Swallowing Rehabilitation Affects Period of Hospitalization after Surgery for Tongue Cancer

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Abstract

Functional rehabilitation has been reported to improve swallowing. The effect of the presence or absence of such rehabilitation has yet to be compared in oral cancer patients, however. The purpose of this study was to investigate its effect on correlations between the period of hospitalization and the period of tube feeding (from the day of surgery to termination of tube feeding) and period of oral nutrition (from termination of tube feeding to discharge). Body weight was also measured on admission and discharge and the difference calculated. A correlation was observed between period of hospitalization and period of tube feeding in the rehabilitation group, and with the periods of tube feeding and oral nutrition in the non-rehabilitation group. In the rehabilitation group, the period of tube feeding appeared to affect period of hospitalization. On the other hand, termination of tube feeding did not tend to affect period of hospitalization. These results suggest that both periods were factors affecting period of hospitalization in the non-rehabilitation group. Not performing swallowing rehabilitation, therefore, resulted in the period of oral nutrition affecting the period of hospitalization. This suggests that it is essential that nutrients be ingested in moderation after termination of tube feeding, when they are only taken orally. Moreover, these results also indicate that rehabilitation is important in improving quality of life after discharge.

Key words: Tongue cancer — Swallowing rehabilitation — Tube feeding

Introduction

Recent advances in therapeutic techniques have markedly improved such outcomes in the treatment of oral cancer, raising interest in postoperative function and quality of life.
The surgical excision of an oral tumor and its surrounding tissue leads to postoperative anatomical change accompanied by dysesthesia and a reduction in tongue motor function, with an eventual reduction in swallowing function. This reduction in swallowing function can result in malnutrition and associated poor wound healing. Moreover, the need for postoperative training aimed at restoration of swallowing function increases when such resection also involves the tongue. Yanai et al. reported that many patients capable of oral intake after total or subtotal glossectomy take longer to ingest food. Resection of the base or at least 50% of the tongue, in particular, has been reported to cause postoperative dysphagia. Moreover, the volume, shape, and flexibility of any reconstructed tissue also affects postoperative swallowing function when such procedures involve the pectoralis major. Furthermore, Hamlet et al. reported bolus transport difficulties and food remnants in the oral cavity and pharynx after swallowing in patients undergoing reconstruction with a surgical flap.

Postoperative rehabilitation for dysphagia in oral cancer patients involves compensatory techniques such as head postural adjustments while swallowing, prosthetic support, including palatal augmentation prostheses, and other approaches, including range of motion and resistance exercises to improve swallowing function. In addition to swallowing function, maintaining and restoring the mental health of such patients has also recently come into consideration, and is viewed as important in improving both swallowing function and QOL.

The Clinical Department of Dysphagia Rehabilitation at Tokyo Dental College Chiba Hospital was established in 2010 and has provided rehabilitation to patients hospitalized for oral surgery together with outpatient services and visiting examinations. Medical professionals responsible for swallowing rehabilitation in oral cancer patients, in particular, work in teams, carrying out such activities based on prior discussion.

Many studies have shown that rehabilitation is effective in improving swallowing function. However, to our knowledge, no studies to date have compared the effect of the presence or absence of swallowing rehabilitation on time to discharge or time to termination of tube feeding in patients hospitalized for oral cancer. Our focus here was on cases in which tongue cancer surgery resulted in postoperative disorders in the preparatory and oral stages of swallowing, such as in bolus formation, retention, and transport.

Therefore, correlations were investigated between the time at which oral intake was commenced and time at which tube feeding was withdrawn by comparing patients who underwent swallowing rehabilitation with patients who did not.

Research Methods

1. Patients

A total of 20 patients were enrolled in the study, comprising 11 in the rehabilitation group (7 men, 4 women; mean age, 61.0 ± 15.3 years; range, 34–87 years), who underwent swallowing rehabilitation after surgery for tongue cancer at the Department of Oral and Maxillofacial Surgery of Tokyo Dental College Chiba Hospital, and 9 in the non-rehabilitation group (8 men, 1 woman; mean age, 55.4 ± 9.5 years; range, 36–66 years), who did not. The patients in the rehabilitation group were selected from among those undergoing rehabilitation during the 1-year period between November 2010 and October 2011; those in the non-rehabilitation group were selected from among patients who did not undergo rehabilitation in 2007. Patients who had undergone resection of the base of the tongue or jawbone were excluded, while patients who had undergone uni- or bilateral neck dissection were included. No patients had received chemotherapy, radiotherapy, or additional surgery during hospitalization. There were no cases of wound infections or postoperative pneumonia.
2. Methods

Problems related to patients scheduled to undergo surgery were discussed in advance at conferences and other meetings, after which the surgical procedure to be adopted and other matters were confirmed. Each patient was given a preoperative swallowing function screening test with informed consent. If dysphagia was suspected based on the results, the patient was then required to undergo video-fluorography or an endoscopic swallowing examination. The predicted degree of postoperative dysphagia and type of rehabilitation likely to be required were then explained. Oral care was initiated postoperatively, depending on the patient’s condition and the results of a conference involving the attending oral surgeon, internists, nurses, dental hygienists, and dietitians, among others. This was followed by postoperative screening tests and swallowing rehabilitation. Rehabilitation comprised indirect training in the form of range-of-motion exercises for the neck and jaw, and exercises for the lips, cheeks, and tongue, as well as articulation training, which were selectively employed depending on postoperative symptoms. Swallowing function was evaluated by observing food intake or endoscopic examination. The results were then analyzed with the help of a dietitian, taking the shape and quantity of food, and posture and method of intake into consideration. Alterations were then made to the shape and quantity of the food to be ingested. A dentist, dental hygienist, or nurse provided subsequent training on an almost daily basis (Fig. 1).

3. Analysis methods

The purpose of the analysis was to identify which factors influenced rehabilitation and how, focusing on their effect on 1) period of tube feeding (from surgery to termination of tube feeding); and 2) period of oral nutrition (length of time between termination of tube feeding and discharge). The relationships between period of hospitalization and period of tube feeding and period of oral nutrition were compared. Weight was also measured on admission and discharge and the difference calculated. Spearman’s rank correlation coefficient (SPSS for Windows 23; SPSS Inc., Chicago, Illinois, USA) was used for all statistical examinations. A p-value of less than 0.05 was considered statistically significant.

4. Ethical considerations

This study was approved by the Ethics Committee of Tokyo Dental College (approval number: 306).

Results

1. Patient background

The extent of tongue resection in the rehabilitation group was subtotal glossectomy in 1 patient, hemiglossectomy in 5, and partial glossectomy in 5. The method of reconstruction in the rehabilitation group was a forearm flap in 6 patients, and none in 5. The extent of tongue resection in the non-rehabilitation group was hemiglossectomy in 6 patients and partial glossectomy in 3. The method of
reconstruction in the non-rehabilitation group was a forearm flap in 5 patients, and none in 4 (Table 1).

2. Results of analysis

The correlation coefficients for period of hospitalization and period of tube feeding, period of hospitalization and period of oral nutrition, and period of hospitalization and weight in the rehabilitation group were 0.77 ($p<0.01$), 0.18 ($p=0.61$), and 0.30 ($p=0.37$), respectively. The correlation coefficients for period of hospitalization and period of tube feeding, period of hospitalization and period of oral nutrition, and period of hospitalization and weight in the non-rehabilitation group were 0.82 ($p<0.01$), 0.89 ($p<0.01$), and 0.64 ($p=0.66$), respectively. In the rehabilitation group, a correlation was observed between period of hospitalization and period of tube feeding, while in the non-rehabilitation group, such a correlation was observed with both period of tube feeding and period of oral nutrition (Figs. 2 to 4). The correlation coefficients for period of hospitalization and period of tube feeding, period of hospitalization and period of oral nutrition, and period of hospitalization and weight in the rehabilitation group were 0.04, 0.24, and 0.21, respectively. The correlation coefficients for period of hospitalization and period of tube feeding, period of hospitalization and period of oral nutrition, and period of hospitalization and weight in the non-rehabilitation group were 0.78, 0.08, and 0.70, respectively. None of these differences were significant, however.

Discussion

Postoperative swallowing rehabilitation for dysphagia in oral cancer patients involves managing oral health and function through collaboration between professionals from a range of disciplines.

The present study describes the swallowing rehabilitation program offered by Tokyo Dental College to patients who have undergone surgical procedures for oral cancer. Here, we focused on the effect of various factors on period of tube feeding or oral nutrition and weight loss during hospitalization.

Factors affecting length of hospitalization

Table 1  Patient profiles

<table>
<thead>
<tr>
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<th>Rehabilitation group</th>
<th>Non-rehabilitation group</th>
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<tbody>
<tr>
<td>Sex</td>
<td>Male</td>
<td>Female</td>
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<td></td>
<td>7</td>
<td>8</td>
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<td></td>
<td>4</td>
<td>1</td>
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<tr>
<td>Age, y</td>
<td>Average</td>
<td>61.0 ± 15.3</td>
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<tr>
<td></td>
<td>Range</td>
<td>34–87</td>
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<td></td>
<td>55.4 ± 9.5</td>
<td>36–66</td>
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<tr>
<td>Extent of tongue resection</td>
<td>Total glossectomy</td>
<td>1</td>
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<tr>
<td></td>
<td>Hemiglossectomy</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Partial glossectomy</td>
<td>5</td>
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<td></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Reconstruction</td>
<td>Forearm flap</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>No reconstruction</td>
<td>5</td>
</tr>
<tr>
<td></td>
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<td>4</td>
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<tr>
<td>Neck dissection</td>
<td>Unilateral</td>
<td>9</td>
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<td></td>
<td>Bilateral</td>
<td>2</td>
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<td>Tracheotomy</td>
<td>Underwent</td>
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<td></td>
<td>no tracheotomy</td>
<td>4</td>
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obviously include the surgical procedure performed, the method of anesthesia, and the method of perioperative management. More studies are needed, however, to identify which background factors affect period of hospitalization and how. In the present study, the focus was on the effect of just one of these factors: recovery of swallowing function. Malnutrition due to such factors can reduce physiological healing ability and delay recovery. In the present study, Spearman’s rank correlation coefficient was used to analyze length of hospitalization, because Wood et al. reported an association between time to

Fig. 2 Correlation between period of hospitalization and period of tube feeding in rehabilitation and non-rehabilitation groups
Outliers not included in straight line representing linear approximation.

Fig. 3 Correlation between period of hospitalization and period of oral nutrition in rehabilitation and non-rehabilitation groups
Outliers not included in straight line representing linear approximation.
* indicates outliers
arthroplasty wound dryness and length of hospital stay by this method. Here, we used weight as an indicator of nutritional status, because this value is simple to understand and easy to use in a clinical setting. Although blood chemistry can provide a more detailed picture of nutritional status, it is usually used to make an evaluation prior to commencement of rehabilitation, so was not used in this study.

Tongue cancer was chosen in this study as patients undergoing glossectomy are prone to dysphagia in the preparatory and oral stages of swallowing. Moreover, swallowing rehabilitation can be more easily introduced in such cases as the state of the tongue can be quickly ascertained visually using a mirror during hospitalization in the acute phase. No cases of total glossectomy were encountered during the study period; all the patients included underwent subtotal glossectomy, hemiglossectomy, or partial glossectomy. Some reports have described subtotal glossectomy patients only ingesting nutrients by tube feeding or a combination of tube feeding and oral intake after discharge. However, because all the patients in the present study were on oral intake at discharge, no particular limitations were seen from the extent of resection. Moreover, patients who did not undergo neck dissection were excluded, as a partial glossectomy may not cause clear dysphagia, often allowing immediate discharge. The patients in the present study, therefore, were selected because they all showed mild to moderate dysphagia after undergoing neck dissection, which often affects swallowing function in the acute phase.

The results of the preoperative swallowing function evaluation were explained along with the suitability of preoperative rehabilitation in cases where the patient was elderly. This is because aging can reduce swallowing function preoperatively without the patient realizing. One patient with mild preoperative pharyngeal residue was seen in the rehabilitation group, although they were unaware of this fact at the time.

Rehabilitation was commenced with a simple screening process based on the results of a consultation, which looked at wound healing, inflammatory findings, absence of fever, and other symptoms. Rehabilitation was scheduled preoperatively, with timing decided in consultation with the oral surgeon in charge of rehabilitation and other medical professionals concerned.

Rehabilitation comprised range-of-motion exercises for the perioral muscles, tongue, neck, and other areas, and articulation train-
According to a report by Logemann\(^6\), postoperative head and neck cancer patients who performed range of motion exercises for the jaw, tongue, and lips exhibited improvement in swallowing and articulation function, while Burkhead \(et\ al.\)^\(^1\) reported that muscle strengthening of the tongue is strongly related to swallowing function.

The present study focused on period of hospitalization to investigate the period of tube feeding and oral nutrition intake. Despite looking at patients undergoing tongue cancer surgery with neck dissection, differences were seen in wound healing and surgical technique within the operative range, which may have resulted in individual differences in the durations of tube feeding and oral intake. Moreover, Smith \(et\ al.\)^\(^12\) noted that dysphagia risk factors were significant predictors of hypoglossal and lingual nerve sacrifice and surgical technique. Here, therefore, we investigated the effect of difference in the method of nutrient intake on duration of hospitalization.

While the present results revealed a correlation between period of hospitalization and period of tube feeding in the rehabilitation group, no such correlation was seen with period of oral nutrition. Meanwhile, in the non-rehabilitation group, such a correlation was seen with both period of tube feeding and period of oral nutrition. The timing of discharge is decided after taking into account factors such as nutritional status, life after discharge and, of course, healing status. We believe that the period of tube feeding affected the period of hospitalization in the rehabilitation group. On the other hand, withdrawing tube feeding did not tend to affect period of hospitalization. In the non-rehabilitation group, however, the results suggested that both periods were factors affecting period of hospitalization. This indicates that not undergoing swallowing rehabilitation causes the period of oral nutrition to impact the period of hospitalization. This suggests that nutrients should only be ingested in moderation during the period after termination of tube feeding, when nutrients are taken only orally, and that rehabilitation be given in order to improve QOL after discharge. Therefore, we believe that rehabilitation during the period in which oral and tube feeding are combined is important in preventing prolongation of period of hospitalization. By ingesting a sufficient amount of nutrients during this combined period, nutritional status improves, which in turn affects wound healing. The results of the present study suggest that this is why the patients were able to leave hospital soon after regular oral nutrition was initiated, even though that period was not necessarily prolonged. No clear correlation was observed between weight and period of hospitalization in either group. Distribution in the rehabilitation group tended to lean slightly towards less weight loss. Weight loss in the non-rehabilitation group appeared to be relatively uniform, regardless of period of hospitalization, although the difference was not significant. Further study employing a larger sample is needed to clarify the correlation between weight and period of hospitalization.

Oral care was also given prior to rehabilitation for swallowing. Therefore, oral cavity function may have been improved by combining swallowing rehabilitation with activation of the oral cavity through oral hygiene.

Current advances in therapeutic techniques have started to reduce the disparity in surgical outcomes between elderly and younger individuals. However, unlike other general surgeries, surgery for head and neck cancer is characterized by important postoperative issues with swallowing function\(^16\). Therefore, our goal here was to investigate the effects of rehabilitative intervention for swallowing in the elderly, as this particular population will continue to grow in the future, making it an important challenge in terms of functional recovery and regulating length of hospital stay.

This study had several limitations, including the short time period addressed and restricted number of surgical techniques employed, which resulted in a small sample size. The period of hospitalization may there-
fore vary for surgeries at other sites. In future study, we intend to further investigate the effect of various other factors on swallowing function in oral cancer patients.

Conflicts of Interest

The authors cite no conflict of interest related to this paper.

References


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