

# Role of Fiberoptic Endoscopy in Evaluating Swallowing Disorders

D. S. Deenadayal\*, Vyshanavi Bommakanti, Bashetty Naveen Kumar, Nabeelah Naeem

Department of ENT and HNS, Yashoda Hospital, Secunderabad, India  
Email: \*aarticlinic@yahoo.com

Received 2 March 2016; accepted 11 June 2016; published 14 June 2016

Copyright © 2016 by authors and Scientific Research Publishing Inc.  
This work is licensed under the Creative Commons Attribution International License (CC BY).

<http://creativecommons.org/licenses/by/4.0/>



Open Access

---

## Abstract

**Objective:** The objective is to assess patients complaining of dysphagia with fiberoptic endoscopic evaluation of swallowing [FEES]. **Study design:** It is a prospective study. **Setting:** The study is conducted at Tertiary referral hospital. **Methods:** In our study, twenty patients with complaints of dysphagia were evaluated with fiberoptic endoscopic evaluation of swallowing. Patients with pharyngeal cause of dysphagia were identified and recommended dietary modifications or positional manoeuvre. **Results:** A total of twenty patients were evaluated with FEES. Patients were categorised into two groups based on the etiological factor: neurological and non-neurological patients. In eleven of the neurological patients, premature spillage was seen in four patients. Pooling for solids was seen in one patient and for liquids in four patients, pooling for both solids and liquids was seen in six patients, penetration was seen in 1 patient and aspiration in one patient. All these patients were diagnosed to have a pharyngeal cause of dysphagia. In the nine of the non-neurological group, pooling of liquids was seen in four patients, and aspiration was seen in one patient. None of the patients of this group had spillage. One patient had penetration. Five patients had pharyngeal cause of dysphagia. Remaining four patients had normal study. These patients with pharyngeal cause were advised dietary modification or positional manoeuvre or a combination of both. **Conclusion:** FEES is an effective and valuable tool for evaluating pharyngeal dysphagia, and is helpful in guiding the patients for diet and rehabilitation. It is essential to assess the safety of swallowing in patients to prevent silent aspiration and aspiration pneumonia.

## Keywords

Fiberoptic Endoscopic Evaluation of Swallowing, Dysphagia

---

## 1. Introduction

The term dysphagia is derived from the Greek words meaning “difficulty to eat” [1]. It refers to any disruption

\*Corresponding author.

**How to cite this paper:** Deenadayal, D.S., Bommakanti, V., Kumar, B.N. and Naeem, N. (2016) Role of Fiberoptic Endoscopy in Evaluating Swallowing Disorders. *International Journal of Otolaryngology and Head & Neck Surgery*, 5, 145-152.  
<http://dx.doi.org/10.4236/ijohns.2016.54025>

in the swallowing process during the transport of bolus from the oral cavity to the stomach [2]. Swallowing is a dynamic process from the beginning to the end hence it requires dynamic evaluation rather than identifying anatomical problems. We tried to understand the physiology of swallowing by performing this study. Fiberoptic endoscopic evaluation of swallowing is a technique that is used to visualize the **pharyngeal and pre-esophageal phases of swallowing**. FEES provides an endoscopic image of the base of tongue, larynx and hypo-pharynx. The path of the bolus is tracked as it passes into the oesophagus—thereby identifying if there is any pathology in the pharyngeal stage. It also helps to assess the safety of swallowing in tracheostomised patients and neurologically ill patients like stroke, Alzheimer's disease, and Parkinson's Disease.

## 2. Aims and Objectives

In this study we tried to:

- 1) Diagnose the presence of dysphagia, and identify its pattern,
- 2) Determine underlying anatomic and physiologic cause of dysphagia and confirm the pharyngeal cause,
- 3) Determine the risk of aspiration,
- 4) Advice regarding oral feeding, type of feeds and use of appropriate behavioral/positional modifications that facilitate safe swallowing.

## 3. Material and Methods

### STUDY DESIGN AND SETTING:

This is a prospective interventional study.

### STUDY PERIOD:

The duration was 1 year from January 2014 to December 2014.

### STUDY SUBJECTS:

The study included patients coming to the ENT OPD of the Yashoda hospital, Secunderabad with history of dysphagia or swallowing difficulty and fulfilling the inclusion criteria.

### INCLUSION CRITERIA:

Patients of all age groups and both sexes, presenting with any of the following complaints, will be included in the study:

- 1) Pediatric patients with feeding problems,
- 2) Patient with complains of choking, during or after eating or drinking,
- 3) Patients with subjective sensation of "LUMP" in the throat,
- 4) Patients with significant change in voice after swallowing (wet voice),
- 5) Patients with complains of pain or discomfort during swallowing,
- 6) Patients complaining of nasal regurgitation,
- 7) Post-tracheostomy patients, for tube feeding or oral feeding,
- 8) Patients with trachea-oesophageal fistula,
- 9) Patients with a history of swallowing difficulty, related to an underlying diagnosis of Parkinson's Disease, Cerebral Palsy, Multiple Sclerosis, Amyotrophic Lateral Sclerosis, dementia, stroke patients.

### EXCLUSION CRITERIA:

Patients with the following disorders or complaints will be excluded from the study:

- 1) Bleeding disorders,
- 2) History of fainting,
- 3) Seizure disorders,
- 4) Movement disorder (dyskinesia),
- 5) Acute cardiac problems,
- 6) Mental retardation.

### SAMPLE SIZE:

20 patients.

### CONTROLS:

No controls.

### STUDY MATERIAL:

For the study, the following things would be required:

- 1) Fiberoptic endoscope,
- 2) Food colours,
- 3) Milk and soft food [Indian Pan Cake] boluses of various sizes and consistencies.

**EXPECTED OUTCOME:**

In all the patients we have tried to identify the cause of dysphagia. In patients with identifiable cause of dysphagia, rehabilitative measures will be offered as described above and efficacy of these rehabilitative measures in improvement in dysphagia after institution of rehabilitative measures is assessed.

**PROCEDURE:**

The standard FEES protocol as proposed by Langmore was followed with slight modifications. In brief, all patients were evaluated at bedside with the upper part of the body being elevated. The endoscope was passed through the most patent nostril without administration of a topical anesthetic or vasoconstrictor and was then moved forward along the floor of the nose through the velopharynx. Afterwards, the tip of the flexible endoscope was advanced into the hypopharynx. The base of the tongue, pharynx, and larynx were observed. The patient's handling of oropharyngeal secretions and spontaneous swallowing was assessed. Next, the patient received teaspoon-sized portions of 3 different food consistencies dyed with blue/green food colouring for ease of visualization. Water, milk and softened Indian pancake were used in succession. All food was given in boluses of approximately 5 mL. For evaluation of the swallowing act, the endoscope was placed in the high position above the epiglottis before and during the swallow to evaluate premature spillage and delayed swallowing reflex. After the swallow, the endoscope was advanced for about 10 seconds to the low position just above the vocal folds to evaluate penetration, defined as any material entering the laryngeal vestibule but remaining at or above the level of the vocal cords, or aspiration, defined as any material entering the airway below the vocal cords. If penetration or aspiration occurred, the presence of protective reflexes (*i.e.*, cough reflex and swallowing reflex) was noted.

The normal passage of the food material in the pharyngeal phase is indicated by a WHITE OUT. Other abnormal findings include

**PREMATURE SPILLAGE:** Material enters the hypopharynx before the laryngeal swallow is initiated; can pool in the vallecula, pyriform sinuses and posterior larynx.

**RESIDUE/POOLING:** Coating of the walls in the hypopharynx that can be penetrated or aspirated.

**PENETRATION:** Bolus sits on the superior surface of the larynx or is above the vocal folds.

**ASPIRATION:** Bolus passes into the larynx.

**BLINDING/MASKING:**

No blinding is done.

**INTERVENTION:**

Interventions done in this study are:

- 1) Diet recommendations,
- 2) Compensatory techniques for improving the safety of swallowing.

**DATA ANALYSIS:**

Data were analysed using SPSS software.

## 4. Results

During the study period, from April 2011 to April 2012, 20 patients with complaints of dysphagia consented for the study and were evaluated with FEES. The patients were aged from 4 months to 76 yrs. The youngest patient was 4 months old and the oldest patient was 76 years.

Of the twenty patients, fifteen patients were males and five were females. The socio demographic profile is summarised in **Table 1**.

**Table 1.** Sociodemographic data.

Total number of patients	20
Youngest age of the patient in the study group	4 months
Oldest patient in the study group	76 years
Number of males	15
Number of females	5

All the patients presented with complaint of dysphagia. On the basis of aetiological cause of dysphagia, these patients were divided into two groups: dysphagia due to neurological cause and non-neurological cause.

Dysphagia was due to neurological cause in 11 patients (Figure 1). Four patients had head injury. During the recovery phase FEES was done to evaluate safety of swallowing. Five patients had dysphagia because of stroke/cerebrovascular accident and one patient had dysphagia secondary to Alzheimers disease. One patient had dysphagia due to lower cranial nerve palsy following right jugular paraganglioma excision.

Dysphagia was secondary to non-neurological etiology in 9 patients (Figure 2). One patient had traumatic

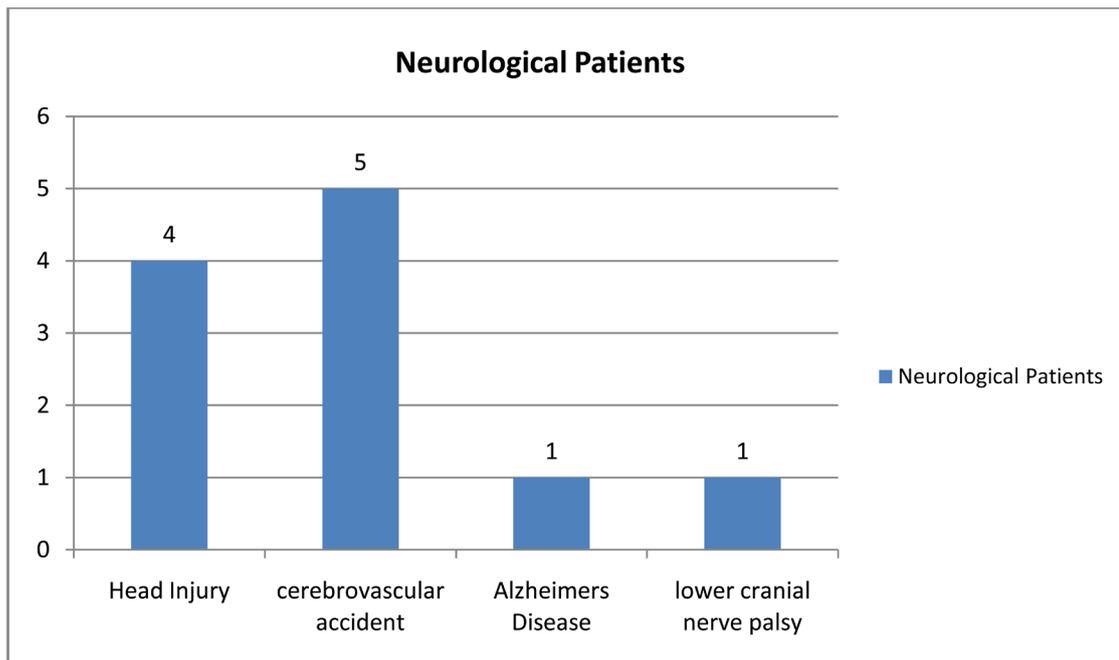


Figure 1. Dysphagia due to neurological cause.

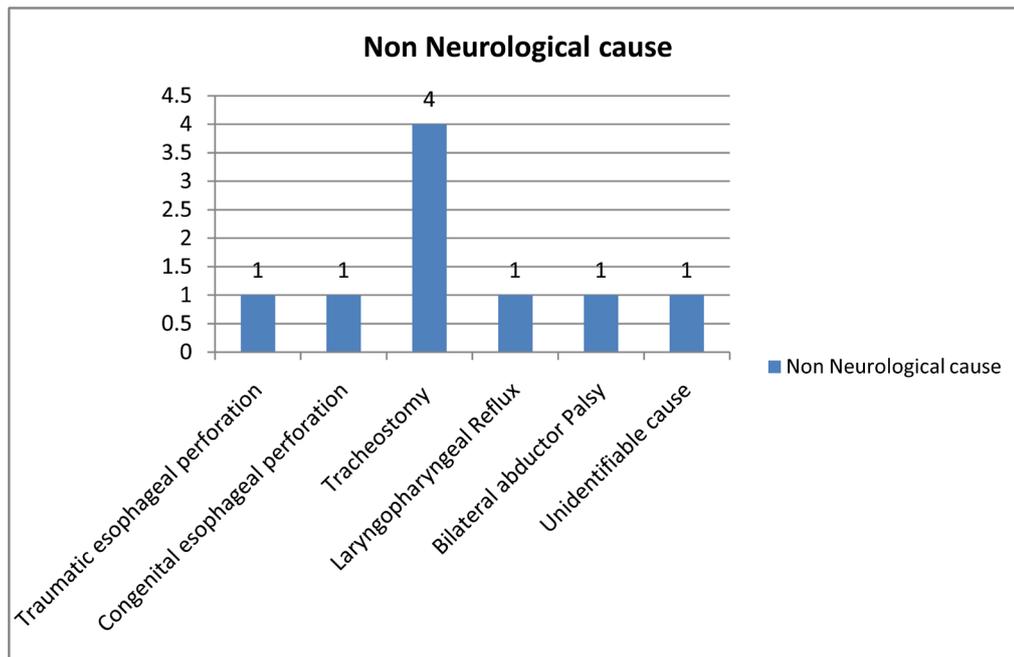


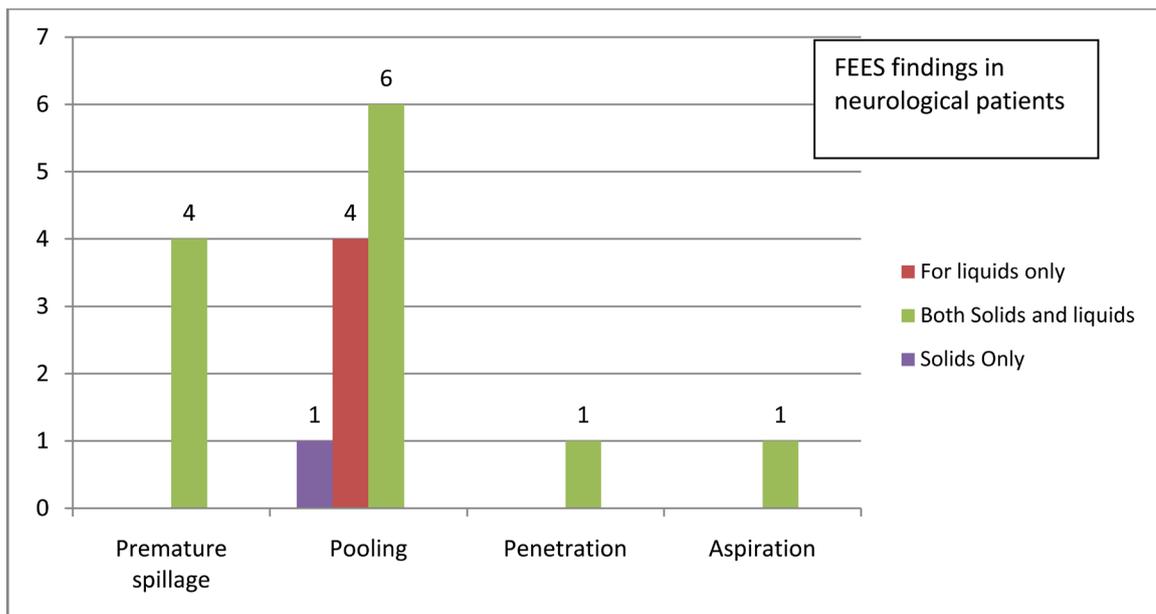
Figure 2. Dysphagia due to non-neurological cause.

esophageal perforation. She underwent esophageal repair. Post surgery FEES was done to assess the safety of swallowing in this patient. Another patient with Bilateral abductor palsy with tracheostomy underwent debrider cordotomy. Post surgery FEES was done as the patient could not tolerate liquid diet. A 4 month old baby presented with cough while feeding and failure to thrive. FEES was done to evaluate the cause and the child was diagnosed to have congenital trachea esophageal perforation. Four patients who were on tracheostomy and Ryles tube feeds, due to varied causes, were referred for decannulation and weaning of Ryles tube. One patient had Idiopathic laryngopharyngeal reflux and another patient presented with dysphagia in whom no other cause could be identified.

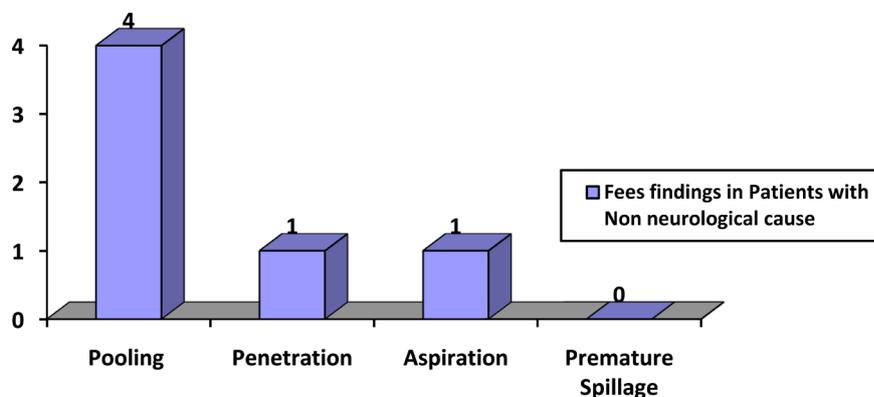
On evaluation, premature spillage was seen in four patients, pooling in fifteen patients, penetration in 2 patients and aspiration in 2 patients.

In neurological patients premature spillage was seen in four patients. Pooling for solids was seen in one patient and for liquids four patients, pooling for both solids and liquids was seen in six patients, penetration was seen in 1 patient and aspiration in one patient. All these patients were diagnosed to have a pharyngeal cause of dysphagia. The results are summarised in **Figure 3**.

In non neurological patients group, pooling of liquids was seen in four patients, aspiration was seen in one patient. None of the patients of this group had spillage. One patient had penetration. The findings are summarised in **Figure 4**.



**Figure 3.** FEES findings in neurological patients.



**Figure 4.** FEES findings in non neurological patients.

In the neurological group, a pharyngeal cause was identified in all the 11 patients. In the non-neurological group, pharyngeal cause of dysphagia was identified in 5 out of 9 patients and 4 patients had a normal study.

Patients with evidence of pharyngeal cause of dysphagia, in both neurological and non-neurological group, were advised rehabilitative measures summarised in **Table 2**. The two patients with trachea-oesophageal fistula were advised surgery for fistula closure. Two patients were advised dietary modification, two were advised positional manoeuvre and four were advised dietary modification and a positional manoeuvre. These eight patients had no evidence of aspiration or pooling or premature spillage or penetration after the advised dietary modification and/or positional manoeuvre and were relieved of ryles tube. Six patients continued to have dysphagia in the form of aspiration or pooling or premature spillage or penetration even with dietary modification and positional manoeuvres and hence were advised to continue nasogastric feeding with ryles tube.

## 5. Discussion

Swallowing is a highly complex act. This reflex is triggered by the Superior laryngeal nerve (branch of vagus nerve) [3]. Various causes can be attributed to dysphagia. It could result from either a specific anatomic problem or physiologic/functional issue (*i.e.*, sensation loss, coordination, or muscle paralysis) [4]. In our study, dysphagia was secondary to a neurological disorder in 11 patients and non-neurological disorder in 9 patients.

Regardless of the underlying pathological cause of dysphagia, in order to appropriately evaluate and treat patients of dysphagia—various diagnostic procedures are required. The purpose of a diagnostic swallow procedure is to assess dysphagia and when appropriate make recommendations for diet level, safe swallow strategies, and swallowing rehabilitation interventions [5].

Videofluoroscopy [VFS] and FEES are the most commonly used instrumental tests for evaluation of swallowing. Videofluoroscopy is considered “gold standard” for evaluation of swallowing. But VFS has its own disadvantages and in particular it cannot be performed at bedside, there is a risk of exposure to radiation hence repeated examination cannot be done. It is a difficult test to be performed in children [6]. Whereas FEES can be performed at bedside. The equipment is portable unlike VFS. We, in our study, could move the equipment and carry on FEES in our OPD, in the recovery room, in the wards and also in the intensive care units. We could perform repeated examination with wide range of boluses altering their sizes and consistencies. Even in infant aged 4 months we could safely carry out the procedure. A study by S Singh report benefits of FEES over VFS [7]. A number of recent studies evaluating the efficacy of FEES have concluded that FEES is not less reliable compared to videofluoroscopy for evaluation of swallowing [8].

FEES is now a first choice method of investigation in Europe due to the important advantages it offers which include easy to use, well tolerated, possibility of bedside examination and less costly [9].

In our present study, we studied the reliability of FEES for assessment of swallowing, although we didn't compare it against the “traditional gold standard” videofluoroscopy. We could reliably identify residue, pooling, penetration and aspiration in all our patients and the findings were consistent upon repeated examinations. According to Aviv *et al.* the VFS and FEES show good agreement with diagnostic findings related to laryngeal penetration, aspiration, pharyngeal residue, compensatory swallow safety strategies recommendations, and diet recommendations [10]. But according to Kelly *et al.*, FEES was better at appreciating penetration than VFS [11].

Silent aspiration refers to the passage of swallowed material into the airways, without the appearance of clear clinical signs, represented primarily by coughing or voice change [6]. The main cause is lack of adequate cough reflex, which is a consequence of the weakness at peripheral level or lack of coordination at central level or reduced pharyngo-laryngeal sensitivity [12]. This silent aspiration is identified with FEES as well as VFS [7]. FEES allows for visualization of the pharynx and larynx immediately before and after the swallow, when silent

**Table 2.** Recommendations by FEES.

Dietary modification	2
Dietary modification with positional manoeuvre	2
Positional manoeuvre	4
Continued ryles tube feeding	6
Surgery [for tracheoesophageal fistula]	2
Normal findings	4

aspiration of pooled secretions can most easily be seen.

In our series, two patients were advised dietary modification, two were advised positional maneuver and four were advised dietary modification and a positional maneuver. These eight patients had no evidence of aspiration or pooling or premature spillage or penetration after the advised dietary modification and/or positional manoeuvre and were relieved of ryles tube. They were followed up for a minimum of three month and none of them had clinical evidence of aspiration pneumonia. Thus FEES was quite reliable in assessing the safety of swallowing and safety of rehabilitative measures.

Six patients continued to have dysphagia in the form of aspiration or pooling or premature spillage or penetration even with dietary modification and positional manoeuvres and hence were advised to continue nasogastric feeding with ryles tube.

In the present study, there were no instances of airway compromise, decrease in the level of consciousness, laryngospasm, or epistaxis that required special treatment. Furthermore, no patient suffered from symptomatic brady- or tachycardia. This is in accordance with the minimal rate of complications reported in the literature [13] [14].

We acknowledge some limitations of our evaluation method FEES, mainly the inability to assess the esophageal phase (which can be solved by complementing our examination with other diagnostic test in suspected patients). Oesophageal phase is better evaluated with VFS.

Another major limitation of the study is the small sample size and the lack of a control group. But the results have an implication in the routine clinical practice and we felt it was worth reporting.

## 6. Conclusion

FEES is an effective and valuable tool for evaluating pharyngeal dysphagia, and is helpful in guiding the patients for diet and rehabilitation. It is essential to assess the safety of swallowing in patients to prevent silent aspiration and aspiration pneumonia.

## References

- [1] Karkos, P.D., Papouliakos, S., Karkos, C.D. and Theochari, E.G. (2009) Current Evaluation of the Dysphagic Patient. *Hippokratia*, **13**, 141-146.
- [2] Siebens, H., Trupe, E., Siebens, A., *et al.* (1986) Correlates and Consequences of Eating Dependency in Institutionalized Elderly. *Journal of the American Geriatrics Society*, **34**, 192-198. <http://www.ncbi.nlm.nih.gov/pubmed/3950287>  
<http://dx.doi.org/10.1111/j.1532-5415.1986.tb04202.x>
- [3] Sang, Q. and Goyal, R.K. (2001) Swallowing Reflex and Brain Stem Neurons Activated by Superior Laryngeal Nerve Stimulation in the Mouse. *American Journal of Physiology-Gastrointestinal and Liver Physiology*, **280**, G191-G200. <http://www.ncbi.nlm.nih.gov/pubmed/11208540>
- [4] Logemann, J.A. (1986) Treatment for Aspiration Related to Dysphagia: An Overview. *Dysphagia*, **1**, 34-38. <http://dx.doi.org/10.1007/BF02408238>
- [5] Leder, S.B. (1998) Serial Fiberoptic Endoscopic Swallowing Evaluations in the Management of Patients with Dysphagia. *Archives of Physical Medicine and Rehabilitation*, **79**, 1264-1269. <http://www.ncbi.nlm.nih.gov/pubmed/9779682>  
[http://dx.doi.org/10.1016/S0003-9993\(98\)90273-8](http://dx.doi.org/10.1016/S0003-9993(98)90273-8)
- [6] Rugiu, M.G. (2007) Role of Videofluoroscopy in Evaluation of Neurologic Dysphagia. *Acta Otorhinolaryngologica Italica*, **27**, 306-316.
- [7] Singh, S. and Hamdy, S. (2006) Dysphagia in Stroke Patients. *Postgraduate Medical Journal*, **82**, 383-391. <http://dx.doi.org/10.1136/pgmj.2005.043281>
- [8] Brady, S. and Donzelli, J. (2013) The Modified Barium Swallow and the Functional Endoscopic Evaluation of Swallowing. *Otolaryngologic Clinics of North America*, **46**, 1009-1022. <http://dx.doi.org/10.1016/j.otc.2013.08.001>
- [9] Nacci, A., Ursino, F., La Vela, R., Matteucci, F., Mallardi, V. and Fattori, B. (2008) Fiberoptic Endoscopic Evaluation of Swallowing (FEES): Proposal for Informed Consent. *Acta Otorhinolaryngologica Italica*, **28**, 206-211.
- [10] Aviv, J.E., Kim, T., Thomson, J.E., Sunshine, S., Kaplan, S. and Close, L.G. (1998) Fiberoptic Endoscopic Evaluation of Swallowing with Sensory Testing (FEESST) in Healthy Controls. *Dysphagia*, **13**, 87-92. <http://www.ncbi.nlm.nih.gov/pubmed/9513302>  
<http://dx.doi.org/10.1007/PL00009561>
- [11] Kelly, A.M., Drinnan, M.J. and Leslie, P. (2007) Assessing Penetration and Aspiration: How Do Videofluoroscopy and Fi-

beroptic Endoscopic Evaluation of Swallowing Compare? *Laryngoscope*, **117**, 1723-1727.  
<http://dx.doi.org/10.1097/MLG.0b013e318123ee6a>

- [12] Ramsey, D., Smithard, D. and Kalra, L. (2005) Silent Aspiration: What Do We Know? *Dysphagia*, **20**, 218-225.  
<http://dx.doi.org/10.1007/s00455-005-0018-9>
- [13] Aviv, J.E., Murry, T., Zschommler, A., Cohen, M. and Gartner, C. (2005) Flexible Endoscopic Evaluation of Swallowing with Sensory Testing: Patient Characteristics and Analysis of Safety in 1340 Consecutive Examinations. *Annals of Otolaryngology, Rhinology, and Laryngology*, **114**, 173-176. <http://www.ncbi.nlm.nih.gov/pubmed/15825564>  
<http://dx.doi.org/10.1177/000348940511400301>
- [14] Aviv, J.E., Kaplan, S.T., Thomson, J.E., Spitzer, J., Diamond, B. and Close, L.G. (2000) The Safety of Flexible Endoscopic Evaluation of Swallowing with Sensory Testing (FEESST): An Analysis of 500 Consecutive Evaluations. *Dysphagia*, **15**, 39-44. <http://www.ncbi.nlm.nih.gov/pubmed/10594257>  
<http://dx.doi.org/10.1007/s004559910008>