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Original Article

Comparison of quality-of-life in tongue cancer patients undergoing tongue reconstruction with lateral upper arm free flap and radial forearm free flap

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Abstract: Surgery entails radical resection, neck dissection and tongue reconstruction has been commonly used in treatment of T2 and T3 tongue squamous cell carcinoma. Although lateral upper arm free flap (LUFF) and radial forearm free flap (RFFF) are similar in texture and thickness, significant differences can be noticed in the donor-site function and surgical demands. In the treatment of T2 and T3 tongue cancer, the choice of either LUFF or RFFF is still not defined.We aim to investigatethe long-term QOL of patients with moderate tongue defect and reconstruction with LUFF or RFFF, based on which to provide clinical suggestion for tongue reconstructions.Sixty-five patients (T2 or T3 stage, 42 underwent tongue reconstruction with RFFF and 23 with LUFF) treated at the Department of Oral and Maxillofacial Surgery, Hospital of Stomatology, Sun Yat-Sen University from January 2005 to June 2009 were included. The QOL of each patient was determined using the questionnaire designed based on the University of Washington Quality-of-Life (UW-QOL, version 4). The questionnaire was accomplished by a qualified medical staff blinded to the study after telephone communication with each patient. Statistical analysis showed that no significant difference was noticed in the long-term QOL of patients with tongue cancer after tongue reconstruction using LUFF or RFFF, respectively, indicating that similar QOLs were obtained in the long-term follow-up of patients with tongue cancer (T2 or T3 stages) using LUFF and RFFF for reconstruction.

Keywords: Quality-of-life, lateral upper arm free flap, radial forearm free flap, tongue reconstruction, tongue cancer, UW-QOL

Introduction

Tongue cancer, a common malignancy in oral cavity, presents a major public health problem worldwide, especially these with smoking habits [1]. Surgery is preferred in clinical practice, which entails radical tumor resection, neck dissection and tongue reconstruction [2, 3]. Primary closure is recommended for the repairing of small-size lesion in oral cavity [4]. However, reconstruction using flaps are needed for the moderate tongue defects [5].

The resection site and the flaps used for reconstruction are closely associated with soft tissue impairments after surgery in oral cavity [6]. Two microvascular free-flaps, named lateral upper arm free flap (LUFF) and radial forearm free flap (RFFF), have been used in tongue reconstruction [7-9]. Although these two flaps are similar in texture and thickness, significant differences have been noticed in the donor-site function and surgical demands. Therefore, the choice of either LUFF or RFFF is still not well defined. In a previous study, Hara et al compared the swallowing function of 23 patients undergoing tongue reconstruction using LUFF or RFFF, respectively. Their results indicated the type of flaps showed no effects on the swallowing function [2]. Nevertheless, when taking speech function and morbidity into consideration, the efficiency of LUFF was superior to RFFF as primary closure and low donor site morbidity were noticed [10]. This leads us to investigate the potential benefits and disadvantages of LUFF and RFFF with larger patient cohort and long-term evaluation.

In this study, we evaluated the long-term QOL in patients with tongue cancer (T2 or T3 stages)

Table 1. Comparison of age and postoperative duration in LUFF group and RFFF group

	Group		t	*P* value
	A	B		
Age	47.09 ± 11.309	41.08 ± 7.974	1.682	0.102
Postoperative duration	40.09 ± 19.13	34.54 ± 8.02	1.195	0.241

SD, standard deviation; Group A, those received tongue reconstruction using RFFF; Group B, those received tongue reconstruction using LUFF; LUFF, lateral upper arm free flap; RFFF, radial forearm free flap.

Table 2. Comparison of gender and tumor stage in LUFF group and RFFF group

	Group		χ^2	*P* value
	A	B		
Male				
Male	24	13	0.0022	0.961
Female	18	10		
Tumor stage				
T2 stage	26	13	0.179	0.672
T3 stage	16	10		

undergoing reconstruction with microvascularized LUFF or RFFF, based on which to present which flap is more effective in the improvement of QOL. Our results indicated no statistical difference was noticed in the QOL of patients with tongue cancer after tongue reconstruction using LUFF or RFFF, respectively.

Materials and methods

Patients

The study population was treated at the Department of Oral and Maxillofacial Surgery, Hospital of Stomatology, Sun Yat-Sen University from January 2005 to June 2009. The inclusion criteria were as follows: (i) those diagnosed with squamous cell carcinoma of tongue; (ii) those with restriction of tongue cancer to T2 or T3 stage; (iii) those received reconstruction of tumor-site using LUFF or RFFF, combined with radical resection and neck dissection; and (iv) those with no local relapse and metastasis. Written informed consents were obtained from each patient. The study protocols were approved by the Ethical Committee of Hospital of Stomatology, Sun Yat-Sen University.

Sixty-five patients were included in this retrospective analysis. Among these patients, 42 were divided into group A, which were subject to tongue reconstruction using RFFF; and 23 were divided into group B, which were subject to tongue reconstruction using LUFF (**Tables 1** and **2**).

Clinical examination

The design of the questionnaire was based on the University of Washington Quality-of-Life (UW-QOL, version 4). The questionnaire was accomplished by a qualified medical staff blinded to the study after telephone communication with each patient.

Statistical analysis

The continuous variables were presented as mean ± standard deviation. SPSS 13.0 software was used for the data analysis. Data normally distributed were analyzed using student't test. Chi square test was performed for the frequency analysis. Spearman correlation analysis was used to evaluate the association between demographic data and the UW-QOL scores. $P < 0.05$ demonstrated statistical difference.

Results

Demographic information

Tables 1 and **2** summarized the demographic information of the patients. No statistical difference was noticed in the age, gender, postoperative lapse, and tumor stages.

Validity and reliability of UW-QOL questionnaire

For the validity analysis, pain was not related to the total QOL score (Pearson correlation coefficient, 0.193; $P = 0.267$). Other variables were well related tototal score, including disfigurement, activity, recreation/entertainment, swallowing, chewing, speech, shoulder disability, tasting, saliva, mood, anxiety, health-related QOL compared with the month before reconstruction, health-related QOL during the past 7 days, and overall QOL during the past 7 days (**Table 3**), indicating that the construct validity was satisfactory. Cronbach's alpha was calculated to determine the reliability of the ques-

Table 3. Correlation between each domain and the total score in the UW-QOL questionnaire

	Pearson correlation coefficient	*P* value
Pain	0.193	0.267
Disfigurement	0.365	0.031
Activity	0.639	0.000
Recreation	0.425	0.011
Swallowing	0.630	0.000
Chewing	0.639	0.000
Speech	0.480	0.004
Shoulder disability	0.447	0.007
Tasting	0.604	0.000
Saliva	0.496	0.002
Mood	0.491	0.003
Anxiety	0.591	0.000
Health-related QOL compared with the month before reconstruction	0.358	0.035
Health-related QOL during the past 7 days	0.500	0.002
Overall QOL during the past 7 days	0.553	0.001

UW-QOL, University of Washington Quality-of-Life; QOL, Quality-of-Life.

Table 4. Regression analysis between total QOL score and age, gender, postoperative duration and tumor stage

	Group A				Group B			
	β	SE	t	*P* value	β	SE	t	*P* value
Age	-3.853	1.963	-1.963	0.066	4.059	6.714	0.605	0.562
Gender	73.851	43.503	1.698	0.108	-49.149	99.460	-0.494	0.634
Postoperative duration	2.243	1.107	2.026	0.059	14.534	7.190	2.021	0.078
Tumor stage	-15.890	29.108	-0.546	0.592	-60.752	94.186	-0.645	0.537

SE, standard error.

Table 5. Comparison of postoperative QOL

	Group		t	*P* value
	A	B		
Pain	93.18 ± 11.39	94.23 ± 10.96	-0.267	0.791
Disfigurement	75.00 ± 13.36	82.69 ± 15.76	-1.540	0.133
Activity	76.14 ± 18.06	84.62 ± 16.26	-1.391	0.174
Recreation	79.55 ± 19.88	80.77 ± 14.99	-0.192	0.849
Swallowing	80.45 ± 18.64	88.46 ± 15.19	-1.311	0.199
Chewing	72.73 ± 29.79	76.92 ± 25.94	-0.422	0.676
Speech	76.82 ± 12.87	80.77 ± 21.39	-0.685	0.498
Shoulder disability	69.09 ± 15.40	68.46 ± 20.35	0.104	0.918
Tasting	82.73 ± 22.29	78.46 ± 20.75	0.561	0.579
Saliva	88.64 ± 18.85	87.69 ± 21.66	0.135	0.893
Mood	94.32 ± 10.72	92.31 ± 15.76	0.449	0.656
Anxiety	90.45 ± 14.30	90.77 ± 14.41	-0.063	0.950
Health-related QOL compared with the month before reconstruction	60.23 ± 35.07	63.46 ± 28.17	-0.286	0.779
Health-related QOL during the past 7 days	80.00 ± 12.34	72.31 ± 25.21	0.004	0.319
Overall QOL during the past 7 days	83.64 ± 11.77	83.08 ± 21.36	0.320	0.921
Total	1202.95 ± 112.76	1225.00 ± 111.76	0.039	0.692

tionnaire. The calculated alpha value was 0.785, demonstrating the reliability of the questionnaire was excellent.

Association between the demographic information and QOL

In this study, regression analysis was performed to investigate the correlation between the demographic information and the QOL. No statistical difference was noticed between the postoperative QOL and the demographic information, including age, gender, postoperative lapse, and tumor stages (**Table 4**).

Comparison of QOL in LUFF group and RFFF group

Table 5 summarized the total score of patients. Compared with the LUFF group, no statistical difference was noticed in the pain (P = 0.791), disfigurement (P = 0.133), activity (P = 0.174), recreation/entertainment (P = 0.849), swallowing (P = 0.199), chewing (P = 0.676), speech (P = 0.498), shoulder disability (P = 0.918), tasting (P = 0.579), saliva (P = 0.893), mood (P = 0.656), anxiety (P = 0.950), health-related QOL compared with the month before reconstruction (P = 0.779), health-related QOL during the past 7 days (P = 0.319), and overall QOL during the past 7 days (P = 0.921) of the RFFF group. This demonstrated that reconstruction using LUFF or RFFF showed no difference in the long-term QOL of this cohort.

Discussions

In this study, two groups were similar in the demographic data, and no statistical difference was identified in the long-term QOL in LUFF group and RFFF group, indicating that in cases of moderate tongue defects, the efficiency of reconstruction with LUFF and RFFF was similar. This long-term follow up study could provide appropriate guidance for tongue reconstruction using LUFF or RFFF.

This study showed no statistical difference between QOL and the demographic information, including age, gender, postoperative lapse, and tumor stages. The major concern of tongue reconstruction is recovery of swallowing and speech function [11]. Besides, other concerns are presented by a certain population such as time of returning to work and appearance [12]. Compared with aged population, quicker and better healingwas achieved in young patients after surgery, butharsh demands to the time of returning to work and appearance of wound were requested by these patients. To some extent, this may explain the fact thatno statistical difference was noticed in the QOL between the young patients and the aged population.

In tongue reconstructions, too much free tissue transfer (FTT) may induce clumsy profile of the tongue, while less FTT may impair the recovery of tongue function [13]. All these could affect the function of tongue after reconstruction. Therefore, the defect and tissue mass should be taken together into consideration prior to establishing reconstruction strategies. Fortongue defect less than 1/3 in size, direct suturing would be appropriate without destroying the oral cavity function [12]. For large defects (e.g. total ectomy or subtotal ectomy), flaps provided more bulk are needed for reconstruction, such as pectoralis major myocutaneous pedicled flap and anterolateral thigh flap [14-16]. In this study, for the patients with tongue cancer, tumor stages (T2 or T3) were not correlated with the QOL of patients. Thus, we concluded that these flaps were suitable for the reconstruction of moderate tongue defects in patients with T2 to T3 tongue cancer.

A common concern in the reconstruction of tongue using free flaps is the fat necrosis [17]. In our previous experiences, the risk factors of fat necrosis in pectoralis major myocutaneous flapsincluded obesity, subcutaneous tissues dissection using electrotome, and designing of skin island beyond the seventh costal cartilage [18]. To our knowledge, the fat content in female was comparatively higher than the male counterpart (17-25 % vs 14-20 %) [19]. Therefore, we speculate the fat content in these flaps were comparatively higher in female compared with those inmale patients. Nevertheless, compared with the pectoralis major myocutaneous flaps, the content of the fat in the LUFF and RFF was much lower and no fat necrosis was identified in these patients during the follow up. This may explain the non-correlation between the postoperative QOL and the gender of patients.

In our previous studies, we investigated the clinical efficiency of tongue reconstruction with LUFF and RFFF, respectively [20]. Short-term outcomes were satisfactory in the postoperative appearance, speech and swallowing of

these patients. However, long-term outcomes are still not well defined. In this study, no correlation was identified between postoperative duration and QOL during the 5-9 years follow up. This indicated the QOL was stabilized. We speculated that this may be associated with the fact that the patients have passed the stage of wound healing, psychological adaption, flap atrophy and the "5-high relapse risk-years", and reached a safer and more analyzable stage. Also, this confirmed the necessity and clinical significance of the QOL analysis in this long-term stagy.

In a previous study, Hara et al evaluated the swallowing function after intraoral soft tissue reconstruction using RFFF and LUFF [2]. They concluded that the resection site rather than the type of flaps, affected the swallowing function. However, LUFF was recommended as it showedless donor-site morbidity [8]. In this study, besides swallowing function, we evaluated the other domains of QOL according to the UW-QOL. Total QOL scores and the score of each domain were similar in the patients of both groups, indicating that RFFF and LUFF showed no difference in the QOL of patients with T2 or T3 tongue cancer. Nowadays, we have been focusing on a study with larger cohort of patients to evaluate the long-term QOL, and at the same time, objective evaluations of speech and swallowing function are carried out in these patients.

In conclusion, similar QOL was obtained in the 5-9 years follow up of patients with tongue cancer (T2 or T3 stages) using LUFF and RFFF for reconstruction. LUFF and RFFF showed various features in the donor-site morbidity and surgical demands. Considering less donor-site morbidity with satisfactory primary closure, we are apt to recommend LUFF for the tongue reconstruction for patients with moderate tongue defect.

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Disclosure of conflict of interest

None.

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