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Functional and Oncological Outcomes of Pectoralis Major Myocutaneous Flap Reconstruction in Orofacial Surgery

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Abstract

Background: *The pectoralis major myocutaneous (PMMC) flap is a consistent workhorse for orofacial reconstruction, especially in developing countries. This study assesses the outcomes of PMMC flap reconstruction for complicated orofacial deformities.*

Methods: *Retrospective observational examination of 75 adult patients with PMMC flap reconstruction for orofacial defect was conducted. Data included demographics, reasons for surgery, complications, viability of the flap, functional outcome, and 12-month survival. Statistical examination looked at indication vs outcome relationships ($p<0.05$).*

Results: *The group was predominantly male (80%) with stage III/IV tumors (86.7%). Indication was mainly squamous cell carcinoma (73.3%, $p=0.001$). Overall survival of the flaps was 94.7% with a complication rate of 28% for malignant cases. Osteoradionecrosis had the most complications (50%) and poorest survival (75%). Complications that were significant were orocutaneous fistula (8.0%, $p=0.022$) and partial flap necrosis (6.7%, $p=0.034$). Functional result at 6 months had normal speech in 53.3% and normal swallowing in 46.7% of patients. Overall survival at 12 months was 86.7% with 66.7% disease-free survival.*

Conclusion: *PMMC flap reconstruction is demonstrated to be highly reliable with satisfactory functional outcomes. Patient selection and disease basis have significant influences on complications and survival, with osteoradionecrosis having special consideration for best results.*

Keywords: *PMMC flap, Orofacial reconstruction, Complications, Functional outcomes*

I. Introduction

Orofacial reconstruction following extensive ablative surgery for tumors, trauma, or congenital deformities remains one of the most challenging aspects of head and neck surgery, with meticulous planning required to restore both form and function while minimizing morbidity and optimizing patient quality of life (1). The pectoralis major myocutaneous (PMMC) flap, first described by Ariyan in 1979, has been a reliable workhorse for the reconstruction of complex orofacial defects, particularly in the developing world where facilities for microsurgery may not be available (2,3). Despite the increased popularity of free tissue transfer procedures, the PMMC flap continues to demonstrate excellent reliability, versatility, and cost-effectiveness in the treatment of extensive soft tissue defects of the oral cavity, oropharynx, and hypopharynx, with success rates in excess of 90% in numerous large series (4,5,6). Anatomical advantages of the PMMC flap include its reliable blood supply from the pectoral branch of the thoracoacromial artery, profuse tissue bulk for filling large defects, and long reach to the various anatomical subsites of the head and neck area without the need for microsurgical anastomosis (7,8). Complication rates ranging from 6-53% have been recently documented, with major flap

necrosis occurring in approximately 6-10% of cases, yet minor complications in the form of partial skin paddle loss, wound dehiscence, and orocutaneous fistula formation are still effectively treated with meticulous surgical technique and postoperative care (9,10,11). The bilobed PMMC flap variation has further enhanced its utility, particularly for full-thickness defects requiring both internal lining and external cover, with superior complication prevention compared to traditional single-paddle configurations (12). Patient selection criteria influence outcomes significantly, with prior radiotherapy, late tumor stage, malnutrition, and medical comorbidities demonstrating a direct correlation with increased complication rates and compromised functional recovery (13,14). Functional outcomes following PMMC flap reconstruction, including speech intelligibility, swallowing function, and oral competence, have been acceptable in the majority of patients, with normal or mildly impaired function observed in approximately 70-80% of patients six months post-surgery (15). The current research presents a comprehensive analysis of orofacial reconstruction using PMMC flap procedures, examining patient demographics, indications, surgical outcomes, complications, and functional recovery parameters in an attempt to establish evidence-based findings for the aim of enhancing patient management and surgical decision-making in contemporary head and neck reconstructive surgery.

II. Methods

This retrospective observational study was conducted at Ahsania Mission Cancer and General Hospital, Dhaka Specialized Hospital, Uttara and Uttara Adhunik Medical College Hospital from July, 2020 to June, 2024. The study population included adult patients who underwent PMMC flap reconstruction for defects of the orofacial region resulting from primary malignant tumors (including squamous cell carcinoma, mucoepidermoid carcinoma, and adenoid cystic carcinoma), osteoradionecrosis, benign tumor excisions, post-traumatic defects, and post-infective conditions. Inclusion criteria comprised patients with complete clinical records and a minimum follow-up of 12 months. Exclusion criteria included patients with incomplete data or loss to follow-up. Data collected encompassed demographic information, indication for reconstruction, surgical details, postoperative complications, flap survival rates, revision surgeries, functional outcomes (including speech, swallowing, and oral competence), length of hospital stay, and oncological outcomes at 12 months. Outcomes were compared based on the underlying cause of reconstruction. Statistical analysis was performed using appropriate tests (e.g., Chi-square or Fisher's exact test) to assess the association between indications and postoperative outcomes, with a significance threshold of $p < 0.05$. The primary endpoints included flap survival (complete or partial), complication rates, revision surgery, and patient survival at 12 months postoperatively. Ethical approval was obtained from the institutional review board, and the study adhered to the Declaration of Helsinki guidelines. Data was performed using SPSS version 26.0.

III. Results

Table 1 presents the baseline characteristics among 75 study subjects for demographic, clinical, and nutritional variables. The majority were male (80%) and ≤70 years (86.7%). Reconstructions were primarily conducted in the oral cavity (66.7%), with a statistically significant difference across reconstructed fields ($p = 0.011$). Highly advanced stages of tumors (III–IV) were most frequent (86.7%), and 73.3% underwent no prior radiotherapy. Nutritionally, 40% were of BMI <20, and 33.3% were of >10% weight loss, though the latter were not of statistical significance. Interestingly, low hemoglobin (<13 g/dL) and albumin (<3.4 g/dL) were significant correlations ($p = 0.007$ and $p = 0.006$, respectively), indicating their possible role in clinical outcome. **[Table 1]**

Table 1: Basic Characteristics of the Study Population (n = 75)

Basic Characteristics	Category	Frequency (n)	Percentage (%)	p-value
Gender	Male	60	80.0	0.275
	Female	15	20.0	
Age Group (years)	≤70	65	86.7	0.275
	>70	10	13.3	
Reconstructed Region	Oral Cavity	50	66.7	0.011
	Oropharynx	15	20.0	
	Hypopharynx	10	13.3	
Tumor Stage	I–II	10	13.3	0.281
	III–IV	65	86.7	
Prior Radiotherapy	Yes	20	26.7	0.455
	No	55	73.3	
Prior Surgery	Yes	10	13.3	0.281
	No	65	86.7	
BMI (kg/m²)	<20	30	40.0	0.928
	≥20	45	60.0	
Weight Loss (%)	>10%	25	33.3	0.264
	≤10%	50	66.7	

Hemoglobin (g/dL)	<13	35	46.7	0.007
	≥13	40	53.3	
Albumin (g/dL)	<3.4	30	40.0	0.006
	≥3.4	45	60.0	

Table 2 gives the clinical indications of orofacial reconstruction with the PMMC flap in 75 patients. The highest frequency reason was primary malignancy, and the highest of these was squamous cell carcinoma (SCC) at 73.3%, which was significantly associated (p = 0.001). The rest of the malignancies like mucoepidermoid carcinoma (6.7%) and adenoid cystic carcinoma (4.0%) were lower but still statistically associated (p = 0.042 and p = 0.056, respectively). Non-neoplastic causes were osteoradionecrosis (5.3%, p = 0.034), trauma (2.7%, p = 0.076), removal of benign tumor (4.0%, p = 0.081), and post-infective deformity (4.0%, p = 0.089), each contributing minimally. Collectively, malignancies, and in particular SCC, were the predominant and statistically most significant indications for PMMC flap reconstruction. **[Table 2]**

Table 2: Reasons for Orofacial Reconstruction Using PMMC Flap (n = 75)

Reason for Reconstruction	Frequency (n)	Percentage (%)	p-value
Primary Malignancy			
- Squamous Cell Carcinoma (SCC)	55	73.3	0.001
- Mucoepidermoid Carcinoma	5	6.7	0.042
- Adenoid Cystic Carcinoma	3	4.0	0.056
Osteoradionecrosis	4	5.3	0.034
Trauma (post-traumatic)	2	2.7	0.076
Benign Tumor Excision	3	4.0	0.081
Post-Infective Defect	3	4.0	0.089

Table 3 compares patient outcomes across different indications for orofacial reconstruction by the PMMC flap. Primary malignancy from SCC made up the largest number of patients (73.3%) and registered 28% complication rate, 92.7% flap survival, 5.5% revision rate, and 85.5% 12-month survival. While fewer in number, mucoepidermoid and adenoid cystic carcinoma presented no revision surgeries and 100% 12-month survival but had slightly lower rates of complications (20% and 33.3%, respectively). Osteoradionecrosis had the highest complication rate (50%) and revisions (25%), as well as reduced flap survival (75%) and 12-month survival (75%). Trauma and excision of benign tumor cases were free from complications and revisions, with total flap and patient survival. Post-infective defects also showed moderate complication rates (33.3%) but good flap and patient survival. **[Table 3]**

Table 3: Comparison of Reconstruction Reasons with Patient Outcomes (n = 75)

Reason for Reconstruction	n (%)	Complication Rate (%)	Flap Survival Rate (%)	Revision Surgery Required (%)	12-Month Survival Rate (%)
Primary Malignancy (SCC)	55 (73.3)	28.0	92.7	5.5	85.5
Mucoepidermoid Carcinoma	5 (6.7)	20.0	100.0	0.0	100.0
Adenoid Cystic Carcinoma	3 (4.0)	33.3	100.0	0.0	100.0
Osteoradionecrosis	4 (5.3)	50.0	75.0	25.0	75.0
Trauma (Post-traumatic)	2 (2.7)	0.0	100.0	0.0	100.0
Benign Tumor Excision	3 (4.0)	0.0	100.0	0.0	100.0
Post-Infective Defect	3 (4.0)	33.3	100.0	0.0	100.0

Table 4 shows the postoperative complications experienced in the study population. Surgical site infection was the most prevalent complication (13.3%), followed by wound dehiscence (10.7%) and medical complications (9.3%), though their p-values (>0.05) indicate that there is no statistically significant relationship. In contrast, orocutaneous fistula (8.0%, p = 0.022), partial flap necrosis (6.7%, p = 0.034), and total flap necrosis (2.7%, p = 0.041) were statistically significant, suggesting that these complications are significantly correlated with poorer outcomes. Hematoma/seroma was present in 5.3% of the patients but was insignificant (p = 0.073). Table 5 summarizes the functional status at 6 months postoperation, with points of emphasis including speech intelligibility, swallowing, and oral competence. Normal speech intelligibility was present in more than half of the patients (53.3%), whereas 26.7% were mildly impaired and 20% were severely impaired; the correlation was statistically significant (p = 0.021). [Table 4]

Table 4: Postoperative Complications

Complication	Frequency (n)	Percentage (%)	p-value
Flap Necrosis (Partial)	5	6.7	0.034
Flap Necrosis (Total)	2	2.7	0.041
Wound Dehiscence	8	10.7	0.065

Orocutaneous Fistula	6	8.0	0.022
Surgical Site Infection	10	13.3	0.081
Hematoma/Seroma	4	5.3	0.073
Medical Complications	7	9.3	0.089

Swallowing function was likewise equally distributed, with 46.7% having normal functioning, and 33.3% mild and 20% severe dysphagia (p = 0.038). Oral competence was preserved in the majority (86.7%), only 13.3% being incompetent, which is likewise statistically significant (p = 0.017). Table 6 presents postoperative recovery parameters, including hospital stay, time to oral feeding, and ICU admission. The majority of patients (73.3%) were discharged within 14 days, a statistically significant result (p = 0.014), demonstrating effective recovery in the majority. Again, 80% achieved oral feeding within 7 days (p = 0.029), indicative of favorable early postoperative function. **[Table 5]**

Table 5: Functional Outcomes at 6 Months Postoperatively

Function	Category	Frequency (n)	Percentage (%)	p-value
Speech Intelligibility	Normal	40	53.3	0.021
	Mild Impairment	20	26.7	
	Severe Impairment	15	20.0	
Swallowing Function	Normal	35	46.7	0.038
	Mild Dysphagia	25	33.3	
	Severe Dysphagia	15	20.0	
Oral Competence	Competent	65	86.7	0.017
	Incompetent	10	13.3	

20% of patients necessitated ICU admission, although this did not achieve statistical significance (p = 0.089). Overall, the outcome demonstrates largely eventless recovery, and early return to oral intake and decreased hospital stay were significantly related to the postoperative course of the group. Table 7 presents oncological outcomes at 12-month follow-up. The locoregional control was achieved in 80% of patients, and 66.7% were free of disease at the passage of time. Post-treatment, 20% showed local or regional recurrence, and 13.3% developed distant metastasis. **[Table 6]**

Table 6: Length of Hospital Stay and Recovery

Variable	Category	Frequency (n)	Percentage (%)	p-value
Hospital Stay (days)	≤14	55	73.3	0.014
	>14	20	26.7	
Time to Oral Feeding (days)	≤7	60	80.0	0.029
	>7	15	20.0	
ICU Admission	Yes	15	20.0	0.089
	No	60	80.0	

Total survival was as good as 86.7%, implying that while a subgroup of patients had recurrence and metastasis, most were oncologically stable and survived the first postoperative year. These findings corroborate a relatively effective surgical and adjuvant treatment program in the management of orofacial cancers. **[Table 7]**

Table 7: Oncological Outcomes (12-Month Follow-up)

Outcome	Frequency (n)	Percentage (%)
Locoregional Control	60	80.0
Disease-Free Survival	50	66.7
Recurrence (Local/Regional)	15	20.0
Distant Metastasis	10	13.3
Overall Survival	65	86.7

IV. Discussion

The present study demonstrates better outcomes with PMMC flap reconstruction in 75 patients, with an overall mean flap survival rate of 94.7% and satisfactory functional outcomes, which closely mirrors recent literature while revealing quite a number of important differences in patient outcomes and complications. Our 28% complication rate for squamous cell carcinoma patients is lower than the 40-41% in the current large series by Gupta et al. and Sharma et al., but comparable with the 22% of McLean et al. in their pectoralis major myofascial flap series (16,17,18). The absence of total flap loss in our series is contrary to some recent publications; Gupta et al. observed no total flap loss in 100 consecutive cases, while Sharma et al. had total flap necrosis occurring in 2.7% of cases, suggesting variability in surgical technique and patient selection criteria (16,19). Our observation of partial flap necrosis in 6.7% of cases is consistent with Gupta et al.'s 6% major flap necrosis, but greater than the 3-4% in some more recent bilobed PMMC series (16,20). Statistical significance of

orocutaneous fistulae development (8.0%, p=0.022) in the current study conforms with findings by Chen et al., who established fistulae formation as an independent factor for poor prognosis, particularly in patients with a history of radiotherapy (21). Patients with osteoradionecrosis in our series had the highest complication rate (50%) and lowest flap survival (75%), compared with Johnson et al.'s 35% complication rate when they studied PMMC reconstruction in osteoradionecrosis, suggesting that patient selection and timing of reconstruction could have a significant bearing on results (22). Our functional outcomes reveal better speech intelligibility (53.3% normal) than that of 40-45% in recent systematic reviews, though our swallowing outcomes (46.7% normal function) are comparable to Kumar et al.'s 45-50% determination in their functional outcome following PMMC reconstructions (23,24). Our much lower revision surgery rate for SCC (5.5%) than 11-15% reported in recent literature may be due to superior surgery technique and patient selection (25,26). Hospital stay patterns in our present study (73.3% <14 days) exhibit economy comparable to that in recent reports but higher than the 10-12% in most current series, the 20% admission to ICU rate being higher than the 10-12% in most recent series and possibly due to differences in perioperative management protocols (27,28). Our 86.7% 12-month survival parallels more recent oncologic outcomes reported by Patel et al., albeit our 66.7% disease-free survival is a bit lower than the 70-75% of more recent large reports, possibly because 86.7% of our series were stage III-IV cancers (29,30).

V. Limitation of the study

This retrospective single-center case series of 75 patients limits generizability and possibly causes selection bias. The 12-month follow-up period restricts assessment of long-term functional results and oncological control. Lack of standardized functional evaluation tools and comparison with alternative reconstructive methods further constrains clinical relevance.

VI. Conclusion

PMMC flap reconstruction yields life-altering outcomes with 94.7% success, improving quality of life in patients with catastrophic orofacial deformity. Appropriate patient selection and meticulous surgical technique can prevent complications and maximize functional restoration. This evidence confirms PMMC flaps as the gold standard for the treatment of complex orofacial reconstruction for low-resource environments. The improvement over malignant conditions versus osteoradionecrosis highlights the absolute importance of treatment protocols specifically designed for the patient. These results will enable surgeons worldwide to optimize reconstructive strategies and improve patient results.

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