

Original Research Article

# Effects of Lingual Exercises, Swallowing Maneuvers Along With Conventional Therapy on Improving Swallowing Function and Quality of Life in Stroke Patients with Dysphagia

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## ABSTRACT

**Background:** Dysphagia is one of the common features among stroke patients, It may lead to dehydration, malnutrition that affects the recovery further it affects the quality of life. In stroke, dysphagia is due to the involvement of lack of cerebral cortex function which control voluntary swallowing function, involvement of medulla which controls involuntary swallowing action also lack of sensory input from cranial nerves, etc., conventionally for dysphagia management there are symptomatically medical management along with the primary stroke medical management, there are minimal concentration through the exercises with different manoeuvres for managing stroke with dysphagia. So, the aim of this study is to analyze and compare the effects of lingual exercises along with swallowing manoeuvres with conventional therapy on improve swallowing function and quality of life in stroke participants with dysphagia.

**Materials and Method:** 10 participants with age group between 55 to 65years were selected according to the selection criteria. They were randomly divided in to two groups. Group A was given conventional therapy which includes medical management, diet modification and positioning. In group B was given lingual exercises, swallowing manoeuvres along with conventional therapy. The entire procedure was explained to the participant and informed written consent was obtained. In group A Conventional therapy was given and in group B lingual exercises, swallowing manoeuvres along with conventional therapy was performed; therapy session for both groups was 2 sessions per day, each session lasting for 30 mins for 4 days per week for total a period of 4 weeks. The outcome measures were assessed before and after intervention by dysphagia handicap index and functional oral intake scale. The result was analyzed before and after the intervention of both the treatment in both the groups using the student paired 't' test and unpaired 't' test.

**Result:** The swallowing function and quality of life assess using dysphagia handicap index and functional oral intake scale. Group A received conventional therapy the pre and post mean values of dysphagia handicap index was  $167.2 \pm 2.95$ ,  $147 \pm 7.483$ . The pre and post mean value of functional oral intake scale was  $1 \pm 0$ ,  $2.6 \pm 0.5477$ . ( $p=0.0077$ ) Similarly in group B received lingual exercises, swallowing manoeuvres and along with conventional therapy. The pre and post mean values of dysphagia handicap index was  $168.4 \pm 2.51$ ,  $101.6 \pm 8.678$ . The pre and post mean values of functional oral intake scale was  $1.8 \pm 0.4472$ ,  $6.2 \pm 0.4472$ . ( $p=0.001$ ) The result calculated by using student paired 't' test showed significant difference in dysphagia handicap index and functional oral intake scale.

In group A and group B, post mean values of dysphagia handicap index was  $147 \pm 7.483$ ,  $101.6 \pm 8.678$ . The post mean values of functional oral intake scale was  $2.6 \pm 0.5477$ ,  $6.2 \pm 0.4472$ . ( $p=0.001$ ) The result calculated by using student unpaired 't' test showed significant difference in dysphagia handicap index and functional oral intake scale in group A and group B.

**Conclusion:** This study concluded that lingual exercises, swallowing manoeuvres along with conventional therapy is more effective as compared with conventional therapy in the management of dysphagia with stroke.

**Keywords:** Dysphagia, stroke patients, diet modification, lingual exercises, swallowing manoeuvres, dysphagia handicap index and functional oral intake scale

## INTRODUCTION

Swallowing is a voluntary muscular action to pass food through throat and oesophagus. It is a normal procedure in all human beings. Dysphagia is an inability of swallowing functions, if patient having difficulty in passing food and regurgitation of food. Patient also has continuous hiccups it is a signs of dysphagia. This process is controlled by nervous system and involved voluntary and involuntary muscle contraction. Dysphagia is common in neurological conditions like Parkinson's disease, motor neuron diseases, stroke, head injury and multiple sclerosis.

Stroke is a medical condition which results from poor blood flow to the brain resulting in cell death. <sup>(1)</sup> There are two main types of stroke: ischemic, due to lack of blood flow and haemorrhagic, due to bleeding, Both result in hampering of the brain function. Signs and symptoms of a stroke may include sensory and motor loss on one side of the body, which may lead to unilateral loss of vision, speaking problem, and loss of swallowing function. <sup>(2,3)</sup> Strokes are classified into two major categories: Ischemic and Haemorrhagic. <sup>(4)</sup> Symptoms of stroke are sudden in onset, over seconds to minutes and in most cases are non-progressive. The symptoms depend on affected areas of brain.

Dysphagia occurs in about 77 % acute stroke patients and oropharyngeal dysphagia is most common in stroke. <sup>(5)</sup> Sometimes, people with dysphagia are unaware of having it. Functional swallowing occurs as a result of a series of purposeful movements that allow transport of food from the oral cavity into the stomach while avoiding passage of food into the airway. The medulla controls the involuntary swallowing reflex. The voluntary swallowing may be initiated by the cerebral

cortex. A sensation might suggest the difficulty in the passage of solids or liquids from the mouth to the stomach. A lack of various other inadequacies or pharyngeal sensation of the swallowing mechanism. The act of swallowing is called deglutition. It allows a food or liquid bolus to be transported from the mouth to the pharynx and oesophagus, while shutting the epiglottis through which it enters the stomach. Normal deglutition involves a complex series of neuromuscular contraction which are both voluntary and involuntary. It is a smooth and coordinated process .It is divided into three distinct phases: oral, pharyngeal and oesophageal.

The swallowing process is organized with sensory input from receptors in the base of tongue, the soft palate, posterior pharyngeal wall and facial arches tonsils. This input is then transmitted to the swallowing centre which is located within the pontine reticular system, through for facial, glossopharyngeal, and vagus cranial nerves. The information then is conveyed back to the muscle that help in swallowing through the trigeminal, facial, glossopharyngeal, vagus and hypoglossal cranial nerves, with the trigeminal hypoglossal and nucleus ambiguous constituting the efferent levels. It can be seen in hemispheric stroke, brainstem stroke or pseudobulbar and suprabulbar palsy.

In brain stem stroke the reported incidence is as high as 81%. Cranial nerve involvement result in swallowing dysfunction of the oral stage [CN V(trigeminal), CN VII(facial)], [the pharyngeal stage (CN IX (glossopharyngeal), CN X(vagus) and CN XI(accessory)], or oral and pharyngeal [CN XII(hypoglossal)]. Achalasia is a major exception to usual pattern of dysphagia in that swallowing of fluid tends to cause more

difficulty than swallowing solids. The parasympathetic ganglia of the Auerbach's plexus of the entire oesophagus gets destroyed idiopathically, which lead to functional narrowing of the lower oesophagus, and peristaltic failure throughout its length. The normal pathophysiology and physiology of swallowing and eating is fundamental to evaluating and treating disorders of eating and swallowing and developing dysphagia rehabilitation programs. The process of swallowing and eating are complex behaviours including both reflexive and volitional activities involving more than 30 nerves and muscles. <sup>(6)</sup>

### **Types of Dysphagia:**

#### **Oropharyngeal dysphagia:-**

Oropharyngeal dysphagia is abnormalities of muscles, nerves or structures of the oral cavity, pharynx, and upper oesophageal sphincter. There is difficulty in preparing and transporting the food bolus through the oral cavity, which also initiates the swallowing.

This may be associated with aspiration or nasopharyngeal regurgitation. <sup>(7)</sup>

#### **Oesophageal and obstructive dysphagia :-**

Oesophageal dysphagia is usually due to mechanically obstructed lower oesophageal sphincter or cardia of stomach and can also be caused due to mortality problem in same. In oesophageal dysphagia patient complain of food sticking in their lower throat, neck, retro-sternal discomfort or epigastrium. <sup>(7)</sup>

Malnutrition and dehydration, aspiration pneumonia, compromised general health, chronic lung disease, choking, and even death may be a consequence of dysphagia. Morbidity related to dysphagia is a major concern. Adults with dysphagia may also experience (a) disinterest and/or less enjoyment of eating or drinking and/or (b) embarrassment or isolation in social situations involving eating. Dysphagia may increase caregiver, burden and may require significant lifestyle alterations for the patient and the patient's family.

## **MATERIALS AND METHODS**

This was an experimental study which was conducted to evaluate the effects of lingual exercise, swallowing manoeuvres along with conventional therapy on improving swallowing function and quality of life in stroke patients with dysphagia on age group 55-65 years. The subjects who meet the inclusion and exclusion criteria and willing to participate in the study were included. We had approached about 10 participants out of which 5 were female and 5 were male. They participants and relatives were explained about the study and the evaluation procedure. The informed written consent form was collected from the participants and relative. Inclusion criteria:- Acute stroke patient with dysphagia (after 1 week of incidence to 6 months of onset), Participants should be medically stable, Participant age group above 55 to 65 yrs., Both male and female participant, Participant should have an oropharyngeal type of dysphagia. The exclusion criteria of the study was: - Dysphagia stroke Participants with Poor saliva control with gurgly vocal quality or drooling, Participants with noticeable facial drop or tongue deviation, Participants with abnormal volitional cough or weak reflexive cough, Participants with facial palsy or bell's palsy, Participants with weakness of muscle of mastication, Participant should have an dysphagia in neuromuscular weakness in facial injury or any neuromuscular weakness disorder.

### **PROCEDURE:**

The study protocol was presented in front of protocol and institutional ethics committee of Dr. A.P.J. Abdul Kalam College of Physiotherapy, PIMS, Loni. All the participants referred were screened according to the inclusion and exclusion criteria. The informed written consent was obtained from the participant regarding the procedure prior to the study. 10 participants with acute stage of stroke were included in the study. The participants were divided into two groups, group A with 5 participants were given conventional therapy and group

Group B with 5 participants were given lingual exercises and swallowing manoeuvres along with conventional therapy for a period of 4 weeks. The Total duration of each session was 30 min with 2 sessions per day performed for 5 days per week for a total duration of 4 weeks. In group A, conventional therapy which comprised of medical management (proton pump inhibitors, antireflux medication, and calcium channel blockers), diet modification, and postural techniques along with Ryle's tube was used in the management of participants. In group B, lingual exercises and swallowing manoeuvres along with conventional therapy were used which included posture, positioning technique, Pacing and Feeding Strategies, Isometric Lingual Exercise, Laryngeal elevation, Masako or tongue hold, Shaker Exercise, Hyoid Lift Manoeuvre, Mendelssohn Manoeuvre, Effortful Swallow, Supraglottic Swallow and Super Supraglottic Swallow Manoeuvre.

The Pre & Post readings were taken before & after the interventions. The interventions were given for 4 weeks. The data was collected & analyzed by student's paired 't' and unpaired 't' test statistical methods and results was obtained.

#### Outcome Measures:

Participants are assessed by using scales which was calculated before and after the intervention:-

- Dysphagia Handicap Index

- Functional Oral Intake Scale

## DATA ANALYSIS AND RESULT

### Age distribution in group A

Table no 1: Age distribution in group A

AGE GROUP	MALE	FEMALE	TOTAL
55-60	2	1	3
60-65	0	2	2
TOTAL	2	3	5

### Age distribution in group B

Table no 2: Age distribution in group B

AGE GROUP	MALE	FEMALE	TOTAL
55-60	1	2	3
60-65	2	0	2
TOTAL	3	2	5

### Comparison of pre-intervention and post-intervention values of dysphagia handicap index, functional oral intake scale in group A and group B

The mean of dysphagia handicap index values of group A was  $167.2 \pm 2.95$  before intervention and  $147 \pm 7.483$  after intervention. The mean of functional oral intake scale values of group A was  $1 \pm 0$  before intervention and  $2.6 \pm 0.5477$  after intervention. Similarly the mean of dysphagia handicap index values of group B was  $168.4 \pm 2.51$  before intervention and  $101.6 \pm 8.678$  after intervention. The mean of functional oral intake scale values of group B was  $1.8 \pm 0.4472$  before intervention and  $6.2 \pm 0.4472$  after intervention. The results were calculated by students paired 't' test showed significant difference in dysphagia handicap index and functional oral intake scale in group A and group B.

Table no 3: Comparison of pre-intervention and post-intervention values of dysphagia handicap index, functional oral intake scale in group A

Outcome Measures	Pre-Intervention Mean + SD	Post-Intervention Mean + SD	Student's Paired "T" Test Value	'P' Values And Result
Dysphagia handicap index	$167.2 \pm 2.95$	$147 \pm 7.483$	4.967	'P'=0.0077, Significant
Functional oral intake scale	$1 \pm 0$	$2.6 \pm 0.5477$	4.92	'p'=0.001, significant

By applying student Paired 't' test there is significant increase in the mean values of dysphagia handicap index and functional oral intake scale from pre to post conventional therapy. ('p'=0.0077) and ('p'=0.001)

### Comparison of pre-intervention and post-intervention values of dysphagia handicap index, functional oral intake scale in group B

**Table no 4: Comparison of pre-intervention and post-intervention values of dysphagia handicap index, functional oral intake scale in group B**

Outcome Measures	Pre-Intervention Mean + SD	Post-Intervention Mean + SD	Student's Paired 'T' Test Value	'P' Values And Result
Dysphagia handicap index	168.4 ± 2.51	101.6 ± 8.678	20.10	'p' =0.001, Significant
Functional oral intake scale	1.8 ± 0.4472	6.2 ± 0.4472	5.76	'p' =0.001, Significant

- By applying student paired “t” test there is significant decrease in the mean values of dysphagia handicap index from pre to post group B. (‘p’=0.001)
- By applying student paired “t” test there is significant increase in the mean values of functional oral intake scale from pre to post group B. (‘p’=0.001)

**Table no: 5 Comparison of pre and post individual components of the dysphagia handicap index in group A**

Components	Pre-Intervention Mean + SD	Post-Intervention Mean + SD
PHYSICAL	60.60 + 3.286	57 + 2.121
FUNCTIONAL	59.60 + 3.507	49.20 + 7.225
EMOTIONAL	47 + 4.472	41.20 + 8.319

- By applying student paired “t” test there is significant decrease in the mean values individual components of dysphagia handicap index from pre to post conventional therapy. (‘p’=0.0077)

**Table no: 6 Comparison of pre and post individual components of the dysphagia handicap index in group B**

Component	Pre-Intervention Mean + SD	Post-Intervention Mean + SD
PHYSICAL	61.80 + 1.643	37.20 + 2.683
FUNCTIONAL	60.60 + 3.286	35.60 + 5.683
EMOTIONAL	46 + 3	28.80 + 2.775

- Comparison of post-intervention values of dysphagia handicap index, functional oral intake scale in group B.
- By applying student paired “t” test there is significant decrease in the mean values individual components of dysphagia handicap index from pre to post group B. (‘p’=0.001)

The mean of dysphagia handicap index values of group A and group B was  $147 \pm 7.483$  before intervention and  $101.6 \pm 8.678$  after intervention. The mean of functional oral intake scale values of group A and group B was  $2.6 \pm 0.5477$  before intervention and  $6.2 \pm 0.4472$  after intervention. The results were calculated by students unpaired ‘t’ test showed significant difference in dysphagia handicap index and functional oral intake scale in group A and group B.

**Table no 7: comparison of post-intervention values of dysphagia handicap index, functional oral intake scale in group A & group B**

Outcome Measures	Group A Mean + SD	Group B Mean+ SD	Student's Unpaired 'T' Test Values	'P' Values And Result
Dysphagia handicap index	147 ± 7.483	101.6 ± 8.678	8.859	'p' =0.001, Significant
Functional oral intake scale	2.6 ± 0.5477	6.2 ± 0.4472	13.33	'p' =0.001, Significant

- By applying student's unpaired ‘t’ test, there is a significant decrease in the mean value of dysphagia handicap index from pre intervention to post intervention of conventional therapy i.e. group A and lingual exercises along with swallowing manoeuvres i.e. group B (‘p’=0.001).
- By applying student's unpaired ‘t’ test, there is a significant increase in the mean value of functional oral intake scale from pre intervention to post intervention of conventional therapy i.e. group A and lingual exercises along with swallowing maneuvers i.e. group B (‘p’=0.001).

Table no: 8 Comparison of post individual components of the dysphagia handicap index in group A and group B

Component	Post-intervention group A MEAN ± SD	Post-intervention group B MEAN ± SD
PHYSICAL	57 ± 2.121	37.2 ± 2.683
FUNCTIONAL	49.2 ± 7.225	35.6 ± 5.683
EMOTIONAL	41.2 ± 7.483	28.8 ± 2.775

- By applying student paired “t” test there is significant decrease in the mean values individual components of dysphagia handicap index post conventional therapy to post lingual exercises along with swallowing maneuvers. (‘p’=0.001)

## DISCUSSION

Dysphagia is one of the most common clinical manifestations occurring in approximately 77 % of stroke participants. Oropharyngeal dysphagia is most common in stroke and affects the quality of life. In stroke swallowing muscle are directly impacted if the part of brain that controls it is involved. The swallowing muscles are indirectly impacted if stroke interferes other motor functions which impact swallowing. Swallowing can be extremely difficult if the muscles used in the process are weak or uncoordinated. Exercises for dysphagia treatment can induce the change in neuroplasticity and contribute to an increased volume and strength of muscles and enhanced cooperation of the affected swallowing muscles, which will improve the swallowing capacity.

The present study was conducted to compare the combined effect of lingual exercises, swallowing manoeuvres with conventional therapy in acute stroke participants suffering from dysphagia. In total, 13 participants were tested, 3 participants did not match the inclusion criteria. A total of 10 participants were recruited and were randomly divided into 2 groups. 5 participants were assigned to group A who received conventional therapy and 5 participants were assigned to group B who received additional lingual exercises along with swallowing maneuvers. All the participants completed the 4 weeks of intervention.

The swallowing function and quality of life assess using dysphagia handicap index and functional oral intake scale. Group A received conventional therapy the pre and post mean values of dysphagia handicap index was  $167.2 \pm 2.95$ ,  $147 \pm 7.483$ . The pre and post mean value of functional oral intake scale was  $1 \pm 0$ ,  $2.6 \pm 0.5477$ . (‘p’=0.0077)

Similarly group B received lingual exercises, swallowing manoeuvres and along with conventional therapy. The pre and post mean values of dysphagia handicap index was  $168.4 \pm 2.51$ ,  $101.6 \pm 8.678$ . The pre and post mean values of functional oral intake scale was  $1.8 \pm 0.4472$ ,  $6.2 \pm 0.4472$ . (‘p’=0.001) The results were calculated by using student paired ‘t’ test showed significant difference in dysphagia handicap index and functional oral intake scale.

In group A and group B, post mean values of dysphagia handicap index was  $147 \pm 7.483$ ,  $101.6 \pm 8.678$ . The post mean values of functional oral intake scale was  $2.6 \pm 0.5477$ ,  $6.2 \pm 0.4472$ . (‘p’=0.001) The results were calculated by using student unpaired ‘t’ test showed significant difference in dysphagia handicap index and functional oral intake scale in group A and group B.

## CONCLUSION

This study concluded that lingual exercises and swallowing manoeuvres along with conventional therapy is more effective as compared with conventional therapy alone for the management of dysphagia in stroke condition.

### Limitations of Study

1. The study was conducted on patients with oropharyngeal dysphagia.

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2. The study was conducted on acute stroke patients with the incidence upto 1 week-6 months.
3. The study included smaller sample study
4. The study was conducted on limited age group(55-65 years)
5. The intervention was done only for 4 weeks i.e. a short-term study
6. The study was limited to Pravara Rural Hospital.

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**Conflict of Interest:** None

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