

Effect of hand-free CTAR exercise on and degree of aspiration in dysphagia: A report of 2 cases

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Introduction

Dysphagia is a common occurrence in neurological diseases and leads to various complications, such as dehydration, aspiration pneumonia and malnutrition. Weakening of the suprahyoid muscles in the anterior neck region is known to affect opening of the upper esophageal sphincter and lead to aspiration. Therefore, therapeutic exercises to strengthen the suprahyoid muscles are important for patients with aspiration or a high risk of aspiration. The Shaker exercise is effective in increasing hyoid motion, decreasing aspiration, and opening the upper esophageal sphincter. Chin-tuck-resistance and chin to chest exercises serve the same Purpose as the Shaker exercise, but can be performed while sitting. It can also activate suprahyoid muscles nearly similar to the Shaker exercise. However, since these exercises can be carried out by hand, using a tool that provides resistance such as a resilient ball or a resistance bar, at least one hand is required to have proper function and strength. Therefore, patients who are unable to functionally use both hands for various reasons, such as limb paralysis, spinal cord injuries, traumatic or acquired brain injuries, are limited by their conditions. The Purpose of this study was to investigate the effect of CTAR exercise using hand-free resistance bar on hyoid movement and aspiration in patients with dysphagia, who had difficulty in functional use of both hands.

CASE REPORT

This study recruited two men with dysphagia after stroke, aged 57 and 62 years respectively. They had difficulty using both hands properly because of paralysis of the left upper extremity and rheumatoid arthritis of the right hand in patient 1 and paralysis of both upper extremities in patient 2. This study investigated the effect of 4 weeks of hand-free CTAR exercise on hyoid movement and aspiration. The exercise involved isotonic and isometric parts. In isometric CTAR, the patients were asked to chin tuck against the device 3 times for 60 s each, with no repetition. In isotonic CTAR, the patient performed 30 consecutive repetitions by strongly pressing against the resistance device and then releasing it. (Figure 1) Based on videofluoroscopic swallowing study, the degree of aspiration was measured using the Penetration-Aspiration Scale (PAS) and two-dimensional motion analysis of the hyoid bone. After post-intervention, the hyoid movements in both patients improved by 0.16, 0.22 cm (anterior movement), 0.26, 0.28

cm (superior movement) and PAS scores decreased by 2 and 2 points, respectively.(Table 1)

Conclusion

This study confirms that hand-free CTAR exercise is applicable and helpful in improving hyoid movement and reducing aspiration in patients with dysphagia after stroke. Therefore, this exercise can be introduced as an intervention for improving the swallowing function in patients with dysphagia who have difficulty using both hands.

Table 1. Changes in parameters before and after treatment

	patient 1			patient2		
	Before treatment	After treatment	Improvement rate(%)	Before treatment	After treatment	Improvement rate(%)
Anterior movement of the hyoid bone (cm)	1.45	1.61	11.0	1.54	1.76	14.2
Superior movement of the hyoid bone (cm)	1.55	1.81	16.7	1.63	1.91	17.1
PAS	6	4		6	4	

PAS: penetration-aspiration scale



Figure 1. Hand-free chin-tuck-resistance exercise