International Journal of Current Research and Review
DOI: https://doi.org/10.31782/IJCRR.2022.141409

Research Article

IJCRR
Section: Healthcare

Comparison of Outcomes of the Radial Forearm Free Flap Vs Pectoralis Major Pedicled Flap for the Reconstruction of Oral Soft Tissue Defects

Abdul Malik Mujahid[1], Musadiq Asrar[2], Ifrah Rahed[3], Kashif Mehmood[4], Usman Ishaque[5], Noor Ali[6]

[1]MBBS, FCPS Plastic Surgery, Senior Registrar Plastic Surgery, Burn & Plastic Surgery Department, Teaching Hospital Dera Ghazi Khan; [2]MBBS, FCPS Plastic Surgery, Medical Officer, Burn& Plastic Surgery Department Sheikh Zayed Medical College/ Hospital Rahim Yar Khan; [3]MBBS, Post graduate Resident MS Plastic Surgery Department, Qaid E Azam Medical College, Bhawal Victoria Hospital, Bahawalpur; [4]MBBS, FCPS Plastic Surgery, Medical Officer Plastic Surgery, Jinnah Burn & Reconstructive Surgery Center, Allama Iqbal Medical College, Lahore; [5]MBBS, FCPS Plastic Surgery, Medical Officer Plastic Surgery, Jinnah Burn & Reconstructive Surgery Center, Allama Iqbal Medical College, Lahore; [6]MBBS, FCPS Plastic Surgery. Senior Registrar Plastic Surgery, Plastic Surgery Department, Bolan Medical Complex Hospital, Quetta.

ABSTRACT

Introduction: Head and neck cancers are one of common cancers with peri oral cancers are more prevailing in areas with use of tobacco, ghutka and alcohol. Peri oral soft tissue defects can occur after tumor ablation or trauma.

Objectives/Aim: To assess the flap survival and oral competence in radial forearm free flap versus pedicled pectoralis major myocutaneous flap.

Method: A randomized control trial was conducted at Department of Plastic Surgery BVH, Bahawalpurfrom July 2019 to December 2020. A total of 60 patients were randomly divided in two equal groups. In Group A, radial forearm free flap and in Group B pedicledpectoralis major myocutaneous flap were used for reconstruction offull thickness defects. Data was entered and analyzed by using SPSS version 27.0. Mean and Standard Deviation were calculated for quantitative variables. Frequency and percentages were calculated for qualitative variables.Chi-square test was used to compare the flap survival and oral competence between the groups and p<0 .05 was taken as statistically significant.

Results: The mean age of patients in group A was 47.47 ± 12.28 years and in group B was 48.40 ± 12.02 years. Out of 60 patients, 80%& 60% of patients in group A & B were males respectively. Partial Flap lossin group A was 6.67% and in Group B 10%. Overall flap survival was 93.33% in Group A & 86.67% in Group B with the p > 0.05 which is not statistically significant.

Conclusion: Radial forearm free flap is comparable option for head and neck reconstruction to the pectoralis major myocutaneous flap with fewer complication rate and overall successful outcome.

Key Words: Radial forearm free flap, Pedicled Pectoralis Major myocutaneous flap, Survival rate, Peri oral defects, Tumor, Oral cancers

INTRODUCTION

Head and neck cancers are one of common cancers with peri oral cancer are more prevailing in areas with use of tobacco, ghutka and alcohol. Peri oral soft tissue defects can occur after tumor ablation or trauma. Surgical management of oral squamous cell carcinoma typically involves resection of tumor with a 1 cm margin under frozen section control that may create a full-thickness defect, requiring more complex methods of reconstruction.[1] The reconstruction of peri-oral defects has been a challenge for plastic surgeons especially with involvement of commissure to achieve both functional and aesthetic with a favorable appearance. The competence of the orbicularis muscle sphincter must be maintained, as this is critical to achieve a functional recovery. The functional goals of the cheek and lip reconstruction are to maintain intraoral mucosal lining and to preserve the surface area of the oral aperture. The aesthetic goals are

Corresponding Author:
Dr. Abdul Malik Mujahid, Senior Registrar of Plastic Surgery, Burn and plastic surgery Department, Teaching Hospital, D.G. Khan Medical College, Der Ghazi Khan; Email. Iqbalian_127@yahoo.com

ISSN: 2231-2196 (Print) **ISSN:** 0975-5241 (Online)

Received: 20.05.2022 **Revised:** 12.06.2022 **Accepted:** 02.07.2022 **Published:** 20.07.2022

to provide replacement of external soft tissue following the subunit principals of vermiliocutaneous junction and lip aesthetic units.[2]

Basic principal of plastic surgery is to replace like with like tissue. The selection of reconstructive options is based on the nature, size and location of the defect as well as on the general health and prognosis of the patient.[3] In 1979, use of the pectoralis major flap was first described for reconstruction of oral soft tissue defects. Since that it has become a one of commonly used option because of its relative reliability, availability and the ease of dissection.[4] In last two decades there was a significant advancement in plastic surgery techniques and with advent of microsurgical methods different other options came into practice for reconstruction of oral and peri oral soft tissue reconstruction. Nowadays, Radial forearm free flap is in routine practice in reconstructive head and neck surgery and is used as workhorse flap because of its reliable anatomy, long pedicle length, good size vessels, suitable thinness and relative scarcity of hair and to substitute mobile oral mucosa.[5]

In 2010, O'Neill et al. compared radial forearm free flap and Pectoralis Major Myocutaneous pedicled flap for reconstruction of oral and oropharyngeal defectsand found 5.4% of flap loss with wound dehiscence with pectoralis myocutaneous flap while no flap loss and wound dehiscence in Radial forearm free flap reconstruction.[6] In another study, C. Avery stated that free tissue transfer has become the preferred reconstructive option with success rates of 95% or higher with fewer complications and better functional outcomes.[7] Pipkorn et al. in his study, emphasized on functional considerations in oral cavity reconstruction and mentioned Different assessment tools for oral functions.[8] Li and Zhang et al. and Yang and Li et al. use 14 item oral health impact profile (OHIP-14) and the University of Washington quality of life (UW-QOL) questionnaire and showed better outcome in RFFF group as compared to PMMF.[9, 10]

Rationale of my study is that Radial forearm free flap is better choice than pedicled pectoralis major myocutaneous flap in terms of functional and aesthetics outcome.As no local data is available regarding the comparison of both options, so this study will set a baseline data regarding the management of perioral soft tissue defects reconstruction andwill not only help in selecting the suitable option in our developing population but also addresses local patient concerns regarding functional outcome in terms of oral competence post-surgery.

MATERIALS AND METHODS

A Randomized control trials was conducted at Department of Plastic and Reconstructive Surgery Bahawal Victoria Hospital Bahawalpur from July 2019 to December 2020. A sample size of 60 was calculated with the 5% level of confidence, 80% power of study and taking flap loss as 0% in group A (Radial forearm free flap) and 5.4% in group B (Pectoralis Major pedicled flap).[7] Sampling was done Through a non-Probability consecutive sampling and patients were divided into two equal groups. Patient with oral and perioral soft tissue defects of upper lip, commissure, lower lip involving mucosa and buccal mucosal defects > or =50% of the lip size after trauma or tumor resection presenting within 6 months of diagnosis, aged between 15-65 years of either gender were included. Patients with prior head and neck surgery advanced staged disease, history of diabetes mellitus or peripheral vascular disease or bleeding disorders were excluded.After approval from ethical institutional review board (Ref.No ET/12510/P-290-PF, Dated.20 June, 2019), written informed consent was taken from all the patients. All the patients were operated by the consultant plastic surgeon with 10 year post fellowship experience. If surgery remained uneventful, then he/she was discharged on 5th post-operative day in both groups. All the patients were followed up by researcher himself/herself on weekly basis for first month then monthly up to 6 months. The data was entered and analyzed by using SPSS version 27. Mean and Standard Deviation were calculated for quantitative variables like age, defect size. Frequency and percentage was calculated for qualitative variables likegender, defect location, type of flap used, flap loss, oral competence and flap outcome. Chi-square test was used to compare the flap survival and oral competence between the groups and p <0 .05 was taken as statistically significant. Confounder or effect modifier i.e age, gender, location of the defect and etiology was controlled through stratification and post stratification Chi square test was applied using p <0.05.

RESULTS

Out of 60 patients, in group A, 80% were males while 20% were females. In group B, 60% were males and 40% were females. Age range in this study was from 15-65 years with mean age of 47.935 ± 12.15 years. The mean age of patients in group A was 47.47 ± 12.28 years and in group B was 48.40 ± 12.02 years. Defect size ranged from 6.01± 2.1 cm in group A while 5.97 ± 2.03cm in group B (Table No .1) Location of defect included 13% upper lip defect, 46.67% oral commissural defect and 40% of the patients with lower lip defect in Group A. Group B had 10%, 56.67% and 33.33% defect of the upper lip, oral commissure and lower lip region respectively.(Figure.1) In this study Radial Forearm Free Flap was used in group A(Figure.2 a,b,c,d) and Pedciled Pectoralis Major Myocutaneous Flap in group B(Figure.3.a,b,c,d).

In group A, Oral competence was present in 29 (96.67%) patients and 26 (86.67%) patients in group B. Group A had 1 (3.33%) patient while Group B had 4 (13.33%) patients with

inadequate oral competence. Partial Flap lossin both groups A & B was noted as 6.67% and 10% respectively with 02 patients in group A and 03 patients in group B. However no complete loss was noted in free flap group while 1 (3.33%) of the patient in group B had complete flap loss. Overall flap survival was 93.33% in free flap group and 86.67% in pedicle flap group with the $p > 0.05$ which is not statistically significant. (Table No.2)

Stratification of Oral competence in both groups with respect to gender, age, location of defect and etiology is shown in Table.No.3 Stratified data of Flap Loss in both groups with respect to gender, age, location of defect and etiology is shown in Table No.4.

Table 1: Age and defect size among groupsin study subjects

Variables	Group A (n= 30)	Group B (n= 30)	p value
Age (Years)	47.47 + 12.28	48.40 + 12.02	0.76
Defect size (cm)	6.01 + 2.81	5.97 + 2.03	0.37

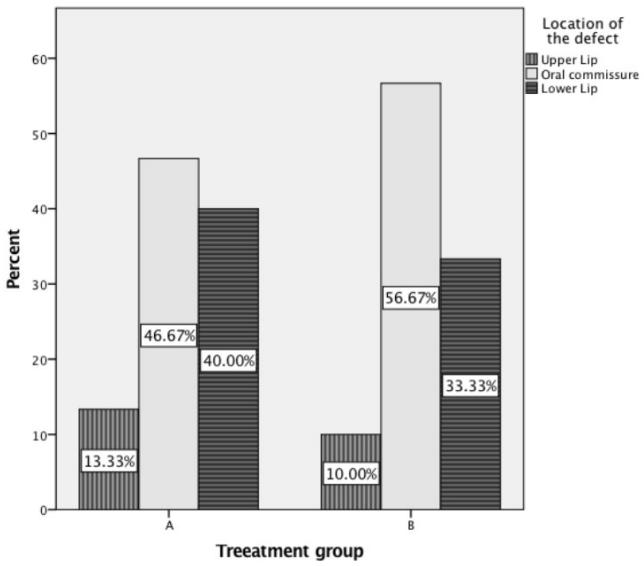

Figure 1: Location of defect in study subjects n= 30 in each group.

Figure 2: GROUP-B, Radial Forearm Free Flap Case. (Picture A, B- Pre operative frontal and lateral view), (Picture-C. Intraoperative view with radial forearm free flap), (Picture-D. Post-operative result)

Figure 3: GROUP B. Pedicled Pectoralis Major Myocutaneous Flap Case.
(Picture A,- Pre operative view), (Picture B- Intra operative View), (Picture C, Pectoralis Major musculocutaneous flap marking), (Picture- D, Post operative result).

Table 2: Oral incompetence and flap loss among groups

Variables	Group A (n= 30)	Group B (n= 30)	p value
Oral Competence			
Yes	29 (96.7%)	26 (86.67%)	0.35
No	1 (3.3%)	4 (13.3%)	
Flap Loss			
Non necrosis	28 (93.3%)	26 (86.7%)	
Partial flap loss	02 (6.7%)	3 (10.0%)	0.53
Complete flap loss	00 (00.0%)	1 (3.3%)	

Table 3: Stratification of oral competences among groups

Variables		Oral competence	Groups Frequency (%age)		p-value
			Group A (n= 30)	Group B (n= 30)	
Gender	Male	Yes	23 (95.83%)	16 (88.89%)	
		No	1 (4.17%)	02 (11.11%)	0.56
	Female	Yes	6 (100%)	6 (100.0%)	
		No	0 (0%)	0 (0.0%)	
Age	15-39 Years	Yes	6 (100%)	5 (100%)	
		No	0 (0%)	0 (0%)	
	40-65 Years	Yes	23 (95.83%)	21 (84%)	0.35
		No	1 (4.17%)	4 (16%)	
Location of Defect	Upper lip	Yes	4 (100%)	3 (100%)	
		No	0 (0%)	0 (0%)	
	Oral commissure	Yes	13 (92.85%)	14 (82.35%)	0.45
		No	1 (7.15%)	3 (17.65%)	
	Lower lip	Yes	12 (100%)	9 (90%)	
		No	0 (0%)	1 (10%)	
Etiology	Trauma	Yes	5 (100%)	4 (100%)	
		No	0 (0%)	0 (0%)	0.35
	Tumor	Yes	24 (96%)	22 (84.61%)	
		No	1 (4%)	4 (15.39%)	

Table 4: Stratification of flap loss among groups

Variables		Flap Loss	Groups Frequency (%age)		p-value
			Group A (n= 30)	Group B (n= 30)	
Gender	Male	Non necrosis	22 (91.67%)	16 (88.88%)	
		Partial flap loss	2 (8.33%)	1 (5.56%)	
		Complete flap loss	0 (0%)	1 (5.56%)	0.53
	Female	Non necrosis	6 (100%)	10 (83.33%)	
		Partial flap loss	0 (0%)	2 (16.67%)	
		Complete flap loss	0 (0%)	0 (0%)	
Age	15-39 Years	Non necrosis	6 (100%)	5 (100%)	
		Partial flap loss	0 (0%)	0 (0%)	
		Complete flap loss	0 (0%)	0 (0%)	
	40-60 Years	Non necrosis	22 (91.67%)	21 (84%)	0.54
		Partial flap loss	2 (8.33%)	3 (12%)	
		Complete flap loss	0 (0%)	1 (4%)	
Location of Defect	Upper lip	Non necrosis	4 (100.0%)	3 (100%)	
		Partial flap loss	0 (0.0%)	0 (0%)	
		Complete flap loss	0 (0.0%)	0 (0%)	
	Oral commissure	Non necrosis	12 (85.71%)	14 (82.35%)	
		Partial flap loss	2 (14.29%)	3 (17.65%)	0.45
		Complete flap loss	0 (0.0%)	0 (0%)	
	Lower lip	Non necrosis	12 (100.0%)	9 (90%)	
		Partial flap loss	0 (0.0%)	1 (10%)	
		Complete flap loss	0 (0.0%)	0 (0%)	

Table 4: ***(Continued)***

Variables		Flap Loss	Groups Frequency (%age)		p-value
			Group A (n= 30)	Group B (n= 30)	
Etiology	Trauma	Non necrosis	5 (100%)	4 (100.0%)	0.55
		Partial flap loss	0 (0%)	0 (0.0%)	
		Complete flap loss	0 (0%)	0 (0.0%)	
	Tumor	Non necrosis	23 (92%)	22 (84.61%)	
		Partial flap loss	2 (8%)	3 (11.54%)	
		Complete flap loss	0 (0%)	1 (3.85%)	

DISCUSSION

Reconstruction of soft tissue defects after trauma or tumor resection is always a challenging task in head and neck region considering the functional and aesthetic outcome. Ariyan S was among the first to use pedicled Myocutaneous Pectoralis Major flap for head and neck defects.[11] In the era of 21st century, free flaps are more commonly used due to improved microsurgical techniques and facilities but still the use of pedicled Pectoralis Major Myocutaneous is in practice because of its advantages, including its proximity to the head and neck, simplicity of harvesting and as an alternative when microsurgical flap failure occurs. The disadvantages include reduced neck mobility, thickness of the flap leading to possible reduced swallowing or speech function; need to rotate the vascular pedicle of the flap 180° when using the skin paddle to resurface the neck and simultaneous two-team approach is difficult in comparison to the classical free radial forearm or anterolateral thigh flap.[12]

In our study, partial flap loss in both group A &B was 6-67 percent and 10 percent respectively while No complete flap loss was noted in free flap group which is comparable to the results by Sheikh et al.[13] Oral competence was good in upper lip defects with no drooling of saliva or liquids while in oral commissural defects and lower lip defects, one patient had poor oral competence in Radial Forearm Free Flap group. Three patients in pedicled pectoralis major myocutaneous flap had drooling of saliva and problems in speech due to poor oral competence. Poor competence was seen in the same patients who had partial necrosis or complete flap failure. Revision surgeries were performed in pedicled pectoralis major myocutaneous flap for competence. Flap failure was noted in patient who was chronic smoker and had venous congestion. Partial flap loss was also reported to be 13.3% in the descriptive case series on pedicled pectoralis major myocutaneous flap by Abid.[14] Another local study by Khan F had 67.59% overall complication in pedicled pectoralis major myocutaneous flap group[15]. Flap salvage techniques were used and Deltopectoral flap was used to cover the defect in salvage cases.[16] Unfortunately most female patients were in Group B i.e. 12 patients. Breast tissue was affected, which can have a major cosmetic impact in female patients.[17] It can also sometimes affect shoulder function.

Khalid FA et al. suggested that despite minimal complication quoted with free microsurgical reconstruction, yet the pedicled flaps are useful alternative in selected cases, and are quick to perform with lesser secondary procedures requirement[18]. Our previous experience reported 25% complication rate with pectoralis flap.[19] Mallet et al. in 2009,[20] outlined the same post-operative complications rate between these two flaps. O'Neill, reported that significant differences found insuture dehiscence complication in pectoralis major myocutaneous flap and atelectasis was more frequent in Radial Forearm free flap; major flap complications, leading to another surgery were more frequent in the Radial Forearm free flap group.[6]

Hsing et al. in 2011, presented their series of 491 patients treated for oral cavity cancer. They found no significant difference in overall quality of life between patients treated with pedicled pectoralis major myocutaneous flap versus free flaps. Nevertheless, they reported significant differences between two groups in speech, shoulder mobility and mood domains with better outcomes for the free flap group.[21] Xiao et al. found no significant differences betweentwo groups (ALT flap and pectoralis major myocutaneous flap) for activity, swallowing, speech, saliva, or mood and anxiety domains.[22]

After introduction of radial forearm free flap by Yang et al.[23] in 1981, conventional locoregional flap were replaced by Radial Forearm free flap for head and neck reconstruction due to its pliability, thinness, pedicle length and vessel size. Although radial forearm flap results in excellent soft tissue reconstruction, it is usually associated with donor site morbidity that may include visible scar, wound breakdown,tendon exposure and skin graft loss. Long-term complications include reduced wrist mobility, wrist or hand weakness, sensory deficits, persisting pain, decreased hand dexterity and cosmetic deformity in objective and subjective assessments.[24]

Limitation of our study is that patient satisfaction regarding donor site complications in Radial Forearm free flap group was not evaluated. Further limitation was the operative time which was not included in the observation. In the settings of developing country with emerging expertise, it is suggested that conventional pedicled workhorse flap are preferable option to the free flaps. However with the advent of advanced microsurgical technique one must opt for better outcome.

CONCLUSION

This study concluded that Radial forearm free flap is comparable option for head and neck reconstruction to the pectoralis major myocutaneous flap with fewer complication rate and overall successful outcome. However, further research regarding time and cost analysis is deficient in our low socio economic population. Thus definitive procedure for head and neck reconstruction in review of our results depends on the patient factors and expertise of the team for maximal outcome.

ACKNOWLEDGEMENT

Authors acknowledge the immense help received from the scholars whose articles are cited and included in the references of this manuscript

Source of Funding

None

Conflict of interest

None

Authors Contribution

Dr. Abdul Malik Mujahid

Principal contributor, conceptualization and design of research work

Dr. Musadiq Asrar

Co contributor, plagiarism correction, final approval

Dr. Ifrah Rashed

Co contributor, data analysis,

Dr. Kashif Mehmood

Statistical analysis, literature search

Dr. Usman Ishaque

Writing of manuscript, collection of data, drafting

Dr Noor Ali

Literature search, result analysis, review of manuscript

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