

Original Research Article**Reconstructive surgeries in oral cancers**Rithin Suvarna,¹ Aravind Pallipady,² Ranjith Rao,³ Ashok Hegde,¹ Panchami⁴¹Department of General Surgery, A. J. Institute of Medical Sciences, Mangalore, India²Department of Pathology, A. J. Institute of Medical Sciences, Mangalore, India³Department of General Surgery, Kasturba Medical College, Mangalore, India⁴Department of Physiology, Father Muller Medical College, Mangalore, India**Abstract**

Surgery forms the mainstay of treatment of oral cancers with addition to radiation and chemotherapy. Surgery however can have cosmetic, functional and psychosocial effects especially if the tumour is extensive or treatment is aggressive. 20 cases of primary oral squamous cell carcinoma operated at A.J. Institute of Medical Sciences and their associated tissue defects formed a part of the present study. The site, size and involved soft tissues, patient factors and surgical expertise were taken into account while selecting reconstructive option. Pectoralis major myocutaneous flap was the commonest reconstructive option followed by free fibular flaps, free forearm radial artery flaps and skin grafting. These patients were followed up for one year and the complications encountered were studied. Oro-cervical fistula, trismus and recurrence of malignancy were the complications encountered. It was thus concluded that for a given surgical defect it may be a combination of different flaps or modification of a single flap which will give optimum reconstruction and thus restoring function and aesthetics with minimum donor area morbidity. Pedicled flaps like myocutaneous flaps are best suited for large soft-tissue defects, composite defects, partial and total glossectomy defects and in advanced cases presenting at late stages of the disease and as a salvage procedure in case of failure of a free flap or in treating a complication from an existing flap.

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1. Introduction

Oral cancers form a major bulk of the cancers seen in head and neck cancer services.¹ The American Joint Committee on Cancer (AJCC)² staging system divides the malignancy sites originating in the head and neck into six major groups: lip and oral cavity, pharynx, larynx, nasal cavity and paranasal sinuses, major salivary glands and thyroid. Surgical excision of the primary lesion and the cervical lymph nodes

form the mainstay of treatment in most instances with the addition of radiation or chemotherapy as an adjuvant depending on the stage of the disease at presentation. The cosmetic, functional and psychosocial results of oral cancer treatment may combine to produce devastating effects on the patient, especially if the tumour is extensive or the treatment particularly aggressive. A variety of functions can be affected, including speech, deglutition, management of oral secretions and mastication, requiring well-

planned reconstructive techniques and extensive rehabilitative management. In recent years significant advances have taken place in some of the strategies for the postsurgical rehabilitation of the oral cancer patient. These include advances in reconstructive surgical techniques, especially the advent of microvascular free flap tissue transfers and qualitative improvements in biomaterials permitting use of osteointegrated implants. The ability to give standard care demands a simultaneous reconstruction of the defects and ensuring good quality of life after the cure of the cancer.³

There are many options available for surgical reconstruction in head and neck squamous cell carcinomas but the goals for reconstruction are re-creating oral competence, cosmesis, and maintenance of dynamic function while allowing adequate access for oral hygiene.⁴ Selection of a technique is based on its ability to satisfy the particular reconstructive requirement of the defect. Success in reconstructive surgery requires viable coverage and restoration of form, contour and function. Techniques available to the reconstructive surgeon for the management of surgical defects are considered as a reconstructive ladder progressing from simple to more complex procedure i.e primary defects can be closed by direct closure or a skin grafting. More complex surgeries require reconstruction by local flap or distant flap.⁵ Given the wide differences in anatomy, functionality and aesthetic implications of the various sites in oral cavity, one has to make a right choice from a host of reconstructive procedures available. It is important at the same time to adhere to the reconstructive ladder using the simplest procedure possible to get the best and the most consistent results.⁵ The present study was done to classify various tissue defects during oral surgeries. The study would also find out in detail the various options available for functional and cosmetic reconstruction and study prospectively

the different outcomes and complications encountered

2. Materials and methods

This prospective study was done at A.J. Institute of Medical Sciences, Mangalore, India. Patients admitted for surgical treatment of only oral malignancies between February 2006 and September 2008 were studied. A total of 20 cases were studied. Only those cases having resectable lesions being treated by surgery primarily were taken. Detailed history was taken from the patients and thorough clinical examination was performed. The findings were recorded in the proforma. Approval was taken from the institutional review and ethical committee. An informed consent was taken before carrying out any diagnostic or therapeutic procedure. The patients underwent either fine needle aspiration cytology and/or edge/wedge biopsy of the lesion to ascertain the tissue diagnosis. Imaging modalities like X-rays, sonology and computed tomographic scans were done to assess the extent of the tumor and to look for lymphatic and distant spread when required. Other basic investigations were done as and when required.

Operative details were noted in terms of the resective surgery done, tumor margins, the tissues lost to resection, the size of the resulting defect and the margins of the defect. Details of the reconstructive procedure were noted in terms of the nature of the procedure and outcome. Post-operatively, patients were followed up for occurrence of any major complication, take of the graft or survival of the flap and at a later date for any disability and effects on physical appearance. The patients were followed up for a period of one year at three monthly intervals to assess the outcome of the procedures and also to identify any delayed complications or recurrences and how to manage them. Statistical analysis of the data was done using Chi-square test and Fisher's Exact test. $P < 0.05$ was

considered to be significant. Statistical package SPSS version 11.5 was used for the analysis.

3. Results

A total of 20 cases were operated upon during the course of the study. All cases were diagnosed histopathologically as squamous cell carcinoma. Eleven cases had lesions in buccal mucosa (55%) with or without retromolar trigone, alveolus and floor of the mouth involvement. Four cases had alveoli, two cases of tongue and two cases of hard palate and one lip. The majority of the cases were in TNM stage 4.

3.1 Surgical treatment: All the cases were treated with wide excision of the lesion giving a clearance of 1 to 2 cm. Nineteen cases underwent primary reconstruction, one case was for secondary reconstruction. Majority of the cases were started with neck dissection, approach being through McFee incision. Upper incision was continued onto the chin converting to lip-split incision if access mandibulotomy (Fig. 1) would be needed. Maxillectomy cases involving hard palate were approached with Weber-Ferguson incision. Seventeen cases (stage 3 and 4) underwent radical or modified radical neck dissection simultaneously. One case was stage 2 with N0 and other case was T1 with N1 but since the patient was elderly neck dissection was not done, to decrease morbidity. Defects were assessed, measured and flaps harvested accordingly. Ten out of the 11 pedicled flaps were pectoralis major myocutaneous (PMMC) flaps (Fig. 2), all harvested with skin paddles and the donor sites closed primarily using rotation if needed and drains were placed at the recipient and donor sites. Among the free flaps two were radial artery free forearm (RAFF) (Fig. 3) flaps and four free fibular flaps (Table 1) (Fig. 4). Donor sites of all closed with split skin grafts and immobilized with plaster of Paris slabs. Vascular anastomosis done onto facial artery and internal jugular vein using 8-0 to 10-0 prolene or ethilon

sutures. Closed suction drains were placed beneath the flaps to prevent salivary collection. One case of tongue flap underwent flap division three weeks after 1st procedure. Two cases underwent local rotation flaps and one case was skin grafted. There were no cases with intra-operative complications. Defects encountered were classified as soft tissue defects (floor of the mouth, tongue and buccal mucosa) which included 10 cases, four cases of bony defects only and six cases of composite defects (soft tissue and bone).



Fig. 1: Post segmental mandibulectomy



Fig. 2: Pectoralis major myocutaneous donor site



Fig. 3: Donor site marked for radial artery free forearm flap



Fig. 4: Harvesting fibula with paddles

Table 1: Procedures performed

Procedure performed	No. of cases	Percentage
Skin grafting (SSG)	1	5%
Rotation flaps	2	10%
Tongue flap	1	5%
PMMC flap	10	50%
Free forearm radial artery flap (RAFF)	2	10%
Free fibular flap (FFF)	4	20%

3.2 Complications of the procedure: Complete coverage of the defect was achieved in 18 patients. Two patients had partial flap necrosis. There were no cases of total flap necrosis. One had flap dehiscence. There were two cases of peri-operative mortality. One of the partial necrosis cases presented with oro-cervical fistula during follow up. Major post-operative complications included salivary collection below the flap in one case managed with drain insertion and compression bandage, hyponatremia in two patients, myocardial ischemia in one patient, pleural effusion in one patient, donor site seroma formation in one patient and parotid (salivary) fistula in two patients and in one case drain was placed under the flap and treated conservatively

with oral medications till complete wound healing was achieved (Table 2).

Table 2: Complications based on type of flap

Complications	Pedicled	Free	Rotation
Major			
Total flap necrosis	0	0	0
Partial flap necrosis	1	0	0
Minor			
Flap dehiscence	0	0	1
Salivary fistula	3	0	0
Oro-cervical fistula	1	0	0
Trismus	1	0	0

10 PMMC flaps were compared with six free flaps using Fischer's Exact test which showed a statistical significance ($P = 0.029$) in the favour of free flaps. But the sample size is small as compared to other authors, which is the limitation of this study.

3.3 Follow up: Cases were followed upto for a period of one year, initially during chemotherapy and subsequently for once in three months. Integrity of the implants was examined with X-rays. Cases were referred to radiation or chemo-radiation as per the oncologist's advice and histopathology findings. There was one case of delayed complication in the form of trismus presenting one year after surgery, in a patient with growth near retro-molar trigone treated with wide excision and PMMC flap cover. He was managed with scar revision, delto-pectoral flap cover and physiotherapy. One case of carcinoma of the tongue presented with recurrence and extensive loco-regional spread, glottic oedema 10 months post chemo-radiation leading to mortality after two months. One case of partial flap necrosis leading to oro-cervical fistula during follow-up of six months was

managed with 2nd procedure of PMMC Flap cover from the side opposite to previous surgery. One case of carcinoma of the buccal mucosa T1N1M0 who had not undergone neck dissection during primary resection presented with bilateral neck secondaries after six months, proved by FNAC. He underwent bilateral neck dissection. Rest of the 16 patients were disease free and healthy during follow-up of one year.

3.4 Results of reconstructive flap surgeries:

Seventy five percent (15) of the flaps were healthy post-operatively. Two patients had partial flap necrosis and one patient had rotation flap dehiscence. No case had an added disability after the surgery. Two patients expired due to other causes like sepsis and myocardial infarction post operatively. One patient had a defect in lower lip post flap dehiscence. Two out of the 18 cases had recurrence at one year follow-up. One patient had bi-lateral neck secondaries for which he underwent radical neck dissection. One patient expired one year after surgery due to loco-regional recurrence and extensive spread. One developed trismus which was operated.

3.5 Survival based on flap morphology: All the free flaps survived (100%). Two pedicled flaps had partial flap necrosis. There were no cases of complete flap necrosis.

3.6 Cosmesis: Free flaps had better aesthetic outcome compared to pedicled flaps.

4. Discussion

Numerous other studies done were consistent with age group of patients (mean-55.5 years) in our study. It was also noted that the majority of patients present in TNM stage 4 and hence the defect size and contents may increase or the defects may be composite.⁶⁻¹⁰ Among the patients in our study group, majority had larger and composite defects which needed a bulky tissue transfer and the preferred flap was a

pedicled myocutaneous flap like PMMC flap. Owing to the wide variation of tissue defects in size, location and the tissue lost, a variety of reconstructive procedures were utilized. In only one case skin graft was used. PMMC flap was the most commonly used pedicled flap.⁹ The pectoralis major myocutaneous flap should be the suitable flap for the advanced-staged cancer patient with a limited life expectancy.¹¹ It can be used as a salvage procedure after free flap failure or when there is a shortage of the microsurgery facility.¹²

The pectoralis major myocutaneous flap is a hardy flap and can be performed with relative ease even by those not specialised in plastic surgery. This makes it an important tool for a general surgeon practicing in a country like India with its high incidence of head and neck malignancy.¹³

Free tissue transfer technique was used in six patients, which were done using operating microscope. In centres where facilities for micro vascular surgery exists, micro-vascular free flaps offer an attractive option for oral cavity reconstruction as evidenced by superior patient satisfaction with regard to ultimate cosmesis and function. Free flaps take longer operating time compared to pedicled flaps due to increased time taken for flap elevation, dissection of recipient vessels and micro-vascular anastomosis

Bony defects of segmental mandibulectomy were managed with microvascular osseous cutaneous fibular flaps, all cases having skin paddles to cover intraoral defects. Partial bone loss like marginal mandibulectomy and partial maxillectomy were managed with pedicled PMMC flaps. There were no cases of failures among free fibular flaps as against the study conducted by Shpitzer et al.¹⁴ who had 4(8.5%) cases of total failure out of 47 cases. In our study there were no total or partial failures which correlate with Cordeiro PG et al.¹⁵ who had 100 % free flap success rate in a study of 150

osseous mandible reconstructions. Vascularized fibular free flap is very suitable and has an excellent success rate for reconstructing both the composite or simple long-spanned mandibular defect. Osseous free flaps have very high success rate with good –to-excellent functional and cosmetic results. The fibula donor sites are best suited followed by alternative donor sites (i.e., radius and scapula) which are best reserved for cases with large soft-tissue and minimal bone requirements. The ilium flap is recommended only when other options are unavailable.^{14,16} Reconstruction plates are not effective in bridging large defects of the resected mandible. Reconstruction bridges for mandibular reconstruction can be used only in selected cases which are not eligible for microvascular free flaps.¹⁷ Other free flap used was Radial artery free fore arm flap, both of which had 100% survival. One case was for a defect of subtotal glossectomy. Flap survival was complete but the patient presented with recurrence post radiotherapy and died 2 months after recurrence. Second case was for a full thickness defect involving buccal mucosa and skin. Here a bipaddle flap was used to cover both skin and mucosa. Flap survival was total and the patient received chemo-radiation subsequently. Two rotation flaps were used, one for a small mucosal defect in the form of naso-labial flap and another one for a lower lip defect in the form of advancement flap. Latter case had flap dehiscence which was managed conservatively.

Donor sites of free flaps were covered with split thickness skin grafts harvested locally or from thigh, in all cases. The success rate was 100% and the donor sites were immobilized for at least 10 days with plaster of Paris casts. Donor sites of pedicled flaps were closed primarily. Only one case of seroma formation noted among 10 cases of PMMC flaps which was managed with drain placement successfully. There were no other donor sites morbidity among pedicled and free flaps.

All the free flaps survived well, while PMMC flaps had failures. 1 case (10%) had a partial flap necrosis for which a 2nd procedure was contemplated and another similar case managed conservatively later presented as oro-cervical fistula. These results with PMMC flap are comparable with a study by Ord RA¹⁸ in which three cases (6%) had partial necrosis and a similar number had total flap failure. The female gender, primary tongue cancer, subtotal or total glossectomy, bipedicling of flaps, prior chemotherapy, and presence of systemic disease (e.g., diabetes) emerge as significant risk factors for flap necrosis.¹⁹ In prospective study conducted by Mehta S et al¹⁹ out of 220 patients 89 patients (40.5 percent) developed flap-related complications in PMMC Flaps. In our study 6 (60%) out of 10 patients had flap related complications. In another study on PMMC flaps by Shah JP et al²⁰ Flap-related complications developed in 63% of the patients. These included flap necrosis, suture line dehiscence, fistula formation, infection, and haematoma. Post-operatively only one patient had disability secondary to resection or reconstruction. One late complication of trismus following reconstruction for buccal mucosa and retro molar trigone defect was managed by refashioning defect and covering raw surface with delto-pectoral flap. Good mouth opening was achieved with active physiotherapy. One patient of partial flap necrosis developed oro-cervical fistula during follow-up. He was managed with a PMMC Flap cover from side opposite to previous surgery. One patient who had not undergone neck dissection presented with bilateral neck secondaries which was managed with bilateral radical neck dissection.

5. Conclusion

Oral malignancies affect older individuals and most of them present in advanced stage of the disease and hence the lesion at presentation is often too large. Hence some form of reconstructive procedure is frequently required

by the surgeon treating head and neck malignancies with the aim of maintaining the functional integrity of the different structures of the oral cavity. The surgeon has to choose from a variety of procedures to best suit the defect and the patient requirements. Skin grafts along with local, distant and free flaps can be used for reconstruction of the tissue defects left by surgical excision of the tumors. For a given defect it may be a combination of different flaps or modification of a single flap which will give optimum reconstruction restoring function and aesthetics with minimum donor area morbidity. Pedicled flaps like myocutaneous flaps are best suited for large soft-tissue defects, composite defects, partial and total glossectomy defects, in advanced cases presenting at late stages of the disease and as a salvage procedure in case of failure of a free flap or in treating a complication from an existing flap. Operating time needed is short and the surgical expertise needed is also less hence can be performed even in a general surgery unit and in a hospital not well equipped with operating microscope and other facilities to deal with micro-vascular surgeries. Complication rates like flap necrosis and dehiscence may be higher and has to be dealt with a second procedure in some cases. Micro-vascular free flaps have allowed great flexibility to the reconstructive surgeon to import composite tissues matching the requirements at the site better than other methods and have become the method of choice in a great number of defects. Complications that may occur must be recognized early and managed efficiently in a short time frame because there is a narrow window of opportunity to salvage potential flap failure. Comparing the data of complications based on type of flaps and calculating significance using Fischer's exact test it was shown that free flaps had better results which provided better reconstruction and less physical disability as compared to PMMC flaps which were bulky initially but attained good contour over period of time. The site, size and involved tissues of the defect, patient factors, and surgical

experience and expertise should be taken into account when selecting a reconstructive option.

References

1. Watkinson JC. Stell and Maran's head and neck surgery. 4th ed. Woburn (MA): Butterworth-Heinemann, 2000.
2. Green FL, Page DL, Fleming ID. AJCC Cancer Staging Manual. 6th ed. New York: Springer-Verlag, 2002.
3. Paparella MM. Otolaryngology: Plastic and Reconstructive Surgery and Interrelated disciplines. 3rd ed. Philadelphia: Saunders, 1991.
4. Brown JS. T2 tongue: reconstruction of the surgical defect. *Br J Oral Maxillofac Surg* 1999;37:194-199.
5. Mathes J, Nahai F. Clinical and musculocutaneous flaps. St. Louis: Mosby, 1982.
6. Nayak UK, Swain B. Myocutaneous v/s microvascular free flaps in oral cavity reconstruction-a comparative study. *Indian J Otolaryngol* 2004;56:96-99.
7. Takushima A, Harii K, Asato H, Nakatsuka T, Kimata Y. Mandibular reconstruction using microvascular free flaps: a statistical analysis of 178 cases. *Plast Reconstr Surg* 2001;108:1555-1563.
8. González-García R, Rodríguez-Campo FJ, Naval-Gías L, Sastre-Pérez J, Muñoz-Guerra MF. Radial forearm free flap for reconstruction of the oral cavity: clinical experience in 55 cases. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2007;104:29-37.
9. Ahmad QG, Navadgi S, Agarwal R, Kanhere H, Shetty KP, Prasad R. Bipaddle pectoralis major myocutaneous flap in reconstructing full thickness defects of cheek: a review of 47 cases. *J Plast Reconstr Aesthet Surg* 2006;59:166-173.
10. Chen HC, Demirkan F, Wei FC, Cheng SL, Cheng MH, Chen IH. Free fibula osteoseptocutaneous-pedicled pectoralis major myocutaneous flap combination in reconstruction of extensive composite mandibular defects. *Plast Reconstr Surg* 1999;103:839-845.
11. Wadwongtham W, Isipradit P, Supanakorn S. The pectoralis major myocutaneous flap: applications and complications in head and neck reconstruction. *J Med Assoc Thai* 2004;87:S95-S99.

12. El-Marakby HH. The reliability of pectoralis major myocutaneous flap in head and neck reconstruction. *J Egypt Natl Canc Inst* 2006;18:41-50.
13. Nagral S, Sankhe M, Patel CV. Experience with the pectoralis major myocutaneous flap for head and neck reconstruction in a general surgical unit. *J Postgrad Med* 1992;38:119-123.
14. Shpitzer T, Neligan PC, Gullane PJ. Oromandibular reconstruction with the fibular free flap: analysis of 50 consecutive flaps. *Arch Otolaryngol Head Neck Surg* 1997;123:939-944.
15. Cordeiro PG, Disa JJ, Hidalgo DA, Hu QY. Reconstruction of the mandible with osseous free flaps: a 10-year experience with 150 consecutive patients. *Plast Reconstr Surg* 1999;104:1314-1320.
16. Maciejewski A, Szymczyk C. Fibula Free Flap for Mandible Reconstruction: analysis of 30 consecutive cases and quality of life evaluation. *J Reconstr Microsurg* 2007;23:1-10
17. Mariani PB, Kowalski L. P. Magrin J. Reconstruction of large defects postmandibulectomy for oral cancer using plates and myocutaneous flaps: a long- term follow-up. *Annals of Plastic Surgery* 2006;35:427-432
18. Ord RA. The pectoralis major myocutaneous flap in oral and maxillofacial reconstruction: a retrospective analysis of 50 cases. *J Oral Maxillofac Surg* 1996;54:1292-1295.
19. Mehta S, Sarkar S, Kavarana N, Bhatena H, Mehta A. Complications of the pectoralis major myocutaneous flap in the oral cavity: a prospective evaluation of 220 cases. *Plast Reconstr Surg* 1996;98:31-37.
20. Shah JP, Haribhakti V. Loree TR, Sutaria P. Complications of pectoralis major myocutaneous flap in head and neck reconstruction. *Am J Surg* 1990;160:352-355.

Corresponding author

Dr Aravind Pallipady
Associate Professor
Dept of Pathology
A.J. Institute of Medical sciences
Mangalore; 575004, India.
Mobile: 09448127559
E-mail : aravindpatho@gmail.com