

# RECONSTRUCTION OF COMPLEX ORAL DEFECTS USING BI-PADDLE PECTORALIS MAJOR FLAP - TECHNICAL MODIFICATIONS AND OUTCOME IN 54 CANCER PATIENTS

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**ABSTRACT : Objective:** Reconstruction of locally advanced oral cancer presents a great challenge to the head and neck surgeon. The main goal of reconstruction is to provide intraoral lining and soft tissue cover. We discuss the use of Bipaddle pectoralis major myocutaneous flap (PMMF) and its modifications for reconstruction of complex oral defects following radical resection.

**Study Design:** Retrospective analysis of prospective oral cancer data base.

**Setting:** Tertiary Care Regional Cancer Center.

**Patients:** Three hundred and ten patients were operated for oral carcinoma in this unit between 1993 and 2001. The oral cancer patients who required soft tissue reconstruction for lining and cover were analyzed. Patients in whom bipaddle PMMF were utilised were studied in terms of surgical technique, morbidity, function and cosmetic outcome.

**Results:** Ninety-one (29.4 %) oral cancer patients required reconstruction for lining as well as cover. Of these, 54 (17.4 %) patients underwent a bipaddle PMMF flap reconstruction. Two horizontal skin islands were used in patients with lateral defects and two vertical islands in patients with central defects. There was no complication in 41 (76%) patients. Complete flap loss was seen in only one patient and differential flap loss in 2 patients (4 %) while seven (13 %) patients had only minor complication. All the patients received post-operative Radiotherapy. Good to average functional and cosmetic outcome was observed in 90% patients.

**Conclusions:** Bipaddle PMMF offers an effective and reliable reconstructive option for complex oral defects. By using certain technical modifications, majority of complex oral defects can be managed successfully using a Bipaddle PMMF. In a developing country like India with a large oral cancer disease burden Bipaddle PMMF should be used routinely for complex oral defects in view of its simplicity, versatility and reliability.

**Key Words:** bipaddle pectoralis major myocutaneous flap, oral cancer

## INTRODUCTION

Head and neck cancers constitute a significant cancer burden and oral and oropharyngeal cancers are the third most common cancer in males and the fourth most common cancer among females in developing nations (1,2). Radical surgery along with radiotherapy still remains the treatment of choice. Reconstruction of composite defects of the oral cavity following radical surgical ablation remains a difficult and challenging task. Large full thickness lateral and central defects of the oral cavity can pose significant functional and cosmetic problems for the patient. Various methods have been described for repair of these defects including skin grafts, fasciocutaneous flaps, myocutaneous flaps and free flaps (3,4,5). The choice of reconstructive method depends

upon the type of defect and surgical expertise available. Ariyan (4) has first reported the usage of Pectoralis major myocutaneous flap (PMMF) in 1979 for reconstruction of head and neck defects and since then it has become the workhorse for head and neck reconstructions (6). PMMF flap is a versatile and sturdy flap with wide range of applications. It can be used alone or in combination with a fasciocutaneous or a free flap. Despite the emergence of free flaps in the 80s many head and neck surgeons especially in the developing countries still use PMMF because of its simplicity and reliability. Bipaddle PMMF is a modification utilizing two skin islands for reconstructing composite oral defects (7,8). Depending on the requirements various modifications are feasible using a Bipaddle PMMF. We

present our experience of 54 Bipaddle PMMF and discuss the types of modifications of flap design, technical details of reconstruction and outcome in oral cancer patients with composite defects.

**Patients and methods :** A retrospective analysis of Oral Cancer Database of the Surgical Oncology unit of Institute Rotary Cancer Hospital (IRCH), All India Institute of Medical Sciences (AIIMS) was performed. A total of 310 cases of oral cancer were operated between 1993 and 2001. Ninety-one patients had full thickness composite lateral and central oral defects including skin, mucosa and mandible. In 54 of 91 patients Bipaddle PMMF was used, and in the remaining a combination of PMMF and DP flap was used. Defects involving the buccal, alveolo-buccal and retromolar trigone were classified as lateral defects and defects involving the floor of the mouth, central alveolus, and lower gingivo-labial sulcus were classified as central defects. For the sake of describing technical modifications, the patient population was divided into lateral defect group, central defect group and female group in this study. The patient profile, operative details including reconstructive techniques, and surgical outcome were analyzed separately in 54 patients undergoing Bipaddle PMMF reconstruction.

**Operative Technique:** A standard commando resection under general endotracheal anesthesia was performed in all the patients. Appropriate neck dissection (SOHND/ MND / RND) was also performed depending on the clinical and operative findings. All central arch mandibular defects were reconstructed using a titanium mandibular reconstruction plate (Martin, Tuttlingen, Germany). A two team approach was used whenever feasible to perform resection and flap dissection simultaneously. Skin incision was always planned preserving the DP flap for salvage situations. All the donor sites on the chest wall were closed primarily without using skin grafts.

#### Operative technique of Bipaddle PMMF:

**Reconstruction of Lateral defects (Male):** A total of 28 patients had composite lateral defects. Bipaddle PMMF flap with two horizontal skin islands (Fig-1) was planned in this group to facilitate the reconstruction of lateral defect. One island was used for mucosal reconstruction and the other for skin defect. Depending upon the proximity to oral commissure and the lip loss, the anterior part of the flap was either completely divided in patients with intact commissure or folded and used for commissure reconstruction in patients with lip loss. Whenever a titanium plate was used, the excess

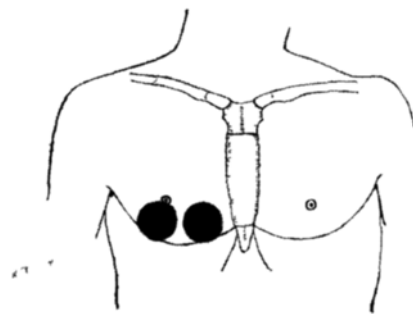


Fig 1: Planning of Bipaddle pectoralis major myocutaneous flap (PMMF) with two horizontal skin islands in male patients with lateral defects.



Fig II A Patient with carcinoma of right buccal mucosa

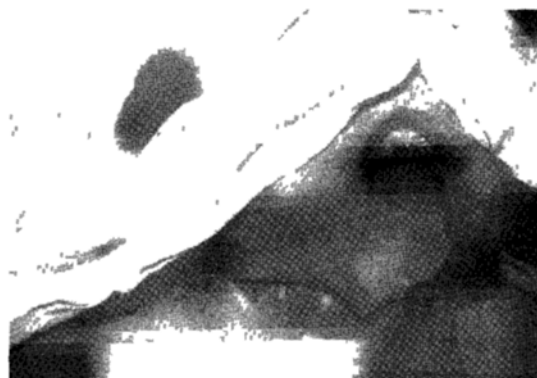


Fig II B · The post resection full thickness cheek defect

PMMF muscle was used to wrap the plate to avoid late exposure. The clinical photographs of a male patient undergoing bipaddle PMMF reconstruction for lateral defect are shown in Figure 2A to 2D.

**Reconstruction of Central defects (Male):** A total of 12

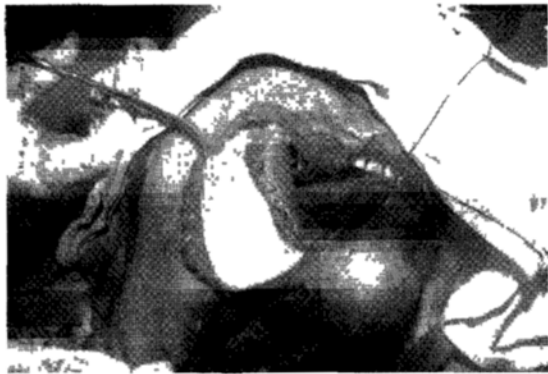


Fig II C Bipaddle pectoralis major myocutaneous flap (PMMF) designed and raised for reconstruction



Fig II D The post operative picture

patients had central defects including skin of the chin, central arch of mandible and floor of the mouth. In this group two vertical PMMF skin islands were planned (Fig-3) to facilitate the reconstruction of floor of mouth and chin. After fixing the titanium plate with cut ends of mandible, the flap was tunneled through the floor and the proximal skin island was used to reconstruct the floor of mouth and the distal skin island was used for reconstruction of chin. The divided lower lip was sutured over a deepithelialized segment of the PMMF flap. The distal most part of the pectoralis major muscle was fixed with the tunneled proximal muscle segment in the neck after wrapping the plate. This avoids late plate exposure over the chin. In addition, the cut ends of suprahyoid muscles were sutured with the PMMF pedicle to avoid the sagging of hyomandibular complex. This helps in avoiding a tracheostomy and postoperative respiratory obstruction.

**Reconstruction in Female patients:** A total of 14 female patients had Bipaddle PMMF reconstruction for central and

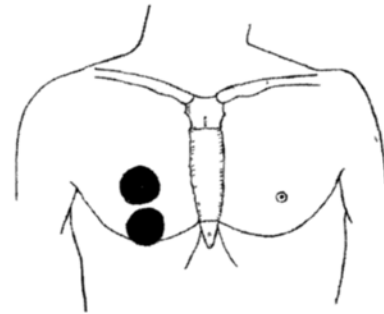


Fig III Planning of Bipaddle pectoralis major myocutaneous flap (PMMF) with two vertical skin islands in male patients with central defects

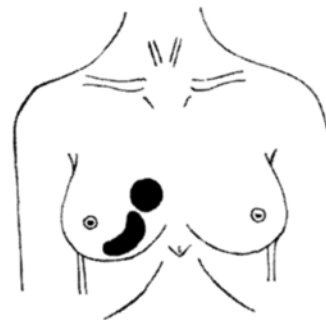


Fig IV Planning of Bipaddle pectoralis major myocutaneous flap (PMMF) in female patients

lateral defects. To avoid the problems of bulky PMMF due to breast tissue, the skin islands were placed in the inferior and medial part of the chest in an oblique fashion (Fig-4). This part of the chest wall in female patients contains minimal fat and breast tissue. In addition this modification does not alter the breast contour significantly.

## RESULTS

Bipaddle PMMF was used in 54 / 310 (17.4%) oral cancer patients for reconstruction of complex lateral and central defects following radical resection of cancer. The patient characteristics, type of defects, average defect size and sex distribution are shown in Table I. Forty-one (76%) patients had primary healing without any complication. Thirteen (24%) patients had morbidity (Table-No.II). Those who had minor complication and marginal flap necrosis recovered on conservative management. Total flap loss was seen in only one patient who required resurgery using contralateral bipaddle PMMF. Two (4%) patients had loss of the outer paddle only due to vascular insufficiency and were salvaged

**Table - I : Showing patient profile and type of defects**

Total no. of oral cancer patients	310
Total no. of Bipaddle PMMF used	54 (17.42 %)
Mean age (yrs)	51 (range 23 – 80)
Male : Female	40 : 14
Central vs Lateral defects	15 vs 39
Average defect size	20 cm <sup>2</sup> ( 9 – 30 cm <sup>2</sup> )

**Table -II : Showing morbidity, functional and cosmetic outcome**

Minor Complications	-	7 (13 %)
Flap dehiscence	-	4
Collection (seroma)	-	3
Major Complications	-	6 ( 11 % )
Total Flap Loss	-	1
Differential flap Necrosis ( outer paddle )	-	2
Marginal Necrosis outer paddle (vascular)	-	3
Cosmetic and Functional outcome-		
Good	-	41 (76%)
Average	-	9 (16%)
Poor	-	4 (8%)

using a deltopectoral flap. All the patients received postoperative radiation therapy. The functional and cosmetic outcome are shown in Table No II. The mean hospital stay was 9 days (5-42).

## DISCUSSION

Reconstruction of complex oral cavity defects following radical excision of oral cancer is a great challenge to the head and neck surgeon. Various methods have been described to reconstruct these defect including skin grafts, fasciocutaneous flaps, myocutaneous flaps and free flaps (3,4,5). The choice of method of reconstruction depends up on the type of defect, expertise of the surgeon and availability of microvascular facilities.

PMMF described by Ariyan has been the workhorse for head and neck reconstruction in most of the head and neck centers in view of its reliability, simplicity and versatility (4,6). Despite the excellent results with free flaps, the facilities and expertise for microvascular surgery are not widely available in most of the developing countries.

The main aims of reconstruction in complex oral defects are provision of a mucosal lining, skin cover and bulk (9,10). A combination of PMMF and Deltopectoral flap is a popular method for reconstruction of full thickness oral defects. The main drawbacks of the above method are, prolonged hospital stay, two stage procedure and skin graft requirement with associated morbidity (11).

Various modifications of PMMF are described including unipaddle, bipaddle and osteomyocutaneous flap (11,12). In addition PMMF covers the carotid artery and restores the contour of the neck following comprehensive neck dissection (11,13). There is minimal donor site morbidity as all donor site defects were closed primarily in the current series.

In the current study Bipaddle PMMF was used to reconstruct a variety of complex oral defects. With increasing experience we have introduced some technical modifications and tried to evolve some guidelines in planning the flap in patients with central defects and lateral defects. In addition certain modifications made in female patients also helped in improving the overall out come of the procedure. To avoid the bulky breast tissue, the skin islands were placed in the inferomedial part of chest wall. This placement also helps in maintaining the normal contour of the breast.

In patients with large lateral defects placement of two horizontal skin islands facilitates contouring of flap and placement of skin islands in horizontal axis. Depending upon the proximity to commisure flap can be further modified and used for reconstruction of angle of mouth.

Reconstruction of composite central oral defects is extremely challenging because of the associated cosmetic and functional problems. We have used two vertical skin islands to reconstruct the floor of the mouth and chin. Lower lip was interpositioned over a deepithelialised area of the flap. Titanium mandibular reconstruction plates were used for central mandibular arch defects in all the patients. Plates were wrapped with vascularized flap muscle to avoid late exposure and extrusion of plate. We also anchor the supra hyoid muscles with the flap muscle to avoid the fall back of tongue and maintain the integrity of hyomandibular complex. By using this modification tracheostomy could be avoided in 90% of the patients.

## CONCLUSION

Bipaddle PMMF offers an effective and reliable reconstructive option for complex oral defects. By using certain technical modifications, majority of complex oral defects can be managed successfully using a Bipaddle PMMF. Bipaddle PMMF is a very reliable flap with good vascularity and better radiotherapy tolerance. Cosmesis of immediate single staged bipaddle PMMF is much superior to other alternative multi staged double flaps with less hospital stay and less psychological trauma to the patient. In a developing country like India with a large oral cancer disease burden, Bipaddle PMMF should be used routinely for complex oral defects in view of its simplicity, versatility and reliability.

## REFERENCES

- 1 Parkin DM, Pisani P, Ferlay J (1993) Estimates of the worldwide incidence of eighteen major cancers in 1985. *International Journal of Cancer* 54: 594-606
- 2 Mohanty BK, Bahadur S, Lal P et al (2000) Cancers Head and Neck. In: Rath GK and Mohanty BK, Eds. *Textbook of Radiation Oncology: Principles and Practice*. B I Churchill Livingstone Pvt Ltd: 131-199
- 3 Bakamijan VY, Culf NK, Bales HW (1967) Versatility of the deltopectoral flap in reconstructions following head and neck cancers. In: Sanvenero-Roselli C, Boggio-Robutti G, Eds. *Transactions of the Fourth International Congress of Plastic and Reconstructive Surgery, Rome*. Amsterdam: Excerpta Medica: 808-823
- 4 Ariyan S (1979) The pectoralis major myocutaneous flap: A versatile flap for reconstruction in the head and neck. *Plastic and Reconstructive Surgery* 63: 73-81
- 5 Soutar DS, McGregor IA (1986) The radial forearm flap in intraoral reconstruction: experience of 60 consecutive cases. *Plastic and Reconstructive Surgery* 78: 1-8
- 6 Magee WP, McGraw JB, Horton CE et al (1980) Pectoralis "paddle" myocutaneous flaps: The workhorse of head and neck reconstruction. *American Journal of Surgery* 140: 507-513
- 7 Morain WD, Geurkink NA (1980) Split pectoralis major myocutaneous flap. *Annals of Plastic Surgery* 5: 358-361
- 8 Weaver AW, Vandenberg HJ, Atkinson DP et al (1982) Modified bilobular ("gemini") pectoralis major myocutaneous flap. *American Journal of Surgery* 144: 482-488
- 9 Freeman JL, Gullane PJ, Rotstem LM (1985) The double paddle pectoralis major myocutaneous flap. *Journal of Otolaryngology* 14(4): 237-240
- 10 Ord RA, Avery BS (1989) Side-by-side double paddle pectoralis major flap for cheek defects. *British Journal of Oral and Maxillofacial Surgery* 27: 177-185
- 11 Bathena HM, Kavarna NM (1989) The folded, bipaddled pectoralis major composite flap in oral cancer reconstruction. *British Journal of Plastic Surgery* 42: 441-446
- 12 Jacob OJ (1994) One stage reconstruction of large oral mucocutaneous defects with double paddled pectoralis major myocutaneous flap. *Australia New Zealand Journal of Surgery* 64: 208-211
- 13 Haers PE, Graiz KW, Sailer HF (1994) The bilobed myocutaneous pectoralis major flap in closure of combined intra- and extraoral defects. *International Journal of Oral and Maxillofacial Surgery* 23: 214-218

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