



A STUDY TO COMPARE THE EFFECT OF SHAKER EXERCISES AND SWALLOW-STRENGTHENING EXERCISES IN STROKE SURVIVORS WITH OROPHARYNGEAL DYSPHAGIA.

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ABSTRACT

Introduction: Dysphagia is common after acute stroke with a reported incidence as high as 47%. The Dysphagia in stroke is usually considered to indicate a brain stem lesion caused by vertebrobasilar disease or bilateral corticobulbar fiber damage, but it has also been reported in unilateral hemisphere lesions. This can cause aspiration pneumonia, Many treatments such as shaker exercise Mendelsohn maneuver, effortful swallowing, have been reported to improve swallowing in patients with dysphagia.

AIM: To compare the effect of shaker exercises and swallow- strengthening exercise in stroke survivors with oropharyngeal Dysphagia.

METHOD: 22 stroke patient with oropharyngeal dysphagia aged between 55 to 75 in group as Group A(n=11) and Group B (n=11),Pateint were evaluated at baseline and immediately after the intervention on basis of FOIS(function oral intake scale).

RESULT: Between group comparis on of pre intervention of functional oral intake scale (FOIS) demonstrated statistical non significance with $p > 0.05$ which indicates that both the intervention techniques have equal effects on stroke patient with dysphagia. Based on these within and between group comparisons using paired and unpaired t tests respectively, this can be resulted that both the intervention techniques i.e shaker exercise and combination of mendelsons maneuver and swallow strengthening have the same effects on stroke patient with disphagia.

CONCLUSION: Statistical significant difference was not found between both groups- group A and group B in the post intervention shaker exercise and swallow strengthening exercise. The study showed improvements in swallowing function of patient, which suggest that use of shaker exercise and swallowing strengthening exercise can be implemented individually to improve swallowing function of stroke patient with dysphagia and have shows no harmful effect in any individual.

KEYWORD: Functional Oral Intake Scale, Dysphagia, shakar exercise, swallow strengthening etc.

INTRODUCTION

Dysphagia is common after acute stroke with a reported incidence as high as 47% . Voluntary swallowing is initiated by activation of the cortical motor strip or stimulation of the supplemental motor area. The reflexive portion of a swallow is controlled by the bilateral ‘swallowing centers’ of the brainstem, while several cranial nerves and spinal nerves are involved in oropharyngeal swallowing⁽¹⁾ The phases of swallowing may be summed thus:

1. The mouth and nose are closed.
2. The larynx is raised and closed and its upper part is obliterated by the back of the tongue.
3. The pharyngeal space is obliterated by (a) raising the larynx, and (b) retraction of the tongue. (The posterior wall of the pharynx does not come forward; the pharynx is not constricted but is compressed from before backward against the posterior wall, that is, against the vertebra.)
4. The pharynx is opened up, and with the three outlets closed a negative pressure is obtained by (a) dropping the larynx and (b) allowing the tongue to go forward.
5. During this movement the laryngeal pharynx still remains high, in close relation to the epiglottis. It is in an open-mouthed condition.
6. Food is tipped over the back of the tongue.
7. Food is sucked into the open mouth of the laryngeal pharynx, which, as it receives the bolus, drops from the epiglottis down to its normal position, thus opening up the larynx again, after the food has passed.
8. The food is probably sucked some distance down the esophagus⁽³⁾
9. The primary condition of interest was oropharyngeal dysphagia, defined by abnormal swallowing physiology of the upper digestive tract⁽⁶⁾.

The Dysphagia in stroke is usually considered to indicate a brain stem lesion caused by vertebrobasilar disease or bilateral corticobulbar fiber damage, but it has also been reported in unilateral hemisphere lesions, including stroke.⁽²⁾ The presence of dysphagia is identified using 1 of 3 types of diagnostic techniques, and as detected from clinician testing including screening, clinical bedside, or instrumental tests. Aspiration was defined to be a sign of dysphagia⁽⁷⁾. The medical management for dysphagia is endoscopically placed feeding tubes or nasogastric feeding tubes may be required for early enteral feeding. Based on nutritional parameters and patient survival, enteral feeding through a PEG tube may be superior to nasogastric feeding in patients with acute stroke and dysphagia. Immunosuppressive therapy in patients with inflammatory myopathies may be more promising in improving symptoms of dysphagia in this setting.⁽⁸⁾ The pharyngeal phase is especially important as it is directly related to aspiration. Aspiration occurs when or bolus enters the airway through the vocal cords instead of being swallowed into the esophagus. This can cause aspiration pneumonia, which can be fatal. Therefore, swallowing rehabilitation are important to ensure safe swallowing in stroke survivors with dysphagia ⁽⁴⁾ Dysphagia is a complication that occurs about 37–78% of stroke patients. Complications of dysphagia include dehydration and malnutrition, and aspiration

pneumonia which can lead to death. Therefore, proper treatment after early diagnosis is critical. Many treatments such as shaker exercise Mendelsohn maneuver, effortful swallowing, have been reported to improve swallowing in patients with dysphagia ⁽⁴⁾. Shaker exercise (SE) is a remedial method to train the swallowing-related muscles located in the front of the neck⁽⁵⁾.The shaker exercise consist of isometric and isotonic contraction movement. Isometric contraction movement-1st part of exercise isotonic contraction movement- 2nd part of exercise⁽³⁾. The shaker exercise is based on the anterior and superior movement of the hyoid bone by the contraction of the thyrohyoid,mylohyoid,geniohyoid and anterior belly of the digastric muscle thus its effectiveness has been reported for strengthening the suprahyoid and infrahyoid muscle and for UES opening ⁽⁵⁾. the Shaker exercise can be effectively applied for improvement of the swallowing function by facilitating anterior and superior movement of the hyoid bone and larynx through⁽³⁾. The Mendelsohn maneuver is intended to maintain elevated hyoid and laryngeal motion during swallowing in order to increase the UES opening time and range. In normal swallowing, the contraction time of the suprahyoid muscles is extremely short because the anterior-superior movement of the hyoid bone is within about 1-2 seconds. Hyoid movement pulls on the thyroid and cricoid cartilages; thereby, UES is allowed about a 6-mm opening. Maximal hyoid excursion occurs at the time of the first cricopharyngeal opening and, thereafter, the bolus passes through the esophagus. However, the Mendelsohn maneuver can intentionally prolong the contraction time of the suprahyoid muscles by holding the hyoid bone up to its maximum when the suprahyoid muscles are contracted during swallowing ⁽⁵⁾.This study be carried out to compare the effect of shakers exercise and swallow strengthening exercises in stroke patients diagnosed with oropharyngeal dysphagia after stroke.

NEED FOR STUDY

Previous studies have found high incidence (47%) of dysphagia. As previously discussed , dysphagia may cause many complications such as aspiration pneumonia, dehydration and in some case death. It is important to consider the early treatment and rehabilitation of dysphagia post stroke. There are many studies present showing effective result of Shakers exercises and swallow strengthening exercises. But there are no study present comparing this two techniques So the present study have been carried out to compare the effect of shakers exercises and swallow strengthening exercises in patient with oropharyngeal dysphagia.

AIM

To compare the effect of shaker exercises and swallow- strengthening exercise in stroke survivors with oropharyngeal Dysphagia.

OBJECTIVES OF THE STUDY

1. To assess the effect of Shaker exercises on Functional Oral Intake Scale in stroke survivors with oropharyngeal dysphagia
2. To assess the effect swallow-strengthening exercises on Functional Oral Intake Scale in stroke survivors with oropharyngeal dysphagia .
3. To compare the effect of shaker exercises and swallowstrengthening exercises on Functional Oral Intake Scale.

HYPOTHESIS

1. There is significant effect of shaker exercise on functional oral intake scale in subject with oropharyngeal dysphagia.
2. There is significant effect of swallow-strengthening on functional oral intake scale in subject with oropharyngeal dysphagia.

NULL HYPOTHESIS:

There may be no significant difference of improvement on subject with oropharyngeal dysphagia by the intervention of shaker exercises and swallowstrengthening exercises on Functional Oral Intake Scale .

ALTERNATIVE HYPOTHESIS:

There may be significant difference of improvement on subject with oropharyngeal dysphagia by the intervention of shaker exercises and swallowstrengthening exercises on Functional Oral Intake Scale.

SELECTION OF CRITERIA➤ **Inclusion Criteria:**

- a. Pre-diagnosed dysphagia after stroke.
- b. No significant cognitive deficit (Mini-Mental State Examination score >18).
- c. Above fair grade (grade 3) obtained on muscle testing of the neck.

➤ **Exclusion Criteria:**

- a. Neck pain or neck surgery
- b. Severe communication problem.
- c. Unstable medical condition.
- d. Presence of a tracheostomy tube and feeding tube.

METHODOLOGY

Study design: Comparative study

Sample size: 22

Formula: minimum sample size to estimate significant difference in two means

$$N = ZS \frac{(m_2(1Z - 1m + Z^2)2)^2}{2}$$

$Z_1 = 1.64$ – at 95% confidence $Z_2 = 1.28$ – at 80% power

$$N = 2(1.14) \frac{(4.75^2(1.54 + 1.28) - 3.73)^2}{2}$$

Group A.

$$\text{Mean} = \frac{M_1}{M_2}$$

S_1 SD= 1.06

Minimum sample size for the study

$$N_1 = 11.$$

Group B.

$$\text{Mean} = \frac{4.75}{3.74}$$

S_2 SD=1.22

$$N_2 = 11$$

Study population: 55years to 75 years of age group.

Study duration: 6 months

Sampling method: purposive sampling

Study setting: Dr. Ulhas Patil Medical Collage and Hospital

MATERIALS

Pen

Assessment sheet

Consent form

Functional oral intake scale(FIOS)

OUTCOME MEASURES

Functional Oral Intake Scale (FOIS)

The functional oral intake scale (FOIS) was developed in 2005 as a tool with very good reliability, validity, and sensitivity to change to objectively determine and monitor the range of oral intake of patients with neurogenic dysphagia. It is an ordinal scale with seven tiers that assesses the oral intake of food and liquids. Different ranges of non-oral feeding are subsumed in levels 1–3, whereas different ranges of oral feeding are included in levels 4–7. It has been the most commonly used scale for the rating of the range of oral intake by patients suffering from dysphagia.⁽³⁾ initial psychometric assessment of functional oral intake scale for dysphagia in stroke patient found interrater reliability was high with perfect arrangement on 85%of rating kappa a statistics randed form 86 to 91 consensual validity was high (90).criterion validity was high at onset and

1 month they conducted that the FOIS had adequate reliability validity and sensitivity

Levels	Description
1	Nothing by mouth
2	Tube dependent with minimal attempts of food or liquid
3	Tube dependent with consistent oral intake of food or liquid
4	Total oral diet of a single consistency
5	Total oral diet with multiple consistencies, but requiring special preparation or compensations
6	Total oral diet with multiple consistencies without special preparation, but with specific food limitations
7	Total oral diet with no restrictions

PROCEDURE

Introduction to the procedure:

Ethical clearance was taken from the ethical committee of Dr. Ulhas Patil College of Physiotherapy, Jalgaon prior to the commencement of the study.

An comparative study was undertaken at Dr. Ulhas Patil medical college and hospital jalgaon. 22 participants were included based on inclusion and exclusion criteria mentioned earlier.

A brief demographic data of all patients wer obtained and a written consent was taken from all participants, and the treatment protocol was explained by the therapist. Participants, who met the inclusion criteria were randomly divided to Group A or Group B. Group A underwent shakar exercise and Group B underwent combination of swallow strengthening and mendelsons maneuver.

The base line data to rule out the exclusion criteria neck mmt, mini mental state examination score, posture of neck and ability to swallow voluntary are wer checked.

Procedure for shakar exercise (Group A)

The patient in supine position on bed therapist was standing one side of the bed. Then therapist asked patient to lifts his/her head with out raising time shoulder therapist simply asked to lifts the head and look at the toes with out lifting shoulder hold position for 60s with rest period between lifts of 60s reputed for 3 times.

Then next part of exercise therapist asked patient for lifts his/her head for 30 repitation with out holding head in fix position.

The intervention was performed for 10 session for 2 week.



Fig No.1A



Fig No.1B

Procedure for combination Mandelson's maneuver and effortful swallowing(Group B)

The patient is in supine or siting position with supported back therapist was standing one site of patient. Patient should performed the Mandelson's maneuver and effortful swallowing at the same time therapist asked patient to performed Mandelson's manuver by holding the larynx for 3-5 second after swallowing swallowing when the larynx is raised upword.

For effortful swallowing therapist asked patient for pushing tongue firmly against the hard palate while squeezing the neck muscles and swallow as forcefully as possible.

The intervention was performed for 10 session for 2 week.

Patient was evaluated by using FOIS before 1st session of treatment on 10th session of tretment.



Fig no 2 a



Fig no 2 b

STATISTICAL ANALYSIS

Statistical analysis: Statistical analysis was done using SPSS statistical package of social sciences version 28.0.1.1. The paired and unpaired t tests were used for statistical hypothesis to compare the outcome measures, post-intervention scores within the group and between the groups respectively. Statistical significance was set at $p \leq 0.05$.

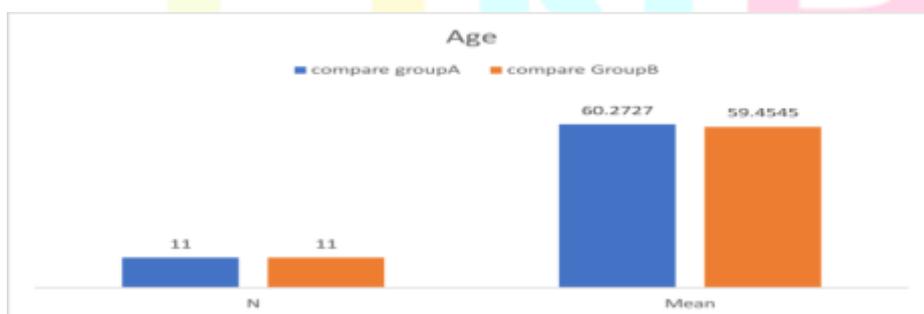
RESULT

The present study included 22 participants who met the inclusion criteria out of 30 assessed individuals. The remaining 8 individuals did not meet the inclusion criteria hence they were not included in this study. In this study participants of age group 55 years to 75 years were included based on the inclusion criteria mentioned. The baseline characteristic data is mentioned in table 1. The participants were equally divided into 2 groups by simple randomization method. Group A and Group B both consisted of 11 participants. Group A received shaker exercise technique and Group B combination of Mandelson’s maneuver and swallow strengthening technique. The mean age of the participants in Group A (shaker exercise) and Group B (combination of swallow strengthening and Mandelson’s maneuver) were 60.27 years and 59.45 years respectively with the p value of 0.939 which indicates that there was no significant difference in the age group of the patients between the groups.

TABLE NO.1

	Group A	GroupB	T-value	P-value
Age (mean± SD)	60.27± 9.84	59.45± 10.11	0.09	0.929

GRAPH NO 1

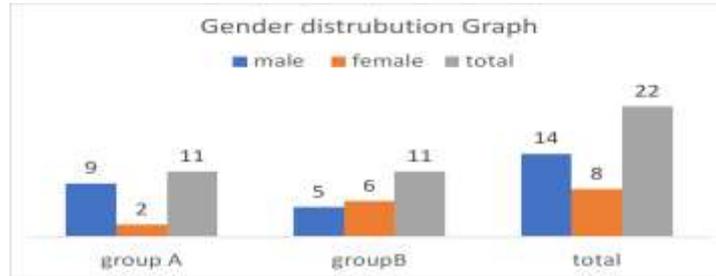


The gender wise distribution in both the groups is shown in the Table 2 and Graph 2

TABLE NO 2

Gender	Group A	Group B	Total
Male	9	5	14
Female	2	6	8
Total	11	11	22

GRAPH NO 2

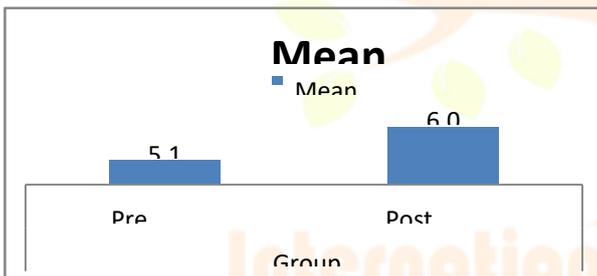


Within group comparison of pre and post intervention of functional oral intake scale in Group A shaker exercise shows improved score on functional oral intake scale with the p values of <0.001 which is statistically significant.

TABLE NO.3 (GROUP A)

		Mean	N	Std. Deviation	VALUE
Group A	Pre treatment	5.18	11	0.874	<0.001
	Post treatment	6.09	11	0.831	

GRAPH NO 3

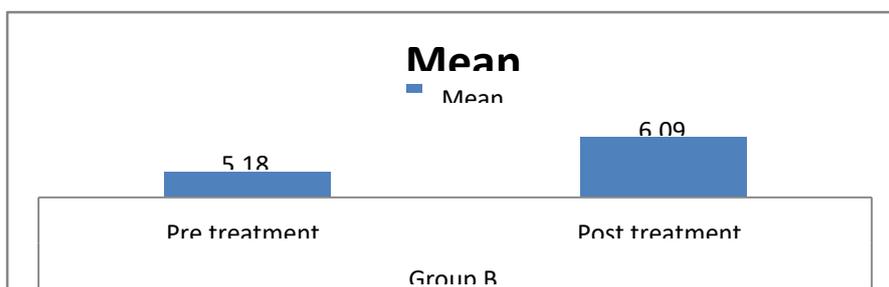


Within group comparison of pre and post intervention of functional oral intake scale in Group B combination of mendelsons maneuver and swallow stenthning shows improved score on functional oral intake scale with the p values of <0.001 which is statistically significant.

TABLE NO.4 (GROUPB)

		Mean	N	Std. Deviation	VALUE
Group B	Pre treatment	5.18	11	0.874	<0.001
	Post treatment	6.09	11	0.831	

GRAPH NO 4



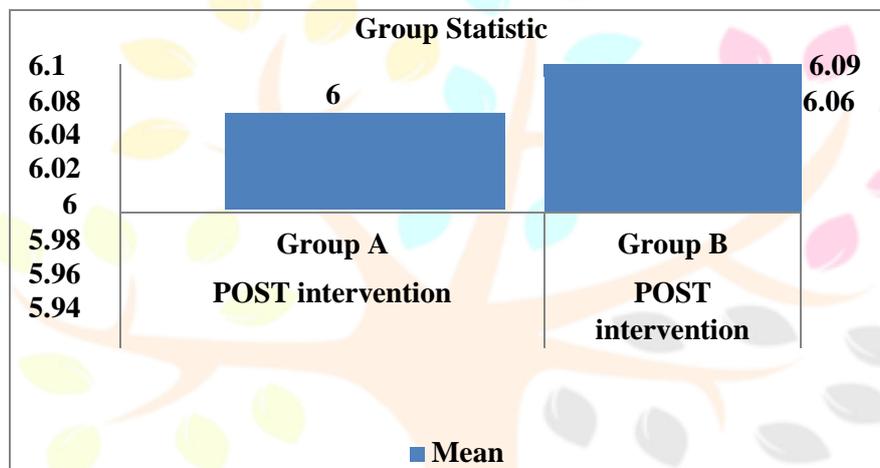
Between group comparison on of pre intervention of functional oral intake scale (FOIS) demonstrated statistical non significance with $p > 0.05$ which indicates that both the intervention techniques have equal effects on stroke patient with dysphagia. (Table 5)

Based on these within and between group comparisons using paired and unpaired t tests respectively, this can be resulted that both the intervention techniques i.e shaker exercise and combination of mendelsons maneuver and swallow strengthening have the same effects on stroke patient with disphagia(Graph no 5).

TABLE NO 5 (COMPARISON OF GROUP A AND GROUP B)

GROUP	N	MEAN	STD. DEVIATION	P-VALUE
GROUP A	11	6.00	0.774	1.015
GROUP B	11	6.09	0.831	

GRAPH NO 5



Discussion

This study was designed to compare the effect of shaker exercises and swallow- strengthening exercise in stroke survivors with oropharyngeal Dysphagia. shakar exercise improve the grad of functional oral intake scale and decreased aspiration in stroke patient with disphagia as well as swallow strenthning and mendlson maneuver also improve the grad of functional oral intake scale and decreased aspiration in stroke patient with dysphagia In comparison, of it was found that both the techniques were equally effective in improving oropharyngeal dysphagia in stroke survivors. The mean age of the participants in Group A (shaker exercise) and Group B (combination of sallow strenthning and mendelsons maneuver) were 60.27 years and 59.45 years respectively with the p value of 0.939 which indicates that there was no significant difference in the age group of the patients between the groups. in a study by Michael A.crary Ciselle P Carnaby Mann (2005) on initial psychometric assessment of functional oral intake scalefor dysphagia in stroke patient found interrater reliability was high with perfect arrangement on 85%of rating kappa a statistics randed form 86 to 91 consensual validity was high (90).critenrion validity was high at onset and 1 month they conducted that the FOIS had adequate reliability validity and sensitivity to change in functional oral intake scale that finding suggest that the FOIS may be appropriate for estimating and documenting change in functional eating of stroke patient over time.⁽²⁾ Within group comparison of pre and post intervention of functional oral intake scale in Group A shaker exercise shows improved score on functional oral intake scale with the p values of < 0.001 which is statistically significant. In study by aq Jong-Bae Choi,Sen-Hwa Shim(2017)on effect of shaker exercise in stroke survivors with oropharyngeal dysphagia randomized control design. Found that there seemed to be no significant

difference in baseline characters between group ($p > 0.05$). Both groups showed improved score on both pPAS and FOIS ($p < 0.05$). However, the experimental group showed greater improvement than the control group with significant differences on both PAS and FIOS score between groups ($p < 0.05$)⁽³⁾ Kendall and Kanard 2001, Kimohchung kim ham 2010, Mastuo and Palmer 2008, Ertekin and Aydogdu 2003. In other words, SE is closely related to strengthening of the suprahyoid muscle, increasing movement of the hyoid bone, and protecting of the airways. Previous studies repeating the effect of shaker exercise on suprahyoid muscle activation in healthy adults have indicated an increase in muscle fiber recruitment. Within group comparison of pre and post intervention of functional oral intake scale in Group B, combination of Mendelsohn's maneuver and swallow strengthening shows improved score on functional oral intake scale with the p values of < 0.001 which is statistically significant. In a study by J-Hoon Kim, Young A Kim (2017) on effect of combination of Mendelsohn's maneuver and effective swallowing on aspiration in patient with dysphagia after stroke, randomized control trial found that based on PAS assessment all participants showed with liquid type food and also with semi solid food. In a study by Ji-ju-park, OT NoKyoung Hwang, OT on therapeutic exercise for strengthening suprahyoid muscle, role of the suprahyoid muscle in swallowing mechanism, the suprahyoid muscle acts in the pharyngeal phase with swallowing reflex during the swallowing process, the contraction of these muscles plays a role in pulling the hyolaryngeal complex upward, the expected effect of strengthening the suprahyoid muscle is result airway protection, opening of the UES and vocal cord closing influence the functional effect, ultimately this minimises complication such as malnutrition, dehydration and aspirational pneumonia and improves oral dietary ability. Therapeutic exercise for strengthening the suprahyoid muscle, Mendelsohn maneuver is intended to maintain elevated hyoid and laryngeal motion during swallowing in order to increase the UES opening time and range-effortful swallowing training increases all the muscles associated with swallowing and is aimed at increasing the pressure of oropharynx.⁽⁴⁾ Between group comparison of post intervention of functional oral intake scale (FOIS) demonstrated statistical non significance with $p > 0.05$ which indicates that both the intervention techniques have equal effects on stroke patient with dysphagia. Between group comparison of post intervention of functional oral intake scale (FOIS) demonstrated statistical non significance with $p > 0.05$ which indicates that both the intervention techniques have equal effects on stroke patient with dysphagia. That may be because of the shaker exercise result in strengthening of the suprahyoid as well as infrahyoid muscle and for UES (upper esophageal sphincter) opening, Mendelsohn maneuver is effective for opening the UES and increasing hyoid movement in dysphagia patient, Effortful swallowing has positive effect on strengthening of suprahyoid muscle with all muscles of swallowing, that all techniques result in opening UES and strengthening of suprahyoid muscle hence that both the techniques are equally effective. In these study we support the null hypothesis.

CONCLUSION

Statistical significant difference was not found between both groups- group A and group B in the post intervention shaker exercise and swallow strengthening exercise. The study showed improvements in swallowing function of patient, which suggest that use of shaker exercise and swallowing strengthening exercise can be implemented individually to improve swallowing function of stroke patient with dysphagia and have shows no harmful effect in any individual.

CLINICAL IMPLICATION

Both the techniques shaker exercise and swallowing strengthening exercise can be individually used in patients with stroke patient with dysphagia.

LIMITATION

This study evaluate stort term effect of shaker exercise and swallow strenthning,long-term follow-up effect was not monitored. Study population is very small.

REFERENCES

- 1) Bahia, M. M., Mourao, L. F., & Chun, R. Y. (2016). Dysarthria as a predictor of dysphagia following stroke. *NeuroRehabilitation*.
- 2) Ertekin C., & Aydogdu, I. (2003).Neurophysiology of swallowing. *Clinical Neurophysiology*.
- 3) RICHARD LANGTON HEWER, (1987) Dysphagia in acute stroke prospective study was undertaken to define the incidence, duration, and consequences of dysphagia.
- 4) Ji-ju-park,OTnoKyoung Hwang OT ontherapuetic exercise for strengthening suprahyoid muscle role of the suprahyoid muscle in swallowing mechanisum.
- 5) aq Jong-Bae Choi,Sen-Hwa Shim(2017)on effect of shaker exercise in stroke survivors with orophagyneal dysphagia randomized control design.
- 6) Ji-Hoon Kim1), Young-A Kim2), Hye-Jin Lee2), Keum-Sook Kim3), Seung-Tae Kim4), Tae-Sue Kim5), Young- Seok Cho3(2017)Effect of the combination of Mendelsohn maneuver and effortful swallowing on aspiration in patients with dysphagia after stroke.
- 7) M. A., Mann, G. D., & Groher, M. E. (2005). Initial psychometric assessment of a functional oral intake scale for dysphagia in stroke patients. *Archives of Physical Medicine and Rehabilitation*.
- 8) Ferdjallah, M., Wertsch, J. J., & Shaker, R. (2000). Spectral analysis of surface Electromyography (EMG) of upper esophageal sphincter-opening muscles during head lift exercise. *Journal of Rehabilitation Research and Development*, 37(3), 335340
- 9) McCullough GH, Kim Y: Effects of the Mendelsohn maneuver on extent of hyoid movement and UES opening post-stroke. *Dysphagia*
- 10) Wheeler-Hegland KM, Rosenbek JC, Sapienza CM: Submental sEMG and hyoid movement during Mendelsohn maneuver, effortful swallow, and expiratory muscle strength training.
- 11) Pearson WG Jr, Hindson DF, Langmore SE, et al.: Evaluating swallowing muscles essential for hyolaryngeal elevation by using muscle functional magnetic resonance imaging.
- 12) Wheeler-Hegland KM, Rosenbek JC, Sapienza CM: Submental sEMG and hyoid movement during Mendelsohn maneuver, effortful swallow, and expiratory muscle strength training
- 13) Park JS, Oh DH, Chang MY, et al.: Effects of expiratory muscle strength training on oropharyngeal dysphagia in subacute stroke patients: a randomised controlled trial.
- 14) Won, S. Y., & Chang, K. Y. (2014). Comparison of muscle activity between two adult groups according to the number of Shaker exercise. *Journal of Oral Rehabilitation*.
- 15) Logemann JA: Evaluation and treatment of swallowing disorders.
- 16) Rosenbek JC, Robbins JA, Roecker EB, et al.: A penetrationaspiration scale. *Dysphagia*
- 17) Park JS, Oh DH, Chang MY, et al.: Effects of expiratory muscle strength training on oropharyngeal dysphagia in subacute stroke patients: a randomised controlled trial