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Original Article

Clinical Evaluation of Dysphagia with Bedside Tests and FEES in Patients with Aspiration - A Comparative Study

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Abstract

Background: Aspiration while swallowing is a common complaint among the elderly patients. The tests that predict aspiration can be few bedside tests or us of fiberoptic endoscopic evaluation of swallowing (FEES). The latter is an evidence-based test in confirming the aspiration.

Aim of the Study: To assess and compare the values of the bedside tests and FEES in the confirmation of aspiration while swallowing.

Materials and Methods: A total of 86 patients with complaints of aspiration while swallowing were included. The patients were assessed using bedside tests (water swallow test, pulse oximetry, and gag reflex). FEES was also performed I these patients to detect sensitivity and specificity in comparison with bedside tests.

Observations and Results: There were 53 male and 33 female patients. The mean age was 53.86 ± 4.15 years. Dysphagia for solids was present in 60.46% of the patients. Bedside tests showed 71% sensitivity and 64% specificity when correlated with FEES. Moreover, a combination of voice change and choking/cough results in a sensitivity of 86.5% and specificity of 75.2%.

Conclusion: The bedside tests are equally important and have high sensitivity in evaluating patients with dysphagia. Using combination of choking/cough and change of voice as parameters of aspiration when compared to FEES showed high sensitivity and specificity.

Key words: Bedside tests, Bedside tests and fiberoptic endoscopy, Cricopharyngeal, Dysphagia, Fiberoptic endoscopic evaluation of swallowing, Pharynx, Solids

INTRODUCTION

The spectrum of difficulty in relishing the food in human beings varies from simple raw sensation in the throat while swallowing at one end, to difficulty in swallowing one's own saliva at the extreme end. The stages of the spectrum include pain, difficulty, or discomfort during the progression of the bolus from the mouth to the stomach. The difficulty in swallowing may be for solids or liquids or both. Anatomically the dysphagia may result due to pathology in the mouth to the lower end of esophagus. It may be due to purely organic diseases or functional disturbances.[1] The oropharyngeal causes of dysphagia include stroke, post-radiotherapy sequelae, reflux esophagitis, and cricopharyngeal muscle dysfunction. Dysphagia affects the quality of life of the individual, his life expectancy and may lead to complications and economic burden. The complications may be due to aspiration of ingested materials resulting in chest infection, malnutrition, and airway obstruction. Hence, it is imperative on ENT surgeons to detect the causes of dysphagia and the aspiration at an early stage to enable to start rehabilitative measures. The benefit to the patient, in terms of improvement in the quality of life, cannot be underestimated. Review of literature showed many authors attempted to find the utility and efficacy of different methods in identifying aspiration

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and showed varying degrees of sensitivity and specificity for their tests.[2-5] Bedside tests also may be used to identify patients with oropharyngeal dysphagia and those at risk of aspiration. The main clinical indicators of dysphagia at bedside tests are (1) abnormal volitional cough, (2) abnormal gag reflex, (3) dysphonia, (4) dysarthria, (5) cough after swallow, and (6) change of voice after swallow.[6] Teismann *et al*.[5] reported 30% incidence of aspiration in their study of patients with dysphagia and half of them without cough (silent aspiration) and 45% with oropharyngeal residue. Fiberoptic endoscopic evaluation of swallowing (FEES) was developed and popularized by Langmore[7] and modified by Flaksman *et al*.[8] It has become one of the important tests for evaluation of the anatomy of the pharynx and larynx and assessment of the process of swallowing in recent times.[3,4] FEES is being used as an evidence-based investigative tool in the assessment of the pharyngeal stage of the swallow process;[9] to identify the anatomical site and in visualization of the larynx and diagnosis of aspiration by many authors.[10,11] These authors also stated that FEES is an easy, efficient and reliable method to evaluate the swallowing status in stroke patients, moreover, in combination with good bedside clinical examination and swallow exercises, it can be a good tool in assessing patients with post-stroke dysphagia. Post-stroke rehabilitation and prevention of aspiration pneumonia can be effectively done with the help of FEES. The present study was conducted in that context to assess the sensitivity and specificity of bedside tests and compares them with FEES.

Aim of the Study

To assess and compare the values of the bedside tests and FEES in the confirmation of aspiration while swallowing.

Duration of Study

The study was from March 2012 to February 2015 (4 years).

Institute of Study

The study was conducted at the Department of ENT, Kurnool Medical College, Kurnool, Andhra Pradesh.

MATERIALS AND METHODS

A total of 86 patients attending the Department of ENT Outpatient Department with complaints of dysphagia were included in the present study. An Ethical Committee clearance certificate was obtained, and an Ethical Committee cleared consent form was used before commencing the study.

Inclusion Criteria

1. Patients of aged above 45 years and below 70 years were included.
2. Patients with complaints of dysphagia were included.
3. Patients with dysphagia with or without aspiration were included.
4. Patients referred to the OPD before weaning them from nasogastric feeding tube were included.

A thorough clinical history was obtained from the patients and attenders of the patients. The patients were evaluated for level of consciousness, cooperation, verbal, oral apraxia, and articulation.

Exclusion Criteria

1. Patients who cannot obey verbal orders were excluded.
2. Patients with markedly impaired degree of consciousness were excluded.
3. Patients with receptive aphasia or with significant apraxia were excluded from the study.

The bedside assessment of the patients for aspiration was done by assessing cognitive status, gag reflex, voluntary cough, and throat clearing. If the above steps were possible, assessment of saliva was done. Saliva assessment: Crary MA *et al*.[12] state that spontaneous swallowing of saliva and swallowing frequency were assessed. If it is proved impossible to control and swallow saliva, the examination was terminated. Water swallow test (WST): The patient was examined in the sitting position or in 45° reclining position. Few were tested in recumbent position due to difficult positioning. The patient was given 5 ml of water, and when the patient could tolerate that amount of water, he/she was given 20 ml followed by 50 ml of water (thin fluid) and assessed for cough/choking during or after swallowing, wet or weak cough after swallowing.[13] Furthermore, the patient was asked to produce sustained vowel o/a/e before and after swallowing of water. Voice change after swallowing was observed and recorded.[2,3] Pulse oximetry according to Zaidi *et al*.[14] was done for the patients before FEES and for 5 min after the test and results were recorded. 3% or more reduction in oxygen saturation was considered the positive test. FEES was done in all patients who passed a saliva test. The patient was seated for FEES in the sitting position (whenever possible) however, in some cases, this was not possible, instead, a semi-upright position on the bed was adopted. The flexible fiberoptic laryngoscope was inserted through trans nasal route into the pharynx. It provided detailed information about the anatomy of the nose, pharynx, and larynx. Sensation could be tested by touching the tip of the endoscope to various areas of the larynx and reflex adduction of the vocal folds or reflex cough, and choking were observed. Different food consistencies as fluids (water), semisolids (thick juice/yoghurt) and solids (piece of biscuits or bread), and mixed with blue dye, were used to evaluate swallowing. The salient findings noted were residue, penetration and aspiration

into the larynx. All the data recorded were analyzed using standard statistical methods.

OBSERVATIONS AND RESULTS

Among the 86 patients evaluated with bedside tests for dysphagia, there were 53 male and 33 female patients. The patients belonged to the age groups of 45–70 years with a mean age of 53.86 ± 4.15 years [Table 1].

The bedside tests could be performed in an average time of 15.35 ± 2.60 min whereas FEES in about 10.70 ± 1.10 min.

The different types of diseases wherein the aspiration was evaluated in the study included 16 (18.60%) post road traffic accident (RTA) patients, 32 patients (37.20%) with neurological deficit such as cerebrovascular accidents (CVA), cerebral hemorrhage, cerebral contusion, 24 (27.90%) patients following surgical treatment of pharynx, larynx with or without radiotherapy and 14 (16.27%) patients with malignant diseases of the oropharynx, hypopharynx, and larynx [Table 2].

Among these 86 patients bedside tests were done, and FEES was also done to compare and determine sensitivity, specificity, and predictive values. Cough/choking for all test subjects showed a sensitivity of 71.35%, specificity of 69.20%, PPV of 68.50%, and NPV of 72.50%. The sensitivity of change of voice was 76.40%, specificity was 72.50%, PPV was 71.10%, and NPV was 67.30%. The sensitivity of gag reflex was 52.45%, specificity was 55.10%, PPV was 51.75%, and NPV was 50.20%. The sensitivity pulse oximetry was 50.35%, specificity was 47.10%, PPV was 48.25%, and NPV was 53.2% [Table 3]. In this study, aspiration was observed in 69% of patients with decreased or absent laryngeal sensation tested by touching laryngeal structures by the tip of the endoscope during FEES. However, 31% of the patients demonstrated that normal laryngeal sensations in patients showed aspiration during FEES. By combining the two tests of the cough/choking (during or after swallowing) and change of voice (after swallowing) showed a sensitivity of 82.15%, specificity of 79.35%, PPV of 80.40%, and NPV of 79.20% [Table 3].

Among the 86 patients dysphagia for solids was present in 60.46% of the patients. The combination of bedside tests, voice change and choking/cough showed increasing the results in sensitivity of 82.15% and specificity of 79.35% [Table 3].

Table 1: The age and gender incidence in the study group (*n*=86)

Age group	Male (%)	Female (%)	Total (%)
45–55 years	14 (16.27)	11 (12.79)	25 (29.06)
55–65 years	17 (19.76)	14 (16.27)	31 (36.04)
65–70 years	21 (24.41)	18 (20.93)	30 (34.88)

Table 2: The causes of aspiration in the study (*n*=86)

Causes of aspiration	*n* (%)
Road traffic accidents	16 (18.60)
Neurological deficit	32 (37.20)
Post-surgical/radiotherapy	24 (27.90)
Malignant tumors throat	14 (16.27)

Table 3: The sensitivity, specificity, positive predictive value, and negative predictive values in the study (*n*=86)

Bedside test	Sensitivity %	Specificity %	PPV %	NPV %
Cough/choking	71.35	69.20	68.50	67.30
Change of voice	76.40	72.50	71.10	69.80
Gag reflex	52.45	55.10	51.75	50.20
Pulse oximetry	50.35	47.10	48.25	53.2
Cough/choking + change of voice	82.15	79.35	80.40	79.20

DISCUSSION

Evaluating the patients with the aspiration of fluids and solids into the respiratory tract is a major challenge to ENT surgeons as these patients are referred to them. The common diagnostic methods used are X-ray chest plain and contrast materials followed by fiberoptic endoscopic swallowing examination (FEES) and videofluoroscopy. The latter methods are used because they are technically demanding. However, in everyday practice, a thorough clinical history taking and obtaining meaningful information on a patient's swallowing ability using standardized simple bedside clinical tests cannot be overruled. These tests are swallow tests with water, modified in a variety of ways[6,12,13] modified by Okubo *et al*.[15] who combined cough/choking and change of voice following swallow by the patient of given saline. In the present study, the different types of diseases wherein the aspiration was evaluated in the study included 16 (18.60%) post RTA patients, 32 patients (37.20%) with neurological deficit such as CVA, cerebral hemorrhage, cerebral contusion, 24 (27.90%) patients following surgical treatment of pharynx, larynx with or without radiotherapy and 14 (16.27%) patients with malignant diseases of the oropharynx, hypopharynx, and larynx. In a study by Hoy *et al*.[16] the mean age of the entire cohort was 62 ± 13.5 years, and 58% of the cohort was males. The most common identified causes of dysphagia were laryngopharyngeal reflux disease (LPRD) (27%), post-irradiation dysphagia (14%), and cricopharyngeal muscle dysfunction (11%) in 13% of cases. Furthermore, authors Clav´e *et al*.[17] mentioned that, the prevalence of

oropharyngeal functional dysphagia is very high, it affects more than 30% of patients who have had a CVA; 52–82% of patients with Parkinson's disease; 84% of patients with Alzheimer's disease, and up to 40% adults aged more than 65 years. The differences between the later study and the present study are that the aim was to detect aspiration of fluids and solid or semi-solid food material into the larynx, however, in the previous study, the most common cause was LPRD. The bedside tests used for swallowing evaluation was WST described by Gordon *et al*.[18] Coughing during or after completion of swallowing is noted. The presence or absence of post swallow wet-hoarse voice quality was noted. The swallow speed of <10 ml/is scored as abnormal in this study. Whereas Nathadwarawala *et al*.[19] and Kelly *et al*[20] described the standardized bedside swallow assessment wherein the patients are asked to drink 50 ml of water, and the results were reported. In the present study, the four clinical parameters observed during the WST were compared with FEES, namely, choking/cough, change of voice, gag reflex, and pulse oximetry. These parameters represent aspiration of water through the vocal folds. Cough/choking for all test subjects showed a sensitivity of 71.35%, specificity of 69.20%, PPV of 68.50%, and NPV of 72.50%. The sensitivity of change of voice was 76.40%, specificity was 72.50%, PPV was 71.10%, and NPV was 67.30%. The sensitivity of gag reflex was 52.45%, specificity was 55.10%, PPV was 51.75%, and NPV was 50.20%. The sensitivity pulse oximetry was 50.35%, specificity was 47.10%, PPV was 48.25%, and NPV was 53.2%. FEES in the current study FEES was sufficient to detect penetration or aspiration of swallowed materials in the larynx. All the patients examined by FEES tolerated the procedure. None of the patients had any significant complications during or after the procedure. Penetration of laryngeal inlet could be inferred by the presence of colored material after swallowing. These materials touch the superior surface of the vocal folds but not pass below the vocal folds. Aspiration means that the bolus passed the glottis to a level below the vocal folds. The occurrence of aspiration in most patients (75%) who have lost laryngeal sensation reflects the importance of intact laryngeal sensory inputs in the swallowing process. FESS is a valid, effective, low-cost technique that assesses swallowing in a bedside examination. FEES can give information on anatomy, the swallow process, pharyngeal motility, and sensory deficits.[21,22] Although aspiration cannot be seen directly, it can be inferred from residue left after swallowing or ejection of material out of the trachea after coughing.[21] Absent gag reflex was valuable as stated by some authors[22,23] in assessing aspiration, but it was of less significance to predict aspiration as considered by other authors.[24,25] In the current study, some patients with aspiration detected by FEES had absent gag reflex (40%), moreover, 50% of patients with disturbed laryngeal sensation had absent gag reflex. This might suggest a clinical association between disturbed gag reflexes when the laryngeal sensation is affected, however there is no strong correlation between the coincidences of the two conditions. Gag reflex, when compared with FEES, showed less sensitivity and specificity than other parameters tested. Gag reflex resulted in sensitivity of 52.45%, specificity of 55.10%, PPV of 51.75%, and NPV of 50.20%. These results coincided with those obtained by Davies *et al*.[26] who demonstrated that up to 30% of healthy younger adults and 44% of healthy older adults may have unilateral or bilateral absent gag reflexes normally. Pulse oximetry provides a noninvasive method of bedside swallow testing. Authors Rogers *et al*., and Ramsey *et al*.[27,28] found association between oxygen desaturation secondary to aspiration during oral feeding in neurologically disabled individuals. In this study, most of the patients underwent pulse oximetry during FEES and the results were recorded for 5 min after swallowing. The results showed low sensitivity and specificity in comparison with FEES and with other parameters as choking and dysphonia; sensitivity of 82.15%, specificity of 79.35%, PPV of 80.40%, and NPV of 79.20%. This may be explained by that pulse oximetry in stroke patients might be affected by other factors as central causes of hypoxemia rather than swallowing. However, swallowing difficulties in our patients were caused by different etiologies (stroke, RTA, ENT causes, and others).

CONCLUSIONS

Bedside tests can be considered as an important, easy, sensitive, and specific for the detection of aspiration. Combination of choking/cough and change of voice as parameters of aspiration compared with FEES showed high sensitivity and specificity. Further research is needed to establish the most effective combination of bedside tests to detect silent aspiration.

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