simultaneously, but also provide adequate muscle bulk for through and through defects. It doesn't cause any hindrance in mandibular movements, even when used over mandibular reconstruction plate, which makes it different from other flaps used in this region

Its arc of rotation limits its use only for the defects below zygomatic arch and inferior orbital rim. Donor site is closed mostly by primary closure, with minimum morbidity. The bi-paddled variety, however has an increased risk of partial flap loss and thus should be avoided.

## References

1. Warraich RA, Cheema SA. Head and neck reconstructive options for soft tissue defects. *Ann K E Med col* 2001; 7: 11-13.
2. Cheema SA. Experience with pedicled pectoralis major myocutaneous flap in head and neck region. *Pak J Surg* 2003; 19: 72-76.
3. Booth PW, Schendel SA, Haysamen JE. Reconstructive surgery-major flaps. In: Langdon JD. *Operative maxil-*

- lofacial surgery. London: Chapman & Hall, 2007; 660-63.
4. Ord RA. The pectoralis major myocutaneous flap in oral and maxillofacial reconstruction; a retrospective analysis of 50 cases. *J Oral Maxillofac surg* 1996; 54: 1292-5.
  5. Jacob OJ. One stage reconstruction of large oral myocutaneous defects with double paddled pectoralis major myocutaneous flaps. *Aust NZ J Surg*: 1994; 64: 208-11.
  6. Grab and smith, plastic surgery. Head & neck, check reconstruction chapter 43, page 508.
  7. Shah AA, Malik WM. Head and neck reconstruction: a 3 years experience. *Ann KE Med Coll* 1999; 5: 19.
  8. Qureshy FA, Powers M P. Reconstruction of maxillofacial cancer patients. In: fonseca RJ. Oral and maxillofacial surgery. Vol 7. philidelphia: W.B. Saunders, 2000: 394.
  9. Larn KH, Wei WI, Siu KF. The pectoralis major costomyocutaneous flap for mandibular reconstruction. *Plast Reconstr surg* 1984; 73: 904-10.
  10. Johnson MA, Langdon JD. Is skin necessary for intra-oral reconstruction with myocutaneous flaps? *Br J Oral Maxillofac Surg*. 1990; 28: 299-301.
  11. Ferri T, Bacchi G, Bacciu A, Oretti G, Bottazzi D. the pectoralis major myocutaneous flap in head and neck reconstructive surgery: 16 years of experience. *Acta Biomed Ateneo parmense* 1999; 70 (1-2): 13-7.
  12. Lacosta Nicolas JL, Calzoda G. Major myocutaneous pectoralis flap for the head and neck repair. *An ororrinolaringol Ibero Am*. 2002; 29: 125-34.