ASPIRATION RISK: CLINICAL SWALLOW EVALUATION AND FIBEROPTIC ENDOSCOPIC EVALUATION OF SWALLOWING - A COMPARATIVE STUDY

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ABSTRACT

Aims and Objectives: Stroke is the most common neurological disorder leading to dysphagia. Aspiration is a frequent and serious complication in patients with dysphagia. Early identification and management of aspiration risk in stroke patients is crucial, as it helps prevent aspiration during oral feeding and reduces associated morbidity and mortality. This study aimed to identify aspiration risk using Clinical Swallow Evaluation (CSE) and compare the results with Fibreoptic Endoscopic Evaluation of Swallowing (FEES), considered the gold standard.

Methods: A total of 49 stroke patients were included. Bedside CSE was performed for each patient, assessing drooling, delayed swallow initiation, abnormal volitional cough, and dysphonia. Cough after swallowing and voice change after swallowing were evaluated using the single water swallow test, scored as present or absent. Delayed swallow initiation was assessed using Logemann's four-finger method. The CSE scores were then compared with FEES findings for aspiration risk.

Results: The CSE demonstrated a sensitivity of 89.28% and a specificity of 59.09%. The positive predictive value (PPV) was 73.52%, and the negative predictive value (NPV) was 81.25%. The overall accuracy of the CSE was 76%. Among the clinical indicators, cough after swallow showed significant correlation with FEES outcomes.

Conclusion: Clinical evaluation using the six clinical indicators assessed in this study provides a safe and highly sensitive method for identifying aspiration risk at the bedside. While FEES remains the gold standard for objective assessment, CSE offers a fairly accurate alternative when FEES is unavailable. A combined approach using both CSE and FEES may improve diagnostic sensitivity and enhance clinical decision-making.

Keywords: Aspiration Risk, Clinical Swallow Evaluation, Fiberoptic Endoscopic Evaluation of Swallowing

INTRODUCTION

Stroke is one of the most common neurological disorder. The cumulative incidence of stroke ranged from 105-152/ 1, 00,000 per person. The incidence rate of stroke in India is much higher than in other countries with approximately 1.8 million Indians out of a population of 1.2 billion suffer from stroke every year[1]. Stroke often causes swallowing disorder (Dysphagia). 41.6% of patient with stroke experience dysphagia, 38.7% in acute phase and 43.7% in chronic phase[2]. Dysphagia affects more than 50 percent of stroke survivors. If this medical condition is not identified at the earliest and managed appropriately it can lead to poor nutrition, aspiration pneumonia and disability.

Aspiration, defined as the entry of materials into the airway below the vocal fold, is a significant concern in dysphagia management. Aspiration can sometimes be asymptomatic. People may experience a sudden cough, some may have wheeze or they may have trouble breathing and may have a hoarse or a wet voice after eating or drinking. Aspiration increases the risk of Aspiration Pneumonia and leads to longer hospital stay which ultimately affects patient outcome[3]. Also aspirated pneumonia after stroke is associated with higher mortality and hospitalization cost. Additionally, aspirated pneumonia often necessitates transfer to the intensive care units, further complicating recovery and increasing healthcare resource utilization[4]. Although many stroke patients recover swallowing spontaneously, 11 to 50 percent still have dysphagia at 6 months and have slower recovery[5]. Hence, early identification and management of

aspiration risk in stroke patients is very important as it helps in preventing the aspiration during oral feeding, reducing the mortality, morbidity, long hospital stay and cost of care, avoid unnecessary NG insertion and risk of pneumonia. Several studies have concluded that early identification of swallowing difficulties is associated with the lower rates of pneumonia in acute stroke patients.

Aspiration risk is identified through clinical swallow evaluation (CSE) and instrumental evaluation (Fiber Optic Endoscopic Evaluation of Swallowing (FEES) or videofluroscopic evaluation). However, evidence based studies state that clinical evaluation of swallow in identifying the aspiration risk in acute stroke individuals is varied and limited, even though clinical evaluation shows good sensitivity and specificity, it has a lower predictive value of aspiration risk than the instrumental evaluation. FEES is a procedure designed to assess swallowing function through the use of vocal tract visualization and imaging to examine the pharyngeal and laryngeal anatomy. It is an evidence based valuable procedure in examining and managing Dysphagia and identifying the aspiration risk and it is used as a gold standard procedure worldwide along with Video fluoroscopic (VF) assessment FEES has limitations such as intolerance to insertion of nasoendoscope, "White out" period during the swallowing, expertise and equipment requirements. Video fluroscopic (VFS) assessment provides dynamic image of swallowing function by visualizing bolus during the process of swallowing. This allows the speech pathologist to assess all the stages of swallow (oral, pharyngeal) and aspiration risk along with the amount being aspirated[6] in some patients both procedures may be necessary. Current literature supports that both VFS and FEES have their own gold standard. The current study focuses on identifying the aspiration risk using six clinical parameters/ indicator such as: abnormal volitional cough, drooling, delayed swallow initiation, cough after swallow, and voice change after swallow and dysphonia. These parameters were compared with the FEES results.

This study aims to evaluate the effectiveness of the Clinical Swallow Evaluation (CSE) in identifying aspiration risk among stroke patients by comparing its findings with those obtained from Fiberoptic Endoscopic Evaluation of Swallowing (FEES), which is considered a gold standard. It aims to examine the relative contribution of each clinical parameter such as abnormal volitional cough, drooling, delayed swallow initiation, cough after swallow, voice changes after swallow and dysphonia and, where applicable, assign weightage to these features in predicting aspiration, thereby enhancing the diagnostic utility of bedside assessments in clinical settings.

METHODS

The current study was conducted at Bangalore Baptist Hospital, Bangalore, and Karnataka for the duration of 6 months under the department of ENT.

Individuals with different types of cerebrovascular accidents was included for the study, site of lesion was determined by using CT/ MRI, swallow evaluation was carried out within 48 hours. Patients in the study had to be alert, orientated towards verbal stimuli, following simple single step commands and stable enough to undergo CSE followed by FEES. Patient with degenerative disorder or other neurological disorder, structural deformities that affect the swallowing abilities and individuals with tracheostomy were excluded from the study.

All the patients referred by the Neurology department (inpatients) to speech pathologist for a swallowing evaluation were considered following the inclusion criteria as in table I. Bedside clinical swallow evaluation was carried for each patient. Drooling, delayed swallow initiation, abnormal volitional cough and dysphonia were assessed, Cough after swallow and voice change after swallow were assessed by using single water swallow test and scored present or absent. Delayed swallow evaluation was assessed by using Logemann 4 finger method and it is defined as a swallowing response (transition between the oral and pharyngeal stages of the swallow) occurs when the bolus rolls over the base of tongue before the swallowing response triggers. The results of CSE were scored as the risk of aspiration present/absent if any one of the clinical parameters were identified, and also based on clinician opinion. Then all patients underwent FEES procedure.

Table 1: Type of CVA included in the study (n= 49)

Type of the stroke/CVA	Number
Cerebellar	2
Fronto tempo parietal	6
Intracranial	4
Middle cerebral artery	16
Medullary	9
Pontine	2
Subdural haemorrhage	2
Thalamo capsule ganglionic	9

FEES procedure was conducted in the ENT department using flexible fiber-optic laryngoscope, which was passed trans nasally, this enables visualization of the base of the tongue, nasopharynx, hypo pharynx, larynx and also helps in assessing secretions, laryngeal pooling. Slightly modified standard FEES protocol by Langmore frequently used in the ENT department was followed. Food consistencies were dyed with food colour (green). Initially liquid (milk) was presented (1 tsp.), followed by Puree (curd) and then solids (biscuits). Aspiration risk was identified using Penetration Aspiration

Scale (PAS) and clinical parameter such as abnormal volitional cough, drooling, delayed swallow initiation, and cough after swallow, voice changes after swallow and dysphonia were identified. All the obtained data was statistically evaluated.

RESULTS

Total of 49 patients were evaluated for the study who underwent FEES to identify the aspiration risk comparing with FEES and also sensitivity, specificity and predictive values. Different types of stroke population were included in the study. Cerebellar (4%), Fronto Tempo Parietal (12 %), Intracranial bleed (8 %), Middle cerebral artery (32 %), Medullary (18%), Pontine (4 %), Subdural haemorrhage (4%), Thalamo Capsulo ganglionic (18%). Out of 49 patients 18% of patients exhibit Dysphonia, Drooling (10%), abnormal voluntary cough (44%), Delayed swallow evaluation (28%), Cough after swallow (26%), wet voice after swallow (08%). Abnormal voluntary cough, delayed swallow evaluation and cough after swallow was present in majority of the patients. The data were analysed comparing the results of the CSE with the results of FEES.

FEES results served as the outcome variable and was the criterion standard to which the six clinical parameters of aspiration risk were compared between Clinical Swallow Evaluation (CSE) and Fiberoptic Endoscopic Evaluation of Swallowing (FEES). For determining sensitivity and specificity, the test scores obtained from routine CSE and FEES trials were analysed using the Chi-square test. All statistical analyses were conducted using SPSS software.

Table 2: Comparison of CSE and FEES for Aspiration risk

Clinical Swallow evaluation	FEES Positive	FEES Negative
Positive	25	9
Negative	3	13

In Table 2, CSE correctly identified 25 patients with aspiration risk when compared with standardized procedure FEES. But incorrectly identified in 3 patients when aspiration risk was there.

Table 3: Diagnostic Accuracy of CSE compared with FEES

Parameters	Value
Sensitivity	89.28
Specificity	59.09
Positive predictive value	73.52
Negative predictive value	81.25
Accuracy	76%

Clinical swallow evaluation showed a sensitivity of 89.28% and specificity of 59.09%. Positive predictive value (PPV) was 73.52% and negative predictive value (NPV) was 81.25 %. Overall accuracy of clinical swallow evaluation showed value of 76%. (Table III). Cough after swallow showed significant results when compared with FEES.

DISCUSSION

In the Indian scenario, most of the small clinical set ups are only dependent on clinical swallow evaluation. CSE at bedside being the only possibility to gain better knowledge regarding the patient's ability of functional swallowing, tolerance of the oral diet. CSE helps in identifying aspiration risk and its impact on physiology of swallowing, and helps in finding out the need for instrumental assessment, and optimal treatment for the establishment of a safe and efficient swallow. The clinicians can make an accurate judgement of the occurrence of aspiration in most post stroke patients by CSE[7]. Similarly, bedside tests are highly sensitive and specific in identifying the dysphagia.

The present study aimed to identify aspiration risk using Clinical Swallow Evaluation (CSE) in comparison with Fiberoptic Endoscopic Evaluation of Swallowing (FEES). The findings revealed that CSE demonstrated high sensitivity (89%), positive predictive value (73.5%), negative predictive value (81.2%), and an overall accuracy of 76%. These results align with those of a previous study that assessed 96 patients using clinical indicators such as difficulty handling secretions, absent swallow, and reflexive cough after swallowing, and reported an overall accuracy of 74% [8].

The current study employed six clinical indicators in the Clinical Swallow Evaluation (CSE), namely: delayed swallow initiation, drooling, abnormal voluntary cough, and cough after swallow, wet voice after swallow, and dysphonia. These indicators were among the most frequently cited in previous literature. Numerous studies have concluded that such clinical signs are reliable predictors for identifying aspiration risk in patients with acute stroke.

The presence of dysphonia, dysarthria, abnormal gag reflex, and abnormal volitional cough, voice change after swallowing, and cough after swallowing has been found to be highly predictive of aspiration risk. High sensitivity and specificity in predicting aspiration, when compared with FEES, were reported with the combination of choking or coughing after swallowing and change in voice, based on a study of 86 patients [9].

Although different studies have reported variable findings—likely due to differences in sample sizes—there is no conclusive evidence to suggest whether sample size directly influences the accuracy of these clinical predictors. In the present study, which included 49 patients, cough after swallow was found to be a significant predictor of aspiration risk when compared with FEES (present study). The sample size was adequate to demonstrate good sensitivity in identifying aspiration. The clinical indicators such as drooling, delayed pharyngeal swallow, laryngeal elevation, coughing/throat

clearing, breathlessness and wet voice after swallow, presence of any one or more than one of these indicators may strongly suggestive of dysphagia.

Several studies have attempted to determine the aspiration risk using various methods. Clinical indicators used in CSE were compared with objective assessment (Videofluroscopic/FEES), various screening protocols were established to use at bedside then comparing with Videofluroscopic/FEES. In review of literature the physiological clinical indicators were reported as being related to the occurrence of penetration and aspiration, and also CSE shows a high positive predictive value and negative predictive values. Current study is in agreement of these results. However, there is no consensus in the literature in terms of best swallow evaluation method in determining the aspiration risk. More researches is needed in these areas.

The most frequently observed stroke types included middle cerebral artery infarcts, medullary strokes, and thalamo-capsulo-ganglionic infarcts. The distribution of stroke subtypes was considered while assessing their association with aspiration risk. A study examining dysphagia in acute stroke patients reported a correlation between stroke subtype and incidence of dysphagia. Total anterior circulation infarcts were associated with a 100% incidence of dysphagia, while partial anterior cerebral infarcts had 36%, posterior cerebral infarcts 33%, and lacunar infarcts 18%. Additionally, 67% of hemorrhagic strokes were found to have post-stroke dysphagia[10]. These findings suggest that the type of stroke may be an important factor in determining the sensitivity and specificity of clinical evaluations in predicting aspiration risk. Our study also incorporated clinician judgment in identifying aspiration risk. The ability to accurately assess aspiration at the bedside during a clinical evaluation requires specialized knowledge, clinical experience, and skills in swallowing assessment and dysphagia management. While the current findings are insightful, more data are needed, and future studies could further explore the relationship between stroke subtypes and the accuracy of clinical predictors of aspiration.

In our study, conducted on a relatively small sample size, aspiration risk was identified in all patients with high sensitivity (89%) and overall accuracy of 76%. Bedside evaluation has been described as a safe and sensitive method for detecting aspiration risk[9]. The combination of clinical signs such as cough after swallow and change in voice was reported to offer good sensitivity and specificity when compared with FEES in the same study. Similarly, a study found a sensitivity of 89% and specificity of 30% when using clinical bedside evaluation for aspiration detection. In another study that used the water swallow test in conjunction with Videofluoroscopy or FEES, sensitivity ranged from 27% to 85%, and specificity ranged from 63% to 88%[11].

The findings of our study align with these previous results and support the conclusion that clinical evaluation can reliably identify aspiration risk with high sensitivity. While specificity may vary across methods and studies, the consistent detection of aspiration during bedside assessments highlights their practical value in clinical settings. A limitation of this study is that it was conducted on a small sample of 49 neurological patients, which may limit the generalizability of the findings. Since swallowing disorders are also common in other conditions such as head and neck cancers, respiratory diseases, and age-related disorders, future research should include larger and more diverse patient populations to further evaluate the effectiveness and applicability of Clinical Swallow Evaluation (CSE) and Fiberoptic Endoscopic Evaluation of Swallowing (FEES) in assessing aspiration risk across different clinical settings.

CONCLUSION

Early detection of aspiration risk in acute post-stroke patients is essential to prevent complications. Clinical evaluation using the six indicators assessed in this study provides a safe and highly sensitive bedside method for identifying patients at risk of aspiration, with abnormal voluntary cough emerging as the strongest predictor. While FEES remains the gold-standard objective assessment, CSE offers a fairly accurate and practical alternative when FEES is unavailable. The combined use of CSE and FEES may improve diagnostic sensitivity, enhance clinical decision-making, and facilitate timely intervention for better patient outcomes.

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