Original Research Article **Allied science**

International Journal of Pharma and Bio Sciences

ISSN 0975-6299

EFFECTIVENESS OF TRANSCUTANEOUS ELETRICAL NEUROMUSCULAR STIMULATION ALONG WITH EXERCISCES MANOEUVER IN DYSPHAGIA: CASE SERIES

DARSHNI. R. THAKKAR*[1], D. MALARVIZHI*[2]

SRM College of Physiotherapy, SRM University, Chennai, India

ABSTRACT

Dysphagia typically refers to difficulty in eating as a result of disruption in the swallowing process. It occurs following stroke with incidence relating to lesion size and location. It has been associated with higher rates of respiratory complications and increased risk of aspiration pneumonia, dehydration and nutritional com-promise. The aim of the study is to find out the effectiveness of TENS along with exercise manoeuvres in the treatment of Dysphagia. The study was Case Series Interventional study with 3 patients, both the genders. The inclusion criteria were Acute Dysphagia less than a month, Dysphagia following Stroke, Trauma and Degenerative disease. All 3 patients received TENS with parameters of 80-100Hz for pulse duration of 300 µs and intensity ranging from 2.5 to 25 mA depending on the patient's tolerance for 30 minutes and immediately followed by Swallowing Therapy exercise such as Head and Neck Positioning, Shakers and Mendelsohn Manoeuvre, 30 minutes duration for 6 days. Functional Oral Intake Scale (FOIS) was used as the outcome measure. Case 1, FIOS pre score was 1 and post score was 2; Case 2, FIOS pre score was 1 and post score was 3; Case 3, FIOS pre score was 4 and post score was 6. The study concluded that there was effectiveness of Transcutaneous Neuromuscular Electrical Stimulation along with Exercise Manoeuvre in improving oral intake ability and improves the quality of life in Dysphagia patients.

KEYWORDS:**Dysphagia, TENS, Exercises, FOIS**

DARSHNI. R. THAKKAR
SRM College of Physiotherapy, SRM University, Chennai, India

INTRODUCTION

Dysphagia is a Greek word which means disorder in eating. It refers to difficulty in intake of food due to the disruption in the swallowing process [1]. Dysphagia usually occurs in 45%- 65% after acute stroke with incidence relating to lesion size and location [2-3]. The presence of Dysphagia increases the risk of pulmonary complications such as pneumonia, aspiration and nutritional compromise which in turn increases the rate of mortality.The epidemiological data for Dysphagia are scare; the prevalence among the age over 50 years is estimated to be from 10 to 22%. In health care institutions, it is estimated that about 12%-13% of patients in short term care hospitals and up to 60% of nursing home have feeding difficulties. Prevalence of 20%-40% of oropharyngeal Dysphagia among special populations such as those with Brain injuries, Cerebrovascular accidents and Parkinson disease [4]The initiation of swallowing is by cerebral cortex and by brainstem swallowing centre[3]. Although not all head injuries affect the areas involved in steering the swallowing process. Many brain injuries such as Cerebral, Cerebellar or Brainstem stroke disrupt the normal physiology of swallowing.The impulse for swallowing begins from the frontal swallowing centre which is located in front of the face area of the motor cortex at the foot of the precentral gyrus. Stimulation of this area induces swallowing activity in the striated muscle of the mouth, tongue and pharynx. Axons of these cortical neuron descends through the white matter of the corona radiate and the internal capsule, the cerebral peduncle of the midbrain and the pyramidal tract fibres in the Pons, which then cross and project onto the motor nerve cells of the medulla oblongata [5].The second swallowing centre is located in the medulla and stimulation of this centre is brought about by the corticobulbar tract, which forms the entire pathway from motor cortex to medulla. This centre consists of at least three separate clusters of nerve cells; first in the vicinity of the nucleus of the tractus solitaries, receive sensory inputs of swallowing from the cranial nerves involved in the sensation of the oropharynx, trigeminal, glossopharengeal and vagus nerve. This centre also coordinates the motor outputs from the nucleus ambigus and the dorsal motor nucleus of the vagus nerve which controls the oesophageal phase of swallowing. Axon from these motor nuclei travels as a part of vagus nerve to the nucleus of swallowing [5-6].Swallowing depends on the co-ordination of sensory pathway from the tongue, mouth, pharynx and larynx and voluntary and reflex contractions involving cranial nerves V, VII, X, XI and XII [6]. Deglutition is the act of swallowing and is a smooth co-ordinate process which involves series of voluntary and involuntary neuromuscular contractions[7-8]. This process involves 3 phases which includes: 1) Oral, 2) Pharyngeal and 3) Oesophageal. Each of these phases has specific function and damage to any phase due to any pathological condition may produce with specific symptoms[8].The important goal for Dysphagia therapy is to prevent or improve the chest complication which reduces the mortality and morbidity rate. To improve the nutritional status and return patients to a normal diet and improve their quality of life. Various methods of physiotherapy have been used for the treatment of Dysphagia. But the concept of effectiveness of Transcutaneous Electrical Neuromuscular Stimulation to facilitate swallowing function is relatively recent and their physiologic change that may occur is unclear. A theory suggests that muscle strength is facilitated in a fashion similar to that of voluntary exercise. Therefore, these Transcutaneous Electrical Neuromuscular Stimulation protocols would involve programs of low repetitions with high external loads and high muscle contraction intensity[9]. A second theory is based upon the muscle recruitment patterns. Transcutaneous Electrical Neuromuscular Stimulation is believed to selectively recruit type II muscle fibres first. Types II fibres produce a higher force contraction that that of type I, slow twitch muscle fibres[10].Exercises such as Shakers exercise, Mendelsohn exercise and effortful swallowing typically do not recruit type II muscle fibres unless vigorous exercise requires their utilization. Hence, a modality such as Transcutaneous Electrical Neuromuscular Stimulation favouring recruitment of type II fibres may produce greater gains in muscle strength than exercise alone[11]. The aim of this study was to find the effectiveness of Transcutaneous Electrical Neuromuscular Stimulation along with exercise manoeuvre in Dysphagia, improving the oral intake ability.

METHODOLOGY

Three patients who were diagnosed to have Dysphagia were taken into the study depending upon the inclusion and exclusion criteria fromSRM Medical College Hospital and Research Centre, Kattankulathur and an informed consent was taken from the patients. The study design was Case Series Interventional study.

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

RESULT

Table 1
Comparison of Effectiveness of TENS along with Exercise Manoeuvre Pre and Post Test Score of FIOS

S.NO	PRE Test Score of FIOS	POST Test Score of FIOS
1.	1	2
2.	1	3
3.	4	6

Case 1, the Pre FIOS score was 1 and Post FIOS score was 2
Case 2, the Pre FIOS score was 1 and Post FIOS score was 3
Case 3, the Pre FIOS score was 4 and Post FIOS score was 6

According to the scoring of Functional Oral Intake Scale there were significant changes from pre and post score in swallowing level and improved swallowing difficulty.

DISCUSSION

In Case 1, according to table 1 the patient age was 60 years, having Dysphagia following stroke. The patient had progressive respiratory complication, which was the major hurdle in the prognosis of the treatment. Functional Oral Intake Scale taken before the commencement of the treatment was scored Level 1 and after treatment the Level was 2, which means patient was able to have sip of water slowly and with great difficulty. The less prognosis of the condition was due to the repetitive cough and sputum which increased the airway resistance during swallowing, hence patient had great difficulty. Therefore, there was minimal difference between the Pre and Post score in this patient, which shows minimal effectiveness of Transcutaneous Electrical Neuromuscular Stimulation along with Exercises.In Case 2, according to Table 1 the patient age was 80 years and had Dysphagia due Lateral Medullary Syndrome. Functional Oral Intake Scale was scored 1 before the commencement of the treatment and was scored 3 after the treatment; patient was able to have fluid through mouth. The major difficulty faced during the treatment was, the patient had complaints of nausea and vomiting which hindered the continuity of the treatment. Age also played a major role in reduce prognosis of the patient. Therefore, there was marked difference between the Pre and Post score in this patient, which shows effectiveness of Transcutaneous Electrical Stimulation along with exercises.In Case 3, according to Table 1 the patient age was 65 years and had Dysphagia post stroke. Functional Oral Intake Scale was scored 4 before the commencement of the treatment and was scored 6 after the treatment; the patient was able to have solid food with minimal difficulty. The prognosis of this patient was fast compared to the above two patients maybe because of no major respiratory and other complications. Therefore, there was marked difference between the Pre and Post score in this patient, which shows effectiveness of Transcutaneous Electrical Stimulation along with the exercises. Transcutaneous neuromuscular electrical stimulation was used on especially type II muscle fibres and increase muscle strength. Transcutaneous Electrical Neuromuscular Stimulation was believed to selectively recruit type II muscle fibres first (a pattern that is opposite that of normal muscle recruitment). Type II fibres produce a higher force contraction than that of type I, slow-twitch muscle fibres [12]. Transcutaneous Electrical Neuromuscular Stimulation has recently been proposed as a treatment option for pharyngeal Dysphagia as it increases hyoid or laryngeal elevation. It can actually stimulate the deep strap muscles of the head and neck in condition with reduced laryngeal elevation. Because it is intended to improve hyolaryngeal elevation, it can be considered a ROM exercise [13]. Recovery of the swallowing disorder can be achieved by the recovery of an injured nerve, as well as the recovery of the strength and muscles involved in the swallowing process. Therefore, the program of repeat exercise 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 [14]. Shaker et al stated that Shaker exercises improves the opening of Upper Oesophageal Sphincter and strengthens the anterior laryngeal musculature [15]. Mendelsohn Exercise enhances the contraction of the suprahyoid muscles in maintaining the laryngeal elevation and in the opening of Upper Oesophageal Sphincter and airway closure [16]. Kiger et al stated that Dysphagia exercise do not recruit type II muscle fibres' unless vigorous exercise is performed. As Transcutaneous Electrical Neuromuscular Stimulation recruits type II muscle fibres, combination therapy of Transcutaneous Electrical Neuromuscular Stimulation and Exercise manoeuvres results in early transition from tube feeding to the oral feeding [17-18].Hence the use of Transcutaneous Electrical Neuromuscular Stimulation should be incorporated in the treatment protocol for Dysphagia particularly in the acute stage. Hence in this study the effectiveness of Transcutaneous Neuromuscular Electrical Stimulation combined with exercise were shown

CONCLUSION

The study concluded that there is effectiveness of Transcutaneous Neuromuscular Electrical Stimulation along with Exercise Manoeuvre in improving oral intake ability and improves the quality of life in Dysphagia patients according to the scoring shown in Table 1.Limitation of the study was small duration of intervention and less sample size. Further studies can be done on large number of sample and on effects of varying frequencies, total number of sessions, different placement of electrodes and on different age group affected by Dysphagia. Further more study can be done to compare the effectiveness of TENS and Electrical Stimulation in Dysphagia, which will enlighten the one more effective than other.

ACKNOWLEDGMENT

The authors would like to acknowledge all people who helped us to complete this study.

CONFLICT OF INTEREST

Conflict of interest declared none.

REFERENCES

1. Singh S & S.Handy. Dysphagia in Stroke patient"; Post Graduate Medicine J.2006; 82(968), 383-391.
2. Daniels SK, Brailey K, Priestly DH, Herrington LR, Weisberg LA, Foundas AL. Aspiration in patients with acute stroke. Arch Phys Med Rehabil 1998; 79: 14–19.
3. Mathela V"Tens with exercise Maneuvers in Dysphagia Rehabilitation"; Asian Journal of Multidisciplinary studies Nov 2013; 2321-9.
4. Syrine GS Sensory Transcutaneous Electrical Stimulation Improves Post Stroke dysphagic Patients. Dysphagia 2010; 25:291-7.
5. Wutichai PMD Comparing the effects of rehabilitation swallowing therapy vs. neuromuscular electrical stimulation therapy among stroke patients with persistent pharyngeal Dysphagia: a randomized controlled study. J Med Assoc Thai 2009 ;92(2), 259-65.
6. Suttipong TMD, Manit W(Occupa-tional Therapy), Vitoon L Compare the Effects of Rehabilitation Swallowing Therapy vs. Neuromuscular Electrical Stim-ulation Therapy among Stroke Patients with Persistent Pharyngeal Dysphagia ; J Med Assoc Thai 2009; 92(2).
7. Crary MA, Carnaby Mann GD, Groher ME. Initial psychometric assessment of a functional oral intake scale for dysphagia in stroke patients; Arch Phys Med Rehabilitation 2005 ;86(15), 16-20.
8. Leelamanit V, Limsakul C, Geater A. Synchronized electrical stimulation in treating pharyngeal dysphagia. Laryngoscope. 2002; 112 (12), 2204-10.
9. Ludlow CL, Humbert I, Saxon K, Poletto C, Sonies B, Crujido L. Effects of surface electrical stimulation both at rest and during swallowing in chronic pharyngeal Dysphagia ; Dysphagia 2014; 22 (1), 1-10.
10. Beom J, Kim S, Han T. Electrical Stimulation of the Suprahyoid Muscles in Brain injured Patients with Dysphagia: A Pilot Study; Ann Rehabil Med 2005; (35), 322-7.
11. Gallas S, Marie JP, Leroi AM Sensory transcutaneous electrical stimulation improves post-stroke dysphagic patients 2010; 25(4), 291-7.
12. Steele CM, Thrasher AT, Popovic MR. Electric stimulation approaches to the restoration and rehabilitation of swallowing: a review; Neurol Res 2007 ;29(1), 9–15.
13. Lazarus C, Logemann JA, Gibbons P. Effects of maneuvers on swallow functioning in a dysphagic oral cancer patient ; HeadNeck2013; 15, 419–24.
14. Robbins JA, Kays SA, Gangnon RE, Hind JA, Hewitt AL, Gentry LR, Taylor AJ. The effects of lingual exercise in stroke patients with Dysphagia ; Arch Phys Med Rehabil 2007;88:150–8
15. Shaker R, Easterling C, Kern M. Rehabilitation of swallowing by exercise in tube-fed patients with pharyngeal dysphagia secondary to abnormal UES opening 2002; 122(5), 1314-21.
16. Lake D A. Neuromuscular electrical stimulation. An overview and its application in the treatment of sports injuries; Sports Medicine 1992 ;13, 320-36.
17. Kiger M, Brown CS. & Watkins L. Dysphagia management: An analysis of patient outcomes using VitalStim therapy compared to traditional swallow therapy; Dysphagia 2006; 21(4), 243-53.
18. Crary MA., Carnaby-Mann, GD, Faunce A. Electrical stimulation therapy for dysphagia: descriptive results of two surveys; Dysphagia 2007;22(3), 165–73.