

Effect of chin tuck against resistance exercise on patients with dysphagia following stroke: A randomized pilot study.

NeuroRehabilitation. 2018;42(2):191-197. doi: 10.3233/NRE-172250. PMID: 29562558
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Abstract

BACKGROUND:

Recently, chin tuck against resistance exercise (CTAR) has been reported as a remedial treatment for pharyngeal dysphagia. However, the clinical evidence of the effect is still lacking.

OBJECTIVE:

This study investigated the effect of CTAR on the swallowing function in patients with dysphagia following subacute stroke.

METHODS:

The patients were randomly assigned to an experimental (n=11) or a control group (n=11). The experimental group performed CTAR using the CTAR device. The control group received only conventional dysphagia treatment. Both groups received training on five days a week, for four weeks. The swallowing function was measured using functional dysphagia scale (FDS) and penetration-aspiration scale (PAS), based on a videofluoroscopic swallowing study (VFSS).

RESULTS:

The experimental group showed more improvements in the oral cavity, laryngeal elevation/epiglottic closure, residue in valleculae, and residue in pyriform sinuses of FDS and PAS compared to the control group ($p<0.05$, all).

CONCLUSIONS:

This study demonstrated that CTAR is effective in improving the pharyngeal swallowing function in patients with dysphagia after stroke. Therefore, we recommend CTAR as a new remedial training alternative to HLE.

Effect of Hand-free “Chin Tuck against Resistance (CTAR)” Exercise on Hyoid Bone Movement and the Degree of Aspiration in Stroke Patients with Dysphagia: A Report of 2 Cases

Journal of the Korean Dysphagia Society 2018;8:121-125 Sang Hoon Jung, M.D.1 , Dong Hwan Oh, O.T.2 , Doo-Ho Lee, O.T.3 , Na-Kyoung Hwang, O.T.4 , Hee-Su Park, O.T.2 , Hee-Jung Kim, O.T.2 , Yong Hwa Kwon, O.T.2 , Yunho Kim, M.D.1 , Nami Han, M.D.1

This study recruited two men with dysphagia after stroke, aged 57 and 62 years. They had difficulty using both hands properly due to 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 examined the effects of 4 weeks of hand-free chin-tuck-resistance exercise on the hyoid movement and aspiration. The exercises 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. Based on a video fluoroscopic swallowing study, the degree of aspiration was measured using the Penetration-Aspiration Scale (PAS) and two-dimensional motion analysis of the hyoid bone. Post-intervention, the hyoid movements in both patients improved by 0.16 and 0.22 cm (anterior movement), and 0.26 and 0.28 cm (superior movement), and the PAS scores decreased by 2 and 2 points, respectively. This study confirms that hands-free chin-tuck resistance exercise is applicable and helpful for improving the 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. (JKDS 2018;8: 121-125)

Keywords: Dysphagia, Hand-free chin-tuck-resistance exercise, Stroke, Swallowing, Suprathyroid muscle

Effects of chin tuck against resistance exercise versus Shaker exercise on dysphagia and psychological state after cerebral infarction.

Eur J Phys Rehabil Med. 2017 Jun;53(3):426-432. doi: 10.23736/S1973-9087.16.04346-X. Epub 2016 Nov 10. PMID: 27830923 Gao J¹, Zhang HJ².

Abstract

BACKGROUND:

The incidence of stroke is high in China. The dysphagia caused by cerebral infarction (CI), seriously affects patients' life quality, and even endangers patients' lives. It is necessary to explore how to improve dysphagia caused by CI.

AIM:

To compare the effects of rehabilitation training on dysphagia and psychological state after CI between Shaker exercise and chin tuck against resistance (CTAR) exercise.

DESIGN:

Control study. Blind.

SETTING:

Inpatients.

POPULATION:

A total of 90 patients with dysphagia after CI were divided into CTAR group, Shaker group and control group by random digit table (each group with 30 patients).

METHODS:

Video fluoroscopic swallowing study (VFSS) and Self-Rating Depression Scale (SDS) were performed on all patients before intervention. VFSS was evaluated based on Penetration-Aspiration Scale. All patients received routine treatments including internal medicine, traditional rehabilitation training and routine nursing. The patients in control group only receive the routine treatments. Besides the routine treatments, the patients in CTAR group also received CTAR exercise, and the patients in Shaker group also received Shaker exercise. VFSS was performed again on all patients, respectively, 2, 4, and 6 weeks after exercise. SDS was performed again on all patients 6 weeks after exercise.

RESULTS:

There were no statistical differences amongst the three groups in VFSS and SDS before intervention ($P>0.05$). After intervention, all patients had various degrees of improvement for dysphagia in the three groups, especially between 2 and 4 weeks in CTAR and Shaker groups. The total effective rate was significantly higher in CTAR group (86.67%) and Shaker group (76.67%) than in control group (43.33%) (all $P<0.05$). The scores of SDS was significantly lower in CTAR group than in Shaker group and control group 6 weeks after intervention (all $P<0.05$).

CONCLUSIONS:

For the patients with dysphagia after CI, CTAR exercise can significantly relieve depression and has the similar effect on improving swallowing function as compared with Shaker group.

CLINICAL REHABILITATION IMPACT:

This study suggests that in conscious patients CTAR exercises have greater impact on CI-related depression than Shaker exercises.

Evaluating the Training Effects of Two Swallowing Rehabilitation Therapies Using Surface Electromyography--Chin Tuck Against Resistance (CTAR) Exercise and the Shaker Exercise.

Dysphagia. 2016 Apr;31(2):195-205. doi: 10.1007/s00455-015-9678-2. Epub 2016 Feb 2. PMID: 26837612
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Abstract

In this study, the efficacy of two dysphagia interventions, the Chin Tuck against Resistance (CTAR) and Shaker exercises, were evaluated based on two principles in exercise science-muscle-specificity and training intensity. Both exercises were developed to strengthen the suprathyoid muscles, whose contractions facilitate the opening of the upper esophageal sphincter, thereby improving bolus transfer. Thirty-nine healthy adults performed two trials of both exercises in counter-balanced order. Surface electromyography (sEMG) recordings were simultaneously collected from suprathyoid muscle group and sternocleidomastoid muscle during the exercises. Converging results using sEMG amplitude analyses suggested that the CTAR was more specific in targeting the suprathyoid muscles than the Shaker exercise. Fatigue analyses on sEMG signals further indicated that the suprathyoid muscle group were equally or significantly fatigued (depending on metric), when participants carried out CTAR compared to the Shaker exercise. Importantly, unlike during Shaker exercise, the sternocleidomastoid muscles were significantly less activated and fatigued during CTAR. Lowering the chin against resistance is therefore sufficiently specific and intense to fatigue the suprathyoid muscles.

KEYWORDS:

Deglutition disorders; Esophageal sphincter, upper; Muscle fatigue; Sternocleidomastoid muscle; Submental muscles; Swallowing intervention

Effects of Strengthening Exercises on Swallowing Musculature and Function in Senior Healthy Subjects: a Prospective Effectiveness and Feasibility Study.

Dysphagia. 2015 Aug;30(4):392-403. doi: 10.1007/s00455-015-9611-8. Epub 2015 Apr 4. PMID: 25840788
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Abstract

Head and neck cancer (HNC) patients may develop dysphagia due to muscle atrophy and fibrosis following chemoradiotherapy. Strengthening of the swallowing muscles through therapeutic exercise is potentially effective for improving swallowing function. We hypothesize that a customized Swallow Exercise Aid (SEA), developed for isometric and isokinetic strengthening exercises (against resistance), can help to functionally strengthen the suprathyroid musculature, which in turn can improve swallowing function. An effectiveness/feasibility study was carried out with ten senior healthy volunteers, who performed exercises 3 times per day for 6 weeks. Exercises included chin tuck against resistance (CTAR), jaw opening against resistance (JOAR), and effortful swallow exercises with the SEA. Multidimensional assessment consisted of measurements of maximum chin tuck and jaw opening strength, maximum tongue strength/endurance, suprathyroid muscle volume, hyoid bone displacement, swallowing transport times, occurrence of laryngeal penetration/aspiration and/or contrast residue, maximum mouth opening, feasibility/compliance (questionnaires), and subjective swallowing complaints (SWAL-QOL). After 6-weeks exercise, mean chin tuck strength, jaw opening strength, anterior tongue strength, suprathyroid muscle volume, and maximum mouth opening significantly increased ($p < .05$). Feasibility and compliance (median 86 %, range 48-100 %) of the SEA exercises were good. This prospective effectiveness/feasibility study on the effects of CTAR/JOAR isometric and isokinetic strengthening exercises on swallowing musculature and function shows that senior healthy subjects are able to significantly increase swallowing muscle strength and volume after a 6-week training period. These positive results warrant further investigation of effectiveness and feasibility of these SEA exercises in HNC patients with dysphagia.

Treatment and evaluation of dysphagia rehabilitation especially on suprathyroid muscles as jaw-opening muscles[☆]

Jpn Dent Sci Rev. 2018 Nov; 54(4): 151–159. Published online 2018 Sep 8. doi: [10.1016/j.jdsr.2018.06.003](https://doi.org/10.1016/j.jdsr.2018.06.003)

PMCID: PMC6175969 PMID: [30302133](https://pubmed.ncbi.nlm.nih.gov/30302133/) [Koji Hara](#), [Haruka Tohara](#),* and [Shunsuke Minakuchi](#)

Summary

In our aging society, the number of patients with dysphagia, which is associated with disease and aging, is rapidly increasing. The swallowing reflex is a complex process that involves coordinated contractions of swallowing muscles. Many researchers have reported that age-related changes, such as frailty and sarcopenia, affect swallowing muscles and contribute to the decline in the swallowing function. Thus, simple, non-invasive evaluation methods and exercises for swallowing muscles in elderly patients with dysphagia are important.

Anterior–superior hyolaryngeal elevation during swallowing results from contractions of the suprathyroid muscle, which plays a primary role in opening the upper esophageal sphincter, along with relaxation of the cricopharyngeal muscle and laryngeal closure. Thus, many researchers have studied methods for evaluating and augmenting suprathyroid muscles. On the other hand, some researchers have reported on dysphagia rehabilitation focused on jaw-opening actions, because hyolaryngeal elevation muscles correspond with jaw-opening muscles. In this study, we describe a new dysphagia evaluation method and an exercise that focuses on suprathyroid muscles with application of jaw-opening actions.

Abbreviations: SH, suprathyroid; sEMG, surface electromyography; 320-ADCT, 320-row area detector computed tomography; JOF, jaw-opening force; JOE, jaw-opening exercise; JOFT, jaw-opening force test; JOR, jaw-opening against resistance

Keywords: Dysphagia, Suprathyroid muscle, Swallowing, Hyoid, Jaw-opening, Aging

Chin tuck against resistance (CTAR): new method for enhancing suprathyoid muscle activity using a Shaker-type exercise.

Dysphagia. 2014 Apr;29(2):243-8. doi: 10.1007/s00455-013-9502-9. Epub 2013 Dec 15. PMID: 24337867
Yoon WL¹, Khoo JK, Rickard Liow SJ.

Abstract

For patients with dysphagia resulting from upper esophageal sphincter dysfunction, strengthening the suprathyoid muscles through therapeutic exercise has proved effective in restoring oral feeding. The aim of this study was to compare the maximum and mean surface electromyography (sEMG) activity of the suprathyoid muscles during the Chin Tuck Against Resistance (CTAR) exercise and the Shaker exercise for both isokinetic and isometric tasks. During the CTAR exercises, the participant is seated while tucking the chin to compress an inflatable rubber ball, whereas during the Shaker exercise, the participant is lay supine while lifting the head to look at the feet. Forty healthy participants (20 males, 20 females) aged 21-39 years completed all four tasks in counterbalanced order, with measures of resting activation taken prior to each exercise. Although subjective feedback suggested that the sitting position for CTAR is less strenuous than the supine position for Shaker, the results of separate analyses showed significantly greater maximum sEMG values during the CTAR isokinetic and isometric exercises than during the equivalent Shaker exercises, and significantly greater mean sEMG values were observed for the CTAR isometric exercise than for the Shaker isometric exercise. Clinical trials are now needed, but the CTAR exercises appear effective in exercising the suprathyoid muscles, and they could achieve therapeutic effects comparable to those of Shaker exercises, with the potential for greater compliance by patients.