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# BEDSIDE SWALLOW EVALUATION IN ACUTE STROKE

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***ABSTRACT***

***Introduction:*** ***Dysphagia can be defined as the inability to transfer the food from the mouth through the pharynx and esophagus into the stomach safely and efficiently (Johnson & Barbara 1998) due to different causes.***

***Aims: -*** ***To determine the type of dysphagia occurring in stroke patients.***

***- To design a dysphagia assessment protocol and management considerations of dysphagic symptoms in stroke patients.***

***Methodology:*** ***Subjects taken for the study included 13 patients who were admitted in intensive care units following stroke. Dysphagia assessment both informal and formal was administered in these patients within 1 month of stroke.***

***Conclusion:*** ***This study reveals that oral dysphagia and oropharyngeal dysphagia is prominently seen in patients with stroke. Hence, screening of stroke patients for dysphagic symptoms should be made mandatory by a Speech Language Pathologist.***

***Key words:*** ***Bedside Swallow, Acute Stroke, Dysphagia***

## INTRODUCTION:

Swallowing or deglutition is a complicated neuromuscular activity whereby food is transferred from the mouth to the stomach. The act of swallowing requires the coordination of cranial nerves, the brain stem, cerebral cortex and 26 muscles of the mouth, pharynx and oesophagus. The main cranial nerves that influence swallowing include the trigeminal, facial, glossopharyngeal, vagus and hypoglossal. Neural networks that are responsible for this automatic swallowing are coordinated in the Medulla oblongata. The swallowing process can be divided into four phases: Oral preparatory phase, Oral phase, Pharyngeal phase and Esophageal phase (Jones 1988).

The oral preparatory phase begins with the reception of the food into the mouth and preparation of bolus by the movement of the labial and mandibular musculature in the process of mastication. This is followed by the oral phase in which the tongue propels the food bolus into pharynx by the action of the superior longitudinal and the transverse muscles. During this phase the soft palate rests down on to the back of the tongue and the hyoid bone moves upwards and forwards to elevate the posterior part of the tongue. The involuntary phase starts with the Pharyngeal phase during which the bolus is transported to the lower part of the laryngopharynx. The nasopharyngeal isthmus is closed by elevation of the soft palate and its approximation to the posterior pharyngeal wall. And the inlet of the larynx is closed by the approximation of the aryepiglottic folds. In the last phase of swallowing the bolus passes from the lower pharynx to the esophagus and then it enters the stomach by peristaltic movement.If there is any disruption in one of the element of normal swallowing it leads to swallowing difficulty.

**Causes of Dysphagia:** Among a large number of causative factors like Traumatic Brain Injury (TBI), Parkinson's disease and Motor neuron disease (ALS), Stroke constitutes the most prominent cause of dysphagia.

**Stroke:** A stroke is the rapidly developing loss of brain function due to disturbance in the blood supply to the brain (Donnan, 2008)

- **Ischemic Stroke**: The most common type of stroke, accounting for almost 80% of all strokes. It is caused by a clot or other blockage within an artery leading to the brain.
- **Intracerebral Hemorrhage and Subarachnoid Hemorrhage:** It is caused by the sudden rupture of an artery within the brain.

**Dysphagia in Stroke:**

Swallowing abnormalities are a common functional impairment of acute stroke. In patients with ischemic stroke, the involvement of the arterial territory of the total middle cerebral artery was more frequently associated with dysphagia (Francesco et al, 2004). Delayed swallow reflex, laryngeal incompetence and pharyngeal residue following deglutition, are frequent sequela following stroke (Campbell & Scott, 1998).

## NEED FOR THE STUDY:

In acute stage of stroke, dysphagia is found in up to 76% of patients and an increased mortality rate following silent aspiration is observed (Daniels & Brailey, 2009). These studies reveals the necessity to estimate the dysphagic symptoms immediately following the stroke.

## OBJECTIVES OF THE STUDY:

- To determine the type of dysphagia occurring in stroke patients.
- To design a dysphagia assessment protocol and management considerations of dysphagic symptoms in stroke patients.

## METHODOLOGY:

Subjects taken for the study included 13 patients who were admitted in intensive care units following stroke. Dysphagic assessment both informal and formal was administered in these patients within 1 month of stroke. The informal dysphagia assessment included questionnaires based on the medical history, clinical observation, clinical examination, signs and symptoms to identify the type of dysphagia and evaluation of swallowing with various diets. The diets taken for the assessment include liquid (thin- water; thick-mango juice),semi-solid (idli-sambar /bread soaked in milk) and solid (biscuits).The formal assessments were done using standardized tools Gugging Swallowing test (Rosenbeck, Westgren et al, 2007) and Clinical bedside evaluation (Logemann, 2000).

### I. INFORMAL ASSESSMENT

**A) Medical History:**

**B) Clinical Observation**:

- Patient posture
- Mental status (Attention, Alertness, Orientation problem, Memory Disturbances)

**C) Clinical Examination**

**Oral structure and function:** Range, rate and strength of lip/tongue/velar movements

**Cranial Nerve Examination:** Mainly Trigeminal, Facial, Glossopharyngeal, Vagus and Hypoglossal Nerve

**II. ASSESSMENT BASED ON SYMPTOMS:**

**III. SWALLOWING ASSESSMENT WITH DIET:**

Dry swallow test, evaluation with liquid/semisolid/solid diet textures

**B) FORMAL ASSESSMENT:**

**1) The Gugging Swallowing Screen (GUSS):** It is divided into 2 parts: indirect swallowing test (part 1) and the direct swallowing test (part 2), which consists of 3 subtests (Appendix-1). Each tested item is valued as pathologic (0 points) or physiologic (1 point). The indirect swallowing test should score 5 to proceed the testing to second part. If the score is 0-4, further investigation should be done (Rosenbeck et al, 2007).

2) **Clinical Bedside Assessment (CBA):** It was developed by Logemann (2000). It is a standardized tool for assessing oropharyngeal dysphagia. It contains 28 items (Appendix-2) which are rated as "safe" or "unsafe" for each patient.

**Results:** The findings of the informal & formal assessment are listed below

**A) Informal Swallow Assessment:**

**I a) Medical History:**

| No | Age | Onset | Neurological findings-CT Scan | H/O Earlier Stroke | Other Medical Problem |
|---|---|---|---|---|---|
| 1 | 70/ F | 8 days | - Infarct in (L) Tempero - Parietal Region, Basal Ganglia,Corona Radiata. -Infarcts in left ACA-MCA, MCA-PCA. | - | ®Hemiplegia |
| 2 | 68/ F | 7 days | Infract in® Basal Ganglia , ® MCA Stroke. | Infract in ®Basal Ganglia (2 yr) | Hypertension(HTN),Diabetes mellitus (DM), ®UMN involvement, (L) hemiplegia |
| 3 | 76/ M | 12days | ®MCA hemorrhagic infarct, Rt frontoparietal infarct. | Infract in (L) Tempero-Occipi- | Urinary Tract Infection(UTI) |

| | | | | | |
|---|---|---|---|---|---|
| | | | | tal region (1 yr) | |
| 4 | 70/ M | 1month | Bleeding in the left putamen | - | HTN,DM, Global Aphasia ®hemi paresis, |
| 5 | 78/ M | 4days | ® Tempero-Parietal infarct | (L)MCA Infract.(2YR) | (L)hemiplegia, Aphasic,HTN |
| 6 | 73/ F | 7 days | Parieto-occipital infract | ®Frontal region (2yr) | Aspiration pneumonia, fever, hypothyroidism, HTN, UTI |
| 7 | 63/ M | 3days | ® MCA infract predominantly basal ganglia | ® MCA infract (2yr) | Pseudo bulbar Palsy, HTN,DM |
| 8 | 69/ F | 2week | Small infract in ®Thalamus &B/L Capsulo ganglionic region | - | (L) hemiplegia, Aphasic |
| 9 | 60/ F | 1 week | Infract in Inferior-Posterior part of ® cerebellum | | Vertigo, vomiting Ataxic gait |
| 10 | 68/ F | 12days | Lacunar infracts in B/L Capsulo-ganglionic region | - | Epilepsy, Global Aphasia Fever |
| 11 | 71/ M | 1month | (L) Basal ganglionic hemorrhage | - | HTN, vomiting, GERD, Dysarthric, fever ®Upper limb affected,Urinary infection |
| 12 | 74/ F | 3weeks | ®MCA hemorrhagic infract | (L)MCA Infract. (10 yr) | HTN, DM UTI, Metabolic encephalopathy |
| 13 | 72/ F | 1month | ® MCA territory infract | - | Altered sensorium, HTN |

**Table-1 depicts the neurological investigations of 13 stroke patients**

**b) Clinical Observation**:

| | **Posture-Upright/Lying** | **Drooling** | **Xerostomia** | **Tracheostomy** | **NGT** | **Mental Status** |
|---|---|---|---|---|---|---|
| **No. of patients** | 3 / 10 | 8 | 3 | 2 | 9 | 6 (affected) |

**Table 2 Depicts the clinical observation of 13 stroke patients**

**c) Clinical Examination:**

**i) Oral Structure and function:** On oral structural and functional evaluation deviation of the lip and tongue deviation was observed in 11 patients but however they were in altered sensorium. Among 13, 3 patients exhibited restricted rate and range of the lip and tongue movements (AMR- /pa/:2-3 syllable/sec, /ta/ & /ka/:.1-2 syllable/sec). A sluggish movement was observed for the velopharynx, the voice quality was slightly breathy and soft and a weak volitional cough was noted in 4 of the patients. Oral sensations and oral reflexes were present but inadequate for 3 patients.

**ii) Cranial Nerve examination:**

| | CN **V** | CN **VII** | CN **IX** | CN **X** | CN **XII** |
|---|---|---|---|---|---|
| **No. of patients intact** | 2 | 1 | - | - | - |
| **Affected**: Complete | 11 | 9 | 10 | 10 | 10 |
| Mild | - | 3 | 3 | 3 | 3 |

**Table 3 Depicts the Cranial Nerve examination of 13 stroke patients**

**II) Assessment based on symptoms:** The results of the symptom analysis of dysphagia in 13 patients are given below.

| **Oral Dysphagia** | **No. of Patients** | **Pharyngeal Dysphagia** | **No. of patients** |
|---|---|---|---|
| 1)Difficulty in initiating swallow | 13 | 1)Delayed pharyngeal transit time | 4 |
| 2)Difficulty in forming bolus | 13 | 2) Delayed pharyngeal swallowing | 4 |
| 3)Difficulty in holding food | 13 | 3)Aspiration | 9 |
| 4)Oral residue | 2 | 4) Sensation of obstruction | 2 |
| 5)Tongue thrust | - | 5) Throat pain | 2 |
| 6)Spillage of food | 10 | 6) Residue of food in pyriform sinus | - |
| 7)Uncontrolled bolus- pharynx | 13 | 7) Change in dietary habits | 13 |

| | | | |
|---|---|---|---|
| 8)Repetitive lingual rolling | - | | |
| 9) Piecemeal deglutition | 3 | | |
| 10)Mouth pain | 2 | **Esophageal Dysphagia** | |
| 11)Taste changes | 10 | 1) GERD | 1 |
| 12)Nasal regurgitation | 10 | 2) Pharyngeal regurgitation | - |
| 13)Dry mouth/pooling of saliva | 3 | 3) Sensation of food sticking | - |
| | | 4) Recurrent pneumonia | 2 |

**Table 4: Shows no: of patients exhibiting each symptom.**

**III) Swallowing Assessment with Diets:**

Dry swallow was assessed in all 13 patients and swallowing assessment with diet was evaluated in only those patients who could elicit voluntary swallow reflex and it constituted 4 patients. The dry swallow test revealed a delayed volitional swallowing reflex (mean time: 5 sec) in 4 of the patients and was absent in remaining 9 patients. In these four patients the oral transit time was delayed (mean time: 4sec) for liquids. All the four patients showed symptoms like oral spillage, diminished tongue pumping, gurgly voice and occasional coughing immediately after swallowing liquid. And they required 2-3 swallows for swallowing small quantity of liquid completely. The oral transit time for 3 patients who had been assessed with semi-solid was 5 sec, 3.5 and 4.5 sec respectively for semi-solid. They exhibited piecemeal deglutition, oral residue and wet gurgly voice on phonation after swallow. While assessing with solid diets in 3 patients the masticatory time was found to be 10sec, 13 sec and 14 sec respectively. The oral transit time was also delayed to 5, 6 and 6 sec respectively. And they required 3-4 swallows to complete the swallowing process.

**B) Formal Swallow Assessment:**

The standardized test GUSS & CBA was administered on 13 patients and their scored are highlighted below.

| **Test / Patient** | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CBA** (no. of unsafe swallows) | 22 | 26 | 26 | 21 | 20 | 20 | 20 | 19 | 19 | 24 | 15 | 24 | 26 |
| **GUSS** (total score-20) | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 11 | 2 | 13 | 12 | 2 | 2 |

**Table 5 shows the scores obtained for standardized tests (CBA & GUSS)**

## DISCUSSION:

### A) Informal Swallow Assessment:

### I a) Medical History:

Thirteen patients with dysphagia following stroke have been taken as the subjects for the study. Among these 3 of them had hemorrhagic stroke. Considering the neurological investigation (CT scan) majority of the patients (6) had MCA infarct. Ischemic lesions in the territory of the left middle cerebral artery have been shown to cause impaired oral stage, problems with labial, lingual, and mandibular coordination, apraxia, and a prolonged pharyngeal transit time which is also supported by Shaheen, 2006. In 4 patients lesion was found in basal ganglia. Basal ganglia stroke may result from damage to the sensorimotor pathways between the cortex and brainstem. This emphasize the importance of cortical input to the brainstem swallowing center in maintaining the systematic modulations characteristic of normal swallowing physiology. The remaining patients had lesion in cerebellum, Thalamus, Putamen & frontoparietal region. Research reveals that these lesions can result in dysphagia even though they do not involve directly the swallowing centre brainstem. The cerebellum is attached to the brainstem by the cerebellar peduncles. Therefore any lesions on the cerebellum can also results in oropharyngeal dysphagia (Sue Curffman, 2006).Basu & Sengupta (2008) reports that bilateral putaminal lesion can lead to dysphagia. Thalamic and frontal lesions typically produce a severe sensory deficit on the opposite side that may exceed the motor weakness resulting in severe dysphagic symptoms.

### b) Clinical Examination:

### Oral Structure and Function & Cranial Nerve Examination:

Lesions in the cortical & subcotical structures result in severe motor & sensory deficits of oral structures. These deficits in turn result in oral dysphagic symptoms (Sengupta, 2008).The act of swallowing is a complex process and requires the coordination of Cranial Nerves and the brain stem these nerves mediate the sensation and movement related to swallowing. Any abnormalities affecting these nerves may have a negative impact on the individual's ability to swallow. In this study almost all patients exhibited partial/complete cranial nerve dysfunction.

**II) Assessment based on Symptoms:** In 10 patients the most prominent symptoms observed were: (a) spillage of food indicating incomplete lip closure or impaired oral sensation. (b) Pooling of saliva in mouth and presence of oral residue suggestive of reduced tongue pumping action.(c)oral expectoration(d) piecemeal

deglutition,(e)difficulty in initiating swallow,(f) difficulty in forming and holding bolus in mouth. These symptoms are indicative of oral dysphagia in these patients. These findings are also supported by Mearin (2000) in acute stroke patients. In 4 patients the symptoms delayed pharyngeal transit time, gurgly voice, sensation of obstruction in throat and in 9 patients aspiration & change in dietary habits were observed indicating laryngeal incompetence and disrupted pharyngeal peristalsis. This is suggestive of oropharyngeal dysphagia. Daniel, 1996 reported delayed pharyngeal swallow (consistency specific) and pharyngeal stasis in stroke patients which supports the findings of the present study.

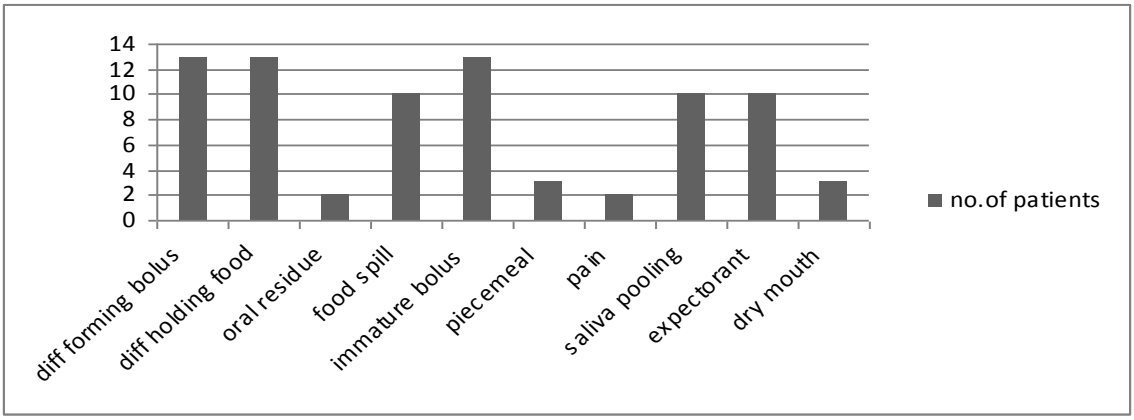


**Fig 1.Depicts dysphagic symptoms in stroke along x-axis & patients along y- axis**

### III) Swallowing Assessment with Diet

The swallowing assessment with diets were done with dry swallow test, liquid (thin & thick), semi-solid and solid diets. The oral and pharyngeal transit time were estimated for each patient. The Oral transit time can be defined as the duration from onset of bolus for first posterior movement to the entrance of the bolus head into pharynx and the pharyngeal transit time is the duration of bolus head to enter into pharynx until the hyoid comes back to rest. The normal value for oral transit time is 1-2 sec and that of pharyngeal transit time is 0-1sec for dry swallow whereas for liquids and solids the oral transit time is 1.5 - 2 sec and 2-5 sec (Platt, 2002) A delayed dry swallow reflex (mean time: 5sec) was noted in 4 of the patients and for that of liquid was 4 sec on an average. In the remaining 9 patients the dry swallow reflex was absent hence diet swallow evaluation could not be administered. The oral transit time for semi-solid on an average was 4.2sec and for solid was 5.6sec.In normals the masticatory time is 5-8sec (Platt, 2002) depending on the texture of the diet. In this study the masticatory time was also prolonged (mean: 12.3sec.) in 4 patients. The symptoms observed during liquid swallowing were gurgly voice, diminished tongue pumping and occasional cough. This delay in oral transit time, masticatory time along with the oral symptoms indicates oral dysphagia.

**B) Formal Swallow Assessment:** On administering the standardized tests, GUSS and CBA mean score of 19 and 23 was obtained respectively. GUSS score is 0-2 in 10 in patients suggesting severe dysphagia and in 3 patients it 11- 14 suggesting a moderate dysphagia. In CBA an increased number (mean score: 23) of unsafe swallows were obtained which suggests the presence of oropharyngeal dysphagia in these patients.

## CONCLUSION:

Dysphagia is commonly associated with stroke mainly hemorrhage. This study reveals that oral dysphagia and oropharyngeal dysphagia is prominently seen in patients with stroke. Symptoms seen commonly include saliva pooling, oral expectoration, piecemeal deglutition, difficulty in initiating swallow, difficulty in forming and holding bolus in mouth, aspiration, delayed oral & pharyngeal transit time. However, concern given to the immediate assessment and management of these dysphagic symptoms by a Speech Language Pathologist is often minimal. Hence, screening of stroke patients for dysphagic symptoms should be made mandatory.

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