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Role of a two-step suture in the prevention of postoperative transoral salivary fistulas during reconstruction of the oral cavity

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Abstract

Transoral salivary fistulas are one of the most serious postoperative complications after operations for oral cancer, and we propose a new, two-step suture method to avoid them. From January 2005 to September 2017, 240 patients were recruited at the Shanghai Ninth People's Hospital and divided into experimental (n = 89) or control (n = 151) groups. The experimental group was treated by a two-step suture technique, while the control group had conventional sutures. Statistical differences were assessed using the chi squared and *t* tests, as appropriate. Only two patients developed transoral salivary fistulas in the experimental group, while in the control group there were 14 (9%). The incidence of fistulas in the experimental group was significantly lower than that in the control group (p = 0.035). Regression analysis showed that there was a significant correlation between the groups and the incidence of salivary fistulas (p = 0.032). The two-step suture technique is safe, effective, and easy to learn, and could reduce the incidence of postoperative salivary fistulas.

Keywords: Transoral salivary fistula; Suture; Reconstruction

Introduction

Oral cancer is the sixth most common cancer worldwide and accounts for nearly 3% of all cancers.[1–4] The reconstruction of defects that result from resection of tumours poses a major challenge when trying to restore oral function, and the ideal method will enable complete resection of the tumour, avoidance of acute or chronic complications, and reduction in morbidity at the recipient and donor sites.[5]

Various techniques are used for reconstruction, and a combination of local flaps and non-vascularised bone grafts are suitable for the reconstruction of small defects. Large defects, however, need microvascular free tissue flaps,[6,7] but breakdown of sutures can lead to salivary fistulas in the floor of the mouth early in reconstruction. These complications are common, and usually develop in patients with systemic or chronic disease and malnutrition. However, they also develop in healthy patients who have oral cancers that require radical resection.[8,9] The incidence of transoral salivary fistulas ranges from 5%–29% after reconstruction with a local flap, and from 0–15% after a free flap,[10,11] and some patients with such fistulas require long-term dressing changes, or more invasive treatments, before they heal.

The objective of this clinical study is to describe what is, to our knowledge, a new suturing technique for flaps called the two-step suture, which can be used in reconstruction of the oral cavity to reduce the incidence of transoral salivary fistulas.

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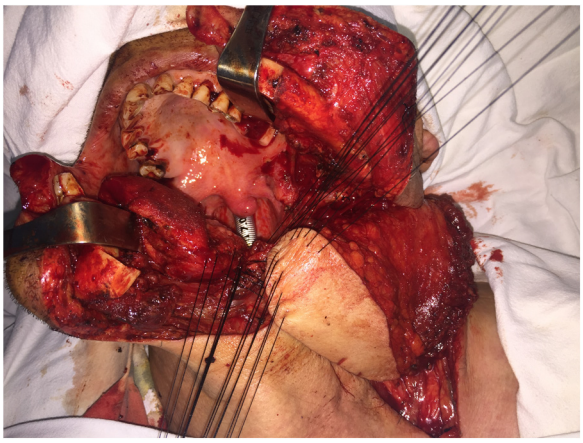

Fig. 1. The flap was placed against the mucous membrane before the temporarily truncated mandible was reattached with a titanium plate.

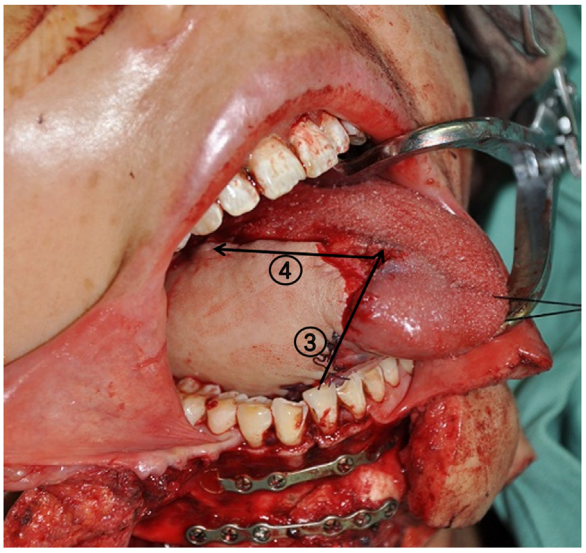

Fig. 2. Mandibular continuity was restored and the mucosa of the bone cutting line was sutured.

Methods

We designed and implemented a retrospective case-control study. From January 2005 to September 2017, 240 patients were recruited from the Department of Oral and Maxillofacial-Head and Neck Oncology, Ninth People's Hospital, School of Medicine, Shanghai Jiao Tong University. The study was approved by the Institutional Review Board of the Ninth People's Hospital, and all participants gave their informed consent. All the patients were treated by reconstruction with free flaps or pectoralis major myocutaneous flaps after a combined resection of the tongue or floor of the mouth, mandible, and neck. The patients were divided into an experimental and a control group, depending on the suture technique used.

The two-step suture was used in the experimental group (having been designed and first used by our team) whereas a conventional suture technique was used in the control group. The predictor variable was the method of the suture, and the outcome variables were the incidence of transoral salivary fistulas and postoperative complications (which were recorded throughout the postoperative and follow-up periods). Other variables recorded included the patients' personal details, duration of operation, site of tumour, type of free flap, and details of general health (which were assessed using the American Society of Anesthesiologists (ASA) classification system.[5]

Suture technique

All patients had a combined operation on the tongue or floor of the mouth, mandible, and neck, and reconstruction with pectoralis major myocutaneous flaps or free flaps. In the experimental group, the two-step suture was used while the flap was temporarily in place with the tongue and mucous membranes, and before the temporarily truncated mandible was reattached using a titanium plate. When mandibular continuity was restored, the suture was fixed (Fig. 1). The two-step suture is a delayed suturing technique. During the first step, the flap is stitched together with the oral mucosa, but without tying a knot. In the second step, after the mandible has been reset, all the sutures are tied.

In the control group the traditional suture method was used. The flaps and the lingual and gingival mucosa were almost completely sutured, then mandibular continuity was restored and the mucosa of the bone cutting line sutured (Fig. 2).

Statistical analysis

Data were analysed with the aid of IBM SPSS software (version 22, IBM Corp). The significance of differences between the experimental and control groups were analysed with the chi squared or *t* test, as appropriate, and probabilities of 0.05 or less were accepted as significant.

Results

The variables recorded are shown in Table 1, and there were no significant differences between the groups. Table 2 shows that there were 2/89 fistulas in the experimental group and 9/151 in the control group, which was significant ($p = 0.035$), and gives the main causes of fistulation. Table 3 gives the regression analysis, which shows a significant correlation between groups and the incidence of transoral salivary fistulas ($p = 0.032$). Table 4 shows a comparison of the other variables studies, only the duration of hospital stay days is different between two groups.

Table 1
Number (%) of patients in the experimental and control groups unless otherwise stated.

Variable	Experimental group (n = 89)	Control group (n = 151)	p value
Age (years):			0.729
Range	34–75	25–75	
Mean	54.8	54.5	
Sex:			0.942
Male	81	137(93)	
Female	8	14(7.3)	
Smoking history:			0.376
Smoker	21	55(38)	
Non-smoker	51	91(62)	
ASA classification:			0.134
Grade I	15	30(20)	
Grade II	35	62(41)	
Grade III	37	53(35)	
Grade IV	2	6(4)	
Site of tumour:			0.196
Floor of mouth	43	60(40)	
Tongue	46	91(60)	
Mean (SD) duration of hospital stay (days)	15 (5)	17 (7)	0.063

Table 2
Transoral salivary fistulas: incidence and main cause in the two groups.

Cause	Experimental group (n = 89)	Control group (n = 151)	p value
Poor suture	0	6	0.035
Compromised flap	1	5	
Malnutrition	1	3	

Discussion

Transoral salivary fistulas are a common complication of reconstructive surgery of the head and neck. Several authors have shown that reconstruction with a free flap decreases the incidence of transoral salivary fistulas, yet these techniques cannot completely prevent them.[12,13] Conditions that affect the healing of tissue (such as radiotherapy, malnutrition, infections, or advanced disease) are the most common risk factors for their formation. However, they can also occur in healthy patients.[11,14] When no risk factors are present, the most likely cause should be identified when the flap is being fixed.

Several authors have discussed choices of flap, harvesting, and modelling techniques, but not the topic of how to fix the flap.[7,15,16] We think, however, that the suture technique is one of the key factors that affects the development of these fistulas. The main purpose of this study therefore, was to reduce the incidence of transoral salivary fistulas in patients with cancers of the oral cavity by improving our suture technique. All surgeons have their own particular technique, and that used in the control group is the most widely-used in China. No clinical signs of fistula were recorded in the 89 cases in the experimental group during a 10-week postoperative follow-up, so we conclude that our proposed two-step suture technique can significantly reduce the incidence of transoral salivary fistulas.

Reconstruction of the tongue and floor of the mouth is challenging, and transoral salivary fistulas often develop in patients with cancers of the oral floor or tongue, so all our patients had cancer of the floor of the mouth or tongue. The traditional suture method is difficult, and our two-step suture makes the reconstruction easier.

Our results show that the experimental group had a shorter postoperative hospital stay than the control group, although the difference was not significant, possibly because of the small sample size. If we further increase the sample size, differences between the two groups may well emerge.

We also analysed the relation between transoral salivary fistulas and duration of postoperative hospital stay, which showed that patients with salivary fistulas stayed for more than 15 days longer than those without, which was significant. This also suggested that the reason for the longer hospital stay in the control group was mainly that there were more fistulas in the control group. Salivary fistulas significantly increase the duration of postoperative hospital stay, and also cause great economic and mental stress.

A potential disadvantage of the two-step suture technique is that it makes the operation 20–30 minutes longer. However, this could be justifiable if we compare the patients' discomfort and medical costs involved in the management of a transoral salivary fistula.

Every study, including our own, has its limitations. First, this is a retrospective study, which reduces the level of evidence. Secondly, the control and the experimental groups had different surgeons, who had different levels of experience and skill. Finally, the free flaps varied, and there was no consistency. These all affected the outcomes and might have influenced the conclusion.

Table 3
Multivariate regression analysis of factors that affect the development of salivary fistulas.

Variable	Exp (B)	95% CI	p value
Groups (experimental compared with control)	13.108	1.846 to 31.476	0.032
Age	2.960	0.769 to 6.989	0.462
Sex	2.017	0.938 to 3.172	0.844
Smoking	2.212	0.898 to 4.965	0.265
Site of tumour	0.903	0.697 to 2.457	0.203
ASA grade	6.831	0.927 to 22.475	0.079

Table 4
Comparisons of study variables between patients with and without transoral salivary fistulas.

Study variable	Salivary fistula (n = 16)	No salivary fistula (n = 224)	p value
Mean age (years)	53	55	
Sex:			0.169
Male	13	205(92)	
Female	3	19(9)	
History of smoking:			0.143
Smoker	8	72(32)	
Non-smoker	8	152(68)	
ASA classification:			0.806
Grade I	2	43(19)	
Grade II	7	90(40)	
Grade III	5	85(38)	
Grade IV	2	6(3)	
Site of tumour:			0.650
Floor of mouth	6	97(43)	
Tongue	10	127(57)	
Mean (SD) duration of hospital stay (days)	16 (4)	31 (11)	0.007

Conclusion

Our purpose was to reduce the incidence of transoral salivary fistulas by surgical means. The two-step suture technique is safe, effective, and easy to learn, and may prevent transoral salivary fistulas after reconstruction of the tongue and floor of the mouth during radical resection of a tumour in selected patients.

Conflict of interest

We have no conflicts of interest.

Ethics statement/confirmation of patients' permission

This study was approved by the Institutional Review Board of the Ninth People's Hospital IRB. All participants gave their signed informed consent.

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