Original Article

Functional Outcomes of Pectoralis Major Myocutaneous Flap for Reconstruction in Head and Neck Surgeries

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ABSTRACT

Objective: To determine the functional outcomes of pectoralis major myocutaneous flap for reconstruction in head and neck surgeries.

Study Design: Descriptive study

Place and Duration of Study: This study was conducted at the Department of Oral and Maxillofacial surgery, Ziauddin University, Karachi from January 2020 to March 2021.

Materials and Methods: All patients who fulfilled the inclusion criteria and visited to ZUH, Karachi were included in the study. Informed consent was taken after explaining the procedure, risks and benefits of the study. All patients underwent pectoralis major myocutaneous flap for reconstruction. Post procedure patient was followed till one month for the assessment of functional outcomes. All the collected data were entered into the proforma attached at the end and used electronically for research purpose.

Results: Mean ± SD of age was 56.8±15.3 years. In distribution of gender, 31 (73.8%) were male while 11 (26.2%) were female. In functional outcomes pectoralis major myocutaneous flap, mean pain score was 85.7±25.3, mean appearance score was 76.7±31.4, mean speech score was 64.52±32.6 and mean shoulder score was 58.1±34.09.

Conclusion: It is to be concluded that PMM flap has higher rate in shoulder score and speech score. Further large-scale work is recommended for validation of current findings.

Key Words: Head Surgery, Neck Surgery, Pectoralis Major Myocutaneous Flap, Reconstruction

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INTRODUCTION

Head and Neck cancer is the frequently identified cancer across the globe and is considered as 8-10 % of all cancers in Southeast Asia.[1] The need to reconstruct structures with complex anatomy and function in a highly visible region makes head and neck oncologic surgery very challenging. For moderate to large defects, free flaps have gained worldwide approval, as they are pliable and not bulky, and are nowadays considered the gold standard of treatment.

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Although, free flaps are routinely employed but require microsurgical expertise, availability of recipient vessels, postoperative intensive care unit monitoring, and a patient who can tolerate major surgery.[2] And also these flaps require a long operative time, as they need very careful harvesting of the flap and micro vascular sutures.[2] As a result, this type of surgery may become quite stressful for the patient, especially for the elderly or compromised patients. The surgeon has to keep in mind that the best therapeutic option must always be tailored to the patient.[3] After radiation therapy, surgery always becomes much more difficult, and micro sutures, especially venous ones, can be very challenging.[4,5] Furthermore, recovery after surgery is always delayed, with a higher complication rate. In such cases, reconstruction with a regional flap could be preferable to a free flap. Regional flaps generally allow decreased operative time, since they do not require micro sutures. They can be harvested and transferred rapidly, decreasing morbidity related to general anesthesia and intensive care.[6-8]

Currently, Pectoralis Major Myocutaneous Flap is utilised as a salvage mechanism if a free vascularized flap fails or as a reconstructive alternative for patients who are deemed unsuitable for free flaps. Furthermore, they can be employed as chimeric flaps in conjunction with a free vascularized flap to restore extensive head

and neck deformities.[9] Pectoralis Major Myocutaneous flap showed its resilience in the presence of comorbidities and infections and achieved success in 93.1% and Pectoralis Major Myocutaneous Flap proved excellent in head and neck cancer surgery even in malnourished patients.[10] For patients with oral cancer who perform poorly on the Karnofsky test and have a concurrent chronic condition, the Pectoralis Major Myocutaneous Flap can be a good alternative. Being a bulky flap, Pectoralis Major.

For stage IV oral cancer, the massive bone defect can be efficiently repaired using a myocutaneous flap.[9,11,12] Due to the distinct vascular pedicle, simplicity of harvesting the flap, and low postoperative morbidities, Pectoralis Major Myocutaneous flap is often considered as a valid alternative to the free flap to repair the oral defect.[13,14] Unfortunately, data regarding functional outcomes after PMM flap is scarce at local as well as international level. So, it is important to determine the functional outcomes of PMM flap in patients undergoing head and neck surgery. Therefore, this study was aimed to determine the functional outcomes of pectoralis major myocutaneous flap for reconstruction in head and neck surgeries.

MATERIALS AND METHODS

This descriptive study was conducted in the Department of Oral and Maxillofacial surgery, Ziauddin University. Study was started after taking approval from CPSP and ethical review committee of the institute. All patient fulfilling the inclusion criteria were enrolled in the study from OPD or emergency department of Dr. Ziauddin University Hospital. Before enrolment risk and benefits regarding study were informed to the patient and written informed consent was taken from patient/guardian. Baseline demographics and clinical history were taken at the time of admission. All patients underwent pectoralis major myocutaneous flap for reconstruction by oral and maxillofacial surgeon having more than 5 years of post-fellowship experience. Post procedure patient was followed till one month for the assessment of functional outcomes. All the findings of quantitative and qualitative variables such as age, gender, place of residence, height (measured by using stediometer), weight (measured by using digital weighting machine), BMI (weight in Kg/Height in m^2), type of procedure, tumor site, flap size, history of radiotherapy or chemotherapy, TNM classification and functional outcomes (pain, appearance, speech and shoulder) were noted in a predesigned performa.

Inclusion criteria ▪ Patient aged 20-80 years. ▪ Trauma cases that needed primary reconstruction flaps or salvage procedure. 39 ▪ Reconstruction of oral oncologic defects: buccal mucosa, floor of mouth, mandibular defects etc.

Exclusion criteria ▪ Cases in which pectoralis major was congenitally missing as in Poland Syndrome. ▪ Cases in which shoulder was already involved in different pathologic conditions. ▪ Age less than 20 years and age greater than 80.

Data analysis: Data was entered in SPSS version 21. Mean±SD/Median (IQR) was reported on basis of normality for quantitative variables such as age, height, weight, BMI, flap size and functional outcomes score (pain, appearance, speech and shoulder). Qualitative variables such as gender, place of residence, type of procedure, tumor site, history for radiotherapy/ chemotherapy and TNM classification were reported as frequency and percentage. Functional outcomes were stratified for age, gender, BMI, type of procedure, tumor site, flap size, history for radiotherapy/ chemotherapy and TNM classification. Post stratification independent t-test/ANOVA was used taking p-value.

RESULTS

In this study 42 patients were included to evaluate the functional outcomes of pectoralis major myocutaneous flap for reconstruction in head and neck surgeries and the results were analyzed as: The distribution of continuous variables was tested by applying Shapiro-Wilk test for age group (P=0.098), weight (P=0.110), height (P=0.191), body mass index (P=0.166), flap size (P=0.188), pain score (P=0.180), appearance (P=0.077), speech (P=0.066) and shoulder (P=0.199) as shown in table 1**.**

Table No.1: Descriptive Statistics for Distribution of Continuous Variable

Variables	Mean±SD	P-Value
Age Group	56.8±15.3	0.098
Weight	63.6±8.7	0.110
Height	162.3±14.5	0.191
Body mass index	26.7±5.6	0.166
Flap Size	71.4±10.3	0.188
Pain	85.7±25.3	0.180
Appearance	76.7±31.4	0.077
Speech	64.52±32.6	0.066
Shoulder	58.1±34.09	0.199

Table No.2: Stratification of age group with functional outcomes

Functional Outcomes		Age Group [In years]		P-Value
		20 – 60	>60	
Pain	Mean	89.13	81.58	0.344
	±SD	25.92	24.78	
Appearance	Mean	72.83	81.58	0.375
	±SD	36.08	24.78	
Speech	Mean	62.61	66.84	0.681
	±SD	33.33	32.49	
Shoulder	Mean	55.22	61.58	0.554
	±SD	33.96	34.84	

Table No.3: Stratification of gender with functional outcomes

Functional Outcomes		Gender		P-Value
		Male	Female	
Pain	Mean	86.29	84.09	0.808
	±SD	23.12	32.15	
Appearance	Mean	77.42	75.00	0.829
	±SD	28.39	40.31	
Speech	Mean	62.58	70.00	0.524
	±SD	31.93	35.49	
Shoulder	Mean	57.10	60.91	0.754
	±SD	32.57	39.61	

Table No.4: Stratification for type of procedure with functional outcomes n=42

Functional Outcomes		Type of Procedure		P-Value
		Primary	Salvage	
Pain	Mean	89.61	82.15	0.429
	±SD	25.92	32.41	
Appearance	Mean	80.69	71.57	0.400
	±SD	29.25	38.14	
Speech	Mean	65.85	66.12	0.981
	±SD	34.25	35.46	
Shoulder	Mean	61.22	55.40	0.115
	±SD	33.64	40.21	

Table No.5: Stratification of flap size with functional outcomes n=42

Functional Outcomes		Flap Size [In cm^2]		P-Value
		58 – 80	>80	
Pain	Mean	88.54	83.62	0.627
	±SD	24.85	33.22	
Appearance	Mean	81.58	73.91	0.512
	±SD	28.25	39.51	
Speech	Mean	66.42	68.91	0.858
	±SD	36.98	35.88	
Shoulder	Mean	60.21	56.88	0.804
	±SD	34.51	39.15	

Table No.6: Stratification of TNM classification with functional outcomes n=42

Functional Outcomes		TNM Classification							P-Value
		Stage 0	Stage I	Stage II	Stage III	Stage IV A	Stage IV B	Stage IV C	
Pain	Mean	76.24	78.92	79.21	81.05	91.28	84.25	86.94	0.988
	±SD	30.11	28.59	29.36	33.34	38.51	35.25	33.14	
Appearance	Mean	61.21	65.86	68.69	71.28	79.01	70.25	72.83	0.983
	±SD	31.25	28.91	29.25	31.28	32.11	33.11	32.18	
Speech	Mean	58.45	65.61	68.58	62.36	74.25	61.28	66.21	0.987
	±SD	29.12	33.27	38.58	32.58	35.47	39.54	33.58	
Shoulder	Mean	53.20	57.44	54.17	55.92	68.18	58.19	57.55	0.982
	±SD	30.19	31.12	34.24	31.58	39.58	30.23	33.21	

DISCUSSION

The reconstructive ladder, which progresses from basic to more advanced approaches, is used in head and neck reconstructive surgery to pick the most pertinent reconstruction strategy to make up a tissue deficiency following tumour excision.[15] At the lower end of the spectrum, regional flaps have proven to be dependable and straightforward to harvest, making them an excellent choice for covering major tissue abnormalities in the head and neck area. The most frequent is the pedicled pectoralis major myocutaneous flap (PMMF).[16,17] PMMF is easily mobilized and can even reach the level of the skull base due to a rather lengthy pedicle that contains the thoracoacromial artery as the axial vessel. PMMF enables rebuilding right after resection via a single-stage surgery, which was previously not workable.[5,18]

In our study, mean age was 56.8±15.3 years. Sen S, et al reported mean age as 48.20±11.62[10] while Pradhan P, et al documented as 45±10.00 years.[13] The study of Wei W, et al noted mean age as 63.5 years.(19) In this study, 31 (73.8%) were male while 11 (26.2%) were female. Akhtar A, et al noted males 461 (76.8%) and females 139 (23.2%).[1]

The study of Sen S, et al found 22 (75.86%) males and 07 (24.14%) females[11] where Pradhan P, et al had 22 (73.3%) males and 08 (26.7%) females.[13]

Present study recorded mean pain score 85.7±25.3, mean appearance score 76.7±31.4, mean speech score 64.52±32.6 and mean shoulder score 58.1±34.09. Wei W, et al reported the mean score of different functional outcomes i.e. pain 91.4±15.9, appearance 87.4±20.1, speech 70.3±16.4 and shoulder 64.9±23.1.[18] Although many studies have examined the advantage of a flap to reduce the occurrence of pharyngocutaneous fistula, the impact of the type of flap on the primary endpoint of swallowing function has so far been understudied.

The pectoralis major myocutaneous flap is easily accessible, simple to harvest, and does not necessitate

the use of a microvascular surgeon.[19] Other benefits include shorter operating times, lower hospital expenses and resources, a low failure rate, and a plenty of tissue. PMMFs might also be kept on hand for postoperative problems.[20,21] However, using a PMMF has both cosmetic and functional implications, including a conspicuous lateral neck bulge, muscular contraction when denervation is not possible, breast distortion in women, and reduced range of motion in the ipsilateral neck and shoulder.

CONCLUSION

This study may help to generate local evidence as well as help the surgeon to appropriately choose the treatment option in order to improve functional outcomes and quality of life of patient. It is to be concluded that PMM flap has higher rate in shoulder score and speech score. Further large-scale work is recommended for validation of current findings.

Author's Contribution:

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REFERENCES

1. Akhtar A, Hussain I, Talha M, Shakeel M, Faisal M, Ameen M, et al. Prevalence and diagnostic of head and neck cancer in Pakistan. Pak J Pharm Sci 2016;29(5 Suppl):1839-46.
2. Kavownark A, Tantipasawasin SJCHJ-วโพซ. The Study of Skin Shrinkage in Pectoralis Major Myocutaneous Flap. Chonburi Hospital J-วารสาร โรง พยาบาล ชลบุรี 2020;45(2):125-32.
3. Abati S, Bramati C, Bondi S, Lissoni A, Trimarchi MJIjoer, health p. Oral cancer and precancer: A narrative review on the relevance of early diagnosis. Int J Environmental Research Public Health 2020;17(24):9160.
4. Meier JK, Spoerl S, Spanier G, Wunschel M, Gottsauner M, Schuderer J, et al. Alternatives to free flap surgery for maxillofacial reconstruction: focus on the submental island flap and the pectoralis major myocutaneous flap. BMC Oral Health 2021;21(1):1-8.
5. Bhattacharya S, Panuganti A, Thankappan K, Balasubramanian D, Iyer SJJoH, Physicians N, et al. Pectoralis major myocutaneous flap in females: Report of the technique and literature review. J Head Neck Physicians Surgeons 2021;9(2):159.
6. Anehosur V, Vadera H, Bhat A, Satyanarayana S, Kumar NJIJoO, Head, et al. Does Pectoralis Major Myocutaneous Flap Cause the Shoulder Morbidity: A Clinical Comparative Study. Ind J Otolaryngol Head Neck Surg 2020;11:1-7.
7. Neville J, Tilak M, Kumar JA, Mishra N, Singh AK, Sharma N, et al. Mango-shaped Bi-paddled pectoralis major myocutaneous flap reconstruction for large full-thickness defects post resection of squamous cell carcinoma of oral cavity: An analysis of 232 cases. National J Maxillofacial Surg 2022;13(2):216.
8. Sen S, Gajagowni J, Pandey J, Dasgupta P, Sahni A, Gupta S, et al. Effectiveness of pectoralis major myocutaneous flap in the surgical management of oral cancer: a retrospective study. J Stomatology, Oral Maxillofacial Surg 2019;120(1):21-7.
9. Pradhan P, Samal S, Preetam C, Samal DK, Parida PKJIJoO, Head, et al. Pectoralis major myocutaneous flap reconstruction for the mandibular defects in advanced oral cavity malignancies: a retrospective study of 30 cases. J Otolaryngol Head Neck Surg 2018;70(3):415-20.
10. Osman MH, Shaltout SE-DG, Elsers DA, Abbas HS, Shahine MSJTEJoHM. Assessment of the Pectoralis Major Myocutaneous Flap in Closure of Orofacial Defects After Excision of Oral Cancer. Egypt J Hospital Med 2022;89(2):6970-8.
11. Tripathi M, Parshad S, Karwasra RK, Singh V. Pectoralis major myocutaneous flap in head and neck reconstruction: An experience in 100 consecutive cases. National J Maxillofacial Surg 2015;6(1):37.
12. Lee T, Chung C, Chang Y, Kim J. Comparison of clinical and functional outcomes using pectoralis major and cutaneous free flaps for hypopharyngeal squamous cell carcinoma. Archives Plastic Surg 2015;42(05):608-13.
13. Deng L, Li Y, Li W, Liu M, Xu S, Peng H. Management of refractory cervical anastomotic fistula after esophagectomy using the pectoralis major myocutaneous flap. Brazilian J Otorhinolaryngol 2022;88:53-62.
14. Lyu X, Liu S, Zheng L, Huang M, Zhang J, Zhang J. A modified design of the pectoralis major myocutaneous flap for reconstruction of head and neck defect. J Craniofacial Surg 2021;32(5): 1762-4.
15. Chu YH, Lai WS, Lin YY, Liu SC, Lee JC. Pharyngeal reconstruction using a U-shaped pectoralis major myocutaneous flap: an effective

technique that should not be forgotten. Eur Archives of Oto-Rhino-Laryngol 2020;277:217-20.
16. Eguchi T, Kawaguchi K, Sato K, Hamada Y. Using indocyanine green angiography to achieve complete engraftment of pectoralis major myocutaneous flaps. Int J Oral Maxillofacial Surg 2023;52(5):539-42.
17. Sharma AP, Malik J, Monga S, Alam S, Rasool S, Agarwal D, Bahadur S. Analysis of the efficacy of the pectoralis major myocutaneous flap in reconstructive head and neck surgery. Acta Otorrinolaringologica (English Edition). 2022; 73(3):151-6.
18. Singh AK, JF N, Sharma NK, Anandkumar J, Mishra N, Pandey A. Bipaddled Pectoralis Major Myocutaneous Flap in Complex Oral Cancer Defects-A Single Center Experience with Quality of Life Assessment. Ind J Otolaryngol Head Neck Surg 2023;75(2):641-8.
19. Song MS, Lee SJ, Woo SH. Giant thyroid mass excision using energy device and pectoralis major myocutaneous flap reconstruction. Medical Lasers; Engineering, Basic Research, and Clinical Application 2021 30;10(2):115-9.
20. Singh SB, Narola SD, Zapadiya RR, Thakur A. Rahul kaushik, et al. Reconstruction of Composite and Complex Head and Neck Defect Post Supra Major Oncological Resection by using Bilateral Pectoralis Major Myocutaneous Flap. J Oncol Research Review Reports. SRC/JONRR Int J and Maxillofacial Surg 2022 (3).;165:2-4.
21. Liu S, Zhang S, Su Y-X, Zhou X, Gong Z, Wu HJIJoO, et al. Optimization of total tongue functional reconstruction with the sushi roll technique and its application in pectoralis major myocutaneous flaps. Int J Oral Maxillofacial Surg 2023;1.