



# EFFECT OF REHABILITATION SWALLOWING THERAPY AND TRANSCUTANEOUS ELECTRICAL STIMULATION FOR SWALLOWING ON POST STROKE PATIENTS

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## Abstract:

**Background:** Stroke is the 4<sup>th</sup> leading cause of death worldwide. Dysphagia in stroke occurs about 51% worldwide. Dysphagia is caused due to delayed triggering of the swallowing reflex, reduced pharyngeal peristalsis and reduced lingual reflex. There are different treatment approaches for treating dysphagia such as Rehabilitation Swallowing Therapy (RST), Transcutaneous Electrical Nerve Stimulation (TENS), NMES, RST includes postural adjustment, supraglottic swallowing, Mendelsohn Maneuver and effortful swallowing. TENS is applied to cause the muscle contraction and to stimulate sensory pathways. **Method:** in the present study 30 patients were taken and random in two groups, group A (n=15) RST and group B (n=15) TENS respectively. Outcome measures used were MMSE, FIM, STREAM, and FOIS. **Result:** In the present study RST was more effective than TENS statistically proved with unpaired t test MMSE ( $p=0.0115$ ), FIM ( $p=0.929$ ), STREAM ( $p=0.5775$ ) and FOIS ( $p=0.068$ ). When comparison was done within the group, all outcome measures showed non-significant values at pre and post intervention. MMSE ( $p=0.0005$  in group A and B), FIM ( $p=0.0273$  in group A and B), STREAM ( $p=0.0005$  in group A and B) and FOIS ( $p=0.0001$  in group A and B). **Conclusion:** RST showed more effect than TENS in post-stroke dysphagic patients

*Keywords: Stroke, Dysphagia, TENS, RST.*

## I. INTRODUCTION

Stroke is sudden loss of neurological function caused by an interruption of the blood flow to brain. Stroke is 4<sup>th</sup> leading cause of death. Loss of consciousness at stroke persistent serves hemiplegia, multiple neurological deficits and history of persistent stroke are also important predictor of mortality. <sup>[1,2]</sup>

Dysphagia is an inability to swallow or difficulty in swallowing. Dysphagia is stroke occurs about 51% worldwide. Most common problems seen in patients with dysphagia include delayed triggering of the swallowing reflex, reduced pharyngeal peristalsis and reduced lingua reflex. <sup>[1]</sup> Dysphagia involves the synergistic action of at least 32 pairs of muscles and depends on the integrity of sensory and motor pathways of several cranial phases involved in swallowing that is oral, pharyngeal, esophageal. <sup>[2]</sup>

In the oral stage food is continued within the mouth with mastication, mixing with saliva and formation of bolus. In the pharyngeal phase, respiration is momentarily during expiration. In the esophageal phase. Co-ordinate peristalsis carries the bolus through the lower esophageal sphincter into the stomach. The whole process of swallowing lasts approximately 12sec. <sup>[2]</sup>

There is good evidence for the existence of a brainstem swallowing Centre located in the medullary reticular formation on either side of the midline and just dorsal to the inferior olives. <sup>[2]</sup>

Swallow related cortical activity is multidimensional, recruiting brain area implicated in the processing of motor, sensory, attention and affective aspects of the task. Functional imaging studies have provided evidence that there is significant interhemispheric asymmetry in the motor control of swallowing. <sup>[3]</sup>

Rehabilitation swallowing therapy (RST) is compensatory techniques including postural adjustment, supraglottic swallowing the Mendelsohn Maneuver and effortful swallowing have been reported as the standard treatment for stroke survivors with dysphagia. <sup>[4]</sup>

Transcutaneous Electrical Nerve Stimulation (TENS) activates a general proportion of type II muscle fibers that produce higher level of tension that will enhance strength development more in voluntary contraction, the smaller type I muscle fiber are mainly activated. <sup>[5]</sup>

## II. RESEARCH METHODOLOGY

In the present study 2 groups were compared between RST (group A) and TENS (group B). The patients were allocated in groups by random block method using envelopes. All the patients selected were evaluated on the basis of Outcome measure scales i.e. MMSE, FIM, STREAM, FOIS. In group A RST by incorporating Mendelsohn's Maneuver was given for 20mins, 6 days a week for 2 weeks and for group B TENS was applied in the region of suprahyoid and infrahyoid muscles around the thyroid cartilage for the same duration as for group A. During the 1<sup>st</sup> 4 days, 20 contractions were given with rest period of 20sec in between followed by 30 and rest period reduced to 15sec for the next 5 days. In the last 5 days contractions were raised up to 40 with the rest period reduced to 10sec. All the post treatment parameters were measured at the end of 2<sup>nd</sup> week.

### 2.2. Population and sample:

The sample size was calculated using G-power software. Total 35 participants were at the baseline for the study based on the diagnosis of RCI in the MGM school of Physiotherapy Neuro physiotherapy OPD and MGM Hospital. Then on the basis of inclusion and exclusion criteria 30 were included out of 35 for the study.

## 2.2. Data and Sources of Data:

For this study secondary data has been collected. The data was collected from PubMed, google Scholar and Cochrane. The data collection period was for 6 months.

## 2.3. Descriptive statistics:

Descriptive statistics was calculated and analyzed by using Graph pad software. Shapiro-Wilk test was carried out to determine the normality of the data ( $p > 0.5$ ), considering all the normal distribution paired t-test was using to compare the groups within and unpaired t-test was used to compare between groups using MMSE, STREAM, FOIS and FIM.

# I. RESULTS

## 1.1 Results of Descriptive Statics of Study Variables

All the 30 participants completed the study whereas 3 dropped out after 1<sup>st</sup> week due to medical conditions. After performing the normalcy tests paired t test was used for intragroup comparison which wasn't significant in any of the outcome measures while comparison between two groups using unpaired t-test showed significant results for FIM, STREAM and FOIS and was non-significant for MMSE. The statistical results for each outcomes measures are shown in the tables below.

Table 3.1 Descriptive Statistics (MMSE)

Variables	Paired Difference		t-value	p-value
	Mean(SD) Group A	Mean(SD) Group B		
Pre	19.2 ±6.64159	20.8 ±3.18927	0.974	0.0133
Post	21 ±6.425396	25±3.11677	1.092	0.0115

Table 3.2 Descriptive Statistics (FIM)

Variables	Paired Difference		t-value	p-value
	Mean(SD) Group A	Mean(SD) Group B		
Pre	47±11.80	31.93±12.20	3.437	0.9021
Post	49.2±13.19	33.93±12.88	3.206	0.929

Table 3.3 Descriptive Statistics (STREAM)

Variables	Paired Difference		t-value	p-value
	Mean(SD) Group A	Mean(SD) Group B		
Pre	20.6667±6.30	22.933±5.203	1.073	0.4796
Post	27.2±6.879	26.93±5.910	0.1139	0.5775

Table 3.4 Descriptive Statistics (FOIS)

Variables	Paired Difference		t-value	p-value
	Mean(SD) Group A	Mean(SD) Group B		
Pre	3.8±1.08	4.333±0.487	1.74	0.0052
Post	5.06±1.22	5.4±0.736	0.9043	0.068

## II. DISCUSSION

The purpose of the present study was to see the effect of rehabilitation swallowing therapy vs TENS for dysphagia on post stroke patients. The study was done on 30 patients who were randomly selected and were divided into 2 groups A and B. Group A was for rehabilitation swallowing therapy (RST) and group B was for TENS given for 2 weeks

### Gender

In the present study there were total 15 participants in each group in which Group A had 7 females and 8 males and in Group B it was the same. A similar study done by Spronson L. also had similar number of patients in both their groups that is 15. Our study showed statistically equal distribution of both male and female in both groups who underwent PT treatment for 6 consecutive days for 2 weeks.

### Outcome Measures

#### MMSE

Mini mental scale examination (MMSE) is a scale used in our research to test cognitive function of the stroke patients. MMSE has a good reliability and validity and so was selected as one of the outcome measures for our research work. According to a study by Kwang Jae Yu (2018) on different clinical predictors of aspiration pneumonia in dysphagic stroke patients which suggest that MMSE showed good results and other study by G.M.S.<sup>[25]</sup> proves that MMSE was not significant in their research. Our study when compared to these had a less duration of treatment protocol and so did not prove much significant. The patients in our study groups had a low MMSE score pre-treatment and so were not able to understand the treatment protocol and were less co-operative too and hence there was no marked improvement in the MMSE scores post treatment in both the groups.

#### FIM

One study done by Hamilton BB on the 7-level functional independence measure (FIM) shows clinically significant improvements in functional independence and quality of life.<sup>[28]</sup> Another study done by Mizrahi EH, et al<sup>[30]</sup> (2016) on ischemic stroke using FIM as an outcome measure proved similar results. In the study<sup>[30]</sup> pre-admission scores of FIM were not much higher but later during discharge the FIM showed significant improvements in the patients. Our result when compared to this study<sup>[28]</sup> shows similar outcomes when evaluated post treatment with FIM scores showing RST more effective than TENS. The results prove so because the patients in RST group were more co-operative and were able to tolerate the RST measures such as Mendelsohn maneuver, effortful swallowing more easily than TENS which was a bit uncomfortable for the patients.

#### STREAM

Stroke Rehabilitation Assessment of Movement is a measurement tool used to quantitatively evaluate the recovery of voluntary movement and mobility post stroke. When the comparison within two groups was done there was significant improvement in both groups which is proved statistically. Studies done by Ahmed S. et. al<sup>[26]</sup> (2003). Vongsirinararat M, et. al.<sup>[27]</sup> (2016) reveals similar results as our study where there is significant improvement is post treatment STREAM scores. Our results reveal that RST was more beneficial than TENS. RST is effective for activation for swallowing muscles and opening of the upper esophageal sphincter but statistically not significant. The patients in our study group had a very less STREAM score which suggest that they had a sever level of stroke but post treatment Group A showed good improvements in the score and is also supported by 2 other studies.<sup>[26, 27]</sup>

#### FOIS

Functional Oral Intake Scale is an outcome measure of our research chosen to estimate changes in the functional eating abilities of stroke patients over time. When the comparison was done within Group A and B between there was no significant result in both groups. According to a study done by Permsirivanich W<sup>[4]</sup> (2009) shows that they received positive results in FOIS levels. Another study done by Huang YC et al (2018) on swallowing therapy shows good results using the FOIS scale as an outcome measure. Our results when compared to this study did not show much improvement in the patients due to several limitations in our research work such as our



study had a smaller duration of treatment plan as well as some patients did not co-operate throughout the sessions. Group A (RST) showed good results post treatment as the patients were able to tolerate the treatment and were co-operative during the treatment sessions as compared to TENS where patients did not co-operate much during the sessions.

### III. CONCLUSION

This study concludes positive effects of RST and TENS for improving dysphagia in post-stroke patients after 2 weeks of treatment. RST showed better results as compared to TENS in improving dysphagia, it also increases tongue base retraction which improves swallowing in post stroke patients.

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- 6.2. *Statistics*: Statistics were calculated by the department of physiotherapy statistician.
- 6.3 *Funding*: Financial support was provided by the School of Physiotherapy.
- 6.4. *Conflict of Interest*: There was no conflict of interest.

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