



Efficacy survey of swallowing function and quality of life in response to therapeutic intervention following rehabilitation treatment in dysphagic tongue cancer patients

Yan Zhen^a, Jian-guang Wang^a, Duo Tao^b, Hua-Jun Wang^c, Wei-Liang Chen^{a,*}

^a Department of Oral and Maxillofacial Surgery, Sun Yet-sen Memorial Hospital (Second Affiliated Hospital) of Sun Yat-sen University, 107 Yan-jiang Road, Guangzhou 510120, China

^b Department of Otolaryngology Surgery, Sun Yet-sen Memorial Hospital (Second Affiliated Hospital) of Sun Yat-sen University, Guangzhou, China

^c Department of nurses management of Guangdong Provincial People's Hospital, Guangzhou, China

A B S T R A C T

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Purpose: This quasi-experimental parallel cluster study was carried out to investigate the utility of interdisciplinary swallowing therapy exercises in improving swallowing function and quality of life (QOL) in dysphagic cancer patients following tongue resection and subsequent rehabilitation treatment.

Methods: All subjects in the experimental group underwent a structured swallowing training program. The subjects in the experimental group ($n = 23$) received 30 min of swallowing training each day, 6 days per week for 2 weeks. The control group ($n = 23$) received no training. Analysis of variance was used, and the M.D. Anderson Dysphagia Inventory (MDADI) discriminated between groups of subjects.

Results: Patients who underwent structured swallowing training ($n = 23$) showed improvement in the overall MDADI score ($P < 0.01$) compared with the control population. Furthermore, a separate analysis of individual domains of the MDADI (global, emotional, functional, and physical) demonstrated improved QOL. Although the mean score for tongue rehabilitation indicated that $\geq 50\%$ subjects in the functional subscale were improved compared with the control population, the difference was not statistically significant ($P > 0.05$).

Conclusions: This study used objectively timed swallowing tests, an interdisciplinary swallowing therapy protocol, and a swallowing questionnaire to evaluate the effects of swallowing training. We found that implementation of swallowing education and exercises improved dysphagia and QOL in cancer patients following tongue resection and rehabilitation. Furthermore, this study indicated that swallowing safety and dysphagia training for nursing professionals is effective.

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Introduction

Postsurgical dysphagia in tongue cancer patients is a common and serious problem that can lead to pneumonia, dehydration, malnutrition, and a reduced quality of life (QOL) (Gaziano, 2002). Financial costs include a longer length of stay, expenses for antibiotics, X-rays, increased nursing time, and physician consultations (Cichero et al., 2009). In terms of speech and swallowing, patients undergoing 3/4 or total anterior glossectomy had poorer outcome than those receiving either 1/4 or 1/2 glossectomy (Brown et al., 2006). The tongue and soft palate are the most important organs in the oral cavity and oropharynx for the provision of speech and swallowing. The mandible and maxilla are static structures that can

be replaced with vascularized bone, restoring both the form and function of the ablated tissues (Brown, 2008). Appropriate replacement of ablated tissue with free tissue transfer greatly improves functional and QOL outcomes. As long as the tissue is replaced and contraction avoided, the detrimental effect on function is limited. Free flaps can provide vascularized and sensitized skin cover to increase the rate of healing and avoid contraction of the remaining tissues, but they cannot replace the complex muscular movements of the tongue and soft palate (Brown et al., 2006). Therefore, organ preservation appears to translate into functional preservation, at least in tongue cancer. These findings lend objective support to the recommendation for concurrent swallowing therapy as the treatment of choice in cases of stage III and IV tongue cancer.

Dysphagia occurs in up to 50% of head and neck cancer survivors, and is estimated to affect 10,000–20,000 new cases per year in the USA (Kazi et al., 2008), especially those with oral cavity and

* Corresponding author. Tel.: +86 020 81332429; fax: +86 020 81332853.
E-mail address: drchen@vip.163.com (W.-L. Chen).

oropharyngeal cancers (Pauloski et al., 2006). The recovery of swallowing function is integral to rehabilitation of surgically treated cancer patients; however, recovery is very slow and often incomplete following treatment (Nicoletti et al., 2004).

Videofluoroscopy is often used to determine the extent of dysphagia. However, patient-reported scales or questionnaires are helpful for assessing how patients view their swallowing ability following treatment and how changes in swallowing affect their QOL (Kazi et al., 2008). The M.D. Anderson Dysphagia Inventory (MDADI) is a validated and reliable self-administered survey designed specifically for evaluating the impact of dysphagia on QOL in patients who have undergone treatment for head and neck cancer (Chen et al., 2001; Kazi et al., 2008).

There is accumulating evidence that learning new motor skills leads to significant changes in corticomotor control. Appropriate swallowing treatment could reduce complications related to impairment of swallowing function. Several reviews have highlighted the neuroanatomical pathways involved in the control of the tongue musculature (Miller, 2002; Sawczuk and Mosier, 2001), and a series of studies with intracortical microstimulation in conscious monkeys have been systematically outlined. The functional properties of neurons in the primary motor cortex, primary somatosensory cortex, cortical masticatory area, and swallowing cortex are related to tongue movements (Yamamura et al., 2002; Yao et al., 2002). Recently, several studies involving swallowing function have been reported. There is increasing evidence for the effectiveness of different treatments, such as direct dysphagia treatment, compensatory training (Lin et al., 2003), electrical stimulation treatment, and the Mendelsohn maneuver (Peck et al., 2010).

Diagnosis and management of dysphagia are most commonly performed by speech pathologists because of their training in the anatomy, neuroanatomy, and physiology of deglutition (Cichero et al., 2009). However, speech pathologists are usually available only during standard working hours on weekdays. Nurses, however, provide 24-h care. Early signs and symptoms of swallowing problems are more likely to go unnoticed by the healthcare team. A dysphagia clinical nurse specialist can focus attention on this critical problem, and nurses play a key role in identifying, assessing, managing, and preventing complications related to dysphagia (Werner, 2005).

This study was performed to evaluate the efficacy of an interdisciplinary swallowing therapy protocol by well-trained nursing professionals in improving swallowing function and QOL in patients following tongue surgery for squamous cell cancer.

Materials and methods

Study design

A quasi-experimental parallel cluster design of swallowing function and QOL was performed to determine the efficacy of swallowing exercises. Subjects who fulfilled the following criteria were eligible for participation: (1) those who had undergone tongue resection and rehabilitation; (2) complete wound healing after surgery, allowing for functional training; (3) receiving nutrition and hydration via oral intake; (4) MDADI score of 60 or lower; and (5) able to understand Mandarin or Chinese dialect.

Between September 2007 and December 2009, 62 of 146 tongue cancer patients who had undergone tongue resection and rehabilitation were diagnosed with dysphagia. Of these, 46 were selected for the study (23 in the control group and 23 in the experimental group). All subjects and their families gave informed consent and received compensation for their participation. All subjects were patients at the Department of Oral and Maxillofacial Surgery of the Second Affiliated Hospital of Sun Yat-sen University,

Guangzhou, China. This study was approved and reviewed by the Institutional Review Board of Sun Yat-sen Memorial Hospital of Sun Yat-sen University. The subjects ranged in age from 28 to 71 years (median, 55.8 years); 29 were men and 17 were women. Clinically, 6, 10, 21, and 9 patients had stage I–IV cancer, respectively. Of the 46 subjects, 12 had tumors located at the floor of the tongue, 14 at the side of the tongue, 7 near the throat, and 13 at the top of the tongue. Nine of the 46 patients underwent in-continuity segmental mandibular resection, and the remainder underwent mandibular rim resection only. The extent of tongue resection in each patient varied between 10% and 75%. All histological evaluations showed squamous cell carcinoma without psilate regional lymph node metastasis, and the margins were tumor-free. Hypoglossal and lingual nerves were resected on the affected side but preserved on the contralateral side in patients who underwent subtotal glossectomy. Bilateral hypoglossal and lingual nerves were resected in patients who underwent total glossectomy. Laryngeal suspension and cricopharyngeal myotomy procedures were based on the following 2 criteria: (1) excision of the bilateral suprahyoid muscles, and (2) excision of 50% or more of the tongue base.

To avoid confounding the effects of subjects in the experimental and control groups in the same ward, 2 floors of 8 wards each were assigned to the control and experimental groups based on a subject ratio of 1:1 (control:experimental). Thus, 25 subjects on the first floor (8 wards) were assigned to the control group, and 25 subjects on the second floor (8 wards) were assigned to the experimental group. Four subjects were lost because they left China, died, or withdrew from the study. Finally, a total of 46 (92%) subjects participated in the present study (23 subjects in each group).

Research procedure

The experimental group received 30 min general swallowing therapy sessions 6 days per week for 2 weeks. The control group received no therapy. For ethical reasons, the control group received identical swallowing therapy after collection of the post-test data. All experts agreed with the training protocol. The expert team consisted of a rehabilitation physician, a rehabilitation nurse, and a speech therapist from the Department of Rehabilitation in the Department of Oral and Maxillofacial Surgery, Second Affiliated Hospital of Sun Yat-sen University, Guangzhou, China.

The rehabilitation nurse had more than 5 years of clinical experience in surgery units and underwent 1 month of clinical training on swallowing therapy for dysphagic patients to ensure competency in the screening and management of swallowing problems. The rehabilitation nurse completed a questionnaire before beginning the training, which was used to assess baseline knowledge, skills, and confidence in the area of dysphagia. The rehabilitation nurse's training and questionnaire were administered by a speech therapist and the therapist performing the training protocol. The subjects' data were collected by a rehabilitation physician, and swallowing therapy was performed by the rehabilitation nurse.

All data were collected at the beginning of the study and at the end of 2 weeks. However, to prevent any changes in behavior of the rehabilitation nurse at the time of the study, ward managers were not contacted.

Swallowing symptoms questionnaire

The MDADI performance status scale, which measures a patient's global, physical, emotional, and functional perceptions of swallowing dysfunction, was administered to each patient (Barringer et al., 2009). The global assessment consists of a single question assessing how swallowing affects the overall daily routine and represents a general overall assessment of swallowing-related

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