

# Regional Myocutaneous Flaps for Head and Neck Reconstruction: Experience of a Head and Neck Cancer Unit

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## ABSTRACT

**Background:** Pectoralis major myocutaneous pedicle flap and other regional myocutaneous pedicle flaps (RMF), despite the superiority shown by free flaps, have remained relevant in the reconstruction of major head and neck oncologic defects. It has continued to find relevance as the preferred reconstruction of choice in some general head and neck reconstructive applications. While its role has been defined in developed environment, the same cannot be said for developing environment. The aim thus, was to review our experiences with RMFs in head and neck reconstructions, with a view to evaluating the indications and outcomes in a limited opportunity environment with some free flaps expertise.

**Materials and Methods:** This was a retrospective cohort study from records of RMF cases performed for head and neck reconstruction, at the study institution. Eligibility for study inclusion comprised case cohorts with advanced head and neck diseases requiring ablative surgery and reconstruction with pectoralis major flaps and other RMFs. **Results:** A total of 17 cases were treated with RMFs. 10 were pectoralis major flaps while 7 were other RMFs. The main indications were failed free flaps and financial constraints. No regional pedicle flap failure was recorded; however, complication rate was 35.5% (6/17).

**Conclusion:** Pectoralis major flaps and other RMFs were very reliable option for head and neck reconstruction. Free flap failure and financial constraints were the main indications for RMF reconstruction indications in head and neck reconstruction in a developing environment with some free flap expertise.

**KEYWORDS:** Free flap, myocutaneous, pectoralis, reconstruction

## INTRODUCTION

Regional myocutaneous pedicle flaps (RMF) are known to be relevant in the reconstruction of major head and neck oncologic defects with pectoralis major myocutaneous pedicle flap (PMMC) being the best-known RMF. For over three decades, since first described by Ariyan in 1979, PMMC has continually been used in the reconstruction of head and neck oncologic defects.<sup>[1-3]</sup> With time, the free flap came into existence and showed superiority at reconstructing

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three-dimensional head and neck defects. Predictably, It has since grown to become the gold standard for head and neck reconstruction.<sup>[4,5]</sup> Expectedly, high surgical expertise and expensive equipment are required to achieve this high standard; conditions not easily met in many-limited opportunity environments. While RMF continues to be relevant in the reconstruction of head and neck defects in many developing countries; its use is often limited to single-stage salvage reconstructions in more endowed societies.<sup>[6,7]</sup>

This study institution, despite performing, some free flaps have no defined role for PMMC and other RMFs in head and neck reconstruction.

While there are many reports on the indications and outcomes of RMF in the developed environment, the same cannot be said

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for RMF indications in resource-constrained environment.<sup>[8]</sup> The aim of this study thus, was to review our experiences with RMFs in head and neck reconstructions, with a view to evaluating the indications and outcomes from a resource constrained environment with some free flaps expertise.

## MATERIALS AND METHODS

This was a retrospective case series from records of RMF cases performed for head and neck reconstruction, at the study institution. Eligibility for study inclusion comprised cases with advance head and neck diseases requiring ablative surgery and reconstruction (preferential or salvage) with PMMC and/or other RMF. These other types of RMF were platysma, trapezius, deltopectoral, and forehead flaps.

Data collated include; demographic data, pathology and TNM staging, primary site, indications and types of surgery, types of flap, flap complications, deaths, and follow-ups of survivals.

The case series was grouped into PMMC flaps and other RMF. The PMMC was raised using the defensive deltopectoral incision as shown in Figure 1, while other RMFs were raised as simple axial pattern flaps.

Flap indications were classed on the basis of RMF either being the preferential flap of choice (with the requisite reason stated) or as a salvage flap after initial flap failure. Where RMF was the preferential flap of choice, the decision was made at the institution's multidisciplinary tumor board meeting. If RMF was used as a salvage flap, the Institute's Head and Neck Cancer Unit took the decision.

Complications of flap loss were classed as total or partial flap loss, flap skin dehiscence, donor site infection and additional co-morbidity. The total flap loss was adjudged as complete necrosis of the skin, subcutaneous tissue and distal muscle paddle while partial flap loss was adjudged as partial necrosis of skin, and subcutaneous tissue.<sup>[1,9]</sup>

The treating physician, who adjudged patient's fitness for long reconstruction surgery diagnosed additional co-morbidity due to any underlying medical condition.



**Figure 1:** Defensive deltopectoral incision for pectoralis major myocutaneous harvesting with supraclavicular advancement

Data were analyzed using IBM Statistical Package for Social Science (SPSS) for Apple Mac OS version 20.0. Percentages, mean, and standard deviation were analyzed for age, gender, primary site, histopathology, surgery type and indications, reconstruction types, complications, deaths, and follow-ups. The impact of the variables age, gender, surgery type and indications, and reconstructions type on postoperative complication were analyzed using univariate and multivariate analyses. The impact variable on 2 years overall survival (OS) and disease free survival were equally analyzed using Kaplan–Miere's analysis. Chi-square was used to calculate  $P=0.05$ .

## RESULTS

### Demographic data

A total of 17 patients were consecutively treated with RMF between 2011 and 2013 with only one case performed in 2011. Demography and case variables are listed in Table 1. The overall mean age was  $48.8 \pm 16.10$ . All patients were treated for both head and neck malignancies and benign jaw tumors, of which 76.5% (13/17) were malignancies and 53.8% (7/13) of the malignancies were squamous cell carcinomas (SCC). All malignancies were at an advanced clinical Stage IV.

### Indications for regional myocutaneous flaps

A total of 10 cases had PMMC flaps while 7 had other RMF consisting of: 3 platysma flaps, 2 trapezius flaps, 1 deltopectoral flap (DPF) (combined with a PMMC), and 1 forehead flap. The combined DPF and PMMC are shown in Figures 2 and 3. Of the two major indications, the preferential indication was 64.7% (11/17) comprising; financial constraints 29.4% (5/17)

**Table 1: Patient's demographic data**

Variables	Number of patients by flaps	
	PMMC	Other flaps
Age	57.6±12.76 (23-69)	36.2±11.65 (27-62)
Gender		
Female/male	6/4	6/1
Primary site		
Mandible: Alveolus/BM/cheek/ramus/RMT/nose	6	6
Tongue/FOM	1	1
Oropharynx	1	0
Larynx	2	0
Pathology/TNM staging		
SCC		
T 1	0	0
T 2	0	0
T 3	0	0
T 4 (stage IV)	6	1
Sarcoma (stage IV)	2	0
Mucoepidermoid CA (stage IV)	2	1
Ameloblastoma	0	3
Cancrum nasalis	0	1
Deaths	8/10	1/7

BM: Buccal mucosa, RMT: Retromolar trigone, FOM: Floor of mouth, CA: Carcinoma, TNM: Tumor, node, metastasis, PMMC: Pectoralis major myocutaneous, SCC: Squamous cell carcinoma



**Figure 2:** A combined pectoralis major myocutaneous and deltopectoral flap harvesting

and medical co-morbidity 23.5% (4/17) while the salvage indication (surgery) following free flap failure constituted 35.3% (6/17) of the cases. Further breakdown of the indications is shown in Table 2.

The PMMC flaps were used to reconstruct mucosa only in five cases; mucosa and skin in three cases [Figure 3], and esophageal patch in two cases.

For the only PMMC case in 2011, the “free flap not possible” indication was due to lack of free flap expertise. The expertise became available in 2012.

The salvage surgeries were mainly for failed radial forearm free flap (RFFF) reconstructions for buccal mucosa and floor of mouth (FOM) carcinomas resections and a failed anterior lateral thigh (ALT) free flap for esophageal patch following total laryngectomy and others as shown in Table 3.

In the other flap group, 4/7 of the cases had preferential indications. The flaps were used to reconstruct mucosa only defect in four cases, skin only defect in two cases and both skin and mucosa defects for one case. Other salvage RMF surgeries were for failed RFFF in tongue Ca and cancrum nasalis resections and loss of skin paddle in a failed fibula free flap following mandibulectomy.

## Complications

A total of seven complications involving six cases were experienced in the study. The total complication rate was 35.3% (6/17). The complications according to flap type are shown in Table 4. Oro-cutaneous fistulation complication that occurred following one of the flap dehiscence was primarily repaired. In the univariate analysis of variables on postoperative complications, only flap indications had a statistical significant impact variable on complication ( $P = 0.040$ ). Other variables had no significant impact as shown in Table 5.



**Figure 3:** Retromolar trigone Ca muco-cutaneous defect reconstruction with pectoralis major myocutaneous and deltopectoral flap

**Table 2: Primary indications for PMMC**

Indications	Number of patients by flaps	
	PMMC	Other flaps
Preferred reconstruction group	7	4
Financial constraints	3	2
Medical co-morbidity	3	1
Free flap not possible	1	1
Salvage surgery group/failed free flaps	3	3
Radial forearm free flap	2	2
Anterior lateral thigh flap	1	0
Fibula free flap (loss of skin paddle)	0	1

PMMC: Pectoralis major myocutaneous

**Table 3: Surgical resection**

Types of resection	Number of patients by flaps	
	PMMC	Other flaps
Mandibulectomy	7	3
Hemimandibulectomy	1	1
Segmental	5	2
Marginal	1	0
Neck dissection	7	1
Oropharyngectomy	1	0
Laryngectomy	2	0
WLE/LE	7	4

WLE: Wide local excision, LE: Local excision, PMMC: Pectoralis major myocutaneous

**Table 4: Complications following RMF flap**

Complications	Number of patients by flaps	
	PMMC	Other flaps
Flap related complications*	5	2
Total flap loss	0	0
Partial flap loss	2	1
Flap skin dehiscence	1	1
Donor site infection	2	0

\*6 cases had complications. PMMC: Pectoralis major myocutaneous, RMF: Regional myocutaneous pedicle flaps

## Overall survival

A total of 53% (9/17) of the total cases died, and all were adjudged Stage IV malignancies. The deaths based on groups comprised; 80% (8/10) in the PMMC group and 14% (1/7) in the other flap group. A total of 8 cases were disease free (1 mucoepidermoid CA, 1 mandibular alveolus CA, 1 CA Tongue, 1 CA FOM, 3 ameloblastomas, 1 cancrum nasalis).

The cases OS (>2 years) for Stage IV primary malignancies of the head and neck with curative intent surgery was 23% (3/13). The histopathology of these 3-malignant cases with >2 years OS was mucoepidermoid carcinoma and 2 SCC of the tongue and FOM respectively. Of the 77% (9/13) of the malignancy cases that died, 4 cases failed at the neck, 2 cases had primary site failure and 3 cases died of medical causes. The average follow-up time for survivals was 18.33 months. Kaplan–Miere’s analysis of variables on OS found to have no significant impact factor ( $P = 0.673$ ) graphically shown in [Figure 4].

Of the 17 cases, 9 cases were scheduled for chemoradiation as part of the initial treatment plan. Two of the survivals underwent chemoradiation. One of the malignant cases not scheduled for chemoradiation died from other surgical complication while six other cases scheduled for chemoradiation died from their diseases.

## DISCUSSION

Regional myocutaneous pedicle flaps continue to be relevant flaps for head and neck reconstruction because of their ease of accessibility to the surgical field, ease of harvesting, minimal learning curve and reliability.<sup>[2,10]</sup> In a limited opportunity environment, the lack of free flap surgery capabilities (“free flap not possible”) would have to be included as an indication.

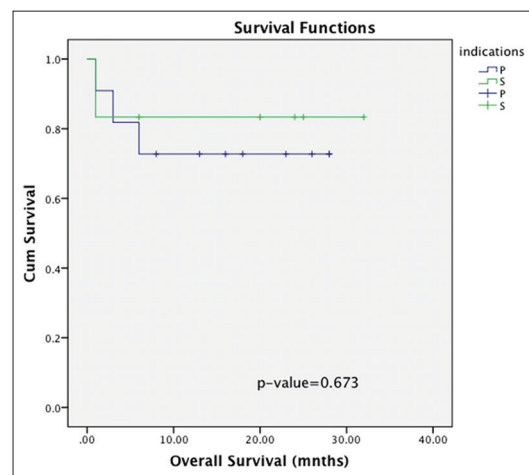
Despite the preference for microvascular surgery in developed environment, RMF has continued to remain in use, as cited in reports from centers in Europe, Asia, and North America.<sup>[3,11,12]</sup> To the best of our knowledge, not much study, in a study center with free flap expertise, has been published in Africa; this being some attempt to undo that.

The preferred reconstructive indication in developed environment includes medical co-morbidity, advance neck metastasis, and cases with a high possibility of free flap failure.<sup>[8]</sup> From this study, the prevalent indications for RMFs were due to failed free flaps (35.3%), financial constraints (29.4%) and medical co-morbidity (23.5%). No other study in the literature conducted in both environments reported failed free flaps as the most prevalent indication for PMMC or RMF salvage surgery. The high rate of free flap failures was possibly due to the steep learning curve associated with learning and incorporating microvascular surgery into a practice. A lot of our early cases were undertaken during the

**Table 5: Variables influencing postoperative complications**

Variables	P (univariate)
Site	
Oral cavity related (14)	0.697
Non-oral cavity related (3)	
Histology	
Benign (5)	0.455
Malignant (12)	
Surgery	
Mandibulectomy (10)	0.073
WLE (7)	
Indications	
Preferential (11)	0.040*
Salvage (6)	
Flap	
PMMC (10)	0.116
Other MF (7)	
CT staging	
T1-3 (0)	0.266
T4 (12)	

\*Statistically significant. WLE: Wide local excision, PMMC: Pectoralis major myocutaneous, CT: Clinical tumour (Staging), MF: Myocutaneous flap



**Figure 4:** Kaplan–Miere’s analysis of impact of surgery indications on overall survival (p = Preferential indications; s = Salvage indications)

start-up of our free flap program. This study environment is a region where head and neck fellowship is undertaken outside the continent of Africa, and the availability of free flap expertise is currently low.

The report of financial constraints as a second indication in this study was at variance with other studies, in that, it was reported to be the most prevalent indication in a developing environment while studies from developed environment adduced co-morbidities as the major indicator.<sup>[3,8]</sup> It can be submitted that in the absence of free flap expertise, financial constraints would be the prevalent indication for RMF, in a developing environment. Patients from developing countries more often than not have very limited resources. Conversely, while some authors have reported relative comparison between the costs of free and regional flap surgery, the reality in limited



opportunity environment is a significantly higher cost for free flaps than regional flap reconstructions prevails.<sup>[13,14]</sup> This is due to the low awareness and absence of microvascular surgery expertise and equipment. These implicitly limit the performance of free flap reconstruction in these regions including where this study was conducted. By this implication, free flap surgery would be costly, and RMFs may be the only option left for some of these patients.

Medical co-morbidity was the third prevalent indication reported in this study. This was at variance with reports from developed environments, which reported it to be the most prevalent indication.<sup>[8]</sup> These in clear terms point to the difference in the mitigating factors for indications of RMF in both environments.

The overall flap-related complication was been reported to be between 18% and 40%.<sup>[5,11,12]</sup> Our flap complications showed a complication incidence of 35% (6/17), with PMMC flaps having a higher overall complication incidence of 40% (4/10). Overall partial flap loss was 17.6% (3/17), flap skin dehiscence was 11.8% (2/17), and donor site infection was 11.8% (2/17). All within similar percentages reported by other authors.<sup>[3,5,11,12]</sup>

This study did not include postoperative quality of life assessment as an indicator to flap outcome, but the limitations of RMF, especially PMMC are well-documented. They include: Excessive tissue bulk, limited pedicle length and arc of rotation, as well as reduced shoulder and neck function.<sup>[10,15,16]</sup>

With the superior outcome following the use of RFFF and ALT for repair of partial or circumferential pharyngeal defect seen in laryngectomy, PMMC use has been criticized for high salivary leakage.<sup>[17]</sup> In this study, 2 patients underwent pharyngeal defect repair with PMMC following total laryngectomy. One case died at ICU 1-week after surgery and could not be assessed for postoperative complications. The second case had salivary leakage that was managed conservatively. She had an OS of 33 months before dying following medical complications. The salivary leakage recorded following PMMC patch was in line with reports in the literature.<sup>[17]</sup>

Donor site infections were observed in this study. A total of two patients in the PMMC group observed donor site infection. They were treated conservatively with copious wound irrigation and secondary suturing.

Bi-paddled PMMC flaps were used in two cases to repair both mucosa and skin for reconstruction of full-thickness cheek defects. Another author has earlier reported this.<sup>[18]</sup>

## CONCLUSIONS

PMMC and other RMF seem a very reliable option in head and neck reconstruction. Free flap failure and financial constraints

are the two-main indications for PMMC and other RMF flaps for head and neck reconstruction, in a developing environment with some free flap expertise. In this era of free flap surgery, environments like mine would inevitably imbibe these trends and commence free flap start-up programs. Flap failure would be inevitable, and PMMC and other RMF would be a very useful salvage. Financial constraints continue to determine treatment choice while co-morbidity is the prevalent indication in our environment. Because of the small sample size in this study, more research would need to be done to validate these findings.

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## Conflicts of interest

There are no conflicts of interest.

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