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Comparing Pedicle and Free Flaps for Reconstruction of Defects in Head and Neck Neoplasm: An Assay for Quality of Life

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Abstract:

Introduction: Reconstruction surgery for head and neck cancers restore patients' function and appearance. Careful selection of flap for reconstruction of a defect after an ablative surgery can be a complex process and may affect on quality of life (QOL) of the patients. This study aimed to compare the quality of life between free and pedicle flap reconstruction groups in head and neck neoplasm patients.

Methods: This was a cross-sectional study of QOL in patients with head and neck neoplasm that attend follow-up clinics from July to September 2019. All patients that underwent reconstructive surgery with either pedicle or free flaps were included in the study. At least 6 month-time was elapsed from the reconstructive surgery. QOL of the patients was evaluated using Medical Outcomes Study Short Form (MOS SF-36) questionnaire. The patients' demographic data and medical history were collected using electronic patients' records.

Results: Seventy patients completed the questionnaire. Forty one (58.57%) patients underwent pedicle and 29 (41.43%) patients free flap reconstructive surgery. There was no significant difference between pedicle and free flap groups with regard to age, gender, radiotherapy or chemotherapy ($P>0.05$).

The present study indicates that there was no statistically significant difference between pedicle and free flap groups with regard to 8 domains of SF-36 questionnaire ($P>0.05$), neither was significant difference between two groups with regard to the physical or mental component summaries ($P>0.05$).

Conclusion: The present study on quality of life of head and neck neoplasm patients that had undergone pedicle or free flaps showed no significant difference between two groups.

Keywords:

Free Tissue Flaps; Surgical Flaps; Quality of Life; Head and Neck Neoplasms

Introduction:

Reconstructive surgery has substantially evolved in the last fifty years, along with the trend of using either free microvascular or pedicle flaps following ablative surgery for head and neck cancers. In 1963, the extended lateral forehead flap was introduced by Ian McGregor. Being the first reliable transposition flap, this was a turning point in reconstructive surgery (1). Subsequently, Ariyan introduced the pectoralis major myocutaneous flap (PMMF) in 1979 (2). The PMMF became the workhorse flap for reconstruction of head and neck defects in several medical centers and extensive research was conducted on the flap. Nevertheless, genuine concerns were raised regarding the reliability of PMMF for some defects. Step by step, free flaps (FF) and other regional pedicle flaps (PF), such as the submental island flap (SMIF) and the supraclavicular flap (SCAIF) were introduced as new options for reconstruction of defects.

The advent of microvascular surgery in 1970s has drastically changed the head and neck reconstruction surgery. The first successful free flap transfer in a human was performed by Taylor and Daniel in 1973 (3). FF reconstruction gradually achieved widespread popularity in managing large head and neck defects.

Flap selection is a highly complex process. The advantages and disadvantages of FF or PF are key issues in choosing the best option for reconstruction of a head and neck defect (4). In addition, the nature of the disease, patients' pre-operative conditions, and the available resources are of considerable importance in choosing entirely appropriate reconstructive option. Preferring one type of flap to the other to obtain the most satisfactory outcomes is still a controversial decision and a source of considerable debate in the literature.

A proper evaluation of the quality of life (QOL) gives valuable information regarding the physical, and the psychosocial well-being of patients and the substantial effects of the disease and its treatment on their health. Using different types of flaps for reconstruction of ablative defects of head and neck neoplasms always raise several important questions regarding key aspects of QOL. The impact of either microvascular flap or PF reconstruction techniques on patients' QOL, make it possible to select an informed choice for clinicians in the future. The present study aimed to compare the QOL between free and pedicle flap reconstruction groups in head and neck neoplasm patients.

Patients and methods:

This was a cross-sectional study of quality of life in patients with head and neck neoplasm attended to head and neck surgery follow-up clinics at Imam Khomeini Hospital Complex and Amir-Alam

Hospital, affiliated to Tehran University of Medical Science from July to September 2019. All patients with head and neck neoplasm who underwent reconstructive surgery with either pedicle or free flaps were included in the study. At least 6 month-time was passed from the reconstructive surgery. Patients have not had any recurrence or distant metastasis thus far. They did not have any other systemic disease or malignancy. The patients' demographic data and medical history were collected using electronic patients' records.

Quality of Life Questionnaire (QOL) is a written set of questions which is given to a large number of people in order to measure the quality of an individual's life across a wide range of particular areas of physical well-being and mental health. Quality of life of (QOL) the patients in the current study was evaluated using Study Short Form Health Survey (SF-36) questionnaire.

The SF-36 QOL questionnaire is comprised of 36 questions that fall into eight health domains: physical functioning (PF) includes 10 questions, role limitations due to physical health (RP) includes 4 questions, bodily pain (BP) includes 2 questions, role limitations due to emotional problems (RE) includes 3 questions, energy/ fatigue (E/F) or vitality (VT) includes 4 questions, Emotional well-being (EW) or mental health (MH) includes 5 questions, social functioning (SF) includes 2 questions, and general health (GH) includes 5 questions. Scores range from 0 (worst) to 100 (best) (5).

There are two clearly different concepts assessed by the SF-36: the Physical Component Summary (PCS), and the Mental Component Summary (MCS) (5). PCS is composed of four domains: PF, RP, BP, and GH. MCS includes the VT, SF, RE, and EW domains (5). The Persian version of SF-36 questionnaire has been validated for Iranian population (6).

Each question was scored separately according to the SF-36 questionnaire guidelines. Subsequently, each domain, PCS and MCS calculated according to SF-36 questionnaire guidelines, too.

Data analysis was performed in SPSS 21 using Student's T and Chi-Square tests. P-values of less than 0.05 were considered statistically significant.

The research protocol was approved by Tehran University of Medical Sciences Ethics Committee (ethics committee registration number: IR.TUMS. MEDICINE.REC.1399.093). All patients completed written informed consent before filling out the questionnaire.

Results:

Two hundred patients with head and neck neoplasm that underwent reconstructive surgery with either pedicle or free flap had been asked to fill out the questionnaire. Among them, 70 patients

completed the questionnaire. Forty one (58.57%) patients underwent pedicle flap reconstructive surgery and 29 (41.43%) patients free flap. Median age of the patients was 53.63 years (Range 18 - 82).

There was no statistically significant difference between pedicle and free flap groups with regard to age, gender, radiotherapy or chemotherapy (Table 1).

Table 1. Clinical Data Analyses of Head and Neck Neoplasm Patients who Underwent Pedicle and Free Flaps Reconstruction

Variables	Total no. of patients (%)	No. of patients (%)		
		Pedicle Flaps	Free Flaps	P Value
Age		56.68±14.71	47.24±15.54	0.012
<50 years	26 (37.14%)	12 (29.27%)	14 (48.28%)	0.105
>50 years	44 (62.86%)	29 (70.73%)	15 (51.72%)	
Gender				
Male	41 (58.57)	27 (65.85%)	14 (48.28%)	0.141
Female	29 (41.43%)	14 (34.15%)	15 (51.72%)	
Radiotherapy	54 (77.14%)	33 (61.11%)	21 (38.89%)	0.428
Chemotherapy	27 (38.57%)	15 (55.56%)	12 (44.46%)	0.685

The most common pathology was squamous cell carcinoma. The most common pedicle and free flap used for reconstruction were pectoralis major myocutaneous and fibula free flap respectively.

There was no statistically significant difference between pedicle and free flaps with regard to 8 domains of SF-36 questionnaire (Table 2).

Table 2. The 8 Medical Outcomes Study Short Form (MOS SF-36) Questionnaire Domains			
Domains	**Pedicle Flaps (N =41)**	**Free Flaps (N =29)**	**P Value**
	Mean± Standard Deviation	**Mean± Standard Deviation**	
Physical functioning	70.3627.09±	75.51±25.88	0.428
Role limitations due to physical health	59.75±42.52	68.10±36.53	0.395
Role limitations due to emotional problems	71.54±40.52	68.96±36.65	0.786
Energy/Fatigue	64.87±25.13	62.24±24.76	0.665
Emotional well-being	68.09±23.05	64.00±24.84	0.481
Social functioning	64.93±31.52	62.06±32.47	0.712
Pain	67.13±31.92	73.36±27.10	0.396
General health	57.80±22.61	60.51±23.35	0.627

Comparison of the physical and mental component summaries between pedicle and free flaps indicated no significant difference either (Table 3).

Table 3. The Physical and Mental Component Summaries			
Scales	**Pedicle Flaps (No. of patients =41)**	**Free Flaps (No. of patients =29)**	**P Value**
	Mean± Standard Deviation	**Mean± Standard Deviation**	
Physical Component Summary	255.06±108.21	277.50±99.93	0.381
Mental Component Summary	269.45±109.74	257.27±104.06	0.642

Discussion:

The field of head and neck reconstruction surgery has substantially improved over the past decades, although it is still a subject of considerable controversy. The primary goal of reconstructive surgery is to restore physical appearance and bodily function to preserve patient's quality of life (QOL).

Several different types of reconstructive options are available such as skin grafts, pedicle and microvascular flaps, etc. Choosing between free and pedicle flap is a complex process. There are some deciding factors to select choice between pedicle and free flap for reconstruction. QOL assessment in head neck cancer patients can provide valuable information to evaluate treatment options.

Several studies have been conducted comparing QOL between patients reconstructed with pedicle and free flaps (Table 4). The validated questionnaires used in previous studies were University of Washington Quality of Life Questionnaire (UW-QOL), 36- Item Short Form Survey (SF-36), European Organization for Research and Treatment of Cancer Quality of Life Questionnaire-Core 30-questions (EORTC QLQ-C30), and Quality of Life Questionnaire-Head and Neck 35-questions (QLQ-H&N35) (Table 4).

Table 4. Summary of Previous Studies Comparing Quality of Life between Pedicle and Free Flaps in Reconstruction of Defects in Head and Neck Cancer Patients

Study (Year)	No.	Primary tumor	Study groups		Questionnaire	Results
O'Neill et al(7) (2010)	114	Head and neck cancer	PMMF	RFFF	-	The group reconstructed with RFFF had better quality of speech.
Hsing et al(8) (2011)	100	Oral cavity cancer	PMMF	Free flap	UW-QOL	The group reconstructed with free flap had better speech, shoulder, and mood domains.
Xiao et al(9) (2013)	81	Oral cavity cancer	PMMF	ALTFF	MOS SF-36, UW-QOL	The group reconstructed with ALTFF had better appearance, and shoulder domains and role emotion domains.

Study (Year)	No.	Primary tumor	Study groups		Questionnaire	Results
Zhang et al(10) (2014)	86	Head and neck cancer	PMMF	ALTFF	UW-QOL	The group reconstructed with ALTFF had better shoulder but worse speech functions.
Zhang et al(11) (2015)	27	Tongue cancer	SCAIF	RFFF	-	There was no statistical significant difference in quality of speech between two groups.
Li et al(12) (2015)	56	Clinical T1-2 tongue carcinoma	IHF	RFFF	UW-QOL	The group reconstructed with IHF had significantly better shoulder function.
Li et al(13) (2016)	41	Tongue cancer	PMMF	RFFF	OHIP-14, UW-QOL	The group reconstructed with RFFF had better shoulder domains, but worse appearance domains.
Spiegel et al(14) (2019)	24	SCC of the oral cavity and oropharynx	SCAIF	RFFF	EORTC QLQ-C30, QLQ-H&N35	The group reconstructed with SCAIF had better speech domains and less problems with the senses.
Meier et al(15) (2019)	86	Oral SCC	LR	Free flaps	UW-QOL	The physical domains: swallowing, chewing, speech, taste, and pain were significantly better in the LR group.
Zhang et al(16) (2020)	83	SCC of tongue	SMIF	RFFF	UW-QOL	The RFFF reconstruction group had higher scores in the domains of activity and recreation.

SCC: squamous cell carcinoma; PMMF: pectoralis major myocutaneous flap; ALTFF: anterolateral thigh free flap; RFFF: radial forearm free flap; SCAIF: supraclavicular artery island flap; SMIF: submental island flap; IHF: infrahyoid myocutaneous flap; LR: local reconstruction; UW-QOL: University of Washington Quality of Life Questionnaire; MOS SF-36: Medical Outcomes Study-Short Form-36; OHIP-14: 14-item Oral Health Impact Profile; EORTC: European Organization for Research and Treatment of Cancer questionnaires; QLQ-C30:Quality of Life Questionnaire-Core 30-questions; QLQ-H&N35: Quality of Life Questionnaire-Core 30 Head and Neck 35-questions

UW-QOL was the most popular questionnaire that has been used in previous studies (8, 9, 10, 12, 13, 15, 16). Validated Persian version of UW-QOL is not yet available. EORTC QLQ-C30 and QLQ-H&N35 questionnaires were used together in one of previous studies (14). Persian version of QLQ-C30 questionnaire has been validated (17), but validated Persian version of QLQ-H&N35 is not yet available. The SF-36 questionnaire has been used in one study thus far (9).

Three studies using UW-QOL questionnaire, microvascular and PMMF scored similarly on global quality of life (8, 10, 13). The other 4 studies that compared pedicle with free flap patients using the same questionnaire did not indicate anything about global QOL (9, 12, 15, 16). Only one study indicates health related quality of life (HRQOL) was better in the local reconstruction group (15), although with the addition of mood and anxiety domains, using an overall composite score is not recommended anymore (18).

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A number of generic multidimensional HRQOL questionnaires are available such as Sickness Impact Profile 68 (SIP-68), and Medical Outcome Study Short Form 36 (SF-36) (19). Generic questionnaires are utilized to evaluate general well-being, and not QOL in a specific disease. SF-36 is used as a generic questionnaire in current study, because it is the most broadly used HRQOL questionnaire and its Persian version was validated too (6, 20).

A study by Xiao el al on QOL in oral cancer patients that underwent reconstructive surgery, used SF-36 questionnaire (9). The study revealed that there was no significant difference between the PMMF and anterolateral thigh free flap (ALTFF) groups with regard to physical functioning, role physical, pain, general health, energy/fatigue, social functioning and emotional well-being. However, the ALTFF group scores were higher than PMMF group with regard to role emotion domain (70.40±13.09 vs 65.59± 9.91, p=0.001) (9). The authors did not mention anything about the physical and mental component summaries (9).

The present study indicates that there was no statistically significant difference between pedicle and free flaps with regard to 8 domains of SF-36

questionnaire, neither was significant difference between two groups with regard to the physical or mental component summaries (Tables 2, 3).

The SF-36 Overall/ Global/Total Score, a global measure of HRQOL, has been growingly reported in the literature. Although several studies using the overall score were published in high-quality journals, its validity as a measure of total HRQOL has been questioned (21). Since the SF-36 total score is not a reliable measure, it is not calculated in the present study.

There are some shortcomings in the present study: First, although there are several head and neck cancer specific QOL questionnaires such as UW-QOL, QLQ-H&N35, QLQ-H&N43 (updated of QLQ-H&N35) (22), and Functional Assessment of Cancer Therapy-Head and Neck (FACT HN) (23), no validated Iranian versions were available. Second, the sample size was relatively small and may not have had sufficient power to find statistically significant results. Third, the study was not randomized.

Conclusions:

The present study on quality of life of head and neck neoplasm patients that had undergone pedicle or free flaps showed no significant difference between two groups. Data from this study provide useful information for surgeons during their decision-making for reconstruction modalities after head and neck ablative surgeries.

Questionnaires specific to QOL in head and neck cancer patients might provide more useful and relevant information regarding each post-operative physical and mental features such as appearance, swallowing, anxiety, etc. The detailed information could be invaluable for selecting better choice between reconstruction flaps.

Authors' Contributions:

MJ and HS designed the study and drafted the manuscript. MM, STH and EK helped in manuscript drafting and analysis as well as acquisition of data. All authors have approved the final version of manuscript.

Conflict of Interest Disclosures:

There are no conflicts of interest in terms of the present manuscript.

Ethical approval/Consideration:

The research protocol was approved by Tehran University of Medical Sciences Ethics Committee (Ref. No: IR.TUMS.MEDICINE.REC.1399.093).

References:

1. McGregor IA. The temporal flap in intra-oral cancer: its use in repairing the post-excisional defect. British Journal of Plastic Surgery. 1963 Jan 1;16:318-35.

2. Ariyan S. The pectoralis major myocutaneous flap. Plast Reconstr Surg. 1979;63(1):73-81.

3. Daniel RK, Taylor GI. Distant transfer of an island flap by microvascular anastomoses. Plastic and reconstructive surgery. 1973 Aug 1;52(2):111-7.

4. Gabrysz-Forget F, Tabet P, Rahal A, Bissada E, Christopoulos A, Ayad T. Free versus pedicled flaps for reconstruction of head and neck cancer defects: a systematic review. Journal of Otolaryngology-Head & Neck Surgery. 2019 Dec;48(1):13.

5. McHorney CA, Ware Jr JE, Raczek AE. The MOS 36-Item Short-Form Health Survey (SF-36): II. Psychometric and clinical tests of validity in measuring physical and mental health constructs. Medical care. 1993 Mar 1:247-63.

6. Montazeri A, Goshtasebi A, Vahdaninia M, Gandek B. The Short Form Health Survey (SF-36): translation and validation study of the Iranian version. Quality of life research. 2005 Apr 1;14(3):875-82.

7. O'Neill JP, Shine N, Eadie PA, Beausang E, Timon C. Free tissue transfer versus pedicled flap reconstruction of head and neck malignancy defects. Irish journal of medical science. 2010 Sep 1;179(3):337-43.

8. Hsing CY, Wong YK, Wang CP, Wang CC, Jiang RS, Chen FJ, Liu SA. Comparison between free flap and pectoralis major pedicled flap for reconstruction in oral cavity cancer patients–a quality of life analysis. Oral oncology. 2011 Jun 1;47(6):522-7.

9. Xiao Y, Zhu J, Cai X, Wang J, Liu F, Wang H. Comparison between anterolateral thigh perforator free flaps and pectoralis major pedicled flap for reconstruction in oral cancer patients-A quality of life analysis. Medicina oral, patologia oral y cirugia bucal. 2013 Nov;18(6):e856.

10. Zhang X, Li MJ, Fang QG, Sun CF. A comparison between the pectoralis major myocutaneous flap and the free anterolateral thigh perforator flap for reconstruction in head and neck cancer patients: assessment of the quality of life. Journal of Craniofacial Surgery. 2014 May 1;25(3):868-71.

11. Zhang S, Chen W, Cao G, Dong Z. Pedicled supraclavicular artery island flap versus free radial forearm flap for tongue reconstruction following hemiglossectomy. Journal of Craniofacial Surgery. 2015 Sep 1;26(6):e527-30.

12. Li P, Fang Q, Luo R, Zhao M, Liu S, Du W, et al. Infrahyoid Myocutaneous Flap Versus Radial Forearm Free Flap in Treating Patients with cT1-2 Tongue Carcinoma. Journal of Hard Tissue Biology. 2015 07/16;24:285-8.

13. Li W, Zhang P, Li R, Liu Y, Kan Q. Radial free forearm flap versus pectoralis major pedicled flap for reconstruction in patients with tongue cancer: assessment of quality of life. Medicina oral, patologia oral y cirugia bucal. 2016 Nov;21(6):e737.

14. Spiegel JL, Pilavakis Y, Weiss BG, Canis M, Welz C. Quality of life in patients after reconstruction with the supraclavicular artery island flap (SCAIF) versus the radial free forearm flap (RFFF). European Archives of Oto-Rhino-Laryngology. 2019 Aug 1;276(8):2311-8.

15. Meier JK, Schuderer JG, Zeman F, Klingelhöffer C, Hullmann M, Spanier G, Reichert TE, Ettl T. Health-related quality of life: a retrospective study on local vs. microvascular reconstruction in patients with oral cancer. BMC oral health. 2019 Dec 1;19(1):62.

16. Zhang J, Wang Y, Han X, Chen H. Comparison of clinical results and quality of life in tongue cancer patients undergoing submental island flap and radial forearm free flap. Journal of Oral and Maxillofacial Surgery. 2020 May 8.

17. Montazeri A, Harirchi I, Vahdani M, Khaleghi F, Jarvandi S, Ebrahimi M, Haji-Mahmoodi M. The European Organization for Research and Treatment of Cancer Quality of Life Questionnaire (EORTC QLQ-C30): translation and validation study of the Iranian version. Supportive Care in Cancer. 1999 Oct 1;7(6):400-6.

18. Rogers SN, Lowe D, Yueh B, Weymuller Jr EA. The physical function and social-emotional function subscales of the University of Washington Quality of Life Questionnaire. Archives of Otolaryngology–Head & Neck Surgery. 2010 Apr 19;136(4):352-7.

19. Hacking HG, Post MW, Schepers VP, Visser-Meily JA, Lindeman E. A comparison of 3 generic health status questionnaires among stroke patients. Journal of Stroke and Cerebrovascular Diseases. 2006 Nov 1;15(6):235-40.

20. Khadka A, Liu Y, Li J, Zhu S, Luo E, Feng G, Hu J. Changes in quality of life after orthognathic surgery: a comparison based on the involvement of the occlusion. Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontology. 2011 Dec 1;112(6):719-25.

21. Lins L, Carvalho FM. SF-36 total score as a single measure of health-related quality of life: Scoping review. SAGE open medicine. 2016 Sep 30;4:2050312116671725.

22. Singer S, Araújo C, Arraras JI, Baumann I, Boehm A, Brokstad Herlofson B, Castro Silva J, Chie WC, Fisher S, Guntinas–Lichius O, Hammerlid E. Measuring quality of life in patients with head and neck cancer: Update of the EORTC QLQ-H&N Module, Phase III. Head & neck. 2015 Sep;37(9):1358-67.

23. List MA, D'Antonio LL, Cella DF, Siston A, Mumby P, Haraf D, Vokes E. The performance status scale for head and neck cancer patients and the functional assessment of cancer therapy□head and neck scale: a study of utility and validity. Cancer: Interdisciplinary International Journal of the American Cancer Society. 1996 Jun 1;77(11):2294-301.