

TIMED TEST OF SWALLOWING IN SIX MONTH POST STROKE INDIVIDUALS

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Abstract

The swallowing problems after acute stroke are often temporary but sometimes leads to various complications such as aspiration pneumonia, dehydration and death. Though these individuals recover from swallowing disorder as assessed subjectively and objectively, it is not known if they have recovered completely. Hence the present study was attempted at identifying any swallowing problems in six month post stroke individuals, using timed test of swallowing. The study followed the Prospective case control design. All the participants in both the clinical and the control group were asked to drink 150 ml of water from a plastic beaker 'as quickly as possible'. The number of swallows performed by the participants was counted by observing the movement of the thyroid notch. A stopwatch was started when the water first touched the lower lip, and stopped when the larynx came to rest, ensuring the last swallow. Timed test of swallow includes quantitative elements i.e., the volume swallowed, the number of swallows used and the time taken, which yields three quantitative indices, which are average volume per swallow (ml), average time per swallow (s) and swallowing capacity (volume swallowed in ml/s) in both the group of participants. The results revealed a significant difference between the means for both the group of participants, at $p < 0.05$ for all the three indices of timed test of swallowing, suggesting that the clinical group exhibited lower volume per swallow, increased time per swallow and a lower swallowing capacity in each swallow than control group. The obtained results were discussed with respect to the stroke and its effect on swallowing. Hence, the timed test of swallow can be used as a clinical tool for identifying swallowing problems in post stroke individuals.

Key words: Post stroke individuals, timed test, swallowing capacity

The swallowing problems after acute stroke are often temporary but sometimes lead to various complications such as aspiration pneumonia, dehydration and death (Gordon, Hower & Wade, 1987; Holas, Depippo & Reding, 1994; Johnson, McKenzie & Seivers, 1993; Warnecke et al., 2008; Smith Hammond et al., 2009). Though these individuals do not complain of swallowing disorder six months post stroke, it is not known if the recovery is complete as assessed subjectively and objectively. Previous studies of individuals with dysphagia, used quantitative measurements like amplitude of EMG muscle activity during swallow, time duration for which the activity is present, swallowing apnea duration, etc. in the assessment of individuals with

swallowing disorders (Vaima, Eviatar & Segal, 2004).

Simple timed test of swallowing was proposed in addition to the routine assessment of individuals with neurological impairment along with reliability and validity (Nathadwarawala, Nicklin & Wiles, 1992; Hughes & Wiles, 1996). Timed test of swallow includes quantitative elements i.e., the volume swallowed, the number of swallows used and the time taken, which yields three quantitative indices, which are average volume per swallow (ml), average time per swallow (s) and swallowing capacity (volume swallowed in ml/s). These indices might be useful in screening those at risk for dysphagia or its complications (Koji et al., 1999). We consider that these measures are the indicators of complete

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recovery as it assesses the finer aspects of swallowing behavior i.e., volume per swallow, time per swallow and the swallowing capacity. We considered that the individuals obtaining age appropriate scores are believed to have recovered completely from their abnormal swallowing behavior and the individuals failing from this test are considered to have persisting swallowing problems which warrants further instrumental evaluation to evaluate the swallowing physiology in them.

Hinds and Wiles (1998) have reported abnormal findings of timed test of swallowing in acute stroke individuals and concluded that a timed water swallowing test can be a useful test of swallowing and may be used to screen patients for referral to a speech language therapist after a acute stroke. Swallowing speed was significantly slower in individuals who reported swallowing problem or those who had abnormal symptoms or signs compared to those who did not, providing further evidence for the validity of timed test of swallowing (Nathadwarawala, McGroary & Wiles, 1994). This study also provided evidence of a significant incidence of disordered swallowing in individuals who had not reported any swallowing problems but, who had symptoms potentially relevant to swallowing (Nathadwarawala, McGroary & Wiles, 1994). Hence this particular measure was chosen in the present study to identify swallowing problems if any in six months post stroke individuals. Six months after the stroke, though these individuals do not complain of swallowing disorder, it is not known if they have recovered completely as assessed subjectively and objectively. Hence the present study was an attempt in this direction with the aim of identifying swallowing problems if any in six month post stroke individuals using timed test of swallowing.

Method

Patients: Participants were divided into two groups. Group 1 comprised of forty male individuals with a history of dysphagia in their acute period of stroke six months ago. All these participants were in the age range of 40 to 60 years. Group 2 consisted of forty male healthy age matched volunteers.

The study protocol followed the case control design.

Assessments

All the participants in both the groups were

subjected to clinical assessment of swallowing.

Clinical Assessment of Swallowing: All the participants were submitted to a detailed clinical assessment of swallowing by a speech pathologist, which included patient identification, questioning about different aspects of swallowing, and structural and functional clinical assessment. For the functional assessment, two 5-ml boluses of liquid (water) and 5 ml of thick consistency, obtained by the dilution of commercially available rice flakes were offered through a graduated syringe. The following parameters were assessed: presence of swallowing complaints on specific questioning; posture during the assessment; cervical auscultation before, during, and after bolus swallowing; vocal quality before and after swallowing; labial closure; use of compensatory maneuvers when swallowing; bolus stasis after swallowing; pneumonia, choking; cough; weight loss and dyspnea. The presence of abnormal findings in any of the assessed parameters, independent of the presence of complaints after specific questioning, classified the participants as having abnormal swallowing function during clinical assessment. All the participants in both the groups were classified as having normal swallowing function as they successfully completed the clinical assessment of swallowing.

All the participants were well oriented and were able to follow the instructions given during the study. All the participants in the group 1 had history of dysphagia with aspiration, as their primary symptom during their acute period of stroke for around ten day following which they returned to oral feeding as ascertained from the medical records. All these participants were on nonoral feeding for around ten days during their acute stroke period and they did not undergo any swallowing therapy due to the orientation and auditory comprehension problem. Presently all these participants were on oral feeding consuming all types of food. The exclusionary criteria considered for both the groups were those who exhibited difficulty in swallowing 10ml of water, those with a past medical history of major surgery on or above the neck, thyroid disease, and individuals who had consumed alcohol in the previous 9 hours. All patients and control volunteers were fully informed about the objectives and methods of the study and gave written informed consent before participation. This study was approved by the local Human

Research Ethics Committee.

Timed test of swallowing: The participants were seated comfortably on a chair in an upright position. The timed test of swallowing was then administered on those who followed the norms of the study. These participants were asked to drink a 150 ml of water from a plastic beaker 'as quickly as possible'. The number of swallows performed by the participants was counted by observing the movement of the thyroid notch. All the participants were able to hold the beaker of water to their mouth and drink. A stopwatch was started when the water first touched the lower lip, and stopped when the larynx came to rest, subsequent to the last swallow. Participants were instructed not to spill the water through the mouth while performing the test. This was repeated when the spillage through the mouth was observed. Hence the number of swallows performed by the participants and the time taken to complete the 150ml of water was noted by the two independent judges. Using these information, following timed test parameters were calculated by both the judges.

1. Volume per swallow is defined as the volume of the water consumed during single swallow i.e., 150 ml/ average no of swallows performed by the participants.
2. Time per swallow is defined as the time taken to consume a single bolus of water i.e., average time taken to complete the 150ml of water / average no of swallows performed by the participants.
3. Swallowing capacity is defined as volume of the water consumed per second i.e., 150ml/ average time taken to consume the 150 ml of water

Inter judge reliability was calculated in fifteen of the participants to ensure that the measurement made by the judges were same. Independent t-test was used to compare the significant difference between the means of both the groups.

Results

The present study investigated swallowing problems if any in six month post stroke individuals using timed test of swallowing. The results of independent t-test revealed that there is a significant difference between the means of both the groups, at $p < 0.05$ for all the three indices of timed test of

swallowing which is shown in the table 1. Inter judge reliability was found to be 96% and hence the measurement made by both the judges were considered as reliable.

Parameters	Control group		Clinical group	
	Mean	SD	Mean	SD
Average volume per swallow (ml)	25.01 25	6.083	16.853	2.258
Average time per swallow (s)	1.027 8	0.173	1.328	0.171
Swallowing capacity (ml/s)	25.32 7	8.159	12.921	2.547

Table 1: Mean and SD of the timed test indices in six months post stroke individuals.

From the table, it is clear that the clinical group exhibited lower swallowing capacity and volume per swallow and increased time per swallow as compared to the control group. Also 11 participants from the clinical group (28%) obtained age appropriate scores and the remaining participants (72%) obtained reduced bolus volume per swallow, increased time per swallow and lowered swallowing capacity suggesting persisting subtle swallowing abnormality though they do not complain of swallowing problem. This indicates that few of the post stroke individuals did have subtle swallowing abnormality which needs to be evaluated using other instrumental evaluation. This further suggests the need for screening of swallowing behavior in the post stroke individuals using the timed test of swallowing.

Discussion

Most of the previous studies with dysphagia and stroke have aimed at detecting aspiration through bedside examination and video fluoroscopy. Previous bedside assessments of swallowing function have included oral sensory and motor examinations, 3oz water swallow test and simply observing the patient during eating. But, these findings are unlikely to provide information on the subtle swallowing problems, if any, in six months post stroke individuals especially because these individuals do not complain of swallowing disorder. Also, it is not known if they have recovered completely from the initial swallowing problems with no overt complaints. Hence, timed test of swallowing was assessed to identify the dysphagia risk in these individuals. The results revealed a

significant difference between the means for both the groups, at $p < 0.05$ for all the three indices of timed test of swallowing.

A reduction in swallowing capacity can be due to a reduction in average bolus volume, or a prolongation of average time per swallow, or a combination of both. Temporary cessation of breath will lead to prolongation of the average time per swallow and a reduced swallowing capacity; volume per swallow is less affected by respiratory function and in this regard is a better measure of swallowing function alone (Hughes & Wiles, 1996). Changes in average time per swallow and average bolus volume per swallow contribute to the significant reduction in swallowing capacity seen in stroke individuals with a swallowing problem; 'taking smaller sips' and spending longer on each swallow are obvious ways of reducing the risk of overt decompensation occurring (Hughes & Wiles, 1996). Hence, the reduction in the swallowing capacity due to the reduction in volume per swallow or increased time per swallow in the clinical group may be expected as a compensatory mechanism for an abnormal swallowing behavior mechanism (Hughes & Wiles, 1996). But it is interesting to note that these individuals did not attend any swallowing rehabilitation during their acute periods of stroke. However, they learnt the compensatory mechanism without the guidance from the speech language therapist which is evident in the present study. This may pose the individual at risk for developing swallowing problems at the later course of the life span. Therefore, this measurement of swallowing is a likely indicator of abnormal swallowing behaviour.

There are specific patient signs that correlate with presence of dysphagia and aspiration, such as, cough or inability to produce a cough; voice quality change; dysarthria to name a few. These clinical signs are predictors of dysphagia from a screening examination. But these were not evident in six month post stroke individuals at the start of the study but the "timed test of swallowing" revealed increased time per swallow and lowered swallowing capacity in these individuals. This suggests that the recovery is not complete in the clinical group. The failure of the individuals from this test further recommends the use of other instrumental evaluation to delineate the physiological underpinnings of increased time per

swallow and lowered swallowing capacity which would guide the clinician to initiate the rehabilitation process in these individuals.

Though sex is the major determinants of swallowing function (Alves, Cassiani, Santos & Dantas, 2007), it was not controlled in the present study. Also the events such as double swallow could not be accounted for using this procedure which adds further limitations to the present study.

Conclusion

The present study assessed the swallowing in six months post stroke individuals using timed test of swallowing and the results revealed that there is a significant difference between the means for the clinical and control group at $p < 0.05$ for all the three indices of timed test of swallowing suggesting lower volume per swallow, increased time per swallow and a lower swallowing capacity in each swallow of six month post stroke individuals than control groups. Hence the timed test of swallow can be used as a tool for identifying swallowing problems in post stroke individuals who do not complain about swallowing.

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