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Original research article

An observational study of the utility of the Bipaddle Pectoralis Major Myocutaneous flaps in the reconstruction of complex defects after resection of locally advanced oral cavity cancers: A tertiary care experience

[1]Dr. Shubhranshu Jena, [2]Dr. Kumar S Vashist, [3]Dr Rajshekar Shantappa, [4]Dr. M Mallikarjun Rao, [5]Dr Rudra Prakash Panigrahi

[1]Associate Professor, Department of Surgical Oncology, Nizams Institute of Medical Sciences, Hyderabad, Telangana, India

[2]DNB Resident, Department of Surgical Oncology, Nizams Institute of Medical Sciences, Hyderabad, Telangana, India

[3]Additional Professor, Department of Surgical Oncology, Nizams Institute of Medical Sciences, Hyderabad, Telangana, India

[4,5]Fellowship Resident, Department of Surgical Oncology, Nizams Institute of Medical Sciences, Hyderabad, Telangana, India

Corresponding Author:
Dr. Shubhranshu Jena (sjena678@gmail.com)

Abstract

Background and aims: Free flaps are the standard method of reconstruction in advanced oral SCC. But the high incidence of oral SCC in India and the limited availability of plastic surgery pushes for alternate modes of reconstruction. Pectoralis major myocutaneous flap reconstruction has been widely practised in our country.

Aims: To assess the reliability of bipaddle pectoralis major myocutaneous flap for the reconstruction of complex defects following resection of locally advanced oral SCC.

Methods: This study is retrospective in design. A total of 72 patients with advanced oral SCC requiring bipaddle reconstruction operated in the period of September 2019 to August 2022 were included in the analysis. All relevant clinical, intraoperative and histopathological data along with swallowing and speech function assessment at 3 and 6 months were collected and analysed.

Results: 87.5% (n=63) of the patients received surgery as the primary modality of treatment in this study. The various grades of flap necrosis were seen in 16.7% (n=12) patients whereas the rates of major flap necrosis were seen in 5.6% (n=3) of the study patients. All major complications were seen in female patients. A delay in radiotherapy was seen in 12.7% (n =7 of 55) patients with the presence of major complications being significantly associated with delay in radiotherapy. A mean FIGS swallowing and speech function of 3 for both functions were noted in this study at 6 months after surgery.

Conclusion: A PMMC flap reconstruction continues to be a reasonable and reliable alternative form of reconstruction for oral SCCC patients with acceptable early and late outcomes.

Keywords: Bipaddle pectoralis major myocutaneous, oral cavity cancers

Introduction

Squamous cell cancer (SCC) of oral cavity is the second most common cancer overall and most common cancer among male population in the Indian subcontinent [1]. The primary modality of treatment is surgical resection with or without adjuvant radiotherapy (RT). Surgical resections can range from simple wide local excision to composite resections [2]. A composite resection involves en-bloc resection of the tumour with adjoining mandibular/maxillary bone, involved musculature or involved adjoining facial skin and the resection is dictated as per the tumour extent and the structures involved. Such a resection leads to complex defects with loss of oral competence, loss of swallowing reflex, dysphagia and speech abnormalities. Reconstruction of such defects focuses on providing the necessary anatomic integrity and restoration of speech and swallowing function [2, 3]. Free flaps are established as the recommended

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reconstruction modality for such patients as the tissue required can be tailored to the type of defect [2, 3]. A free flap reconstruction is commonly employed in resource rich setup and western countries. Free flaps have a long learning curve and can fail even in the best of hands. Free flap cover is not available in certain situations such as restricted healthcare access and patient comorbidities not permitting a long operation [4]. Whereas in India, the very burden of head and neck malignancies itself along with fewer resource rich centres, advanced stage of presentation limits the availability and utility of free flap reconstruction. Pedicled flaps are the most common and feasible mode of reconstruction in such situation. Among the pedicled flaps, the most used flap is the pectoralis major myocutaneous (PMMC) flap which has become the workhorse flap for head and neck defect reconstruction5. PMMC flaps are used in many centres around the world for their easy learning cover, reliable blood supply and very less chance of flap necrosis [5, 6, 7]. PMMC flaps are also used as a salvage flaps in cases of free flap failure and also in the very elderly, frail and comorbid patients and patients not affording or refusing a free flap reconstruction [2, 3, 6]. Certain patients with locally advanced oral cavity SCC presenting in T3/T4a stage require reconstruction of not only the mucosal lining and volume but also external skin cover. Use of bipaddle modification of PMMC flap is used in many centres with good results as an alternative to the gold standard free flap [5, 6, 7].

Aim: To assess the reliability of bipaddle pectoralis major myocutaneous flap for the reconstruction of complex defects following resection of locally advanced oral SCC

Objective

1. To assess the rates of various degrees of flap necrosis with the use of PMMC flap.
2. To assess the average time interval for receiving adjuvant radiotherapy.
3. To assess the rates of late complications such as swallowing and speech difficulties.

Materials & Methods

This is an observational study with retrospective design. A sample size of 72 patients of operated locally advanced oral cavity squamous cell carcinoma who underwent bipaddle type of pectoralis myocutaneous flap reconstruction in the last 3 years (between September 2019 to August 2022) were selected for this study. All the medical records of these patients were studied along with the follow up records till the last available follow up visit. Patients who had their last follow up 6 months prior to 28th February 2023 were followed up on telephonic interview. Patients whose treatment details or follow up details were inadequate or missing were excluded. The details of primary treatment modality along with any neoadjuvant and adjuvant treatment received, time interval between surgery and adjuvant radiation therapy, any flap necrosis and the degree of flap necrosis in the postoperative period along with an objective assessment of the quality of swallowing and speech function 6 months after the surgery with the help of Functional Intraoral Glasgow Scale (FIGS) is done. All the data were tabulated on Microsoft excel and analysed using SPSS version 23. All the required descriptive data are analyzed using mean, median, inter-quartile range and percentages for numerical data. The rates of flap necrosis are expressed in percentage while any significant delay in starting adjuvant radiation therapy in the subgroup with flap necrosis is calculated using chi square tests. The effect on swallowing and speech 6 months after the surgery is calculated using the FIGS scale with mean, median and inter-quartile range of the scores.

Results

Descriptive data

Our study population comprised predominantly of male patients (76.4%). 56.9% patients are aged more than 50 years. 68.1% of the study population suffered from one or more concurrent comorbid illness. Surgery was the primary modality of treatment in 63 of the 72 patients (87.5%). 9 patients underwent definitive chemoradiotherapy with surgery as a salvage (12.5%). Neoadjuvant chemotherapy was given to 4 patients for downstaging before primary surgery.

Table 1: Clinical characteristics of our study population

Parameter	Subgroups	Frequency	Percentage
Age	≤50	31	43.1
	>50	41	56.9
Sex	Male	55	76.4
	Female	17	23.6
Comorbidities	Diabetes	10	13.9
	Hypertension	13	18.1
	Coronary artery disease	3	4.2
	Cardiovascular disease	1	1.4
	CKD	0	0
	Hypothyroidism	4	5.6
Treatment Details	Primary surgery	63	87.5

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	Primary CTRT	9	12.5
	NACT	4	5.6
	Adjuvant RT	54	87.1

Flap necrosis

Most of our bipaddled flaps healed well without any complications (83.3%). Minor complications like edge necrosis(<5mm) were noted in 11.1% cases. A major loss of flap as in partial or total flap necrosis was seen in 3 patients (5.6%). The rates of necrosis was 17.4% and 11.1% in the primary surgery and salvage after primary radiotherapy respectively. There was no additional risk of flap necrosis upon addition of neoadjuvant chemotherapy. The rates of overall flap necrosis and major flap necrosis was 29.4% and 23.5% in the females and significantly more than male patients.

Table 2: Rates and types of flap necrosis

Complications	Subgroup	Frequency	Percentage
Flap necrosis	No	60	83.3
	Yes	12	16.7
Types of flap necrosis	N	60	83.3
	E	8	11.1
	P	3	4.2
	F	1	1.4
Treatment Given	**Incidence of flap necrosis**		
	Edge necrosis (F:M=1:70)	Partial flap necrosis (F:M=3:0)	Total flap necrosis (F:M=1:0)
Primary surgery	7	3	1
Primary chemoradiotherapy	1	0	0

Time to adjuvant radiotherapy

In our study, a total of 55 out of 62 patients (88.7%) received adjuvant therapy as per standard protocol whereas11.3% of the patients did not receive indicated radiotherapy. The median time to receive adjuvant radiotherapy is 36 days after surgery in this study.48 patients received radiotherapy within 6 weeks after surgery while 7 out of 55 patients (12.7%) had a delay in receiving radiotherapy beyond the 6 weeks after surgery. Any flap necrosis of partial or higher degree was associated with significant delay to start adjuvant radiotherapy (p=0.028). presence of edge necrosis alone was not associated with any significant delay (p=0.178).

Parameter	Subgroup	Frequency	Percentage
Rate of completion of adjuvant radiotherapy	No	7	11.3
	Yes	55	88.7
Delay in the start of radiotherapy	No (≤42)	48	87.3
	Yes (>42)	7	12.7
Time to adjuvant radiotherapy (days after surgery)	Mean	38.5±8.6	
	Median	36	

Flap necrosis (any)	Delay	No delay	Chi-square, p-value
No	5 (10.4)	43 (89.6)	1.813, 0.178
Yes	2 (28.6)	5 (71.4)	

Total	**7 (12.7)**	**48 (87.3)**	
Flap necrosis (partial and higher)	**Delay**	**No delay**	**Chi-square, p-value**
No	5 (10.4)	43 (89.6)	7.172, 0.028*
Edge	1 (16.7)	5 (83.3)	
Partial	1 (100)	0 (0)	
Total	7 (12.7)	48 (87.3)	

Swallowing and speech assessment

Most of our patients were able to take semisolid food without much difficulty. A mean FIGS swallowing was 3 (IQR; 2-4). A speech which required frequent repetition for the stranger to understand was seen in most study patients. A median score of 3 (IQR; 2-4) as FIGS speech scale was noted.

Table 3: FIGS score in our study patients

FIGS score	Mean	Median	IQR
FIGS score (swallow)	3.2±0.6	3	1
FIGS score (speech)	3.4±0.6	3	1

ISSN:0975 -3583,0976-2833 VOL14, ISSUE 05, 2023

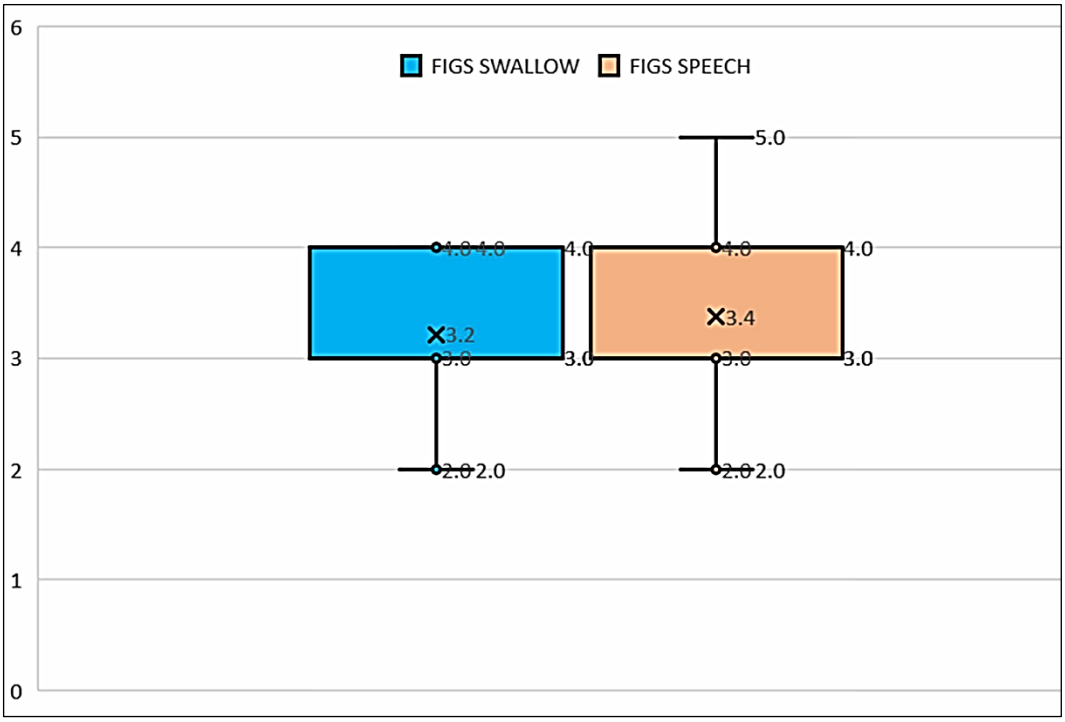

Fig 1: FIGS score swallow and speech function

Image 1

Discussion

This study attempts at assessing early and late outcomes of patients with advanced oral SCC requiring a bipaddle PMMC flap reconstruction. The study population in terms of age group, sex, concurrent comorbid illness, and primary site is comparable to recent Indian study.

Nearly one-fourth of the patients in this study are females (23.6%). The rates of flap complications were significantly higher in females in literature as compared to male gender. A similar result was seen in this study. This higher rate of complications was attributable to the large breast size and thickness of subcutaneous fat. But the complication rates were still comparable to other studies. The outcomes are like the results of free flap reconstruction [2, 3]. 68.1% of our patients suffered from one or more complications. Pedicled bipaddle PMMC flap helps to shorten the operative time while giving similar outcomes [6, 7]. We preferred to split the skin bridge between the mucosal and skin paddle after 10 days and do a secondary closure of the intraoral and skin aspect of the flap unlike the routinely done primary suturing of the flap once the post-surgical edema, inflammation subsides. This might have helped achieve reasonable outcomes in this study.

Our study includes majority of patients who underwent primary surgery (87.5%) and few cases with a residual tumour post primary Chemoradiation (12.5%). There was no difference in the incidence of flap related complications in the two set of patients. Few studies report increased flap related complications in a post radiotherapy scenario. Some studies including ours doesn't share the same result5,6,7. This may be a difference in the intraoperative techniques used by different Surgeons. We prefer to handle and raise the flaps using knife and avoid usage of thermal energy like the mono polar electro cautery application. All the 9 cases post primary radiotherapy underwent salvage surgery between 8 and 10 weeks after completion of radiotherapy. Addition of neoadjuvant chemotherapy did not affect the flap survival and no increase in flap necrosis was noted in these patients.

Flap necrosis could be minor or a major complication depending on the volume of flap loss. An edge necrosis implies only <5mm necrosis at any edge. This is the most common type of flap necrosis in our

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study. Such an edge necrosis did not significantly affect the patients outcome in terms of delay in adjuvant radiotherapy. All patients with an edge necrosis required a minimal debridement of the unhealthy edge and secondary suturing. This did not delay the start of oral intake in our patient probably because the unhealthy edge usually was noted on the outer skin paddle and mucosal paddle was healthy in all of them. Few recent studies have already described the technical aspect of raising a PMMC flap planned for bipaddle reconstruction. This highlights the importance of measuring the defect and planning an adequate coverage but it requires an inclusion of skin along the lateral aspect of chest wall beyond the free lateral edge of the pectoralis major muscle. This variable area of flap skin is deemed to be at risk of necrosis due to slightly reduced vascular supply of the skin and limited reach of my ocutaneous perforators of the flap. This variable factor in the bipaddle reconstruction is influenced by the surgical technique, perforator vessel status, postoperative factors like bleeding, edema and infection [7].

The major flap loss either partial or total necrosis was seen in 4 patients (5.6%). All major complications were seen in female gender. All cases with partial necrosis was seen in outer skin paddle required longer period of Ryles tube feed. All 3 cases required debridement of the unhealthy skin and dressings. While two of the patients required secondary suturing for complete healing of the flap, one case required split skin graft for complete healing. A further 2 weeks was needed before patient could be sent for adjuvant RT in these cases. One patient with total necrosis of the flap in our study came for postoperative follow up 5 weeks after surgery with signs of infection and mandibular plate extrusion. Patient defaulted further treatment and lost to follow up.

The swallowing and speech function after surgery for oral SCC had a median FIGS score of 3.

Most of our patients were able to chew semisolid food without much difficulty. This is comparable to the results of the study by Modi *et al*. who assessed the outcomes of swallowing and speech after free flap reconstruction for oral SCC defects [2]. The influence of other factors like the oral subsite type like tongue or floor of mouth cancer, the volume of defect and the performance status of the patient on the functional outcomes cannot be undermined and is not assessed in this study. The median FIGS score of 2 for swallowing and speech at 3 months in our study suggests there is a gradual improvement in the functional outcome after 6 months. Most patients preferred to consume a liquid diet at this time. A majority of the patients in our study had only completed or about complete the adjuvant radiation therapy at 3 months post-surgery. The effect of radiation such as mucositis could partly explain the functional outcome. So, it may be appropriate to assess the functional outcome after 6 months to get a better assessment of the swallowing and speech function.

Conclusion

A pedicled pectoralis major myocutaneous flap reconstruction after surgery for advanced oral SCC is a very reliable method of reconstruction especially in elderly and patients with concurrent comorbid illness. While, the rates of flap complications are less, any major flap complication can have disastrous complications like significant delay in the time to starting adjuvant treatment and longer period of ryles tube feeding. Reconstruction in female gender requires utmost care to avoid a major flap related complication. A PMMC flap provides a reasonable functional outcome at 6 months after surgery in terms of swallowing and speech function. Thus, a PMMC flap reconstruction continues to be a reasonable and reliable alternative form of reconstruction for oral SCCC patients with acceptable early and late outcomes.

Limitation

This study suffers from the lack of longer follow up. There is no direct comparision of the results between the outcomes after free flap and PMMC flap reconstruction. A longer follow up can give us better understanding of the long term swallowing and speech function in these patients.

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