

Original Article

Effect of electrical stimulation on aspiration in children with cerebral palsy and dysphagia

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Abstract. [Purpose] This study aims to investigate the effect of electrical stimulation on aspiration in children with cerebral palsy and dysphagia. [Participants and Methods] Five children with cerebral palsy and dysphagia were recruited. Electrical stimulation was applied to the submental region targeting submental muscles. All participants received electrical stimulation 30 min/day, 5 days/week, for 4 weeks. Evaluation was performed using the penetration-aspiration scale (PAS), based on a videofluoroscopic swallowing study. [Results] PAS scores showed a statistically significant decrease from 3.8 ± 1.5 to 2.1 ± 1.2 and from 6.4 ± 2.1 to 4.3 ± 2.5 for semisolids type and liquids respectively. [Conclusion] The use of electrical stimulation is effective in reducing aspiration in children with cerebral palsy and dysphagia.

Key words: Dysphagia, Electrical stimulation, Cerebral palsy

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INTRODUCTION

Dysphagia is a common problem after cerebral palsy. Electrical stimulation is generally applied to improve skeletal muscle function in patients with neurological diseases and is used to prevent muscle atrophy, improve circulation, and increase strength¹⁾. Electrical stimulation induces muscle contraction and positively affects brain activation through afferent stimulation²⁾. This technique is also applicable in patients with dysphagia due to neurological diseases. Electrical stimulation has been used in patients with neurological disorders, such as stroke, and has been found to enhance swallowing muscle activity by improving hyoid movement and reducing aspiration^{3, 4)}. However, most previous studies have focused on adults with post-stroke dysphagia, and few studies have been conducted in children with cerebral palsy and dysphagia. Therefore, this study aimed to investigate the effect of electrical stimulation on aspiration in children dysphagia.

PARTICIPANTS AND METHODS

This study recruited 5 patients with cerebral palsy spastic type and dysphagia. The criteria for participation were as follows: 1) a diagnosis of cerebral palsy with dysphagia, 2) cerebral palsy with hemiplegia type, 3) the presence of aspiration or penetration, and 4) age <5 years, 5) GMFCS (Gross Motor Function Classification System) scores level IV or V. Informed consent for participation was obtained in accordance with the principles of the Declaration of Helsinki. All experimental procedures were approved by the institutional review board (KHUHMDIRB 1705-10). All participants provided written informed consent before the study. This study had a one-group, pre- and post-test design.

Patients received electrical stimulation with a Vital Stim device (Chattanooga Group, Hixson, TN, USA) using one pair of electrodes. The Electrodes were attached to the submental region for stimulation of the submental muscles (mylohyoid,

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geniohyoid, and digastric muscles). The intensity was increased until the patients felt a minimal stimulation level in their submental muscles (fixed 80-Hz pulse rate and a biphasic pulse width of 700 μ s). All participants received electrical stimulation for 30 min/day, 5 days/week, for 4 weeks. Evaluation was performed using the penetration-aspiration scale (PAS), based on videofluoroscopic swallowing study. The PAS is an 8-point scale that measures selected aspects of airway penetration and aspiration. The score is determined primarily by the depth to which material passes in the airway and whether material entering the airway is expelled⁵). The statistical analyses were performed using SPSS version 15.0 (IBM Corp., Armonk, NY, USA). The Wilcoxon signed-rank test was used to compare measurement pre and post of the intervention. The significance level was set at $p < 0.05$.

RESULTS

PAS showed a statistically significant decrease from 3.8 ± 1.5 to 2.1 ± 1.2 and from 6.4 ± 2.1 to 4.3 ± 2.5 semisolids and liquids, respectively ($p < 0.05$).

DISCUSSION

The purpose of this study was to evaluate the effect of electrical stimulation in children with cerebral palsy and dysphagia. The results showed that electrical stimulation is effective in reducing aspiration in children with cerebral palsy and dysphagia. Electrical stimulation activate the target muscle. Previous studies have reported that electrical stimulation induces activation of the swallowing muscle in patients with dysphagia. The induction of muscle activation is directly related to the recruitment of the motor unit, which is also related to muscle contraction¹). Therefore, electrical stimulation seems to be the result of increased muscle activity through stimulation of submental muscles in children with cerebral palsy. This is because strong contraction of the submental muscle is essential to reduce aspiration. Electrical stimulation is helpful in reducing the aspiration in children with cerebral palsy and dysphagia. Therefore, this intervention method is proposed as a remedial method for reducing aspiration. This study has some limitations. It is difficult to generalize the results because of the small number of participants. In addition, we did not compare the effects of the control group.

Conflict of interest

None.

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