Research article

Effectiveness of swallowing therapy and forced expiratory technique to prevent aspiration for dysphagia in frail elders

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ABSTRACT

Introduction and Aim: Difficulty or trouble in eating is termed to beDysphagia, which indicates experience of food encountering delays or obstructions as it moves to the stomach from the mouth. Elderly population is prone to develop dysphagia because of various illnesses that affect their swallowing function, thereby raising the threat of aspiration. The primary goal of the current learning is to assess the effectiveness of swallowing therapy and the forced expiratory technique as preventive measures against aspiration in frail elderly individuals with dysphagia.

Methodology: This study is an experimental study done at ACS Medical College and Hospital, specifically in the Physiotherapy OP department. The study involved a sample of 20 individuals and had a treatment duration of 6 weeks. The participants were elderly individuals ranging from 65 to 85 years of age, comprising both males and females. Participants who scored above 18 in the mini mental state exam and fall within levels 3 to 6 according to the FIOS classification were included. The outcome measures used in the study were the functional intake oral scale and the gugging swallowing screen.

Results: Comparing the Functional Intake Oral Scale (FIOS) Score between the Pre-test and Post-test mean values of 4.40 and 6.40 (Swallowing Therapy) reveals a significantly significant difference between the two mean values at $P \leq 0.001$. Comparing the gugging swallowing screen (GUSS)score between the Pre-test and Post-test mean values of 11.30 and 17.60 (Swallowing Therapy), it is very significant that there is a difference between the Pre-test and Post-test mean values at $P \leq 0.001$.

Conclusion: It is concluded that there is significant improvement in effects of swallowing therapy for dysphagia in frail elders and forced expiratory technique to prevent aspiration.

Keywords: Bedside test; dysphagia; forced expiratory technique; FIOS; GUSS; swallowing therapy.

INTRODUCTION

The word "dysphagia," derived from two words "dys" which means difficulty and "phagia" which means "to eat," refers to the experience of difficulty or obstructions when food moves from the oral cavity to the stomach. It can be characterized physically as either oropharyngeal or esophageal. Due to alterations in swallowing physiology with aging, including age-associated disorders that serve as predisposing factors, the aged population is substantially more likely to acquire dysphagia (1). Oropharyngeal dysphagia is a prevalent condition, affecting approximately 13% of individuals aged 65 years and older in the general population and 51% of older individuals living in institutionalized settings (2,3). The highest prevalence of oropharyngeal dysphagia is observed among older patients with neurological diseases, as well as with increasing age and frailty (4).

Physiology of normal swallowing

Swallowing is termed traditionally as a process comprising three internal morphological stages: 1. Oral stage, 2. Pharyngeal stage, and 3. Esophageal stage. The oral phase involves voluntary actions that prepare and propel food into the pharynx, employing the trigeminal, facial, and hypoglossal cranial nerves (numbers V, VII, and XII). Phase of the pharynx, the airway is sealed, and the bolus is propelled into the esophagus. This phase is reflexive. The esophageal phase assists in the further propulsion of the bolus into the stomach by coordinated esophageal peristalsis and relaxation of the lower esophageal sphincter. (11).

Effects of aging on swallowing mechanism

Age-related changes in the oral cavity include connective tissue increase in the tongue, tooth loss, and a decline in strength of mastication (6). Furthermore, the peristaltic motion in the pharynx is notably slowed in individuals over the age of 60 (7). There is a decrease in pharyngeal contraction pressures and pharyngoesophageal wave velocity. Additionally, there is a gradual reduction in the pressure of the upper esophageal sphincter (UOS) with age, accompanied by a delay in UOS relaxation following swallowing (6,8).

Common reasons of dysphagia in elderly

Dysphagia in the elderly can result from a variety of disease entities linked to either oropharyngeal or oesophageal dysfunction. The most frequent cause of oropharyngeal dysphagia in the elderly is stroke,

which affects one-third of stroke patients (9). A number of motor and mechanical reasons are there for the occurrence of oropharyngeal dysphagia. The mechanical causes include zenker diverticulum, cricopharyngeal achalasia, oropharyngeal and laryngeal tumours, head and neck surgery. The motor causes include stroke (9,10,12), dementia, myasthenia gravis and amyotrophic lateral sclerosis (5,13,14). Esophageal dysphagia may result from mechanical and motor causes. The mechanical causes are cervical spondylosis, esophageal tumour, esophageal diverticulum, scleroderma and strictures inflammation. The motor causes such as achalasia, crest syndrome, diabetes and esophageal motility disorder (14). Because they take more medications, have more anatomical and motility abnormalities, cardiac enlargement with concomitant mid-esophageal compression, and have lower saliva production, elderly patients are particularly vulnerable to developing drug-related dysphagia and pill esophagitis. (5,6,14). Most elderly patient with neurogenic dysphagia will require swallowing therapy. The two courses are 1. Change your diet and posture to minimize aspiration while eating some meals orally, and 2. Perform exercises to improve your strength and coordination so that you can resume your normal, full-range swallowing function (5). Five postural techniques (chin-down, chin–up, head turned, head tilted and lying down) which effects the flow of food and can provide optimal compensation in patients with specific defects in oropharyngeal swallow. Dietary changes, particularly thickened liquid diets, are commonly used to prevent liquid aspiration in patients with oropharyngeal dysphagia (15). The supraglottic, super supraglottic, effortful swallow, Mendelsohn manoeuvre, hyoid lift manoeuvre, shaker exercise, and tongue strengthening exercise are several swallowing manoeuvres.

Specific pharyngeal swallow alterations emerge from each of these voluntary manoeuvres. Each exercise lasts many weeks and focuses on a certain oropharyngeal swallowing mechanism. (1 to 6) to be effective (5,15). The diversion of oropharyngeal or stomach aspiration is the process of a substance entering the lower respiratory tract and larynx. Aspiration pneumonia happens when colonized oropharyngeal contents are aspirated. About 40 to 50 percent of people with dysphagia aspirate (16). For the elderly, aspiration pneumonia is a serious issue that can result in hospitalization, expensive care, and occasionally even death. A sufficient amount of voluntarily coughing lowers the risk of aspiration pneumonia and is a crucial defence mechanism for maintaining open airways. Elderly dysphagia and weak cough are the main causes of aspiration (17). Secretions can be expelled by coughing, forced expiratory manoeuvres (huffing once or twice after breathing in), and huffing (exhaling quickly and forcefully while the glottis is open (15). As a measure of success for swallowing, the Functional Oral Intake Scale (FOIS), a 7-point grade scale reflecting patients' reports of food and beverages safely consumed by mouth on a regular basis, is utilized(18).TheGuggingSwallowScreen(GUSS)isintendedtominimizetheriskofaspirationduringtesting.Assessttheseverityoftheaspirationriskandrecommendaspecialdietaccordingly(19).The need and importance of this study is to assess the improvement in swallowing ability and reduce aspiration in elderly with dysphagia after different swallowing manoeuvre and body positions. There were limited researches regarding the dysphagia in elderly.

MATERIALS AND METHODS

The Institutional Review Board of the Faculty of Physiotherapy has approved the study under the reference number BPT IV B/PHYSIO/IRB/2019-2020. An experimental study was conducted with a sample size of 20 participants at ACS Medical College and Hospital in the Physiotherapy OP department. The duration of the treatment period was 6 weeks. The study included elderly individuals aged between 65 and 85 years, both males and females, who scored above 18 in the mini-mental state exam. According to the Functional Independence Outcome Scale (FIOS), participants were required to fall within levels 3 to 6. Individuals with motor dysphagia disorders and a positive result on the bedside test were included, provided they were free from symptoms related to COVID-19. Exclusion criteria encompassed individuals who were dependent on feeding tubes, had undergone head and neck surgeries or had tumours, suffered from gastroesophageal reflux disease, had oral ulcers, had structural disorders such as cervical osteophytes or skeletal abnormalities, scored below 18 on the mini-mental state exam, or displayed one or more symptoms related to COVID-19. The outcome measures used in the study were the functional intake oral scale and the gugging swallowing screen.

Procedure

People who fit the requirements for inclusion in the study were chosen. A comprehensive general assessment was conducted, and a bedside test was performed to evaluate the presence of dysphagia and aspiration. The participants' swallowing ability was measured using the Functional Intake Oral Scale, while the risk of aspiration was assessed using the Gugging Swallowing Screen. Before initiating the treatment, the patients were instructed in the forced expiratory technique to prevent aspiration. The treatment consisted of a 6-week program of swallowing therapy, which included techniques such as supraglottic and super supraglottic swallowing, effortful swallow, Mendelsohn manoeuvre, hyoid lift manoeuvre, tongue strengthening exercises, and the shaker exercise. After the completion of the 6-week treatment period, individuals with dysphagia were re-evaluated to assess any changes in their condition.

Forced expiratory technique

To perform the forced expiratory technique, begin by taking a regular breath in and then exhale forcefully by engaging the muscles of the abdomen and chest wall. While exhaling, keep the mouth and glottis open and softly whisper the word 'huff', resembling a forced sigh. Repeat this process for 2 to 3 repetitions.

Postural technique

Chin up: This position aid in moving food through gravity.
Chin down: The pharyngeal wall and the back of the tongue are more closely spaced in this posture.
Head rotation: The epiglottis is in a more protective position in this position, which narrows the airway and encourages vocal cord closure.
Lying down on one side: By doing this, the gravitational pull that could lead to the residue whenever the patient aspirated breathing again is removed.
Head tilt: This causes the bolus to go down the stronger side.

Swallowing manoeuvres

Supraglottic swallow: The client is instructed to inhale deeply and hold their breath. They are to swallow while still holding their breath and promptly cough thereafter.

Super supraglottic swallow: The patient is instructed to inhale, tightly hold their breath while bending over, swallow, still keeping the breath hold, and cough as soon as they have finished swallowing.

Effortful swallow: Ask the patient to press the tongue against the roof of the mouth as hard as they can. Swallow as hard as they can. It helps to strengthen the tongue muscles.

Mendelsohn manoeuvre: Taught the patient how to hold their Adam's apple up during a swallow.

Hyoid lift manoeuvre: To enhance muscle strength and improve muscular control, one can engage in an activity involving small pieces of paper and a straw.

Here's how one can perform the exercise:

1. Prepare a towel and place a few small pieces of paper on top of it.
2. Take a straw and hold it in your mouth, ensuring a secure grip.
3. Use the suction power of your mouth to pick up one piece of paper by placing the tip of the straw near it and sucking gently.
4. Continue sucking on the straw to maintain the attachment between the paper and the tip of the straw.
5. Carefully bring the paper over a cup or container, making sure to keep the straw and paper steady.
6. Once you have positioned the straw over the container, release the suction by stopping the suction with your mouth.
7. The paper should fall into the cup due to the lack of suction, successfully placing it in the container.
8. Repeat the process with the remaining pieces of paper, aiming to add around 5 to 10 pieces into the container.
9. By repeating this exercise, you can work on building and strengthening the muscles involved in controlling the suction with the straw. It also helps improve fine motor skills and coordination, making it a beneficial activity for muscular control development.

Shaker exercise

1. Patient is asked to lie down on his/her back (supine position) on a comfortable surface or exercise mat.
2. Lift head up, keeping it elevated from the ground for a duration of one minute. Make sure not to strain your neck during this exercise.
3. After one minute, rest head back on the ground for a one-minute break.
4. Repeat this sequence of lifting your head for one minute and resting for one minute a total of three times.
5. Once completed the three sequences, move on to the next part of the exercise.
6. While still lying supine, lift head up from the ground and lower it back down repeatedly, aiming for 30 repetitions.
7. Focus on engaging and contracting the suprahyoid muscle group as you raise your head. These muscles are located above the hyoid bone in the neck and play a role in swallowing and lifting the larynx.

Take breaks as needed throughout the exercise to prevent any excessive strain or fatigue. By following this exercise routine, you can work on enlarging the entrance of the esophagus and strengthening the suprahyoid muscle, which can contribute to improved swallowing abilities and overall muscular control in that area. Remember to consult with a healthcare professional or therapist before starting any new exercise program, especially if you have specific medical conditions or concerns.

Tongue strengthening exercise

Ask the patient to extend their tongue as far as they are able to. A flat object, such as a spoon, should be placed in front of the person's tongue. They should then push against the flat object with both their tongue

and their tongue simultaneously. Keep for one to two seconds with 5 times in total

RESULTS

Age is shown in Table 1 as having a mean and standard deviation of 70.75± 5.22. According to Table 2, the mean values (swallowing therapy) demonstrate a highly significant difference between pre-test and post-test at P ≤ 0.001. When comparing the functional intake, oral scale score between pre-test is 4.40 and post-test 6.40.

According to Table 3, there is a highly significant change between the pre-test and post-test for the gugging swallowing screen score between the 11.30 and 17.60 mean values (Swallowing Therapy) at P ≤ 0.001.

Table 1: Descriptive statistics for demographic data

Parameter	n	Minimum	Maximum	Mean ±S.D.	Skewness	
					Statistics	Std. Error
Age	20	65.00	80.00	70.75± 5.22	.488	.512

Table 2: Comparison of functional intake oral scale between pre & post-test values

#FIOS	Pre-test	Post-test	t- Test	Significance
	Mean & S.D.	Mean & S.D.		
	4.40±0.882	6.40±0.680	-19.49	.000***

(***- P ≤ 0.001)

Table 3: Comparison of guggling swallowing screen score between pre-and post-test values

#GUSS	Pre-test	Post-test	t - Test	Significance
	Mean & S.D.	Mean & S.D.		
	11.30±2.15	17.60±2.11	-17.33	.000***

***- P ≤ 0.001

DISCUSSION

The elderly has a higher risk of developing dysphagia because they are more likely to have conditions that affect the swallowing process. Every element of swallowing function may suffer from aging. Doctors should inquire about the following in order to help patients' symptoms and quality of life: dysphagia in their elderly patients and practice increased awareness of potentially life-altering diagnosis and treatment that is disease-directed. Elderly people who are fragile frequently struggle with dysphagia, which can have catastrophic consequences like aspiration pneumonia. Aspiration occurs when food or liquid enters the airway instead of the esophagus, which can result in respiratory infections and other health issues (20). Swallowing therapy and forced expiratory techniques are two approaches that have been used to prevent aspiration in individuals with dysphagia. The present study was conducted to find out the effective technique to improve the ability of swallowing and to prevent the aspiration in elderly-patients with dysphagia. Cabre *et al*., (2) found that in older patients with pneumonia, oropharyngeal dysphagia is a relatively widespread clinical finding and a sign of the severity of the illness.

Patients can benefit from swallowing treatment to make up for swallowing issues and, in the long run, to strengthen the neuromuscular systems involved in swallowing. Even though the ALS patient's PCF significantly decreased due to bulbar involvement, peak expiratory flow was still improved by forced expiratory method. Swallowing therapy is designed to improve the coordination and strength of the muscles involved in swallowing, as well as enhance overall swallowing function. The inclusion of various techniques targeting different aspects of swallowing allows for a comprehensive approach in addressing the specific needs of each individual. It was noticed that there was improvement in all the above parameters. Forced expiratory technique (FET) is another intervention that has been used to prevent aspiration in individuals with dysphagia. FET involves using controlled forced exhalation during or after swallowing to assist in the clearance of food or liquid that may have entered the airway. By generating a forceful expiration, the aim is to expel any foreign material before it can cause aspiration. 20 samples received the swallowing therapy as well as forced expiratory technique to improve swallowing ability and reduce the risk of aspiration. The Functional Intake Oral Scale was used to gauge the individuals' ability to swallow, and the Gugging Swallowing Screen was used to gauge their aspiration risk. The forced expiratory technique, which prevents aspiration, was taught to the patients before the treatment began. Using procedures including supraglottic and super supraglottic swallowing, effortful swallowing, the Mendelsohn manoeuvre, hyoid lift manoeuvre, tongue strengthening exercises, and the shaker exercise, the treatment consisted of a 6-week regimen of swallowing therapy. Individuals with dysphagia were re-evaluated to see if their condition had changed after the 6-week therapy period.

Aslam and Vaezi(5) stated that swallowing therapy is effective for treating people who have trouble swallowing and can enhance the neuromuscular involvement in swallowing in the long run. Kagaya *et al.,* (15) demonstrated that the recumbent position, chin down, head rotation, side inclination, the recumbent position, and combinations of these all reduce aspiration. Patients with severe dysphagia frequently recline 30 degrees.

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Swallowing therapy and forced expiratory technique have shown promise in preventing aspiration in frail elders with dysphagia. On comparing functional intake oral scale score shows highly significant difference between pre-test and post-test mean values at $P \leq 0.001$. On comparing gugging swallowing screen score shows highly significant difference between pre-test and post-test mean values at $P \leq 0.001$. With reference to the statistical analysis done from the data collected using FIOS and GUSS, it is evident that there is a significant improvement in effects of swallowing therapy for dysphagia in frail elders and forced expiratory technique to prevent aspiration.

CONCLUSION

The swallowing therapy is more effective to increase the swallowing ability of the elderly patients with dysphagia and forced expiratory technique is more effective to reduce the risk of aspiration by improving the weak cough in patients with dysphagia.

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CONFLICT OF INTEREST

The authors declare no conflicts of interest.

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