Original

Infrahyoid Myocutaneous Flap Versus Radial Forearm Free Flap in Treating Patients with cT1-2 Tongue Carcinoma

Peng Li^{1,2)}, Qigen Fang²⁾, Ruihua Luo²⁾, Ming Zhao²⁾, Shantin Liu²⁾, Wei Du²⁾, Jinxing Qi²⁾ and Weihua Lou¹⁾

¹⁾ Department of Otorhinolaryngology Head and Neck Surgery, The First Affiliated Hospital of Zhengzhou University, Henan, China

²⁾ Department of Head Neck and Thyroid Surgery, The Affiliated Tumor Hospital of Zhengzhou University, Henan, China

(Accepted for publication, June 23, 2015)

Abstract: Our goal was to compare clinical and functional results of the infrahyoid myocutaneous flap (IMF) with those of the radial forearm free flap (RFFF) for partial tongue reconstruction. Between January 2005 and June 2012, patients who had received an IMF or a RFFF reconstruction for cT1-2 tongue carcinoma were included, their medical records were reviewed, and they were asked to complete the University of Washington Quality of Life (UW-QoL) version 4 questionnaire at least 12 months postoperatively. Compared to patients with a RFFF reconstruction, patients treated with an IMF had significantly shorter operation time ($p < 0.001$), less hospital cost ($p < 0.001$) and shorter postoperative stay ($p < 0.001$). There were no apparent differences in other scales between the two groups. The mean composite score for the two groups was 88.4 (SD: 14.9) and 86.4 (SD: 15.3), respectively, the finding was not significant ($p = 0.784$). Patients with an IMF reconstruction had significantly better shoulder function, there were no significant differences regarding other domains between the two groups. Compared to RFFF, IMF was a reliable procedure for partial tongue reconstruction.

Key words: Quality of life, Infrahyoid myocutaneous flap, Radial forearm flap, Tongue reconstruction

Introduction

Tongue carcinomas are the most common malignancy in oral cavity¹⁾, these lesions severely affect patients' quality of life and pose significant threat to their lives. Generally, complete and extensive resection is a reliable and current method to improve local control of the diseases, and the surgeon also cares about the postoperative functional results such as speech, swallowing and so on. Since the infrahyoid myocutaneous flap (IMF) was first introduced by Wang et al.²⁾, it has been widely used in reconstruction of small- and medium-sized defects of the oral cavity³⁻⁷⁾. Nowadays, due to advancements of microvascular surgery, free flap, especially radial forearm free flap (RFFF) has been the preferred method for soft tissue reconstruction⁸⁾. Thus, are there significant differences between the two procedures? Few reports to date are available, therefore, our goal was to compare clinical and functional results of the IMF with those of the RFFF for tongue reconstruction.

Materials and Methods

The Zhengzhou University institutional research committee

Correspondence to: Dr Weihua Lou, Department of Otorhinolaryngology Head and Neck Surgery, The First Affiliated Hospital of Zhengzhou University, Zhengzhou, Henan, China; Tel: 86 18838081528; Fax: 86 18638588830; Email: lipeng1528@163.com

approved our study, and all participants signed an informed consent agreement.

We retrospectively reviewed medical records from January 2005 to June 2012 in the Department of Head and Neck & Thyroid Surgery, the Affiliated Cancer Hospital of Zhengzhou University. Enrolled patients were required to meet the following criteria: the primary diagnosis was cT1-2 tongue carcinoma according to UICC 2002 classification; no preoperative surgical or radiation treatments; IMF or RFFF was used for tongue reconstruction; no previous history of cancer, and no impairments in communication; follow-up duration longer than 12 months. These patients were divided into two groups: in group A, all patients received an IMF reconstruction; in group B, all patients were treated with a RFFF. The medical records of included patients were reviewed, and furthermore they were asked to complete the University of Washington Quality of Life (UW-QoL) version 4 questionnaire. All these patients underwent primary tumour resection and unilateral selective neck dissection (SND).

The harvest of a RFFF was performed according to previous description⁹⁾. Simultaneous flap elevation and recipient site surgery were performed to shorten the total operation time. The donor site was closed using a split thickness skin graft.

The harvest of an IMF was performed based on previous studies²⁻⁷⁾. The IMF was elevated from caudal to cephalad. To

Table 1. Characteristics of Patients who had Returned the Questionnaire

	Group A (n=18)	Group B (n=38)	p
Age (years)	53.3 (45-61)	52.5 (33-65)	0.799
Sex			
Male	12	22	0.530
Female	6	16	
Tumor stage			
T1	0	4	0.294
T2	18	34	
TNM stage			
I	0	4	0.294
II	18	34	
Flap size (cm ²)	55 (36-108)	60 (35-120)	0.873
Flap total survival rate	94.4%	100%	0.321
Wound infection	0	0	-
Postoperative radiation	2	5	1.000
Operation time			
≤ 80 minutes	15	7	<0.001
> 180 minutes	3	31	
Hospital cost (RMB)	24,000	41,000	<0.001
Postoperative stay (days)	9.3	12.7	<0.001

promise adequate blood supply, the main trunk and anterior branch of the superior thyroid artery were kept with the flap, and the posterior branch was selectively tied. Careful attention should be taken for identifying and preserve all the veins in the direction of the internal jugular vein. The descending branch of the hypoglossal nerve was preserved to improve postoperative function.

The UW-QoL scale consisted of 12 single-question domains that had between 3 and 6 response options, scaled evenly from 0 (worst) to 100 (best). The domains were pain, appearance, activity, recreation, swallowing, chewing, speech, shoulder, taste, saliva, mood and anxiety. The individual domains were scored according to the UW-QoL guidelines.

The chi-square test and student *t* test were used to assess the general variables, the nonparametric Mann-Whitney test was used to evaluate the UW-QoL scores, and all statistic analyses were performed using SPSS 13.0. A *p*<0.05 was considered significant.

Results

Finally 56 (87.5%) of 64 patients completed the questionnaire, their detail information was described in Table 1. No neck node metastasis was found pathologically. Compared to patients with a RFFF reconstruction, patients treated with an IMF had significantly shorter operation time (*p*<0.001), less hospital cost (*p*<0.001) and shorter postoperative stay (*p*<0.001). There were no apparent differences in other scales between the two groups.

As Table 2 presented, the mean composite score for the two

groups was 88.4 (SD: 14.9) and 86.4 (SD: 15.3), respectively, the finding was not significant (*p*=0.784). Patients in group A had significantly better shoulder function, there were no significant differences regarding other domains between the two groups.

Discussion

In current study, flap size did not differ significantly between the two groups, but a similar study by Deganello et al.⁵⁾ presented a larger skin paddle surface in patients with RFFFs. The difference could be explained by that we just focused on cT1-2 lesions. Furthermore, the finding supported that the IMF might be suitable for small- and middle-size defects^{3,4)}.

We observed that free flap reconstructions required longer operative times. Similar findings have also been reported by Hsing et al.⁹⁾ and Mallet et al.¹⁰⁾. Chepeha et al.¹¹⁾ demonstrated that patients undergoing pedicled flap reconstructions had longer hospital stays than patients receiving free flaps. Similarly, de Bree et al.¹²⁾ reported that compared with the pedicle flap group, mean hospital stay was significantly shorter in the free flap group (24 vs 28 days, *P*=0.005). However, we found that postoperative hospital stays were significantly longer in the free flap group. Several factors may account for this difference. First, the complication rate of our pedicle flaps was lower than in the aforementioned studies. Furthermore, our definition of duration was different, as we only calculated the length of the postoperative hospital stay. Finally, we only included patients with cT1-2 tongue cancers, early stage lesions had a relatively low incidence of complication, but the

Table 2. Comparison of Outcomes of Quality of Life between the Two Groups

Domains	Group A (n=18)	Group B (n=38)	p
Pain	94.4(SD: 11.0)	93.4(SD:11.3)	0.819
Appearance	80.6(SD: 20.8)	76.3(SD: 19.5)	0.582
Activity	94.4(SD: 11.0)	90.8(SD: 12.4)	0.447
Recreation	83.3(SD: 17.7)	86.8(SD: 15.3)	0.620
Swallowing	93.3(SD: 13.2)	92.1(SD: 13.6)	0.819
Chewing	94.4(SD: 16.7)	89.5(SD: 20.9)	0.529
Speech	86.7(SD: 15.8)	84.2(SD: 15.4)	0.691
Shoulder	96.7(SD: 10.0)	84.2(SD: 15.4)	0.039
Taste	86.7(SD: 15.8)	89.0(SD: 14.9)	0.706
Saliva	90.0(SD: 15.0)	87.4(SD: 15.2)	0.663
Mood	80.6(SD: 24.3)	79.0(SD: 22.5)	0.764
Anxiety	80.0(SD: 15.0)	84.2(SD: 15.4)	0.491

other studies included patients who underwent a second extirpation as well as those whose primary cancer originated from sites other than the oral cavity.

De Bree *et al.*⁽¹²⁾ reported that mean surgical costs were significantly higher for patients reconstructed with a free flap instead of a pedicle flap but that in the postoperative period, mean hospital costs were lower. Fattabi *et al.*⁽¹³⁾ found that direct surgical fees and total hospital charges were higher for a microvascular reconstruction than a pedicle flap reconstruction. In the present study, we also noted that free flap reconstructions were associated with higher total hospital costs. However, health care systems and economic conditions might differ among these studies. In our cancer center, patients with oral cancers often came from low income family and had no medical insurance, a high hospital cost was a great burden for these patients.

Successful surgical treatments should not only resect the tumor completely but also achieve wonderfully functional rehabilitation, thus, quality of life (QoL) was increasingly becoming an important assessment of outcome in oncological research⁽¹⁴⁾. The UW-QoL questionnaire has some advantages: it is multi-factorial, allowing sufficient detail to identify subtle change; it is brief and self-administered; it could reflect the QoL as indicated by the patient due to allowing no input from the health provider; it provides questions specific to head and neck cancer. The scale has been proven to be characterized by high validity and reliability⁽¹⁵⁾.

Good speech and swallowing capacity was the principle of tongue reconstruction. Windfuhr *et al.*⁽⁶⁾ described maintenance of solid food and swallowing without reclination of the head was possible for all patients with IMF. Similarly, Ouyang *et al.*⁽⁷⁾ presented their experience of IMF reconstruction and reported all the patients achieved satisfactory function rehabilitation. In current study, we also noted patients in the IMF group had good speech and swallowing capacity, and it was consistent with the outcome of the RFFF group. Furthermore, the finding was confirmed by an objective measurement. Deganello *et al.*⁽⁵⁾ found no significant

differences were found with regard to verbal intelligibility and diet scores between patients with IMF and RFFF. Joo *et al.*⁽¹⁶⁾ presented postoperative flap volume changes were significantly correlated with swallowing and speech outcomes in patients underwent partial glossectomy. Unfortunately tissue atrophy was inevitable after the denervated flap was transferred, such as RFFF. But in our IMF designation, we preserved the motor innervations of the infrahyoid muscles provided by the ansa cervicalis, it could prevent atrophy of the reconstructed tongue. Therefore, we reputed that long term functional results might be better in patients with IMF.

Patients with an IMF reconstruction had significantly better shoulder function. Possible causes might be the neck dissection and the RFFF harvest. But the effect of SND on shoulder function remained unclear, Kuntz *et al.*⁽¹⁷⁾ found that the SND group reported near normal shoulder function at both 6 and 12 months. Teymoortash *et al.*⁽¹⁸⁾ claimed SND of different dimensions and neck levels showed low incidence of surgical complication and acceptable functional and aesthetic results. Therefore, the negative effect on shoulder function of SND was limited. Previous authors had described RFFF had a significant deleterious effect on upper extremity function by a prospective design⁽¹⁹⁾.

Some shortcomings existed in our research. First, it was retrospective so selection bias could not be avoided. Second, only 56 patients were enrolled in this study; in order to generate more conclusive results a larger group of patients need to be studied.

In summary, compared with the RFFF group, infrahyoid myocutaneous flap reconstruction required shorter surgical time and postoperative hospitals stays, and lower hospital costs, and could achieve good speech and swallowing capacity, and better shoulder function. Infrahyoid myocutaneous flap was a reliable procedure for partial tongue reconstruction.

References

1. Fang QG, Shi S, Liu FY and Sun CF. Tongue squamous cell

- carcinoma as a possible distinct entity in patients under 40 years old: a distinct entity? *Oncol Lett* 7: 2099-2102, 2014
2. Wang HS, Shen JW, Ma DB, Wang JD and Tian AL. The infrahyoid myocutaneous flap for reconstruction after resection of head and neck cancer. *Cancer* 57: 663-668, 1986
3. Zhao YF, Zhang WF and Zhao JH. Reconstruction of intraoral defects after cancer surgery using cervical pedicle flaps. *J Oral Maxillofac Surg* 59: 1142-1146, 2001
4. Tincani AJ, Negro AD, Araujo PP, Neves Fda S and Martins AS. Head and neck reconstruction using infrahyoid myocutaneous flaps. *Sao Paulo Med J* 124: 271-274, 2006
5. Deganello A, Gitti G, Parrinello G, Larotonda G, Meccariello G, Leemans CR and Gallo O. Infrahyoid flap reconstruction of oral cavity and oropharyngeal defects in elderly patients with severe general comorbidities. *Head Neck* 34: 1299-1305, 2012
6. Windfuhr JP and Remmert S. Infrahyoid myofascial flap for tongue reconstruction. *Eur Arch Otorhinolaryngol* 263: 1013-1022, 2006
7. Ouyang D, Su X, Chen WC, Chen YF, Men QQ and Yang AK. Anatomical study and modified incision of the infrahyoid myocutaneous flap. *Eur Arch Otorhinolaryngol* 270: 675-680, 2013
8. Fang QG, Li ZN, Zhang X, Liu FY, Xu ZF and Sun CF. Clinical reliability of radial forearm free flap in repair of buccal defects. *World J Surg Oncol* 11: 26, 2013
9. Hsing CY, Wong YK, Wang CP, Wang CC, Jiang RS, Chen FJ and Liu SA. Comparison between free flap and pectoralis major pedicled flap for reconstruction in oral cavity cancer patients-a quality of life analysis. *Oral Oncol* 47: 522-527, 2011
10. Mallet Y, El Bedoui S, Penel N, Ton Van J, Fournier C and Lefebvre JL. The free vascularized flap and the pectoralis major pedicled flap options: comparative results of reconstruction of the tongue. *Oral Oncol* 45: 1028-1031, 2009
11. Chepeha DB, Annich G, Pynnonen MA, Beck J, Wolf GT, Teknos TN, Bradford CR, Carroll WR and Esclamado RM. Pectoralis major myocutaneous flap vs revascularized free tissue transfer. *Arch Otolaryngol Head Neck Surg* 130: 181-186, 2004
12. de Bree R, Reith R, Quak JJ, Uyl-de Groot CA, van Agthoven M and Leemans CR. Free radial forearm flap versus pectoralis major myocutaneous flap reconstruction of oral and oropharyngeal defects: a cost analysis. *Clin Otolaryngol* 32: 275-282, 2007
13. Fattabi T and Fernandes R. Value of microvascular surgery in academic oral and maxillofacial surgery. *J Oral Maxillofac Surg* 71: 189-191, 2013
14. A, Sun KC, DeSilva RN and Smith AC. The assessment of quality of life in patients who have undergone surgery for oral cancer: a preliminary report. *J Oral Maxillofac Surg* 63: 1606-1612, 2005
15. Fang QG, Shi S, Zhang X, Li ZN, Liu FY and Sun CF. Assessment of the quality of life of patients with oral cancer after pectoralis major myocutaneous flap reconstruction with a focus on speech. *J Oral Maxillofac Surg* 71: e1-e5, 2013
16. Joo YH, Hwang SH, Park JO, Cho KJ and Kim MS. Functional outcome after partial glossectomy with reconstruction using radial forearm free flap. *Auris Nasus Larynx* 40: 303-307, 2013
17. Kuntz AL and Weymuller EA. Impact of neck dissection on quality of life. *Laryngoscope* 109: 1334-1338, 1999
18. Teymoortash A, Hoch S, Eivazi B and Werner JA. Postoperative morbidity after different types of selective neck dissection. *Laryngoscope* 120: 924-929, 2010
19. Fang QG, Shi S, Zhang X, Li ZN, Liu FY and Sun CF. Upper extremity morbidity after radial forearm flap harvest: a prospective study. *J Int Med Res* 42: 231-235, 2014