Research Article

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The Pectoralis Major Myocutaneous Flap in Oral and Maxillofacial Reconstruction: Prospective Analysis of 50 Cases

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ABSTRACT

Aim: To evaluate the success of the PMMF in maxillofacial reconstruction, to evaluate the healing outcome at the donor and recipient sites after harvest of PMMF, its complications and the Post radiation health of PMMF.

Materials and method: A clinical study was based on 50 patients who underwent PMMF reconstruction for soft tissue and composite defects following oncological resection for biopsy proven Squamous cell carcinoma in the oral cavity. Primary tumor as dictated by the site and the size was excised with minimum of 1cm margin. PMMF flap was harvested as per standard procedure described and inset into the recipient site defect. Intraoperative parameters like size of the defect and site of the defect were recorded. Postoperative subjective parameters were recorded with a questionnaire on the quality of life. Objectively wound healing parameters were recorded at the donor and the recipient sites. The complications and post radiation parameters were also recorded.

Results: Post-operative subjective evaluation of the patient indicated that 90% felt that it will be difficult for them to go to daily work without getting embarrassed. Bulging over the clavicle was present in 20% of the patients. Shrinkage was evident in 90% of the flaps at the end of 3 months. Dehiscence was present in 18 % of the flaps subjected to radiation. Total loss of flap was observed in 6% of the patients. A postoperative complication such as or cutaneous fistula was present in 26% of the patients at the end of three months.

Conclusion: The PMMF flap is a reliable and practical method of transfer of soft tissue for reconstruction of post-surgical complex ablative defects in oral and maxillofacial region.

Keywords: PMMF flap, reconstruction, complications, quality of life and maxillofacial.

INTRODUCTION

Reconstruction in the head and neck region continues to be a surgical challenge as it requires restoration of form and function. The large oral defects born out of complex oncological resections most often warrant harvest of regional or distant tissue and their inset into the defect as a pedicled or free flap. Pectoralis major myocutaneous flap (PMMF) is known to accept the challenge of reconstruction of these through and through, extensive intra and extra oral high-volume defects in head and neck region[1]. It has infact been declared as the "work horse" for maxillofacial reconstruction.

The pectoralis major myocutaneous flap was first described by Ariyan in 1979 as a means of head and neck reconstruction after ablative surgery. He described four cases in his initial publication two of which were raised as peninsula flaps, one was an island and one a double paddle island[2]. A great many variations have also been described since then, which include incorporation of a

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costochondral segment or a portion of sternum for simultaneous mandibular reconstruction, the use of double paddle flaps for through and through defects where the skin islands are placed vertically above each other or side by side or at times only the muscle flap has been used for intraoral reconstruction without skin paddle[2]. These modifications have increased the versatility and indications for use of these flaps.

The suggested reasons for its versatility and steady performance has been its excellent blood supply, proximity to head and neck, high survival rate, good tolerance to radiation therapy, ease of harvesting, and a very low failure rate of 1.5% to 4.1%[3]. Every flap has its pros and cons. There are well documented complications associated with PMMF ranging from 8.9 to 63%[3].

PMMF remains the corner stone in head and neck primary and salvage reconstruction at least in developing countries. The aim of the study was to evaluate the success of the PMMF in head and neck reconstruction, to evaluate the healing outcome at the donor and recipient sites after harvest of PMMF, its complications and the Postradiation health of PMMF.

MATERIALS AND METHODS

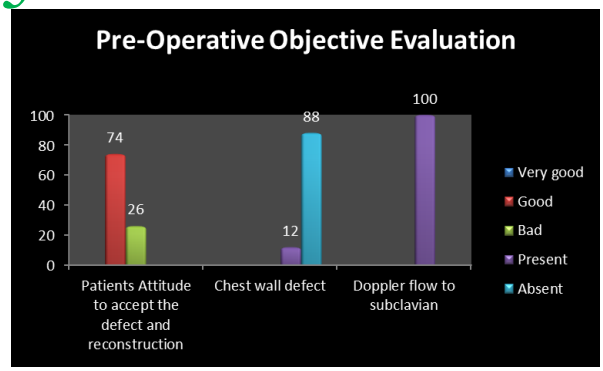
This clinical study was based on 50 patients who underwent PMMF reconstruction for soft tissue and composite defects following oncological resection for biopsy proven Squamous cell carcinoma. This study was conducted between august 2010 and august 2012.

Incisional biopsy was carried out and sent for histopathological evaluation for confirmation of diagnosis. X Ray chest, CT scans and MRI was done to evaluate the size of the primary lesion, degree of involvement and a clinical staging was carried out. Patients with biopsy proven squamous cell carcinoma who needed reconstruction after oncological ablation based on the size of the defect and extent of resection and in whom PMMF was considered the ideal choice were chosen after satisfying the inclusion and exclusion criteria.

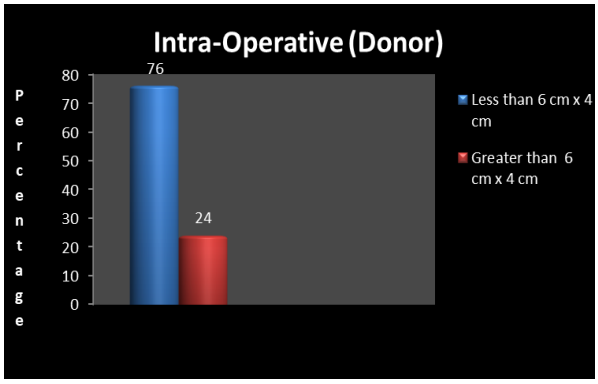
Inclusion criteria were adult patients 25 to 75 years of age with biopsy proven squamous cell carcinoma having post resection defects of oral cavity with or without skin defects below the level of ala tragal line undergoing primary reconstruction. Exclusion criteria were pediatric patients till 15 years of age , patients who preferred microvascular reconstruction, Poland syndrome ,diabetic patients, patients on chemotherapy, renal disorders, liver disorders, peripheral vascular disease and collagen vascular diseases, geriatric patients above 75 years, irradiated patients , patients who underwent salvage operation, patients who needed other flaps in addition to PMMF and patients with flow absent in the pectoral branch of the thoraco acromial vessel on preoperative Doppler.

Preoperative Doppler flow through the pectoral branch of thoraco acromial artery was checked using hand held Doppler EMCO 8 MHz fixed and those with absent flow were excluded from the study. Preoperative Consent forms explaining the procedure in detail were taken. Primary tumor as dictated by the site and the size was excised with minimum of 1cm margin. In cases involving the mandible a hemi mandibulectomy was done along with wide excision of the primary lesion. Modified neck dissection type 2 (MND2) was undertaken in all cases. PMMF flap was harvested and inset into the recipient site defect. Intraoperative parameters like size of the defect and site of the defect were recorded.

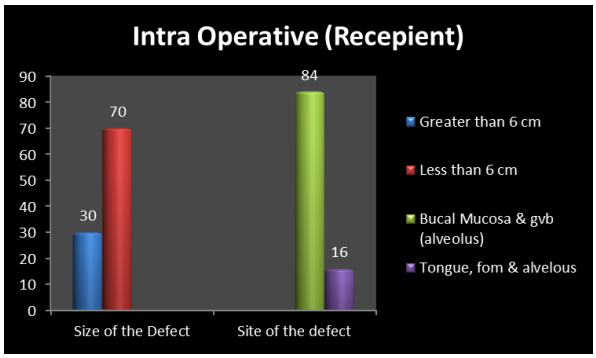
Postoperative subjective parameters were recorded with a questionnaire on the quality of life. Objectively wound healing parameters includes colour change , bleeding point on pin prick ,shrinkage and temperature of the skin over the flap were recorded at the donor and the recipient sites in 24hrs,48hrs,1 week,3weeks,1month,2months and 3months.The incidence of complications such as orocutaneous fistula , infection , necrosis and dehiscence in relation to the flap were recorded at the same interval. Post radiation parameters such as colour , bleeding point on pin prick and wound dehiscence were recorded 1 week after the patient finished his radiotherapy. Statistical analysis was done using chi-square test of association between attributes and unpaired t-test. Significance value was set at 5%. All p-values less than 0.05 were considered as significant. The statistical analysis was performed using SPSS 17.0.



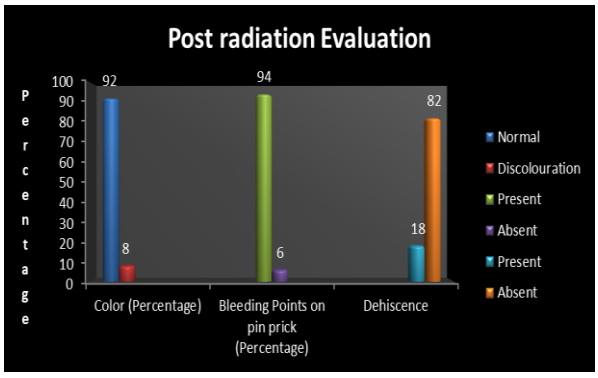
Graph 1: Pre-Operative Objective Evaluation.



Graph 2: Intra-Operative (Donor).



Graph 3: Intra Operative (Recepient).



Graph 4: Post radiation Evaluation.

RESULTS

Out of 50 patients, 13 patients were females and 37 patients were males (Table1). In preoperative evaluation of the patients, attitude of the patient to accept the defect was good in 74% of the patients and bad in 26% of the patients. (Graph 1)

Intraoperatively, size of the skin paddle designed was less then 6x4 cms in 76% of the patients and more than 6x4 cms in 24% of the patients (Graph 2). Intraoperatively the size of the defect at the recipient site measured greater than 6 cms in longest dimension in 30% of the patients and less than 6cms in 70 % of the patients (Graph 3) Site of the primary lesion and ensuing post resection defect involved buccal mucosa, gingivobuccal sulcus with or without alveolus in 84% of the cases and tongue, floor of the mouth and alveolus in 16%.

Post-operative subjective evaluation of the patient indicated that 52% of the patients were unhappy with their appearance after surgery, 88% of the patients said that it will be difficult for them to live a normal life after they are discharged from the hospital, 90% felt that it will be difficult for them to go to daily work without getting embarrassed, 62% patients had some difficulty in talking, 52% had difficulty in eating and 44% had other problems associated with the flap such as loss of sensation, presence of hair on the skin paddle and drooling of saliva.

Distortion of the breast was present in 3%. Deformity of the chest wall was recorded in 15% of the patients. Bulging over the clavicle was present in 20% of the patients and absent in 80% (table2). At the postoperative recipient site colors of the skin paddle remained pale in 2% of the patients and dusky in 2% of the total number of flaps at the end of three months. Bleeding points on pin prick was absent in4% flaps at the end of 3 months.

Shrinkage to some degree was evident in 90% of the flaps at the end of 3 months. Temperature over the skin paddle remained cold in 4% of the patients at the end of 3 months period. Out of the 50 patients, 44 reported back for follow up post radiation therapy and the following were the results of the observations made. In the post radiation period, 8% of the flaps showed discoloration. Bleeding on pin prick was absent in 6% of the patients at one-week

post radiation and Dehiscence was present in 18 % of the flaps subjected to radiation (Graph 4).

Postoperative complications such as orocutaneous fistula was present in 26% of the patients at the end of three months, infection persisted in 4%, Dehiscence was present in 12% of the patients and Necrosis and loss of flap was observed in 6% (Table 3)

DISCUSSION

A revolution in head and neck reconstruction was ushered in with the introduction of pedicled myocutaneous flaps. The current use of free flaps is an extension of the principles of pedicled flaps. Since its introduction, the PMMF has been used widely for reconstruction of oral cavity, oropharyngeal and facial defects as well as repair of oropharyngeal fistula[4]. The patient's attitude to accept the defect and PMMF reconstruction was recorded preoperatively was found to be good in 74.1 % of the patients involved in the study.

Buccal mucosa and Gingivobuccal sulcus are the most common sites of oral cancers in India. Bipaddle PMMF is a good option to provide inner and outer lining in such dual defects. 84% of the patients in this study had involvement of the buccal mucosa, gingivobuccal sulcus with or without alveolus and 9 patients out of them underwent reconstruction with a bipaddle flap design.

Size of the skin paddle used, according to another study ranged from 4x6cm to 9x10cm[5]. 76% of the patients in this study had defect sizes which could be managed with skin paddle less than 6x4cm.The maximum paddle size was limited to 9cms in width and 15cms in length in order to ensure good marginal perfusion of the skin paddle and also avoid skin grafting at the donor site. In the present series 1 out of the 13 female patients had complete flap loss which was attributed to her hypo protenemic status and poor general health. As our study involved a wide age range of female patients with variable breast size, it was considered safe to err on the side of caution i.e women with less bulky breast.

The drawbacks of PMMF from a functional stand point have been its bulk, non-sensate nature, non-pliability leading to oral incompetence when involving the commissure and articulation and swallowing problems when involving the tongue and floor of the mouth. Clinical studies have however shown atrophy after division of the motor nerves generally resulting in 50% reduction of muscle mass within three months of surgery[2]. The patient dissatisfaction and low mood status after PMMF was obvious from the results of the postoperative subjective evaluation questionnaire which indicated that 88% of the patients felt that they will not be able to live their normal life after discharge and 50 to 60% of the patients felt that they were not able to talk, chew and swallow normally. Clinical parameters like flap color, bleeding on pin prick, and temperature of the skin paddle serve as good monitoring parameters for flap vitality.[1] 20% of the flaps appeared clinically pale in the first 24 hours postoperatively and 10% of the skin paddles were cold to touch . These findings could be attributed to oedema, congestion and gravitational forces which may cause mild flap hypoxia.

Comprehensive management of advanced head and neck cancers frequently mandates use of adjuvant external beam radiation therapy which can damage small vessels with potential to adversely affect the microcirculation. Specific vascular damage after radiation therapy includes decrease in smooth muscle density, endothelial cell dehiscence and vessel wall fibrosis[6]. In this study the parameters recorded in the patients available for follow up after first week of completion of radiation therapy revealed that 8% of the flaps showed discoloration and 18% showed mild dehiscence at wound margins which could be managed conservatively. It is difficult to however quantitate the exact level of damage caused by radiation therapy to these flaps but the PMMF has a distinct advantage in that the muscle portion of the flap protects the great vessels in the neck which is a bonus after neck dissection and radiotherapy.

In this study incidence of orocutaneous fistula had a mean value of 11.7% and it occurred mainly in the lower anterior region in the floor of the mouth at tripod junctions. Most of them showed slow progressive healing with resuturing and conservative management strategy. Wound infections cause appreciable morbidity and occasional mortality after head and neck surgery. Many of the infections are nosocomial and an increasing number of them are caused by methicillin resistant staphylococcus aureus[7].The

mean incidence of postoperative infection was 9.57% in this study .Most of them were hospital acquired infections and peaked in incidence between third and fourth week. All of them responded well to appropriate antibiotic therapy. Two cases which had persistent infection not sensitive to most antibiotics were those in patients with total flap necrosis. Suture dehiscence is reported to be dependent upon the vascular integrity of skin margins, bulkiness of the flap, presence of infection, residual tumor at the margins, condition of the tissue bed and tension on sutures. The mean value of dehiscence in this study was 9.43% and most of them responded well to conservative measures. The most dreaded complication of complete flap loss occurred in 3 patients in this study. The possible factors for failure were outlined as malnourishement, hypoalbumenemia, extensive disease and resistant infection.

The complication rates in this series were found to be comparable to other studies in scientific literature. A significant study[8] reviewed the records of 181 patients who had either a PMMF (126 patients) reconstruction or radial forearm flap (51 patients) and reported complication rates of dehiscence 25% , fistula 24%, infection and flap loss 14%. Another study reviewed[2] 50 PMMF where 6% of total flap loss and 6% of partial flap loss were observed.

There is a lot of documentation on the use of PMMF in the setting of a salvage surgery in head and neck reconstruction. In our cases PMMF was used only for primary reconstruction. Higher rates of complications have been associated with parameters like smoking, obesity, large tumor resections and use in reconstruction of palate and above the ala tragal line and other comorbid conditions. [9] The dictum is to follow the most aggressive approach for surgical resection for the primary and the most programmatic approach for reconstruction to achieve the best results.

CONCLUSION

The PMMF flap is a reliable and practical method of transfer of soft tissue for reconstruction of post-surgical complex ablative defects in oral and maxillofacial region. Surgical procedure is straightforward and the results are predictable if most of the principles of myocutaneous flap surgery are followed and the vascular territories are respected. Most of the complications are minor and can be managed conservatively with a slightly prolonged hospital stay. The most dreaded complication of flap necrosis and loss occurs in very small percentile of the patients who mostly have associated co morbid conditions like malnutrition, Hypoalbuminemia, extensive disease and resistant infection. Healing at the donor site is acceptable with no long term functional morbidity. Bulk of the flap however can be a cause of patient dissatisfaction. The robust blood supply of the flap gives it the tenacity to withstand radiation therapy without serious deleterious effects.

Functional performance from the point of providing soft tissue cover for intraoral or composite defect was satisfactory. Subjective performance in terms of acceptance by patients of asthetic outcome and ease of carrying out functional activities such as eating, swallowing, speaking and oral hygiene was average.

Table 1: Gender Wise Distribution of Patients.

	Frequency	Percent (%)
Female	13	26
Male	37	74
Total	50	100

Table 2: Post-operative recipient site parameters.

	Colour (Percentage)			Bleeding Points on the pin (Percentage)		Shrinkage (Percentage)		Temperature of the skin over the flap (Percentage)	
	Dusky	Normal	Pale	Present	Absent	Present	Absent	Cold	Warm
24 Hrs	2	78	20	100	0	0	100	10	90
48 Hrs	4	80	16	100	0	0	100	8	92
1 Week	6	86	8	98	2	14	86	4	96
3 Weeks	6	90	4	96	4	44	56	6	94
1 Month	6	92	2	96	4	44	56	6	94
2 Months	6	92	2	96	5	46	54	4	96
3 Months	2	96	2	96	4	90	10	4	96

Table 3: Post-operative complications (No. of patients)

OC			Infection		Necrosis		Dehiscence	
	Present	Absent	Present	Absent	Present	Absent	Present	Absent
24 Hrs	0	50	0	50	0	50	0	50
48 Hrs	0	50	0	50	0	50	0	48
1 Week	19	31	27	23	4	49	18	32
3 Weeks	20	30	26	24	3	47	19	31
1 Month	17	33	10	40	3	47	14	35
2 Months	13	37	2	48	3	47	9	41
3 Months	13	37	2	48	3	47	6	44
Total	82	268	67	283	16	337	66	281
Mean	11.71	38.29	9.57	40.43	2.29	48.14	9.43	40.14
SD	8.44	8.44	12.05	12.05	1.60	1.46	7.91	7.65
P-Value	p-value < 0.01		p-value < 0.01		p-value < 0.01		p-value < 0.01	

CONFLICTS OF INTEREST

The authors declare they have no potential conflict of interests regarding this article.

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