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Fiberoptic Endoscopic Examination of Swallowing Safety: A New Procedure

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Abstract. A new procedure for assessing the pharyngeal stage of swallowing in patients with dysphagia is described. Called the fiberoptic endoscopic examination of swallowing safety (FEESS), it is being used to detect aspiration and to determine the safety of oral feeding in patients for whom the traditional videofluoroscopic evaluation may be difficult or impossible to perform. Patients for whom the FEESS procedure is indicated are identified and information obtainable via endoscopy is outlined.

Key words: Fiberoptics – Endoscope – Aspiration – Pharynx – Swallowing, pharyngeal stage.

As disorders of the oral pharyngeal stages of swallowing have undergone increasing study, new techniques for investigating dysphagia in these early stages of swallowing have proliferated. Specialists now have a variety of weapons in their diagnostic arsenals, including manometrics, videofluoroscopy, clinical bedside evaluations, ultrasound, electromyography (EMG), and scintigraphy.

Typically, however, only videofluoroscopy and the clinical examination are performed in hospital settings. In smaller hospitals and in nursing homes, frequently only the clinical evaluation is done due to a lack of the equipment necessary to perform videofluoroscopy. It is significant that Logemann et al. [1] reported that 40% of patients who aspirated were not identified by clinical evaluation. Clearly, the clinical exam alone produces inadequate information on the pharyngeal stage of swallowing.

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Even in hospitals that do use videofluoroscopic techniques, patients and circumstances are regularly encountered that preclude the use of videofluoroscopy to assess dysphagia. These include patients who cannot be moved from the intensive care unit (ICU), patients who are unable to be positioned adequately on the fluoroscopy table, patients who are unable to cooperate behaviorally for the study, patients who are very ill and unable to tolerate the risk of aspirating even very small quantities of food, and patients who need an immediate examination.

To provide information about the pharyngeal stage of swallowing in these patients who cannot be adequately examined with videofluoroscopy, we have developed a technique we call the fiberoptic endoscopic examination of swallowing safety (FEESS). Traditional fiberoptic endoscopic assessment of the pharynx and larynx is an established, safe, and reliable procedure in otolaryngology [2]. With this technique, the larynx may be studied without interfering with the function of the structures [3]. Recently, McFarlane and Lavorato [4] have extended the use of this technology to the area of speech pathology to assess dysphonia. In our clinic, we have modified this standard otolaryngologic procedure to focus on the pharyngeal stage of swallowing. Endoscopy provides a clear, direct view of the hypopharynx and larynx. Aspiration, and/or evidence of aspiration, can be directly observed. Required modifications to the traditional procedure are minimal and do not interfere with normal swallowing function.

Materials

A variety of flexible endoscopes are available. We use an Olympus ENF (Type P) flexible fiberoptic nasopharyngolaryngoscope, 3.7 mm in diameter. Tip deflection is accomplished with a single, thumb-operated control. The tip may be deflected 90 degrees upwards and 130 degrees down, allowing ample con-

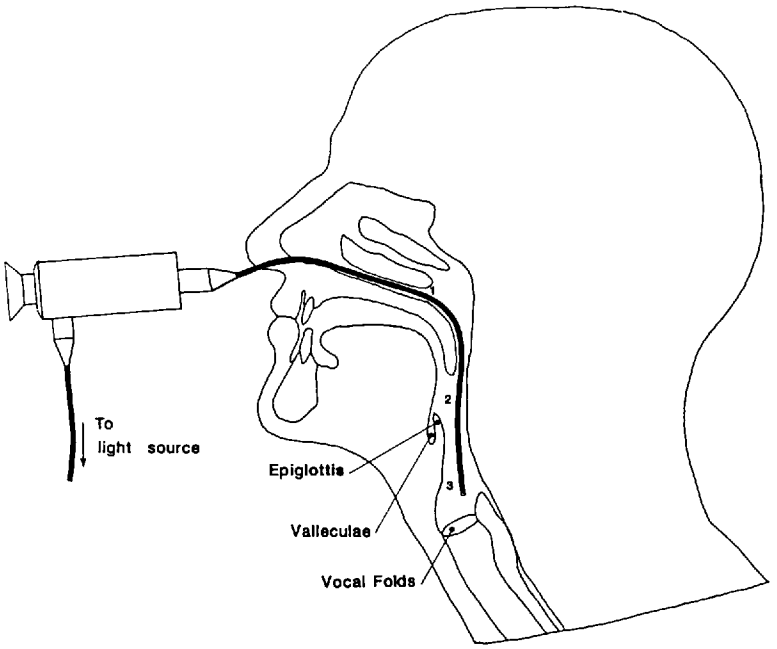

Fig. 1. Properly positioned endoscope for assessment of swallowing.

trol for maneuverability. An Olympus ILK-3 cold light supply is used for illumination.

Methods

Since posture has a significant effect on swallowing abilities, patients are examined in postures typical of those in which they normally eat. Ambulatory patients are seated upright. Bed-bound patients are examined at the bedside. The head of the bed is raised to 45 degrees or more. Other adjustments are made (i.e., raising the foot of the bed, providing lateral support) to duplicate typical eating postures.

We have found that usually no anesthesia is needed for this procedure. Sider et al. [5] noted a reduction in both the urge and the ability to swallow following the application of lidocaine in the pharynx. In rare cases, anesthesia is indicated due to patient discomfort to facilitate introduction of the endoscope. The nares may be anesthetized with a cotton pad that has been moistened with a topical anesthetic and wrung out.

Introduction of the Endoscope

The scope is passed just inferior to the inferior turbinate in the inferior meatus. With the scope in the nasopharynx, the velopharyngeal port can be viewed adequately (Fig. 1, position 1). The patient is requested to dry swallow to allow assessment of velopharyngeal competence during swallowing.

The tip of the scope is then deflected downward and the scope is passed into the oropharynx (Fig. 1, position 2). The amount of saliva in the hypopharynx is noted as a general indication of pharyngeal constrictor competency. General appearance of the pharynx and position of the epiglottis are noted.

Finally, the scope is passed to a point posterior to the epiglottis, where the general appearance of the laryngeal structures can be clearly visualized (Fig. 1, position 3). The patient is asked to dry swallow, to hold his or her breath, to cough, and to phonate, which permit assessment of the adequacy of vocal fold adduction. Rotation of the larynx or asymmetry of the vocal folds is noted.

Introduction of Food

At this point we reach the core of the procedure, in which measured quantities of food and liquid are given to the patient to swallow. Liquid boluses of 5 and 10 ml and pureed boluses of 5 ml are usually presented. Other quantities and consistencies may also be given, depending on the objectives of the particular exam and the patient's status. All material is dyed with green or blue food coloring for contrast.

The actual dynamics of the swallow are difficult to assess with this procedure because the tumultuous upheaval of the larynx and pharynx temporarily obscures any view. However, aspiration before the swallow, secondary to premature spillage into the hypopharynx, and aspiration after the swallow, secondary to pharyngeal residue, can be observed. Any aspiration that occurs during the swallow can usually be identified immediately after the swallow by residue remaining in the airway. The approximate quantity and exact location of even very small amounts of material can be easily visualized and documented. In general, we have found that the amount and exact location of aspirated material are easier to document endoscopically than fluoroscopically. Patient response to penetration or aspiration is also noted.

If aspiration or significant penetration occurs during the FEESS procedure without response from the patient (i.e., coughing or clearing the throat), the evaluation is usually terminated at this point with the knowledge that the patient is a silent aspirator. On the other hand, if a patient has not aspirated up to this point, but has other risk factors (e.g., excess pharyngeal residue, minimal alertness, premature spillage), the evaluation continues to determine his or her swallowing safety. Patients who demonstrate significant pharyngeal residue are observed continously for 1–2 min after the swallow. If this material spills into the laryngeal ventricle, penetration and/or aspiration can then be documented.

Sensitivity Testing

Sometimes, of course, no penetration or aspiration occurs during a swallowing study. However, because we have witnessed

Table 1. Indications for FEESS procedure

Characteristics of patients
Facing immediate discharge
Requiring an immediate decision
With severe contractures
With severe arthritis
Who are minimally alert
In intensive care units
On ventilators/respirators
Who are restrained
Who are in extreme pain/distress
Who are in nursing homes
Who are in hospitals without access to fluoroscopy

only a limited number of swallows, it cannot be assumed that the patient will never aspirate. If there is any indication that the patient's swallowing status is impaired, we directly assess sensitivity in the laryngeal region in order to predict the patient's ability to respond to any potential aspiration. The tip of the scope is deflected to probe the pharyngeal walls lightly, the laryngeal surface of the epiglottis, the aryepiglottic folds, the arytenoids, and/or the vocal cords to determine sensitivity. Although the touch of the probe represents a much stronger stimulus than food or liquid, patients who are insensitive to the probe can be assumed to be insensitive to food or liquid, particularly if the touch of the scope is not sensed at the level of the vocal cords. This information about sensitivity is invaluable in identifying patients who are potentially silent aspirators.

Alternate Procedure

With patients who are at high risk for pneumonia, who currently have pneumonia, or who are currently very ill, we modify the procedure outlined above. Of particular concern are patients with a long history of chronic obstructive pulmonary disease (COPD) who have compromised pulmonary status. With these patients, we forgo the introduction of food and give only a very small amount of water (1 ml) with blue or green food dye added. This liquid mixes with the patient's saliva and provides an easily visualized medium. The patient is then asked to swallow (or if he or she is not alert, the examiner simply waits) and his or her ability to swallow saliva is assessed. If penetration of saliva into the laryngeal ventricle or aspiration of saliva below the level of the vocal cords is observed without response by the patient, the introduction of food is postponed until the patient's medical status improves. If no aspiration occurs on the saliva test, we assess sensitivity, and if it is intact, may decide to introduce food or liquid, if oral feeding is a possibility for the patient.

The FEESS procedure may be contraindicated for some patients who are extremely agitated. On rare occasions, we have had patients who did not tolerate the introduction of the endoscope. However, in more than 50 examinations, we have encountered no other patients who could not be examined with this procedure. Patients who are most suitable for the FEESS procedure are detailed in Table 1.

Discussion

The FEESS procedure provides detailed information about the anatomy and physiology of the pharyngeal stage of swallowing. It is possible to see whether a patient aspirates oral/pharyngeal secretions, food, or liquid when he or she swallows. All of this information is obtainable without regard to the patient's mental status [6], ability to assume and hold a certain position, or ability to delay the swallow until cued, as is necessary with videofluoroscopy. New chairs have recently been introduced that solve many of the positioning problems of videofluoroscopy, but these are not yet widely available. FEESS does not require the extensive effort and expense necessary for use of a radiographic suite with a radiologist, a technologist, and one or more speech pathologists. It can be repeated as often as desired without radiation hazard to the patient. In the videofluoroscopy study, the patient must be given food or liquid to determine whether he or she can swallow safely. This is not necessary during the FEESS evaluation, since aspiration can be detected merely by observing the patient's capacity to swallow saliva.

While the videofluoroscopic evaluation is the most thorough diagnostic tool available today, it is limited in its applicability to some patients and is unavailable to others. In addition, some important data are not obtained through videofluoroscopy but are available with the fiberendoscopic procedure. Radiographic studies may reveal little about vocal fold movement or the physical appearance of the pharyngeal and laryngeal structures, whereas this is revealed by the FEESS. Sensitivity of the critical region involved in airway protection is revealed radiographically only if the patient has penetration or aspiration on the few swallows actually studied. This information is crucial for some borderline patients. In the FEESS procedure, we directly assess sensitivity in those patients who have questionable airway protection.

Since developing this procedure in 1986, we have compared eight subjects both endoscopically and videofluoroscopically. We found that those patients seen to aspirate during the swallow on fluoroscopy were also documented endoscopically because they usually left behind evidence of that aspiration in the laryngeal ventricle or trachea. Also, aspiration was not usually restricted only to the moment of swallowing, but also occurred before and/or after the swallow. These latter events, of course, are witnessed endoscopically as well as fluoroscopically. In all cases, the major findings and recommendations were identical for both evaluations. Currently a more formal study is being conducted to determine the intertest reliability for a sizable population.

The modified endoscopic evaluation is not intended to be a replacement for the videofluoro-

scopic study in the complete evaluation of swallowing. The latter study provides more detailed information about all stages of swallowing and can provide information useful for both differential diagnosis and treatment planning [1]. It also reveals the pattern of dysphagia in an easily recordable format. The fiberoptic endoscopic examination focuses only on the pharyngeal stage of swallowing and does not reveal the complex interaction between various structures that is available from videofluoroscopy. However, the FEESS is a very reliable instrument for identifying aspiration or the potential for aspiration in patients who have oropharyngeal-stage dysphagia. It is an excellent adjunct to videofluoroscopy and is the method of choice for many patients when prompt, reliable information is needed to answer the critical question, "Can my patient swallow with safety?"

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