Assessment and Management of Dysphagia with Fiberoptic Endoscopic Examination of Swallowing (FEES) and its Future Implementation in Indonesia

Susyana Tamin*, Peter K, Ku, Dilys Cheung****

** ENT Department, Faculty of Medicine, University of Indonesia, Dr. Cipto Mangunkusumo Hoapital, Jakarta, Indonesia*

***Department of Surgery, The Chinese University of Hong Kong, Prince of Wales Hospital, Hong Kong, China*

ABSTRACT

Videofluoroscopy (VFSS) was viewed as a gold standard for evaluating patient with dysphagia but now FEES could be considered as a feasible option in assessing swallowing safety.

In a period from September to December 2001, there were 33 patients with swallowing dysfunction referred to Dysphagia Clinic in Prince of Wales Hospital, Hong Kong. FEES was performed to evaluate the abnormalities which caused swallowing disorder on these patients. Treatment was given to the patients according to their swallowing pathologies being detected in the assessment.

Key words : *Swallowing dysfunction, Fiberoptic endoscopic examination of swallowing, Dysphagia*

INTRODUCTION

Oropharyngeal dysphagia is defined as difficulty in swallowing because of structural or movement abnormalities involving the oral cavity, oropharynx, velopharynx, hypopharynx, larynx, and upper oesophageal sphincter. Patients with cancer of the head and neck often manifest as various degrees of swallowing dysfunction or dysphagia. Swallowing in this group of patients may be adversely affected by the cancer itself, or by the surgical, radiation, or chemotherapeutic regimens used for treatment of the cancer. The oral preparatory, oral pharyngeal, and oesophageal phases of swallowing all could be affected by the cancer and its treatment.[1,2]

Deglutition disorder is an increasing problem as the old age population continues to grow, more cerebrovascular or traffic accidents occur, and more aggressive head and neck surgeries are performed. The clinical concerns of dysphagia are not only in diagnosis, but also how to help these patients swallow safely. Clinicians are often confronted with problems such as "should the patient be fed with nasogastric tube," "when could the nasogastric tube be removed, and how dangerous is it to feed the patient orally" and what kind of food is suitable for dysphagia patients.[3]

In addition to clinical history and bedside evaluation, wide variety methods have been developed to assess swallowing disorders. However, only videofluoroscopy and bedside evaluation are performed routinely in many hospital settings. The equipment and personnel for videofluoroscopy are not always available in many hospitals. Subjective perception and bedside evaluation in dysphagia also have their limitations. Thus, a valid and convenient method should be available for the investigation of increasing swallowing problems.[3]

Without using radiographic techniques, Bastian[4,5] and Langmore et al[6,7] observed the pharyngeal phase of swallowing by using a newly developed technique called videoendoscopic-swallowing study (VESS), Fiberoptic endoscopic examination of swallowing (FEES) or Videoendoscopic Evaluation of Dysphagia (VEED). All

of them are the given terminology for this procedure.[8]

Hsiu et al[3] performed a formally controlled comparative study to find out if they could give more support for this new methodology that they devised and even further defy the creed of videofluoroscopy as a gold standard especially in the assessment of swallowing safety.

Dr. Cipto Mangunkusumo Hospital Jakarta – Indonesia, as a state hospital, is one of tertiary referral hospital in Jakarta. A lot of patients who were referred to this hospital and underwent surgery, radiation or chemoradiation as treatment may result in dysphagia. Nasopharyngeal carcinoma is a common tumour in Indonesia. There are 1147 cases during 5 years period from 1990 to 2000, and it is the commonest tumour in adults. We also had 538 cases of Oropharyngeal cancer in the same period. Up to 75 % of NPC patients have neck nodes metastasis at the time of presentation, but even in the N0 neck, first line treatment includes radiotherapy to the nasopharynx and neck using a dose of at least 60 Gy. Recurrent cases may be treated by a second course of radiotherapy, nasopharyngectomy, or both for local disease, or radical neck dissection for neck node involvement.[9]

Dysphagia is not commonly described as a complication of radiotherapy, although many side effects of radiotherapy to the head and neck may contribute to its causation. Complication of radiotherapy for NPC that may impede normal swallowing include xerostomia, trismus, dental caries, motor and sensory neuropathies, neck fibrosis, stricture formation, tissue necrosis, and cerebral necrosis.[9]

Marshall et al[9] have recently shown that dysphagia developing in patients irradiated as treatment for nasopharyngeal carcinoma is related to multiple abnormalities that are detectable using endoscopic and radiological swallowing assessments. Seventy-eight percent of patients had abnormalities in both the oral and pharyngeal phases of swallowing. Seventy-one percent of patients showed penetration of material into the laryngeal vestibule, and 52% of patients aspirated solids or liquids into the trachea. Only 29% showed neither penetration nor aspiration. The incidence of penetration of material into the laryngeal vestibule and aspiration into the airways is high, and the possibility of complications due to persistent aspiration must be considered. [9]

In light of these findings, we reviewed several patients who were referred to a Specialist in Dysphagia Clinic, The Prince of Wales Hospital Hong Kong. Patient history and examination findings, and results of fiberoptic endoscopic evaluation of swallowing (FEES) are reviewed, and the management of such patients were discussed.

PATIENTS AND METHODS

The case notes of 33 patients referred to a Dysphagia Specialised Clinic were reviewed. Evaluation in the Clinic included a detailed history, general examination and assessment of the oral cavity and pharynx. The pharynx and larynx of the patients were also examined endoscopically prior to FEES.

Fiberoptic Endoscopic evaluation of Swallowing (FEES) method.

The protocol of FEES is shown in which was modified from Bastian[4] original program.

Fiberoptic Endoscopic Evaluation of Swallowing (FEES) was performed jointly by a Speech and Language therapist and an Otolaryngologist. Five food consistencies were tested; thin liquid, thick liquid, puree, soft food, and biscuit. Green food colouring was used to improve visibility on endoscopies. The subjects were positioned in postures in which they normally ate, generally seated in an upright position for this procedure. Tongue motion and soft palate elevation were first inspected.

A small amount of lubricating jelly was applied to the portion of the scope, which would be inserted, and the tip of the scope was dipped into an antifogging agent. An Olympus P2 flexible fiberoptic nasoendoscope, attached to a CCD camera and a colour video monitor was inserted gently through the nasal floor. If there was problem about velar function, or about the degree of closure of the velopharyngeal port during swallow, the scope was inserted between the inferior and middle turbinate to assure a viewing position that was enable simultaneous visualization of the velum, and lateral and posterior pharyngeal walls. For observation of other structures during swallow, the

scope was inserted along the floor of the nose. Using the scope to view the nasopharynx, the subject was asked to dry swallow to allow assessment of velopharyngeal competence. The scope was then deflected downward and passed on into the oropharynx untill a distance at which the whole laryngopharynx could be viewed panoramically. Observation of oropharyngeal structures was completed with the tip of the scope in the oropharynx, typically at or just below where the inferior soft palate would be at rest during quiet breathing (mouth closed), with the tongue base, pyriform sinuses, posterior pharyngeal wall, postcricoid and laryngeal structure in view. The position of the scope was readjusted if the subject perceived any discomfort in swallowing. Laryngeal structures are better viewed with the scope tip lower, at about the epiglottis, with the full length of the true vocal folds visible. General appearance of the pharynx and larynx was noted. Adequacy of vocal cord movement was assessed during phonation and inspiration. Pooling or aspiration of saliva was also documented. A dry swallowing was requested again, and pharyngeal constrictor competence was assessed. At the same time, laryngeal elevation could be detected by inspection and palpation with one hand on the neck.

After completing all the preswallowing assessment, we proceeded to the core of this procedure: measured quantities of food, namely thin liquid, thick liquid, puree, gastric rice and biscuit were introduced in sequence to assess the swallowing safety. They were stained greenish to improve visibility of examination. A spoonful of thick liquid was administered, and the subject was instructed to hold the bolus in his mouth for about 10 second. Any premature oral leakage to the pharynx or even preswallowing aspiration was well observed under endoscope. After moderate chewing, the subject was asked to swallow as usual. Since the view was obscured momentarily (less than one second) by the upheaval of the larynx during the height of swallowing, assessment was made on observation just before initiation of swallowing and immediately after the swallowing. The lateralization of food passage or stasis was also documented. Any early loss of the bolus into the valeculae or pyriform fossae, or any penetration or aspiration of bolus material prior to the swallow was noted. Following the swallow, sites previously examined, i.e., nose, valleculae, pyriform fossae, tongue base, pharyngeal walls, postcricoid, true and false vocal cord, were examined for evidence of residue. Sites and sidedness of residue material and estimation (if possible) of how much of bolus introduced appears as residue, were noted. If residue was seen, the patient then was asked to repeat swallowing. Any clearing that takes place during the repetition was also noted. Focus was made on laryngeal penetration or tracheal aspiration in this process. Laryngeal penetration was defined as material spilling into the laryngeal vestibule, not passing below the vocal cord. Aspiration was defined as material falling down the glottis. This observation could be done either by viewing the bolus falling directly into the laryngeal box or between the abducted vocal cords, or by looking for soiling of sub glottis and laryngeal vestibule after swallowing. Occasionally, it was seen as the subject coughed and expectorated the testing material that he had aspirated. If significant pharyngeal residue was noted, the observation was continued for 1 to 2 min after swallowing, to determine if spill over ensued. Three spoonfuls of puree were given in sequence, and the procedure was terminated once aspiration occurred. Response to aspiration and efficiency of cough reflex were also noticed. Since liquid was supposed to be the most difficult consistency for most dysphagic patients to swallow, another three bouts of 3 ml of diluted green food colour dye were administered to subjects who safely pass the above examination. Procedures were terminated if any aspiration happened. Where appropriate, different volumes of fluid, and different modes of presentation (spoon feeding, cup drinking, and straw drinking) were employed. Alterations in head position and other techniques to improve swallowing efficiency were used if required.[9] All procedures were performed by otolaryngologist and speech therapists of the Dysphagia team. All the observation under endoscope was documented by video recorder for later analysis.

INDICATION

Evaluation of swallowing function with FEES does not provide all the same information as a video fluoroscopic study of swallow. However there are a number of indications for FEES, some related to information provided by FEES.[10]

Indications for FEES related to the unique type of information provided by the procedure include:
1. Concerns about alterations in nasopharyngeal,

oropharyngeal, or laryngeal anatomy that may not be apparent on video fluoroscopy
2. Concerns about sensory integrity of pharyngeal and/or laryngeal structures. (This particular equipments for sensory discrimination test are not always available).
3. Concerns about the patient's ability to initiate and maintain airway protection over a given period of time
4. High risk of aspiration, where it is desirable to assess swallows function without food or liquid.
5. It is desirable to assess pharyngeal constriction, in particular, and any differences in constriction from right to left.
6. It is desirable to provide on-line visual feedback to the patient or others
7. It is desirable to assess effects of various strategies, i.e., head turning, breath holding, etc, in a repeated fashion

Indications related to the urgencies of the exam include the following:

1. Patient cannot be transported to the site of a radiographic exam
2. There are concerns about repeated exposure to radiation associated with video fluoroscopy, as when a patient's condition is changing rapidly over a brief period of time
3. There are concerns about the efficacy and/or expense of a radiographic study
4. Information is needed more quickly than scheduling a radiographic exam will permit.[8,10]

Limitations

As noted, FEES cannot provide the examiner with all the same information that can be obtained from video fluoroscopy. For example, FEES does not allow evaluation of bolus management in the oral cavity. The patient's ability to form and hold a bolus in the mouth, transfer it from anterior to posterior oral cavity, deliver it into the pharynx are better observe with fluoroscopy. Another limitation of FEES is, that during the moment of swallow, approximation of tongue and pharynx generally preclude visualization of pertinent event. Information regarding degree of pharyngeal constriction, opening of the upper oesophageal sphincter, and hyoid/laryngeal elevation during the swallow is not available. Similarly, penetration or aspiration of the bolus, which occurs at, or in close proximity to, the time of swallow, cannot be visualized. In addition, most quantitative measures of timing and displacement, which can be obtained from radiographic studies, are not possible with FEES.[8,10]

The examiner, should already acquired the skill in handling flexible endoscope, and also knowledgeable about head and neck anatomy, and the specific physiology of swallowing. Potential risks associated with the procedure include vasovagal response, nosebleed, and a reaction to the topical anaesthetic. Much can be done to minimize the likelihood of any of these risks, for example by taking efforts to put the patient at ease before proceeding with the exam, careful insertion of the scope, limitation of the anaesthetic agent to the nasal mucosa (and away from the larynx), or performing the exam without an anesthetic.[8]

Subject

Thirty-three patients suffering dysphagia were seen in the Dysphagia Clinic in the three months period from September 2001 to December 2001, including 16 cerebrovascular accident patients in their chronic stable status, one patient with post operation of cranio cervical fusion and one tonsillar carcinoma patient with post partial pharyngectomy and glossectomy followed by irradiation, 6 NPC patients post radiotherapy, one patient with malignancy in lung, one patient with malignancy of thyroid and pituitary gland, 1 patient with parkinsonism and 5 patients with chronic obstructive lung diseases. The sex ratio was 22 male to 11 female, and the age ranged from 16 to 94 years old (mean age, 68 years). All patients underwent a FEES examination.

RESULT

Nearly all examinations were abnormal. Only 3 patients with lung malignancy and CVA were normal. Seventy percent of patients showed penetration of material into the laryngeal vestibule, and 61 % of patients aspirated liquids into the trachea (Table 1). Only 9 patients showed neither penetration nor aspiration. Of patients aspirating fluids, 15/24 (63%) did so 'silently', i.e., without any attempt to choke or clear the throat, whilst the remaining 9/24 (37%) were assessed as having a weak or ineffective cough. Vallecular stasis was judged to be present in 76% of patients. Pyriform fossa stasis and coating of the pharyngeal

mucosa were seen in almost 70% of patients with both fluids and puree. Epiglottic inversion showed mild to moderate impairment in most patients (52%). Swallowing reflex was appeared to be normal only in 9 patient and being abnormal in 24/33 patients (73%).

Table 1:
Abnormalities detected by FEES

	Frequency of abnormalities
Vallecular stasis	25/33 (76%)
Pyriform fossa stasis	23/33 (70%)
Pharyngeal coating	23/33 (70%)
Epiglottic inversion	17/33(52%)
Swallowing reflex	24/33(73%)
Laryngeal penetration	23/33 (70%)
Laryngeal aspiration	20/33 (61%)
Reduced cough reflex following aspiration	15/24(63%)

Recommendations made to patients following FEES are shown in Table 2. Although all patients were recommended to have non-oral feeding because of severe dysphagia with aspiration, this advice was re-jected in every case. In six patients, a soft diet, alter-nating with small amounts of fluid, was advised. Two patients were recommended to have an unre-stricted diet as tolerated. Swallowing manoeuvres ad-vised to patients included swallowing adopting a chin down posture (4 patients) and 5 patients were advised to take small volume of food when swallowing.

Table 2: Recommendation following FEES
Advice on diet

	Recommendation	Number of Patient
Advice on diet	Non-oral feeding	13/33 (41%)
	Partially oral	2/33 (13%)
	Oral feeding	18/33 (69%)
Oral feeding	Diet as tolerated	7/20
	Thin,thick,puree,	
	Gastric rice	4/20
	Avoid thin liquid	9/20

Swallowing manoeuvres

	Recommendation	No of patient
	Chin down posture	6
	Multiple swallow with small volume intake	7
	Solid alternately with fluid intake	2

DISCUSSION

FEES is advocated as the first alterna-tive by Bastian,[4] particularly in patients with anatomical or neurological impairments of the laryngopharynx (cerebrovascular accidents, neuro-surgery, head and neck surgery). In Langmore's[7] experience, FEES and video fluoroscopy examinations have similar clinical outcomes: both reveal the presence of dysphagia, both are sensitive to the significant dysphagic fea-tures, and both can be used to determine the effec-tiveness of therapeutic manoeuvers.[6,7,10]

Chih [3] found that premature oral leakage, pharyngeal stasis, laryngeal penetration, and absent of cough reflex as the features of as-piration risk. Premature bolus delivery in the oral phase is the most frequent disorder seen in patients with cerebrovascular accidents.[3] It may result from either poor tongue control, or a delayed swallowing reflex. Eleven patients in their study demonstrated different results in this item. Eight of them were positive in videofluoroscopy, but negative in FEES; the other three, had the opposite results. In our Dysphagia Clinic we found nearly 70 % of patients have pharyngeal static and absent of cough reflex that cause a high probability for silent aspiration.

Pharyngeal stasis is the main cause of aspira-tion after the swallowing reflex. Food residue in the hypopharynx or posterior glottis could be sucked into the airway during inhalation, either by gravity or bydribbling off the arytenoids as swallowing movement continued. The residue may

result from pumping failure, poor laryngeal elevation, and/or cricopharyngeal dysfunction. In addition, by virtue of the three-dimensional panoramic view of endoscope, the amount and localization of pooling could be assessed precisely in FEES. It could also re-veal more about residual bolus flow through the hypopharynx and movement of the laryngeal struc-tures in reaction to the bolus. Laryngeal penetration and tracheal aspiration during the pharyngeal swallowing imply airway in-competence, which is related to either vocal cord palsy or swallowing in coordination. The advantage of FEES lies in its bet-ter viewing of laryngeal anatomy as well as the movement of vocal cord and the supraglottic struc-tures.[3] Fifty-eight percent (19/33) of our patients had laryngeal penetration and tracheal aspiration, only 4 patient had laryngeal penetration without aspiration and 1 patient had aspiration without laryngeal penetration.

Clinically undetected aspiration (silent aspira-tion) was found in 40% to 50% by using barium swal-low. Cough reflex is therefore not a good detector for choking, but it acts as the last defence mechanism of pulmonary aspiration. This result implied that FEESas more sensitive to de-tect cough response. Testing the sensation of larynx and hypopharynx was also possible in FEES and was advocated by some investigators by using the tip of fiberscope.[4,6] However, Chih[3] did not favour this "touch" for fear of triggering laryngospasm. The high proportion of patients aspirating fluids and food into the airway, and the high rate at which such aspiration is either silent or ineffectively cleared were the cause for concern. Although patients seen in their clinic did not report chest problems, the generally progressive nature of post-radiotherapy complications suggests that these patients are likely to aspirate on a long-term basis, with obvious risk of pulmonary complications. Whether or not non-oral feed-ing could prevent any potential risk is yet to be proven, and aspiration of saliva and secretions still could occur.[9] We found 10 of 33 patients have recurrent chest problem at the time and before presentation, but the risk of pulmonary complication was also high in the rest of the patients.

Direct inspection of incomplete closure at nasopharynx during swallowing, or the staining of nasopharynx by the reflux of liquid dye after swallowing test could also assess velopharyngeal competence in FEES. This observation was valuable in assessing patients of irradiated nasopharyngeal carcinoma, who were frequently bothered with velopharyngeal incompetence.[3]

FEES have lower false neg-ative rate of aspiration by virtue of its repeatability and bet-ter viewing of bolus localization and of movement of the supraglottic structures. Furthermore, free of over-cumulative ra-diation dose, FEES allows evaluation of a greater number of individual swallows per examination.[3]

Bastian[4] therefore recommended that videoendoscopic evaluation introduce a significantly smaller "sampling error" than video fluoroscopy in patients whose swallowing function is highly variable. The method devised by Bastian[4] was thus modified in the pre-sent study by increasing the testing frequency in or-der to lower the occurrence of false negative result, which might be misjudged as a safe swallowing. The results of the present study therefore should not be misinterpreted as judging which one was correct, but merely reflected FEES as a more reliable method in assessing swallowing safety.

Although videofluoroscopy provides more comprehensive information about swallowing, includ-ing oral and oesophageal phases, which cannot be as-sessed thoroughly in FEES, there are many practical reasons limiting its use and thus facilitating the pref-erence of FEES: patients who need to be evalu-ated without delay, patients who need to be examined repeatedly, patients who receive biofeedback train-ing, patients who are bedridden or immobilized, pa-tients who are in ICU or on monitors, patients who refuse more radiation exposure, and patients who as-pirate easily.[10] In these situations, FEES is safer, more accessible, and more efficient than video fluoroscopy because the equipment of FEES is portable and the testing materials are commercially available (liquid dye can be replaced with milk).[3,11]

Bastian[5] has suggested helpfully that it is effective to use FEES as the primary tool for screening of large numbers of dysphagic patients, or for follow-up of postoperative patients and patients during treatment, with video fluoroscopy used on a less frequent and more selective basis. Furthermore, because the sensitivity of assessment

by FEES may be enhanced by virtue of its repeatability, this modality in the hands of experienced users is more reliable than video fluoroscopy in safety, as shown in their comparative study. They may now at least claim FEES as the exam of choice in view of swallowing safety. [3,4,5]

Radiotherapy is known to cause xero-stomia in over 90% of patients and also affects pharyngeal motility and sensation. Fibrosis in the neck and reduction of jaw movement are commonly seen. The soft palate often becomes thickened and its movement re-duced, affecting bolus formation and handling and al-lowing regurgitation of food and fluid into the nose. Motor and sensory nerves are both affected by radiotherapy.[9] Although nerves themselves are relatively radio-resistant nerve injury may be secondary to soft-tissue fibrosis. Cranial nerve palsies including recurrent laryngeal and hypoglossal paralysis are well-docu-mented following radiotherapy and may have been implicated in some patients in this study, although tongue immobility may result from fibrosis alone. There were four of our patients having xerostomia and trismus caused by radiotherapy and 2 of them have lingual nerve palsy and facial nerve palsy.[9]

FEES can be a difficult examination in NPC patients because of repeated soiling of the endoscope tip. This may be due to reduced saliva production and abnormali-ties of pharyngeal peristalsis, resulting in coating of the pharyngeal mucosa with the test food or fluid.[9]

The most common management options are there-fore modifications of food consistencies and the use of swallowing manoeuvres to reduce the likelihood of aspiration. Patients find that high water-content foods like congee (a popular Chinese food of porridge-like consistency) and noodles in soup are easy to manage. Other modifications include reduction of volume per mouth-ful, reduction of feeding or drinking rate, and multiple swallows. Alternation of liquids and solids to help clear-ance of pharyngeal residue, and compensatory head and neck postures during the swallow, are commonly recommended.[9]

Six of our patients were suggested to have meal in chin down position especially for liquid consistency, 7 patients were advised to take a small volume of food during swallowing and 2 patients was advised to take solid food alternately with fluid intake.

Conclusion

Swallowing is a complex process.. Evaluating dysphagia by using endoscopic examination could be time saving, revealing, comprehensive, extremely informative and enlightening. The Fiberoptic Endoscopic Evaluation of Swallowing (FEES) can be safely and comfortably administered by a skilled and well–equipped endoscopist. Successful implementation of flexible endoscopy requires complete instrumentation and acquisition of skills.

FEES offers clinician an inexpensive, nonradiographic means of comprehensively imaging the swallow. The images are presented as factual, including the colour, with magnified view of the laryngopharyngeal structures so that the dietary and behavioural management of patients with dysphagia can be readily carried out.

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