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ORIGINAL ARTICLE

A COMPARATIVE STUDY ON THE EFFECTIVENESS OF CHIN TUCK AGAINST RESISTANCE ALONG WITH SHAKER EXERCISE AND MENDELSOHN MANEUVER ALONG WITH EFFORTFUL SWALLOWING EXERCISE IN POST STROKE DYSPHAGIA

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ABSTRACT

Background of the study: The word dysphagia is derived from the Greek words “dys” (with difficulty) and “phagia” (to eat) which means difficulty in swallowing. It refers to problems with transmit of food or liquid from the mouth to the hypo pharynx or through the esophagus. Aspiration is the important complication of dysphagia as it was defined as the penetration of food, liquid, saliva or gastric reflux into the airway. The purpose of the study is to show the effectiveness of Chin Tuck against Resistance along with shaker exercise and Mendelsohn maneuver along with Effortful swallowing exercise to improve swallowing function in post stroke dysphagia. Objective of the study was to compare the effectiveness of Chin Tuck against Resistance along with shaker exercise and Mendelsohn maneuver along with Effortful swallowing exercise in post stroke dysphagia. **Method:** It is an experimental study of 30 patients recruited by purposive random sampling method. They were divided into two groups, Group A and Group B consists of 15 subjects. Subjects in Group A receive of Chin Tuck against Resistance along with shaker exercise and Group B receives and Mendelsohn maneuver along with Effortful swallowing exercise. **Result:** Group A stroke patients included in the study completed the sessions of Chin Tuck Against Resistance along with shaker exercise were re-evaluated at the Eight weeks follow-up. The two-tailed P value is less than 0.0001, by conventional basis; which shows that distinction is exceedingly statistically significant. **Conclusion:** The study concluded that Chin Tuck against Resistance along with shaker exercise was effective treatment for improving swallowing function in post-stroke dysphagia.

Keywords: Chin Tuck against Resistance, shaker exercise and Mendelsohn maneuver, Effortful swallowing, Gugging Swallowing Screening (GUSS), Eating Assessment Tool-10 (EAT-10).

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INTRODUCTION

Stroke is recognized as a leading cause of death and disability and was associated with many medical complications. Stroke is a medical condition which affects arteries leading to destruction in the brain tissues. Approximately 50–60% of those who have had stroke have dysphagia symptoms and 20 % have aspiration pneumonia. Post dysphagia involves difficulty in both oral and pharyngeal phases of swallowing. Many stroke patients recover swallowing spontaneously but some will still experience dysphagia of about 11-50% for at least6 months [1].

Dysphagia is actually defined as difficulty in swallowing or inability to swallow any solid or liquid. It can be seen in hemispheric stroke, brainstem stroke or pseudo bulbar and supra bulbar palsy.81 % of dysphagic symptoms was mainly reported as high in brainstem stroke.

Prolonged and persistent dysphagia may result in excess production of saliva, coughing, drooling, choking during eating and even difficulty speaking or hoarse voice. The complications due to dysphagia are aspiration pneumonia, dehydration, malnutrition and death.

The most common physiological problems seen in dysphagia includes delayed triggering of swallowing reflux, reduced pharyngeal peristalsis and reduced lingual control. Normal swallowing consists of four phases namely,

- Oral-Preparatory Phase (voluntary)
- Oral Phase (voluntary)
- Pharyngeal phase (involuntary)
- Esophageal phase.(involuntary)

In oral-preparatory phase, there will be initiation of taking food into the mouth.

In Oral phase, the swallowing is voluntary. The pattern-elicited response is initiated at the end of this phase. After the pre-oral stage, food enters into the pharynx in from the mouth. After food entering into the mouth the mandible elevates and the lips closes to help in oral contaminant of food. In this phase, when the bolus is passes the anterior facial pillars or touches the posterior wall of the pharynx and the oral stage ends.

In Pharyngeal phase, the swallowing is involuntary. It is the most critical stage of the swallow; airway closure must to prevent the bolus from entering the respiratory system. When the bolus reaches palate glossal arch of the oropharynx, the pharyngeal phase begins. The receptors used in this phase are situatedoverthepalatoglossalandpalatopharyngealarchesandoverthebottomof the tongue. With the beginning of the pharyngeal phase other activities like chewing, coughing, breathing, vomiting are concomitantly inhibited.

In Esophageal phase, food enters esophagus from the pharynx via peristaltic wave motion with some help from gravity.

At the beginning of this phase, the larynx lowers, returning to its normal position. The contraction of crico pharyngeus muscle helps in resuming respiration and also prevents reflux.

Peristalsis is slower in elderly patients but this stage normally lasts for about three and twenty seconds. Esophageal problems can

cause there flux of food back into the pharynx leading to aspiration. Peripheral stimulation of the inner branch of the superior laryngeal nerve is the actual initiation of entire swallowing reflex.

The voluntary initiation of swallowing takes place in special areas of the cerebral cortex of the brain called the Precentral Gyrus (primary motor area), Posterior-Inferior gyrus and the frontal gyrus. Dysphagiais classified as oropharyngeal oresophageal depends in food bolus on the location.

Oropharyngeal Dysphagia: Dysfunction of transfer of food bolus occurs in between pharynx and upper esophageal sphincter.

Esophageal Dysphagia: Dysfunction of peristaltic movement or conditions that obstruct the flow of food bolus between the esophagus and stomach.

- Cranial nerves involved in dysphagia are
- Oral stage (5-trigeminalnerve, 7 facial nerve)
- Pharyngeal stage (9–glosso pharyngeal nerve, 10–vagusnerve, 11-accessory nerve)
- Oral and pharyngeal stage (12 – Hypoglossal nerve)

Functional Grading of dysphagia:

GRADE1–Complaints of dysphagia but still eating normally GRADE 2 -Requires liquid with meals

GRADE3- Able to take semi-solid, but unable to take any solids

GRADE 4 -Able to swallow liquids only

GRADE5- Unable to swallow liquid, but able to swallow saliva, GRADE 6 -Unable to swallow saliva also

Therapeutic exercises that stimulate and strengthen the swallowing related muscle are recommended for dysphagia rehabilitation. The supra hyoid muscle complex responsible for swallowing are critical during the pharyngeal phase of swallowing because it controls the movement of the larynx, hyoid bone and epiglottis to protect the airway and the opening of upper esophageal sphincter to allow bolus transfer into the esophagus. Swallowing exercise is broadly divided into 2 types

1. Direct swallowing exercise (strengthens muscles involved in swallowing)
2. Indirect swallowing exercise (involves the action of swallowing)

Shaker exercise is a therapeutic technique and also a swallow exercise to strengthen the suprahyoid muscles (thyrohyoid, mylohyoid, genio hyoid, anterior belly of digastrics muscle). This exercise doesn't involve swallowing but it strengthens supra hyoid muscles and plays a important role in opening the muscle at the top of the esophagus and its width which helps to keep the airway safely closed when food and drink passes by [2].

Chin tuck against resistance (CTAR) gains popularity in improving deglutition function since 2013.It facilitates airway protection and enhances tongue base retraction[3]. This exercise adequately widens the vallecular space and provides essential airway protection. It helps in improving swallowing movement and strengthens the suprahyoid muscle. It is less strenuous and increases compliance with swallowing. In pharyngeal phase, it helps in advancing the oral diet stage.

Effortful swallowing was first introduced to improve the contact between the base of the tongue and the posterior pharyngeal wall during swallowing thus increasing the pressure

on the bolus [4]. Its goal is to keep food or liquid from stuck in the throat while drinking or eating to protect the airway and clear the residue.

Mendelsohn maneuver has been used as both a compensatory strategy and a rehabilitation exercise since it was first described in the mid 1980[5].It requires the patient to initiate the swallow and at the peak of hyo-laryngeal excursion and maintains supra hyoid contraction before relaxing and completing the swallow. Thus it is designed for reduced Upper Esophageal Sphincter opening and pyriform sinus residue.

The Gugging Swallowing Screen (GUSS) was developed in 2006 at the neurological department in cooperation with the department of clinical Neurosciences and preventive medicine [6].It helps in finding the dysphagia severity and the risk of aspiration. Compared to other dysphagia screens, the test sequences of the GUSS is unique sit starts with saliva swallowing followed by swallowing of liquid, semi- solid and solid items. Some acute-stroke patients have more problems in degluting the liquids like water than semisolid items.

The Eating Assessment Tool (EAT-10)is a dysphagia screening tool developed in 2008 by belaf sky to identify people at high risk of swallowing disorders, It is currently being used worldwide in clinical settings[7]. It is a 10– item self-assessment scale in which patients can complete in a short period of time. The previous data suggests that an EAT -10 score of 3 or greater is abnormal.

METHODS: The study was conducted at JKKMMRF College of Physiotherapy & Outpatient Department. Samples were selected by convenient sampling techniques which consist of both male and female, each group consists of 15 persons.

Group A – Chin Tuck against Resistance along with Shaker exercise.

Group B Mendelsohn maneuver along with Effortful swallowing

Parameter: Gugging Swallowing Screen, Eating Assessment Tool–10

Inclusion criteria: Stroke patients with swallowing difficulty, Age: 35-55years, No nasogastric tube, medically stable, Able to assume sitting position, Able to co-operate, obeys command with ability to imitate were included for the study.

Procedure and Protocols:

Group– a Chin Tuck against Resistance along with shaker exercise

The subjects in the Group A received Chin Tuck against Resistance along with shaker exercise.

Chin Tuck against Resistance (CTAR)

- The patient was instructed to sit in a chair with upright position.
- Then the subject is instructed to tuck in their chin towards the manubrium sternum, it squeeze the inflatable rubber ball placed between their chin and chest.
- Isokinetic Task–squeeze of ball as hard as possible. {1set–30 Consecutive squeezes}
- Isometric task – Squeezing of ball and sustaining the squeeze for a period of time.

{Squeeze for 10-60 reps}

- Dosage: 20minutes-2 session per day, 5 days per week for 8 weeks

Shaker Exercise

- The patient was instructed to do supine lying and raise the head and look at the toes.
- Isometric Task - Holding the head and looking at the toes without moving the shoulder.
- Isokinetic Task-Sustained repetitive head raising for 15times and rest for1 min and continuing the exercise for 30times.
- Dosage: 20 minutes-2 session per day, 5 days per week for 8 weeks.

Group B

The subjects in Group B received mendelsohn maneuver along with effortful swallowing.

Mendelsohn maneuver:

a. The subject was made to sit in a upright position.

b. The patient was made to hold the base of the hyoid bone and maintain this while swallowing.

Dosage: 20minutes, 30-40 swallows 2 sessions per day for 5 days per week for 8 weeks.

Effortful swallowing exercise:

a. The patient was instructed to sit in a upright position.

b. Then the patient was asked to push the tongue firmly against the hard palate while swallowing as forcefully as possible

Dosage: 20 minutes, 30– 40 swallows, 2sessionperday 5 days per week for 8weeks.

Result

Descriptive statistics for Gugging Swallowing Screen–Group A and Group B.

Group	GUSS	Mean	Standard deviation	Pairedt-test
Group A	**Pre-test**	9.80	2.01	7.68
	Post-test	15.20		
Group B	**Pre-test**	9.00	1.74	9.45
	Post-test	11.80		

Descriptive statistic for Gugging Swallowing Screen in Group A shows that paired 't' test values of pre Vs post-test values of GroupAwas7.68at 0.0001 level which was greater than tabulated 't'values (2.13). Group B shows that paired 't'test values of pre Vs post-test values of GroupBwas9.45 at 0.0001level which was greater than tabulated't' values (2.13). This showed alike there is significant difference between pre Vs post test results of Group A and Group B for GUSS. This exposed that there was significant improvement in post –test mean values in response to GUSS in Group A and Group B.

GUSS	Mean	Mean difference	Standard deviation	Unpaired t- test
Group A	15.20	3.40	2.01	4.95
Group B	11.80			

Table1: Gugging Swallowing Screen (GUSS) Post-Test Analysis

The above table shows the post-test analys is results in GUSS for Group A and B. The mean value of Group Awas15.20 which was greater than Group B value 11.80 and the unpaired 't' test was 4.95 at 0.0001 level, which was greater than the tabulated 't" value (2.15). It showed that the statistical difference between Mean values of Group A and Group B.

Group	EAT-10	Mean	Standard deviation	Pairedt-test
Group A	Pre-test	31.40		
	Post-test	13.73	4.53	12.27
Group B	Pre-test	30.27	3.74	4.22
	Post-test	27.13		

Table2: Descriptive statistics for Eating Assessment Tool-10-GroupA and Group B

Descriptive statistic for Eating Assessment Tool in Group A shows that the paired't' test values of pre Vs. post-test values of Group A was 12.27 at 0.0001 level which was greater than tabulated 't' values (2.13). Group B shows that the paired't' test values of pre Vs post-test values of Group B was 4.22 a t0.0001 level which was greater than tabulated 't' values (2.13). This showed that there was significant difference between pre Vs posttest results in Group A and Group B. There was a significant improvement in post–test mean value in response to Eating Assessment Tool-10.

Result

Eating Assessment Tool-10	Mean	Mean difference	Standard deviation	Unpaired t-test
Group A	13.73	12.73	4.07	8.10
Group B	26.47			

Table 3: Eating assessment tool–10 (Posttest analysis)

The above table shows the post-test analysis result in EAT-10for Group A and B. The mean value of Group A is 13.33 which was lesser than Group B value of 26.47

and the unpaired 't' test value was 8.10 at 0.0001 level, which was greater than tabulated 't' value (2.15). It showed statistical significance difference between mean values of Group A and B.

DISCUSSION

The purpose of the study was to determine the effectiveness of Chin Tuck Against Resistance along with shaker exercise and Mendelsohn maneuver along with Effortful swallowing exercise. The study sample comprised of 30 patients of age group 35-55 years grouped as A and B. In each group 15 subjects were participated. Group A with Chin Tuck Against Resistance along with shaker exercise and Group B with Mendelsohn maneuver along with Effortful swallowing exercise. The result of the statistical analysis brings out the following for consideration.

The result showed that there was statistical significant difference between Group A and Group B. The Stroke patients with dysphagia who were treated with Chin Tuck against Resistance along with shaker exercise have shown good improvement in post stroke dysphagia [8.]

In the analysis and interpretation of Gugging Swallowing Screen in Group A and Group B for 15 patients in each group:

The unpaired t test value of GUSS in Group A and B post-test analysis was 4.95which were greater than the tabulated t value2.15.

In the analysis and interpretation of Eating AssessmentTool-10 in Group A and Group B for 15 patients in each group:

The unpaired t test value of EAT-10 in Group A and B post-test analysis was 8.10 which were greater than the tabulated t value2.15. The result showed that there was statistical significant difference between Group A and Group B. The Stroke patients with dysphagia who were treated with Chin Tuck, against Resistance along with shaker exercise have shown good improvement in post stroke dysphagia.

A study conducted to examine the effectiveness of exercise based dysphagia therapy on swallowing ability among patients with cerebrovascular accidents[8]. 48 patients adult patients of both sex aged (18- 65years old) were included. First group received shaker exercise, hyoid lift maneuver, mendelsohn

maneuver, tongue exercises and masako maneuver. Second group received routine care only. Intervention period of 4weeks were taken. Parameters used in this study are Functional oral intake scale (FOIS) and gugging swallowing screen test (GUSS). After getting swallowing exercises, many patients returned to complete oral diet[9].

A study conducted to compare the effects of game based Chin Tuck against Resistance (CTAR) and head lift exercise on swallowing function and compliance of patients with dysphagia after stroke[9] .A total of 37 patients was assigned with 6 weeks as intervention period. The experimental group performed game based CTAR where as the control group performed traditional head lift exercise. As a result game based CTAR exercise has a similar effect as head-lift exercise but it is less strict and more enjoyable and interesting [10-12].

A study conducted to determine the effects of mendelsohn maneuver on measures of swallowing duration in post stroke. Eighteen individuals were included based on the VFSS. Treatment duration was about 8 weeks with 45 minutes persession[10].As a result; mendelsohn maneuver can improve the duration of hyoid movement (anterior and superior) and impact the duration of upper esophageal sphincter opening.

CONCLUSION

The study which was conducted for 8weeks period of intervention showed that Group A of those who received Chin Tuck against Resistance along with shaker exercise resulted in improvement on dysphagia symptoms than Group B who received Mendelsohn maneuver with effortful swallowing.

The study concluded that Chin Tuck against Resistance along with shaker exercise was effective treatment for reducing dysphagia symptoms in post stroke dysphagia patients.

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