



Case Study

## Effects of electrical stimulation combined with dysphagia therapy in elderly individual with oropharyngeal dysphagia: a case study

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**Abstract.** [Purpose] The purpose of the present study was to investigate the effects of dysphagia therapy in an old man with difficulty swallowing in the oral and pharyngeal phases. [Subjects and Methods] The subject was a 72-year-old man with no history of neurological disorders. He was admitted to local hospital because of the complaint of swallowing difficulty. The interventions performed were electrical stimulation and conventional dysphagia therapy. We assessed the tongue and lip muscle strengths. Swallowing function was evaluated by using the video-fluoroscopic dysphagia and penetration-aspiration scales. [Results] After the intervention, the tongue and lip muscle strengths increased from 35 to 39 kPa and from 18 to 23 kPa, respectively. Moreover, the oral and pharyngeal phases of the videofluoroscopic dysphagia scale were improved. Furthermore, aspiration decreased from 4 to 2 points in the penetration-aspiration scale. [Conclusion] Our results suggest that electrical stimulation and conventional dysphagia therapy were effective in improving the swallowing function in an elderly individual with dysphagia.

**Key words:** Aging, Electrical stimulation, Presbyphagia

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### INTRODUCTION

Aging causes various problems related to swallowing. Presbyphagia refers to changes in the sensorimotor nervous system related to swallowing caused by aging. With progression of aging, changes in the motor nervous system, such as a decreased muscle mass and size, that are attributable to sarcopenia can occur<sup>1, 2)</sup>. Sarcopenia presents with a decrease in overall muscle strength and affects the muscles related to swallowing. In particular, weakening of the orofacial muscles, including the tongue, buccinator, and orbicularis oris, and the submental muscles located in the anterior neck region can cause many problems associated with residual bolus in the oral cavity and spillage from the lips, bolus formation, mastication, and reduced hyoid bone movement<sup>3, 4)</sup>. Therefore, swallowing management is essential in elderly individuals who are susceptible to presbyphagia. Accordingly, the present study aimed to investigate the effects of dysphagia therapy in an elderly individual with a chief complaint of swallowing difficulty.

### SUBJECTS AND METHODS

The subject was a 72-year-old man who was admitted with the chief complaint of spillage through the lips during swallowing, difficulty with residue on oral cavity, and aspiration. The purpose of the study were explained to the participant before study inclusion, and informed consent was obtained from the participant according to the principles of the Declaration of

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Helsinki. He had no history of stroke or other neurological disorder with no cognitive problems.

We assessed strength of tongue and lip muscle using Iowa Oral Performance Instrument (IOPI) (IOPI Medical LLC, Carnation, WA, USA). Swallowing function was assessed by using the videofluoroscopic dysphagia scale (VDS) and penetration-aspiration scale (PAS) based on a videofluoroscopic swallowing study (VFSS). Strength measurement revealed tongue and lip muscle strengths of 35 and 18 kPa, respectively. The VDS score was 14 of 40 in the oral phase, indicating problems in tongue-palate contact, mastication, lip closure, and oral transit time. In the pharyngeal phase, the score was 19 of 60, with problems of laryngeal elevation, vallecular residue, and penetration. Based on the VFSS results, the subject was diagnosed as having swallowing difficulties caused by aging or presbyphagia.

Dysphagia therapy performed conventional dysphagia therapy (thermal-tactile stimulation, orofacial exercise) during electrical stimulation (ES). ES was performed using the VitalStim (Chattanooga Group, Hixson, TN, USA). Two pair of electrodes were placed in the suprahyoid region targeting the suprahyoid muscles, and the inter-electrode distance was set at 2.5 mm. The ES provided 2 channels of bipolar electrical stimulation at a fixed 80-HZ pulse rate and a fixed biphasic pulse duration of 700  $\mu$ s. The stimulation intensity was increased until the patients felt a grabbing sensation in neck. The stimulation intensity was set 8.5 mA. Subject received the treatment for 30 minutes/day, 5 day/week, for 4 weeks.

## RESULTS

Tongue and lip muscle strengths improved after the intervention, from 35 to 39 kPa and from 18 to 23 kPa, respectively. VDS scores decreased in both the oral (tongue-palate contact, mastication, and lip closure) and pharyngeal phases (laryngeal elevation and vallecular residue) after the intervention, from 14 to 8 and from 19 to 8.5, respectively. The PAS score also decreased after the intervention, from 4 to 2 points.

## DISCUSSION

This study performed exercises for the tongue, lip, and facial muscles for improvement of oral functions, and ES was applied on swallowing-related muscles in the anterior neck region. According to a previous study, resistance exercise for the tongue is an effective method for reducing aspiration<sup>5</sup>. Moreover, facial muscles contribute to masticatory activities, while the lip muscles contribute to maintaining oral closure during swallowing to generate appropriate intraoral pressure<sup>6</sup>. Improving the strength of these oral muscles can increase intraoral pressure during swallowing and have a positive effect on the pharyngeal phase as well.

A previous study reported that electrical stimulation in patients with dysphagia can activate the swallowing muscles. It is an effective method for inducing antero-superior movement of the hyoid, which has a direct impact on the airway protection mechanism, and can help decrease aspiration<sup>7</sup>. This supports the results of the present study. We performed electrical stimulation and conventional dysphagia therapy in an old man with swallowing difficulty and demonstrated improvements in both oral muscle strength and swallowing function.

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