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A clinical perspective towards oropharyngeal dysphagia management in neurological conditions: a brief literature review

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ABSTRACT

Dysphagia is a condition affecting the passage of solid and liquid food into the stomach due to impaired swallowing mechanisms caused by neurological factors like stroke, progressive diseases, and brain injury. Symptoms usually manifest within seconds of swallowing. In this brief review, the clinical perspective towards oropharyngeal dysphagia management from a speech and language therapist's point of view in neurological conditions will be outlined. This review was carried out by a brief literature screening. This review includes swallowing performance assessment and oropharyngeal dysphagia therapy techniques. Instrumental evaluation techiques were typically used to determine dysphagia presence in the clinical settings. Based on the findings of instrumental evaluation, clinicians must decide the therapy plan. In dysphagia, treatments contain behavioral interventions, central nervous system stimulation, and postural techniques. Behavioral therapy approaches include maneuvers, swallowing exercises, and postural techniques. Electrical stimulation approaches, such as repetitive transcranial magnetic stimulation (rTMS) and transcranial direct current stimulation (tDCS), improve the brain's ability to change and adapt, known as neural plasticity. In conlusion, the significance of evidence-based treatment in swallowing therapies is essential to enhance the comprehension of dysphagia therapy efficacy, particularly through randomized controlled trials.

Keywords: Neurogenic dysphagia, swallowing, behavioral therapy, speech and language therapy

Swallowing is a result of the complex operation of the oral, pharyngeal, and esophageal structures [1]. Consequently, it facilitates the passage of solid and liquid food into the stomach. Dysphagia is linked to a higher likelihood of malnutrition and pneumonia, and results in longer hospitalization, unfavorable prognosis, and mortality [2]. Swallowing mechanisms could be impaired by various neurological factors such as stroke, progressive neurological diseases, and acquired brain injury [3]. Additionally, a normal swallowing mechanism could be negatively affected by other ethiologies and known as anatomical disorders [4], esophageal dysphagia [5], rheumatological disorders [6] and dysphagia and medication-induced dysphagia [7]. Dysphagia is a prevalent and perilous symptom associated with numerous neurological disorders. In this patient group, dysphagia is correlated with a considerably prolonged duration of

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mechanical ventilation and an extended requirement for artificial nourishment. Neurogenic dysphagia significantly increases the risk of pneumonia, the primary cause of mortality in these patients [8]. Moreover, swallowing problems in these patients correlate with diminished quality of life, inadequate pharmacological efficacy, and malnutrition [9]. 20-30% of dementia patients experience severe dysphagia accompanied by silent aspiration, which often remains unrecognized by the individuals themselves [10]. Swallowing difficulties escalate with the advancement of cognitive decline [11].When negatively affected by these conditions, the preceding result is named as dysphagia. Dysphagia, a multidimensional condition that results from a variety of etiological factors, has the potential to disrupt swallowing function, thereby presenting individuals with nutritional challenges. Oropharyngeal dysphagia is characterized by difficulty in starting the swallowing process and the impeded movement of food from the oral cavity to the esophagus. The patients frequently report drooling, coughing, nasal regurgitation, aspiration, or choking, and symptoms of oropharyngeal dysphagia typically manifest within seconds of swallowing [12].

The evaluation and diagnostic methods used to assess dysphagia are subject to variation and are typically determined by the patient's reported symptoms and risk factors. Instrumental evaluations are gold standart evaluations that are employed to ascertain the etiology of dysphagia. Modified barium swallow study (MBSS) and fiberoptic endoscopic evaluation of swallowing (FEES) are procedures that are most frequently employed in the clinic to diagnose the patients with dysphagia [13-15].

After the dysphagia diagnosis, the severity of the dysphagia should be determined and therapy procedure should commence promptly. Thus, the patient's quality of life is increased. Therapies for oropharyngeal dysphagia include behavioural interventions and central nervous system stimulation [16,17]. Behavioral interventions for oropharyngeal dysphagia include motor behavioral techniques, oromotor exercises, adjustments to body and head posture, swallowing maneuvers to improve food movement and protect the airway, sensory and neuromuscular electrical stimulation, and modifying the consistency of the food bolus. In addition to these approaches, Transcranial magnetic stimulation (TMS) and transcranial direct current stimulation (tDCS) are employed to activate the central nervous system and address dysphagia [18, 19].

The present research reviews the current therapy and intervention options for oropharyngeal dysphagia induced by neurological disorders such as stroke, traumatic brain injury, and dementia.

This brief review was carried out by screening the dysphagia and dysphagia management in the literature.

BEHAVIORAL THERAPY APPROACHES

While dealing with oropharyngeal dysphagia, clinicians use maneuvers, swallowing exercises and postural techniques to either rehabilitate the dysphagic patients or redirect the movement of bolus in the oropharyngeal cavities.

Swallowing Therapy Techniques

Effortful swallowing, Mendelsohn, supraglottic swallow and super-supraglottic swallow maneuvers are the most commonly used techniques in the clinical settings. Effortful swallowing maneuver increases the supraglottic pressure and improve base of tongue retraction in the patients [20]. The patient executes swallowing by forcefully pressing the tongue on the hard palate, propelling it posteriorly while engaging the neck muscles. This technique is useful in the patients with decreased submental muscles. Effortful swallowing is also thought to increase laryngeal vestibule movement and UES opening [21]. Mendelsohn maneuver is one the most effective techniques used in the patients with oropharyngeal dysphagia to prevent bolus from falling into the airway thus protecting the patients from choking and premature falling [22]. The patient is expected to consciously control the elevation of the larynx to the greatest extent possible during swallowing. The patient is instructed to elevate the larynx as high as possible for 2-3 seconds. However, it is fairly a difficult technique in the patients with impaired cognitive abilities and motor functions. Both in supraglottic swallow and super-supraglottic maneuvers, it is aimed that the patients protect their airway by holding their breath voluntarily before and during a swallow. After a successful swallow, the patients are asked to form a cough to clear any bolus residue left in the supraglottis [23].

Swallowing Therapy Maneuvers

In addition to swallowing maneuvers, swallowing exercises are utilized by healthcare professionals to rehabilitate the patients. Laryngeal elevation, Masako, Shaker exercises and resistive lingual isometric exercises are included in these exercises. In laryngeal elevation, speech and language therapist wants the patient to produce a prolonged high pitch /i/ sound so that the patient can elevate their larynx and get used to contol it in the elevated position. Then, the patient does laryngeal elevation exercises to raise and sustain the larynx in a heightened posture. This enables the patient to protect airway from any bolus getting in the larynx. Swallowing physiology can be improved using this technique [24]. Masako or tongue hold is another exercise which is used in the patients with dysphagia. With the speech and language therapist's instructions, the patient protrudes the tongue anteriorly between the teeth during the process of swallowing and makes a voluntary swallow. Masako is performed without any bolus presence in the oral cavity. The purpose of this is to enhance the mobility and strength of the posterior pharyngeal wall during the process of swallowing [25]. One of the most important swallowing exercises used in the clinical setting is Shaker exercise. This exercise could be performed both dynamically and statically by the patients. In dynamic type, the patient lies on a horizontal plane. They lie without any support for their necks. They elevate their head to look at their toes by using their neck muscles and thereafter drop their head without pausing to view the toes. In static type, The patient is positioned on a horizontal surface. They lay down without any neck support. They raise their head to observe their toes by engaging their neck muscles and are instructed to maintain this position for a minimum of one minute. The Shaker exercise involves the contraction of the thyrohyoid, mylohyoid, geniohyoid, and anterior belly of diagastric muscles, which causes the hyolaryngeal structures to move upward and forward. The Shaker exercise effectively decreases the occurrence of postswallow aspiration by prolonging UES opening and strengthening muscles that pull the larynx and hyoid up and forward [26]. Last but not least, resistive lingual isometric exercises are used as a treatment to enhance reduced tongue pressure strength and endurance in the patients suffering from oropharyngeal dysphagia since tongue is crucial for the process of swallowing due to its complex muscular structure, which enables rapid and flexible movements during oral activities [27]. Isometric exercises include generating resistance with the tongue, which remains stationary or moves minimally.

Swallowing Therapy Postural Techniques

In oropharyngeal dysphagia management, postural techniques are used. They the mobility of the bolus in the mouth and pharynx and change the size of it. Postural treatments are also suitable for the patients with neurological problems. Postural adjustment can aid in the rehabilitation of the patients with dysphagia by influencing the movement of food bolus to enhance the speed and safety of swallowing through the closing of airways to prevent the inhalation of foreign substances [28]. Chin-down posture, chin-up posture, head rotation, head tilt are the postural techniques used in dysphagia management. In chin-down posture, the chin is brought down towards the neck, which can result in the tongue base moving closer to the back wall of the throat, narrowing the passage to the airway, and expanding the space in the vallecular region during swallowing [29] while chin is elevated, which may aid in the passage of the bolus from the mouth in chin-up posture [30]. The act of maintaining a chin-up posture has the potential to enhance the movement of food bolus through the mouth cavity which could lessen oral residue. Head rotation and head tilt are used to make sure bolus stays in the stronger side of the pharynx by turning the head [31]. This will also limit the amount of bolus residue in the weakened lateral for the patient.

ELECTRICAL STIMULATION APPROACHES

Traditional oropharyngeal dysphagia management is written above. This part will deal with techniques which stimulates patients' central and peripheral nervous system. In recent times, there has been a growing body of research focusing on alternative interventions that try to improve the brain's ability to change and adapt, known as neural plasticity, through the use of non-invasive brain stimulation (NIBS) techniques [32-34] . There are two types of NIBS method. Repetitive transcranial magnetic stimulation (rTMS) and tran-

scranial direct current stimulation (tDCS) are non-invasive brain stimulation (NIBS) treatments that are applied to the cortex or core areas of the brain. NIBS treatment enhances cortical plasticity through direct stimulation of the cortex. rTMS utilizes electromagnetic induction to induce depolarization of post-synaptic connections [35], while tDCS employs direct electrical current to alter the polarity of nerve cells. Generally, rTMS can be categorized into two primary treatment regimens based on the frequency of stimulation: low frequency (≤ 1 Hz) and high frequency (> 1 Hz). Low frequency repetitive transcranial magnetic stimulation (LF-rTMS) suppresses the level of cortical excitability, whereas high frequency repetitive transcranial magnetic stimulation (HF-rTMS) enhances the level of cortical excitability [36]. rTMS can hinder the development of harmful changes in the brain's cortex, enhance beneficial changes in brain activity, and facilitate the restoration of neurological function following a stroke [37]. rTMS has a positive impact on the ability to swallow in those suffering from dysphagia following a stroke. Nevertheless, other elements can impact the effectiveness, including the frequency and location of stimulation. Additional investigation into the mechanism of rTMS and the determination of appropriate parameters will be crucial for the advancement of this innovative intervention in the clinical practice [18]. tDCS, a type of non-invasive brain stimulation, has been found to enhance motor performance following a stroke [38]. This will help the patients with weakened motor functions. tDCS alters the level of cortical excitability in a manner that depends on the polarity. Anodal transcranial direct current stimulation (tDCS) enhances cortical excitability by depolarizing the resting membrane potential, while cathodal tDCS reduces cortical excitability by hyperpolarizing the resting membrane potential [39].

On the other hand, treatments such as pharyngeal electrical stimulation (PES) and neuromuscular electrical stimulation (NMES) specifically focus on the peripheral neuronal pathways by using electrical stimulation. NMES, or neuromuscular electrical stimulation, is a technique that enhances the force of muscle contractions during the process of swallowing. It achieves this by applying electrical stimulation to the anterior neck muscles through electrodes implanted on the skin [40]. NMES is a conventional therapeutic approach for dysphagia. Additionally, NMES is a conventional therapy for dysphagia. The long-term therapeutic benefits of NMES (2-4 weeks) can enhance swallowing function by strengthening the muscles involved in swallowing, rehabilitating the reflex responsible for swallowing, and controlling the excitability of the cerebral cortex [2]. Moreover, NMES can amplify the sensory input in the oral pharyngeal area and improve the responsiveness of muscle contraction [41]. NMES has prompt effects on the onset of swallowing without elevating the likelihood of unfavorable incidents [42]. This stimulation activates sensory pathways in the body. Lastly, PES is an innovative therapy for oropharyngeal dysphagia caused by neurological factors like stroke [43]. It has been demonstrated that PES stimulates neuroplasticity in the pharyngeal motor cortex by directly stimulating the pharyngeal mucosa using intraluminal catheters [44]. PES stimulates the sensory feedback pathways that are essential for ensuring the safety and efficiency of swallowing. Having been implemented, it leads to a higher occurrence of voluntary swallowing and improved management of pharyngeal secretions. Evidence demonstrates that PES is a secure and effective therapeutic approach for managing dysphagia in individuals suffering from stroke and brain injury [45-47].

The techniques utilized in swallowing difficulties differ based on the specific symptoms reported. Not all techniques employed in swallowing therapy are behavioral therapies. Alongside behavioral therapy techniques, video-based feedback methods that enhance the patient's awareness of their swallowing and electrical stimulation approaches are also employed. It would be inappropriate to consider the approaches employed in swallowing therapy in isolation or separately. Diverse therapeutic modalities should be employed concurrently based on the patient's condition to maximize the outcome [48-50].

CONCLUSION

This study examines the existing treatment and intervention choices for oropharyngeal dysphagia caused by neurological conditions. Oropharyngeal dysphagia management is sustained using both behavioral therapy approaches and technological instruments, most

of which are still yet to be clinically proven effective. However, a standart dysphagia therapy protocol has not yet been established. Implementing a dysphagia therapy procedure seems to be quite vital. Therapy procedures could be fully maintained if only dysphagia could be handled by means of an interdisciplinary approach. In this approach, speech and language therapists play a very importan role in rehabilitation process of the dysphagic patients. Both before and during therapies, each dysphagia therapy team member has to be aware of the importance of patient safety to avoid any unnecessary mistakes which could endanger the patients' health. To further understand the efficacy of dysphagia therapies, especially research involving randomized controlled trials is needed, and evidence-based treatment in swallowing therapies is really important.

Ethical Statement

Ethical approval is not required for this study. There are no human or animal elements in our study. This review was carried out by a brief literature screening.

Authors' Contribution

Study Conception: ST, FSK, NÇ; Study Design: ST, FSK, NÇ; Supervision: ST, FSK, NÇ; Funding: ST, FSK, NÇ; Materials: ST, FSK, NÇ; Data Collection and/or Processing: ST, FSK, NÇ; Statistical Analysis and/or Data Interpretation: ST, FSK, NÇ; Literature Review: ST, FSK, NÇ; Manuscript Preparation: ST, FSK, NÇ and Critical Review: ST, FSK, NÇ.

Conflict of interest

The authors disclosed no conflict of interest during the preparation or publication of this manuscript.

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