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Research Article

Post Stroke Dysphagia: An Endoscopic Evaluation

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Abstract

Stroke is a frequent cause of neuromuscular dysphagia. Dysphagia is seen in more than 50% of the stroke survivors. Patients with post stroke dysphagia have a threefold increased risk of developing early aspiration pneumonia. Swallowing evaluation in cases of stroke is usually done clinically at bedside but it lacks adequate sensitivity and specificity and technique is poor in detecting silent aspiration, therefore an objective evaluation of swallowing by endoscopy is desirable. Functional Endoscopic Evaluation of Swallowing (FEES) is now the gold standard for visualizing and evaluating the pharyngeal phase of swallowing. The endoscopic finding indicative of dysphagia was premature spillage, penetration, aspiration and post swallow residue. These findings served as excellent parameters in deciding safe initiation of oral feeding in stroke patients.

We hereby present 59 such cases of post stroke dysphagia evaluated by FEES technique.

Keywords: Stroke; Dysphagia; Swallowing Evaluation; FEES

Introduction

Swallowing is safe and effective transfer of food bolus from the oral cavity to the stomach. Safe means bolus passes without aspiration and effective means there is no post swallow residue in vallecula or pyriform sinuses.

Swallowing is one of the most complex coordinated neuromuscular functions as important as breathing. Swallowing has three phases oral, pharyngeal and esophageal phase.

The oral phase is voluntary and is under cortical and subcortical control. The pharyngeal and esophageal phases are involuntary and are under brainstem and autonomic nervous control respectively. FEES evaluates the pharyngeal phase of swallowing**.** Aspiration is a serious sequela of stroke, and can lead to chest infection, malnutrition, prolonged hospital stays and mortality [1]. Approximately one-third of patients with dysphagia develop pneumonia requiring treatment [2].

FEES is (noninvasive) technique that allows real time visualization of the pharyngeal and laryngeal structures. It is

generally well tolerated and therefore frequently repeatable [3]. It can be performed bed side making it ideal for critically ill patients. This method is more sensitive than video fluoroscopy [4-7]. It detects normal physiology as well as presence of any silent aspiration and efficacy of cough reflex thus guiding the treatment protocols and decision making regarding dietary modification.

Material and Method

This observational study lasted for 18 months and was conducted in the department of ENT at Choithram hospital Indore in collaboration with Neurology Department.

The study was done to evaluate dysphagia in stroke patients following the approval from the institutional ethical committee.

Convenience sampling was used and both the male and female patients were included in the study. This included the patients over the age of 18 years who were diagnosed to have a stroke and were unable to establish oral feeding due to neurological deficit. The patients with oropharyngeal malignancy and congenital malformations were excluded from the study.

FEES was done 14 days to even 3 months after the onset of stroke. This was done depending upon the severity of stroke and symptomatology of patient. Stroke severity was assessed using NIHSS score (Figure 1).

NIHSS SCORE	STROKE SEVERITY	IMPACTED BRAIN DENSITY
0	No Stroke	
0 – 4	Minor Stroke	
5 – 15	Moderate Stroke	
16– 20	Moderate to Severe Stroke	
21 - 42	Severe Stroke	

Figure 1. The National Institutes of Health Stroke Scale or NIH Stroke Scale (NIHSS) is a tool used by healthcare providers to objectively quantify and succinctly communicate the impairment caused by a stroke.

Figure 1: NIHSS Score to assess severity of stroke.

After informed consent and history taking routine ENT examination was done & swallow study (FEES) was conducted, as per standard protocol [8] using foods of various consistencies and findings were documented using Olympus BF -1 TH 190 flexible laryngoscope. The nasal mucosa was anesthetized with 4% lignocaine patty and tip of the scope was applied with lignocaine jelly.

The scope was introduced through the nose and the structures visualized were documented systematically, this included the velopharynx, base of tongue epiglottis and movements of vocal cords and lateral pharyngeal wall (Figure 2).

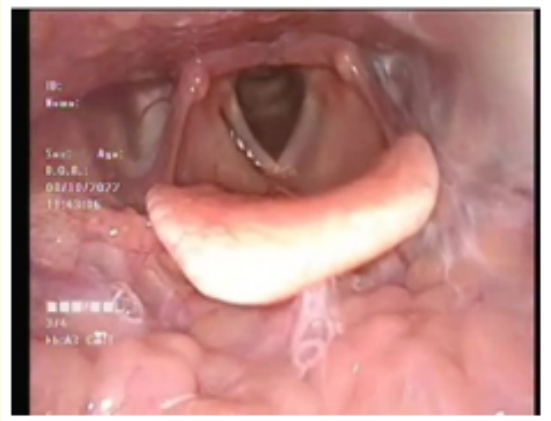

Figure 2: Normal anatomy as seen on fiberoptic laryngoscopy.

The patient was then asked to swallow own saliva and the presence of white out was noted. To evaluate the swallowing ability the patient was given food bolus of varying consistency which included water, milk and biscuits made soft in the milk (Figure 3). To visualize the transit of the bolus edible green or blue color was added so that it could be easily seen on endoscopy.

Figure 3: Food substances of varied consistencies.

5 ml of colored water was first given as water is safe material and even if aspirated silently does not produce any harm. After that thick milk and soft biscuits were administered successively.

The endoscopic findings were recorded. Findings indicative of dysphagia are

- Premature spillage
- Penetration
- Aspiration
- Post swallow residue

Results

The mean age of patients was 63.42 years the highest number of patients were in the age group of 51 to 60 years (Table 1).

There was male predominance. 45 (76%) were males and 14(24%) females (Table 2). The ischemic stroke was more common affecting (76%) of the patients while hemorrhagic stroke was seen in14 (24%) of the patients (Table 3).

52 (88%) patients had supratentorial stroke while 7(12%) patients had infratentorial stroke (Table 4).

Premature spillage was seen in 26(44%) patients (Table 5).

Penetration was seen in 14 (23.47%) patients (Table 6).

Aspiration was seen in15(25.44%) patients (Table 7).

Post swallow residue was seen in 44(74.6%) patients (Table 8).

Age	Number	Percentage
18-40 years	4	6.8%
41-50 years	10	16.95%
51-60 years	14	23.7%
61-70 years	13	22%
71-80 years	10	16.95%
81-90 years	8	13.6%
Total	59	100%

Table 1: Distribution of patients according to Age.

Sex	Number	Percentage
Female	14	24%
Male	45	76%
Total	59	100%

Table 2: Distribution of patients according to Sex.

Type of stroke	Number	Percentage
Hemorrhagic	14	24%
Ischemic	45	76%
Total	59	100%

Table 3: Distribution of patients according to Type of Stroke.

Location of stroke	Number	Percentage
Supratentorial	52	88%
Infratentorial	7	12%
Total	59	100%

Table 4: Distribution of patients according to Location of Stroke.

Spillage	Number	Percentage
Present	26	44%
Absent	33	56%
Total	59	100%

Table 5: Distribution of patients according to Status of Spillage.

Penetration	Number	Percentage
Present	14	23.73%
Absent	45	76.27%
Total	59	100%

Table 6: Distribution of patients according to Status of Penetration.

Aspiration	Number	Percentage
Absent	44	74.5%
Present	15	18.7%
Total	59	100%

Table 7: Distribution of patients according to Status of Aspiration.

Residue	Number	Percentage
Present	44	74.5 %
Absent	15	25.5 %
Total	59	100%

Table 8: Distribution of patients according to Status of Residue.

Discussion

FEES was performed in post stroke patients with dysphagia. Majority of the patients were in the age group of 51 to 60 years the mean age was 63.42 yrs. The mean age was 73.2 years in a study performed by Paciaroni M [9] which is higher than our study.

There was male predominance in our study male to female ratio of 3.2:1: similar study made by Fang sun [10] show male pre dominance of 3:1 which is consistent with our study.

Ischemic strokes (76%) were more predominant as compared to hemorrhagic strokes (24%).

This was consistent with study perform by Paciaroni M & Fang.

Supra tentorial strokes were more common (88%) than infratentorial Stroke. This is consistent with the study done by Paciaroni M., *et al*.

Out of 59 patients, only four had impaired vocal cord mobility.

The superior laryngeal nerve is responsible for laryngeal adapter reflex this collects signal from larynx and transmits it to central nervous system through tractus solitarius nucleus in the brain stem. Patients with pathological changes in the brain stem maybe more susceptible to impaired vocal cord mobility (Foote A G., *et al.* [11].

6 out of 59 patients were already tracheostomized. Tracheostomized patients had higher incidence of penetration, aspiration and spillage hence required Ryles tube feeding.

Spillage

The food bolus already reaching vallecula or pyriform sinuses before initiation of the swallow (Figure 4) and hence there are chances of pre-swallow aspiration. Spillage was present in 44% (26) patients. 9 out of 26 patients with spillage had aspiration. The relative risk of aspiration was about 1.9 times higher in presence of spillage compared to the absence of spillage. Odds of aspiration were about 2.38 times higher when spillage was present compared to when it was absent

Figure 4: Pre mature spillage in vallecula and Pyriform sinus.

Penetration

Penetration means the food bolus enters the laryngeal vestibule but remains above the level of vocal cords (Figure 5). This also increases the risk of pre swallow aspiration. The penetration was present in (23.47%) 14 patients and relative risk of aspiration was about 4.84 times higher when penetration was present compared to when it was absent. Penetration and aspiration do not lie on same continuum as all penetration does not necessarily lead to aspiration. Odds of aspiration were about 11.7 times higher when penetration was present compared to when it was absent.

Figure 5: Penetration of bolus.

Aspiration

This means the food bolus crosses the level of vocal cords and enters the airway (Figure 6). Aspiration was present in (25.44%) 15 patients out of 59. The 4 patients had silent aspiration while 11 patients showed aspiration with intact cough reflex.

Figure 6: Aspiration of bolus.

Residue

Food bolus remaining in the vallecula &/pyriform sinuses after completion of swallow (Figure 7) is known as residue. (74.6%) 44 out of 59 patients had post swallow residue. 14 patients out of 44 had associated aspiration. The relative risk of aspiration being present was about 4.75 times higher in the residue group compared to the nonresidue group. Odds of aspiration being present when residue was present were 6.53 times higher than when it was absent.

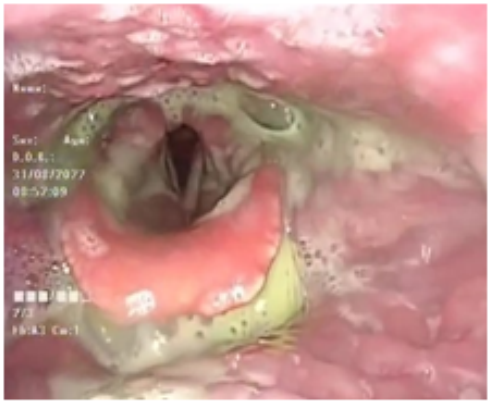

Figure 7: Post swallow residue.

Conclusion

The swallow study was done in stroke patients who had dysphagia and it was observed that infratentorial lesions had more dysphagia as compared to supra tentorial lesions. This is just an incidental observation and groups were not compared. These findings corroborate with finding of study done by Qing Lu Yang., *et al*. [12]. The infratentorial brain region including pons and medulla act as center in the regulation of swallowing and cause coordinated movements of oral, laryngeal and pharyngeal muscles. Any damage to these regions may result in dysphagia. Spillage, penetration and residue can be used as predictors for aspiration. Penetration being the best predictor followed by residue and spillage.

FEES findings are excellent parameters in deciding the safe initiation of oral feeding in stroke patients.

FEES is economical, well tolerated by the patients & is easily repeatable without any harm of radiation exposure and should be performed in all the patients of stroke with dysphagia.

Limitation

Single center study with no follow up.

Convenience sampling was used.

No funding was provided for the study.

Conflict of interest is none.

White out in FEES is a normal finding and it indicates proper airway protection, also it does not interfere with the interpretation of the results. The absence of white out is an indicator of impaired swallowing function.

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