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Comparative Functional Outcome of Primary Closure Versus Pectoralis Major Myocutaneous Flap – A Retrospective Study

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ABSTRACT:

This retrospective study compared Pectoralis Major Myocutaneous (PMMC) flap reconstruction and primary closure in eight patients undergoing Commando surgery for lower alveolus carcinoma. PMMC reconstruction yielded better speech, swallowing, and wound healing outcomes but required longer hospital stays and resulted in bulkier aesthetics. Primary closure was quicker with shorter hospitalization but was associated with higher complication rates, making PMMC the preferred option for larger defects.

Keywords: *Oral cancer, Commando surgery, PMMC flap, primary closure, reconstructive outcomes, squamous cell carcinoma*

INTRODUCTION

The term "Oral Cancer" refers broadly to malignancies affecting the internal structures of the mouth. Untreated oral cancer can metastasize beyond the oral cavity and pharynx to other regions of the head and neck. Oral cancer is a major global health concern, especially in developing countries. Overall, 11.5 adults per 100,000 will develop oral cancer[1]

The most important risk factors considered to significantly contribute to the pathogenesis of the head and neck squamous cell carcinoma are tobacco usage; alcohol consumption.[2-4]

Oral cancer has been one of the most prevalent diseases to have emerged in the Indian subcontinent. In India, gingival-buccal complex cancers are the most common type of oral cavity cancer, often involving the lip commissure and cheek[5]. While radical surgery followed by Radiotherapy/Chemoradiotherapy is the standard treatment, reconstructing the resulting composite defects is the challenge which we deal with.

The Pectoralis Major Myocutaneous (PMMC) flap, a technique pioneered by Ariyan in 1979[6], has a long and significant history as a key reconstructive tool for head and neck defects, notably in oral cancer surgery. Despite the current prominence of microvascular free flaps, the PMMC flap maintains its relevance. Its dependability, ease of surgical harvesting, and minimal impact on the donor site make it a useful alternative, especially for advanced oral cancers or when resources are constrained[7]. Surgical removal often leads to significant defects requiring reconstruction.

However, for localized malignant lesions or in areas where reconstruction is challenging, primary closure may be the preferred method due to the limited recipient area for flap-based reconstruction. It involves simply approximating the edges of the wound and is typically performed after resecting small lesions that do not compromise the anatomical structure's movement and function and can lead to functional and

aesthetic issues like microstomia, and traditional flaps like PMMC, deltopectoral, and forehead flaps have donor site morbidities.

MATERIALS AND METHODS

A single operator retrospective study was performed including selected patients who underwent a pectoralis major flap reconstruction and primary closure flaps. All patients were diagnosed cases of lower jaw squamous cells carcinoma with or without nodal involvement. What was common to all cases was the primary resection of the tumor followed by addressing the neck to clear all lymph nodes by the neck dissection followed by excision of primary tumor were cleared while preserving the Sternocleidomastoid, Internal Jugular Vein, and Spinal Accessory Nerve.

In a PMMC flap reconstruction, the defect was identified, the flap marking was done after designing the flap, surface marking was done followed by incision, elevation of flap, careful dissection and tunneling with rotation of flap and finally inset with closure is done. Selection of the PMMC flap was guided by factors such as the available tissue bulk of the chest wall and the presence of chest hair. Other form of treatment followed the electronic medical records of all patients were reviewed. In this retrospective study conducted at DY Patil Hospital, Navi Mumbai over a period of one year, all the patients were seen in the outpatient department.

The goal for this study was to compare surgical and functional outcomes of primary closure and PMMC flap reconstructive techniques used after Commando surgery in patients diagnosed with squamous cell carcinoma of lower alveolus. A detailed patient history regarding their habits of smoking, tobacco chewing, areca nut consumption and alcohol intake was captured.

STUDY DESIGN AND PATIENT SELECTION

The study was conducted on a total of 8 patients who underwent Commando surgery (combination of mandibulectomy and neck dissection operation). These patients were divided into two groups:

- Group A included 4 patients who underwent Commando surgery with reconstruction using Pectoralis Major Myocutaneous (PMMC) flap.
- Group B included 4 patients who underwent Commando surgery with primary closure of intraoral mucosa.

Inclusion criteria were:

- Histopathologically confirmed squamous cell carcinoma of lower alveolus.
- Patients who needed PMMC flap or primary closure
- Patients who underwent Commando surgery with curative intent.
- Availability of complete medical records and a minimum follow-up period of one year.

Exclusion criteria were:

- Patients with distant metastasis at diagnosis.
- Prior surgery or radiotherapy of the head and neck region.
- Incomplete records or irregular follow-up.
- Patients who required free flap

Data Collection and Parameters Assessed

Patient case files, operative notes, histopathology reports, and follow-up records were used to consolidate data. The following parameters were assessed and compared between the two groups:

1. Demographic details – Age, gender, comorbidities.
2. Tumor characteristics – AJCC 8th Edition TNM staging
3. Surgical details – Hemi-mandibulectomy and Neck dissection
4. Postoperative outcomes:
   - Wound healing status (includes flap viability or dehiscence in PMMC cases).
   - Hospital stay duration (in days).
   - Postoperative complications (e.g., infection, orocutaneous fistula, flap necrosis).
   - Speech and swallowing function at 3-month follow-up.

5. Oncological outcomes – Local recurrence, regional recurrence, distant metastasis, and disease-free survival at 1-year follow-up.

Statistical Analysis:

Given the small sample size, a descriptive statistical analysis was conducted. Continuous factors such as hospital stay and operation time were reported as means, whereas categorical variables such as complication rates and recurrence were reported as frequencies or percentages. Because of the restricted number of participants, no inferential statistical comparisons were made, and the study remained exploratory in nature.

RESULT:

The study included 8 patients (4 males and 4 females) between December 2023 to March 2025 of which 3 patients with squamous cell carcinoma of buccal mucosa 4 patients with lower alveolus 1 with RMT were included in our study. All of the patients underwent the "commando operation" followed by necessary adjuvant treatment. Out of 8 patients,4 patients were reconstructed using a pectoralis major myocutaneous flap and 4 patients underwent primary closure. All patients were followed up after 1 month for the first 6 months, 2 months till 1 year.

Of the included patients,1 underwent tracheostomy during the "commando operation" and were decannulated during the first 5 postoperative days. Furthermore, all patients had a nasogastric tube during the early postoperative period.

SPEECH AND SWALLOWING:

Patients with PMMC: Their speech and swallowing has changed after the operation but is generally better due to bulk and mobility of the flap. The tongue provided the major driving force for swallowing liquid. Therefore, if more residual tongue can be preserved, greater improvements in oral manipulation and swallowing will be obtained.[6]

Primary Closure: Faced more difficulty in speech and swallowing especially with larger defect.

Patient with PMMC and Tracheostomy: Speech and swallowing was more difficult and was changed as compared to patient with PMMC alone.

WOUND HEALING:

Patient with PMMC: 1 out of 4 patients developed wound dehiscence from post operative day 5.

Patients with primary closure: 2 out of 4 patients developed wound dehiscence from post-operative day 8.

AESTHETIC OUTCOME:

Patients with PMMC: Due to bulkiness of the flap the aesthetic is somehow compromised especially in female patients where the adipose tissue make the flap more bulkier leads to facial disfigurement.

Primary Closure: In patients with small defect aesthetics is sometimes disfiguring.

HOSPITAL STAY AND FUNCTION:

Patients with PMMC + Tracheostomy stays longer in hospital than in patients with primary closure and PMMC alone functions better.

SLEEP:

Almost half of our patients stated that they have sleeping disturbances, and almost all of them wake up several times during the night. Nevertheless, only a few of them use medication for sleeping.

Patients with PMMC and PMMC with Tracheostomy: Reconstruction with the bulky pectoralis major myocutaneus flap, it can be implicated that due to the changed anatomical and neuromuscular relations, they could have a higher prevalence of obstructive sleep apnea.

OPERATION TIME:

Primary Closure: Operation time is much faster because after tumor resection, the surgeon directly sutures the defect. (~90mins)

PMMC: Harvesting of the flap (pectoral dissection and tunnelling), and suturing the flap takes more time. (~90mins+)

PMMC with Tracheostomy: Operation time is more than PMMC alone and primary tumor. (90mins + 15 mins)

SALIVARY GLAND COMPLICATIONS:

Salivary Gland Fistula, Sialocele, Freys Syndrome are another set of problems that patients experience after the commando operation, and they can have a large influence on their quality of life.

PMMC: 1 of the 4 patients developed a salivary gland fistula, which was attributed to non-compliance with the prescribed chemotherapy and radiotherapy sessions

Squamous cell carcinoma of right lower buccal mucosa

Operated with: Left segmental mandibulectomy + Modified radical neck dissection+ Primary closure under GA

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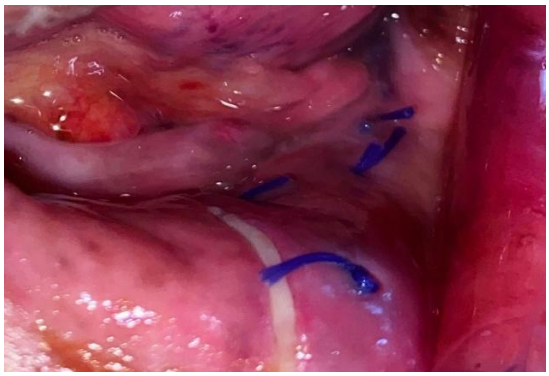

Squamous cell carcinoma of lower left alveolus
Operated with: Posterior segmental mandibulectomy + Left modified radical neck dissection + Primary closure + Tracheostomy under GA

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Squamous cell carcinoma of right buccal mucosa
Operated with: Right mandibulectomy+ Modified radical neck dissection + reconstruction with pectoralis major myocutaneous flap under GA

Squamous cell carcinoma of left lower alveolus
Operated with: Left mandibulectomy + Modified radical neck dissection + reconstruction with pectoralis major myocutaneous flap under General Anaesthesia.

Sr. No.	Primary Closure	Pectoralis major myocutaneous flap
1. Speech and swallowing	Faced more difficulties in patients with PMMC flap	Male: Certain difficulties but better than primary closure outcome. Female: Best outcome out of all criterion even better than the male patients of the PMMC flap.
2. Wound healing	1 out of the 4 patients developed wound dehiscence on POD 5	2 out of 4 patients developed wound dehiscence on POD 8
3. Aesthetic outcome	Less disfigurement compared to the PMMC patients	More disfigurement and bulk seen as compared to primary closure Patients.
4. Hospital stay and outcome	3 to 4 days of hospital stay and on an average lesser than that of PMMC patients	5 to 6 days of hospital stay was seen in patients of PMMC.
5. Salivary gland	Female: No complication Male: No complication	Female: 1 complication Male: No complication

DISCUSSION:

Malignant lesions in the oral and maxillofacial areas can lead to functional and aesthetic issues after surgical removals, such as impaired mastication and pronunciation.[8] In the study of Martin Canis and Fred MS MnConnel, when lesions exceeding 30% to 40% were removed, flap restoration was beneficial for functional recovery, but when lesions within the range of 20 to 30% or less were removed, it was confirmed that the use of primary closure did not have a significant difference in functional recovery[9-11.] Saito et al. stated that the most important benefit of PMMC flap is survival and that complete flap necrosis was absent in their patients.

PMMC flap failure is very uncommon due to its reliable vascularity. According to Jena et al[10] more complications were found in female patients when PMMC flap was harvested in the defect because of high amount of adipose tissue and due to interposition of breast tissue between the muscle and the skin paddle.

The study was a record based retrospective analysis of 8 patients who were histologically proven squamous cell carcinoma of the lower alveolus for which excision of the lesion along with MRND + Segmental mandibulectomy and primary reconstruction with local or regional flaps was the treatment modality with a period of 1-year follow up. Female : Male ratio in the study group is 1:1. ; 90% presented with pain along with mobility in the teeth associated with lesion, Use of tobacco, areca nut, alcohol either in the form of chewing or smoking was seen in most of the patients. Involvement of the lower alveolus is a common finding because of the nature of the sample of the study. [12-15]

Most of our patients stated that their speech quality deteriorated after the operation, however, the pectoralis major myocutaneus flap is a very thick flap that can create a bulk in the oral cavity that can possibly change the physiological movements needed to accomplish these functions.

Wound dehiscence was present more in females; 2 than in male; 1. The most common complication which accounted in 3 patients. Wound dehiscence can be prevented by avoiding over tight closure of

wound that can lead to reduced blood supply of skin margins. It can also be prevented by post operative regular dressing of sutured margins.

The use of primary closure was shorter in terms of operation time compared to the defect repair using flaps. Since the flap was not used, the evaluation of the primary lesion was easy, and the evaluation of recurrence was also smooth.

Even though the procedure produces a disfigurement of the facial aesthetics, most of our patients stated that they are satisfied with their appearance.

CONCLUSION:

In this retrospective study comparing functional Pectoralis Major Myocutaneous (PMMC) flap reconstruction versus primary closure following Commando surgery, PMMC reconstruction demonstrated superior outcomes. Patients undergoing PMMC flap repair had significantly lower rates of wound dehiscence, fistula formation, and surgical site infections compared to those who underwent primary closure.

Additionally, PMMC reconstruction was associated with longer hospital stays but better early functional recovery in terms of speech and swallowing.

Primary closure, while feasible in selected small defects, was linked to a higher risk of postoperative complications and prolonged recovery.

Based on our findings, we recommend PMMC flap reconstruction as the preferred method for defect closure following extensive Commando surgeries, particularly in patients with large, composite defects or poor wound healing risk factors. Reconstruction strategies should, however, be individualized, balancing patient condition, defect size, and available resources.

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