

Comparison of Aesthetic and Functional Outcomes of Microvascular Reconstruction with Other Forms of Reconstruction in Oral Cavity Malignancies

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ABSTRACT

BACKGROUND

Surgical resection is the main stay treatment in oral cancer. Different techniques were used by the surgeons for reconstruction of the normal anatomy. With these, a study was conducted to evaluate the outcome and quality of life in terms of conventional forms of reconstruction and functional outcome in both genders for oral cavity reconstruction.

METHODS

It was a hospital based non randomized study, conducted in the department of surgical oncology, Vydehi Institute of Medical Sciences and research centre, Bangalore from January 2017 to June 2018. Individuals aged 20 – 70 years with confirmed oral carcinoma were included; poor vascular supply of donor area, distant metastasis proved by chest X ray or abdominal ultrasound were excluded. Pre-structured proforma was used to collect the baseline data. ANOVA tests were used. P <0.05 was considered statistically significant.

RESULTS

Majority (27.7 %) were in the age group 51 to 60 years and the male to female ratio was 0.56. Statistically, there was no significant association between gender and type of flaps. 60 % had carcinoma of left buccal mucosa and 40 % had right side carcinoma, statistically there was no significant difference. The mean number of nodes was 20.85 ± 9.52. Statistically, there was no significant association between type of flaps and number of lymph nodes.

CONCLUSIONS

PMMC flap reconstruction is reliable and an affordable procedure with high success rate in achieving treatment goals. However, studies on large sample size for long term is required.

KEYWORDS

Oral Carcinoma, Microvascular Techniques, Local Flaps, Regional Flaps

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BACKGROUND

Oral cancer is an affliction to all the socio-economic statuses, affecting increasingly large numbers worldwide. The widespread use of tobacco and associated products in the lower socioeconomic groups, illiteracy, poverty, and consequential poor oral hygiene awareness contribute to high prevalence and late reporting of oropharyngeal cancer. Whereas, in India, carcinoma of the oral cavity is a major health problem. Constitutes nearly 40 % of cancers.^{1,2} Squamous cell carcinoma (SCC) being the most common malignant neoplasm of the oral cavity, represents about 90 % of all oral malignancies.¹

Surgical resection is the main treatment stay, different techniques were used by the surgeons for reconstruction of the normal anatomy using local flaps or regional flaps. Reconstruction of complex head and neck defects resulting from cancer resection remains a challenge to the surgeons. Microvascular free flaps are considered to be the gold standard for this kind of reparative procedure, pedicle flaps are utilized as a salvage procedure. Specialized technology is involved in microsurgical techniques.³ Among these pectoralis major myocutaneous flaps (PMMFs) are the most reliable and versatile type considered in head and neck reconstruction.⁴ Excellent vascularity, proximity to head and neck region, simple to harvest and consequent to their bulk have the advantages of PMMFs.⁴

Over time, there have been significant changes in reconstructive techniques, with gravitation towards a narrower set of donor sites and a reduction in complication rates.^{5,6} Outcomes were based on donor and recipient site, indication for reconstruction, and the use of an osteocutaneous versus a fasciocutaneous transfer. Despite the widespread use of this technique in the head and neck, not all free flap donor sites or recipient sites are equivalent. We evaluated patients who presented for a microvascular free flap reconstruction of a complex head and neck defect in order to better understand the potential risks and benefits of each type of free tissue transfer.⁷

The final result was derived from the reconstruction procedure and the associated complications were analysed for the outcome. With these a study was conducted to evaluate the better outcome and quality of life in terms of conventional forms of reconstruction and functional outcome in both genders for oral cavity reconstruction.

METHODS

It was a hospital based non randomized study, conducted in the department of surgical oncology, Vydehi Institute of Medical Sciences and research centre, Bangalore. Study was conducted from January 2017 to June 2018, total 18 months. Individuals aged 20 – 70 years with confirmed oral carcinoma and those stable and fit for surgery were included in this research.

Individuals with poor vascular supply of donor area, distant metastasis proved by chest X ray or abdominal ultrasound, those invasion to the skull base, non-cooperative and who did not submit the informed consent were not considered.

Sample size was estimated by using the proportion of Total flap survival rate as 96.7 % from the study by F Demirkan et al.⁸ using the formula $4 PQ/I^2$. $P = 96.7$, $q = 3.3$, $d = 5$ %. Finally the sample size was calculated to be 75. All these were undergoing mucocutaneous flap.

The study population was composed of oral carcinoma or patients who are for salvage procedure, all cases satisfied the inclusion and exclusion criteria. A pre-structured proforma was used to collect the baseline data and an informed written consent was obtained after explaining about the need of the study and the procedures that were to be performed for the collection of data. Detailed history was taken and examination (local and systemic) was performed as per the protocol for those who satisfied the inclusion and exclusion criteria. Routine blood investigations such as complete blood picture, renal function tests, liver function tests, HIV / HbS Ag serology, biopsy, CT-head and neck to find the stage the tumour (TNM Staging), doppler of limbs upper and lower limbs.

Statistical Analysis

Data were analyzed using SPSS version 22. Chi-square, ANOVA tests were used. $P < 0.05$ was considered statistically significant.

RESULTS

In this study, majority (27.7 % 13) were in the age group 51 to 60 years followed by 41 – 50 years (25.5 % 12), 61 – 70 years (23.4 % 11), 31 – 40 years (12.8 % 6), < 30 years (6.4 % 3) and > 70 years (4.3 % 2). There was no significant difference between the ages distributions with respect to type of flaps used (Table 1).

In the study, majority was female (30; 63.8 %) members and the male female ratio was 0.56. Statistically there was no significant association between gender and type of flaps (Table 2).

In the study 60 % had carcinoma of left buccal mucosa and 40 % with right side carcinoma. Statistically there was no significant difference in diagnosis and type of flaps (Table 3).

In the study, the mean number of nodes was 20.85 ± 9.52 . Statistically, there was no significant association between type of flaps and number of lymph nodes (Table 4).

In the study one patient underwent surgery post radial FFF, 3 subjects underwent Post CTRT and 2 subjects underwent Post NACT. There was no significant difference in Type of flaps and treatment received (Table 5).

Age	Types of Flaps			Total
	Pectoralis Major	RFFF	ALT	
<30	3 (10)	0	0	3 (6.4)
31 – 40	4 (13.3)	2 (14.3)	0	6 (12.8)
41 – 50	6 (20)	6 (43)	0	12 (25.5)
51 – 60	9 (30)	2 (14.3)	2 (66.7)	13 (27.7)
61 – 70	7 (23.3)	3 (21.4)	1 (33.3)	11 (23.4)
>70	1 (3.3)	1 (7)	0	2 (4.3)
Total	30 (100)	14 (100)	3 (100)	47 (100)
Statistical analysis	$\chi^2 = 8.114$ p = 0.618 No significant difference			
RFFF	Radial forearm free flap			
ALT	Anterolateral thigh flap			

Table 1. Comparison of Types of Flaps and Age of the Study Participants

Gender	Type of Flaps			Total
	Pectoralis Major	RFFF	ALT	
Female	21 (70)	8 (57.1)	1 (33.3)	30 (63.8)
Male	9 (30)	6 (42.9)	2 (66.7)	17 (36.2)
Total	30 (100)	14 (100)	3 (100)	47 (100)
Statistical analysis	$\chi^2 = 1.974$; p = 0.373 No significant association			
RFFF	Radial forearm free flap			
ALT	Anterolateral thigh flap			

Table 2. Gender Distribution of the Study Participants with Respect to Type of Flaps; n (%)

Diagnosis	Type of Flaps			Total
	Pectoralis Major	RFFF	ALT	
Left side	20 (66.7)	8 (57)	0	28 (60)
Right side	10 (33.3)	6 (43)	3 (100)	19 (40)
Total	30 (100)	14 (100)	3 (100)	47 (100)
Statistical analysis	$\chi^2 = 5.082$; p = 0.079 No significant association			
RFFF	Radial forearm free flap			
ALT	Anterolateral thigh flap			

Table 3. Diagnostic Distribution with Respect to Type of Flaps among the Study Participants; n (%)

Type of Flaps	Mean	SD	Median
Pectoralis Major	19.20	8.19	18.50
RFFF	25.29	10.25	25.00
ALT	16.67	14.98	21.00
Total	20.85	9.52	21.00
Statistical analysis	P = 0.103 No significant association		
RFFF	Radial forearm free flap		
ALT	Anterolateral thigh flap		

Table 4. Distribution of Number of Nodes and Its Comparison with Respect to Type of Flaps among the Study Participants

		Type of Flaps			P Value
		Pectoralis Major	RFFF	ALT	
Surgery	No	29 (97)	14 (100)	3 (100)	0.749
	Post radial FFF	1 (3)	0	0	
	No	28 (93)	12 (86)	2 (67)	
Radiotherapy	Post CTRT	0	2 (14)	1 (33)	0.081
	Post NACT	2 (6.7)	0	0	

Table 5. Treatment and Its Comparison with Respect to Type of Flaps among the Study Participants

DISCUSSION

Oral cancer is increasing among the elderly and otherwise morbid patients. Studies on extensive reconstructive surgery outcomes demonstrated that microvascular reconstructions are possible among these groups of patients. Preoperative evaluation of risk factors and assessment of complications are important tools in choosing the best options for a patient as well as in reducing the risk of postoperative

complications. While microvascular options remain safe and enjoy wide use, some patients require simplified reconstructions such as pedicular flaps for salvage surgery. Several methods of composite flap reconstruction exist for maxillomandibular reconstruction. Of all the oropharyngeal malignancies reported to the SEER (Surveillance, Epidemiology, and End Results program of the National Cancer Institute of the United States Public Health Service) more than 95 % were squamous cell carcinomas (SCC).^{9, 10, 11}

The result of this study compares the three most frequently used flaps. The reconstructive flap should enable a near-functional and aesthetically tolerable solution without disabling donor site morbidity, with a high reliability without complications and reoperations to ensure as short as possible waiting time for further oncological treatment.¹² Comparing overall results, we found no significant differences between flaps for repeat reconstructions of microvascular anastomosis, neck complications, early and late donor site or reconstruction-specific complications, length of hospital stay, postoperative oncological treatment modalities or delay of oncological treatment (days from operation to the start of treatment).^{13, 14}

While we found no statistical difference between the overall complications associated with specific flaps. Previously irradiated patients also experienced significantly more complications as noted elsewhere in this field. Patients age did not differ statistically between groups experiencing complications versus those who did not, although mean age was in fact higher in the group without complications than among those experiencing complications. Bozikov K et al.¹⁵ reviewed the literature concerning microvascular flap surgery among the elderly, an important issue since more than 50 % of patients with SCC are over 65. While the cut-off for old remains undefined, 65 years is typically used, which then leaves the majority of our patients by definition classified as old. Age itself is not a major risk factor for free flap surgery. For instance, in a study by Wester et al.¹⁶ involving ten patients over the age of 90, they reported a success rate of 100 % and 0 % mortality rate. In patients under 65, no contraindications existed for free flap surgery. Finlay et al.¹⁷ reported that in 255 consecutive patients undergoing treatment for oral cancer, 21 % reported difficulty with swallowing solid foods and 46 % were limited to semisolid or liquid diets, which supports the evidence that functional outcome is still very poor in advanced intraoral cancer. Sanderson RJ et al.¹⁸ who studied a series of 135 patients with malignant tumours in the floor of the mouth and found that patients who had their defects reconstructed with myocutaneous flaps showed significantly lower Functional Living Index-cancer scores.

However, in a 10-year follow-up series of 123 patients, Esser et al.¹⁹ found that the functional results obtained for the myocutaneous island flaps and free vascularized flaps were satisfactory for both groups, and only minor differences were noted. In one study on 35 patients who had their defects reconstructed with the free radial forearm flap had a much better functional rehabilitation (P < 0.001) than patients reconstructed with the pectoralis major myocutaneous flap or the anterolateral thigh flap. The use

of this reconstruction modality (free radial forearm flap) had a significant correlation with the use of dentures and the ability to eat a normal diet in contrast to patients reconstructed with the pectoralis major flap or the anterolateral thigh flap, among whom only 6.25 % could consume a normal diet and they could never use a denture permanently, which provides evidence that the use of these reconstructive modalities was the main cause of the poor functional outcome in this group of patients. Pinto et al.²⁰ also described the use of pectoralis major myocutaneous (PMMC) flaps for salvage procedures following resection which had caused soft tissue defect in head and neck region. In a study by El-Marakby et al.²¹ the indications, technique, reliability, complications and the functional and aesthetic outcomes of PMMC flap head and neck reconstruction in 25 selected patients were evaluated. They used the flap in the reconstruction of the oral cavity, oropharynx, hypopharynx and neck or face. They concluded that despite the wide use and the reliability of free flaps in head and neck reconstruction, PMMC is a good option when facility of microsurgery is lacking and as a salvage procedure after free flaps failure.

Kekatpure et al.²² evaluated different factors affecting the selection of pectoralis major flap in the era of free tissue reconstruction for post ablative head and neck defects. A total of 147 reconstructive procedures were performed which included 79 free flaps and 58 pectoralis major flaps. The indications for pectoralis flap selection were resource constraints (36 %), associated co morbidities (20 %), extended/salvage neck dissection (19 %), vessel depleted neck and free flap failure salvage surgery. All the flaps survived with 41 % of patients had flap related complications majority of which were self-limiting and managed conservatively. They conclude that pectoralis major flap is a reliable option for head and neck reconstruction and has a significant role even in this era of free flaps.

Brusati et al.²³ performed PMMC flap for reconstruction after surgical ablation of advanced malignant tumours in the head and neck, in which he found low complication rates and confirmed the reliability of the PMMC flap that offered the possibility of providing large cutaneous islands and a simple, reliable method which can be used in the reconstruction of the cervico-maxillo-facial area.

In a study done by Ahmad et al.²⁴ Bipaddle PMMC flap was performed in 47 patients with large full thickness cheek defects which were secondary to cancer ablative surgery. This modification was based on anatomical location of perforators to ensure good blood supply to both the skin paddles of flap. Therefore, they concluded that this modification was useful alternative where free tissue transfer was not possible or as a salvage procedure in selected large full thickness oral cavity lesions.

CONCLUSIONS

PMMC flap reconstruction is reliable and an affordable procedure with high success rate in achieving treatment goals. However studies on large sample size for long term is required.

Data sharing statement provided by the authors is available with the full text of this article at jebmh.com.

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