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Role of the Speech-Language Pathologist in the Performance and Interpretation of Endoscopic Evaluation of Swallowing: Guidelines

*ASHA Special Interest Division 13, Swallowing and Swallowing Disorders
(Dysphagia) Committee on Endoscopic Evaluation of Swallowing Guidelines*

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About This Document

These guidelines were developed by the American Speech-Language-Hearing Association (ASHA) Special Interest Division 13, Swallowing and Swallowing Disorders (Dysphagia) Committee on Endoscopic Evaluation of Swallowing Guidelines. Members of the committee include: Joe Murray (chair), Kristen Brackett, Susan Brady, Mark Hakel, Donna Lundy, Debra Suiter, David Zirlen, and Janet Brown (ASHA staff liaison). Celia Hooper, 2003–2005 vice president for professional practices in speech-language pathology, served as monitoring vice president.

Executive Summary

These guidelines are an official statement of the American Speech-Language-Hearing Association (ASHA). The ASHA Scope of Practice in Speech-Language Pathology states that the practice of speech-language pathology includes conducting instrumental swallowing evaluations, including fiberoptic endoscopic examinations of swallowing (FEES) (ASHA, 2001).

The use of fiberoptic endoscopy for the assessment of swallowing function was first reported by Langmore, Schatz and Olson (1988) and has been addressed in ASHA practice policy documents since 1992 (ASHA, 1992a, 2002, 2004a, 2004b). These documents define the purpose of the FEES procedure as a comprehensive functional evaluation of the pharyngeal stage of swallowing, leading to recommendations regarding the adequacy of the swallow, the advisability of oral feeding, and the use of appropriate interventions to facilitate safe and efficient swallowing (ASHA, 2004b).

The guidelines for the FEES procedure include the following: rationale, potential candidates, clinical indicators, potential contraindications, safety/adverse effects, exam protocol, and documentation. Special issues addressed in the guidelines include use of food coloring, patient consent, sensory testing, presence of a physician, use of anesthesia and vasoconstrictors, and use of FEES in the pediatric population.

Introduction

These guidelines are an official statement of the American Speech-Language-Hearing Association (ASHA). The ASHA Scope of Practice in Speech-Language Pathology (ASHA, 2001) states that the practice of speech-language pathology includes conducting instrumental swallowing evaluations, including fiberoptic endoscopic examinations of swallowing (FEES). The Preferred Practice Patterns are statements that define universally applicable characteristics of practice procedures and protocols for serving individuals with swallowing disorders across all settings. It is required that individuals who practice independently in this area hold the Certificate of Clinical Competence in Speech-Language Pathology and abide by the ASHA Code of Ethics (ASHA 2003), including Principle of Ethics Rule B, which states “Individuals shall engage in only those aspects of the profession that are within their competence, considering their level of education, training, and experience.”

An overarching concept that applies throughout these guidelines is the importance of providing culturally and linguistically appropriate services (Riquelme, 2004). Obtaining a case history, describing the procedure, selecting linguistically

Background

appropriate stimulus words for examining velopharyngeal closure, and counseling the patient and family in a culturally sensitive manner may require the assistance of a trained interpreter. The patient's and family's cultural preferences should be considered when selecting the foods that are administered during the procedure and making recommendations for dietary modifications.

The use of fiberoptic endoscopy for the assessment of swallowing function was first reported by Langmore et al. (1988) and has been addressed in ASHA practice policy documents since 1992 (ASHA, 1992a, 2002, 2004a, 2004b). These documents define the purpose of the FEES procedure as a comprehensive functional evaluation of the pharyngeal stage of swallowing, leading to recommendations regarding the adequacy of the swallow, the advisability of oral feeding, and the use of appropriate interventions to facilitate safe and efficient swallowing (ASHA, 2004b).

The implementation of the FEES procedure by speech-language pathologists (SLPs) requires advanced knowledge and specific skills. These include determining an appropriate test protocol; making real-time decisions regarding management options during the examination; observing pharyngeal anatomy, physiology, and sensation; observing secretions; directly assessing swallowing function for food and liquid; and assessing the response to therapeutic maneuvers and interventions to improve the swallow (ASHA, 2004b). The knowledge and skills needed to attain competency in the area of FEES and suggestions for how to demonstrate and verify competency are outlined in the document "Knowledge and Skills for Speech-Language Pathologists Performing Endoscopic Assessment of Swallowing" (ASHA, 2002). Suggestions for verifying skills include following a three-step process of observation, practice under direct supervision, and independent practice with indirect supervision after basic knowledge and skills have been attained (ASHA, 2002).

In some states, SLPs' performance of endoscopy (i.e., passing the endoscope) may be specifically addressed by the speech-language pathology licensure law. SLPs should be aware of state and regulatory issues involved in the performance of FEES, as well as third-party payer requirements.

Rationale for Performing Endoscopy

Using endoscopy to assess swallowing dysfunction in patients with dysphagia may be decided based on —

- the selection of instrumentation that best visualizes specific components of the swallow, or
- the practical need to perform an instrumental assessment when no other means is available.

The outcomes of endoscopic assessment may include the following:

- A. Identification of normal and abnormal anatomy and physiology of the swallow as can be viewed with the endoscope (Langmore, Schatz, & Olsen, 1991; Leder, Cohn, & Moller, 1998; Link, Willging, Miller, Cotton, & Rudolph, 2000; Madden, Fenton, Hughes, & Timon, 2000; Wilson, Hoare, & Johnson, 1992; Wu, Hsiao, Chen, Chang, & Lee, 1997).

Potential Candidates for FEES

- B. Evaluation of the integrity of airway protection as it relates to swallowing function (Donzelli & Brady, 2004; Hartnick, Hartley, Miller, & Willging, 2000; Martin, Logemann, Shaker, & Dodds, 1993; Mendelsohn & Martin, 1993).
- C. Evaluation of the effectiveness of postures, maneuvers, bolus modifications, and sensory enhancements in improving swallowing safety and efficiency (Denk & Kaider, 1997; Hirst, Sama, Carding, & Wilson, 1998; Manrique, Melo, & Buhler, 2002; Mendelsohn & Martin, 1993; Ohmae, Logemann, Kaiser, Hanson, & Kahrilas, 1996; Wolf & Meiners, 2003).
- D. Provision of recommendations regarding the optimum delivery and maintenance of nutrition and hydration (e.g., per oral, non-oral, or combinations of the two) (Ajemian, Nirmul, Anderson, Zirlen, & Kwasnik, 2001; Leder, 1998; Willging, 2000).

Candidates for the FEES procedure may be found in a number of settings. The settings may include, but are not limited to, acute care facilities, subacute facilities, rehabilitation centers, long-term care centers, and outpatient medical offices. The following list identifies potential patient populations who may benefit from a FEES procedure and potential clinical indicators for FEES. The list provides examples of patient populations with whom FEES has been utilized and is not meant to be all-inclusive:

- Neurodegenerative disease (e.g., Amyotrophic lateral sclerosis, Parkinson's disease).
- Spinal cord injury.
- Neurological injury (e.g., cerebrovascular accident or traumatic brain injury).
- Following treatment for head and neck cancer (e.g., surgery and/or radiation therapy and/or chemotherapy).
- Vocal fold mobility disorders (e.g., recurrent laryngeal nerve injury, superior laryngeal nerve injury).
- Tracheostomy.
- Mechanical ventilation or other respiratory issues (e.g., chronic obstructive pulmonary disease (COPD), bronchopulmonary dysplasia).
- Medical fragility.
- Mobility problems.

Certain clinical signs and symptoms may suggest the specific use of endoscopy to assess the swallow. Alternately, other clinical signs and symptoms might suggest that endoscopy should not be performed.

Clinical Indicators for FEES

Clinical indicators may include, but are not limited to, the following:

- Symptoms of pharyngeal dysphagia or observed signs of pharyngeal dysphagia.
- Abnormal vocal quality and suspected dysphagia.
- Odynophagia (pain with swallowing).
- Increased difficulties with swallowing over the duration of a meal, secondary to fatigue.
- Hypernasality and suspected nasal regurgitation.

**Potential
Contraindications
for the Use of FEES**

**Safety/Adverse
Effects**

- Need for visualization of the hypopharynx/larynx for biofeedback education and/or rehabilitation.
- Documented pharyngeal dysphagia on videofluoroscopic swallow study (VFSS) that can be retested with endoscopy to —
 - monitor progress.
 - better assess underlying etiology.
 - limit radiation exposure.
- Suspected or observed difficulty swallowing saliva/oral secretions.
- Difficulty with coordinating suck/swallow and breathing (see Special Issues, *Use of FEES in the Pediatric Population*).
- Inability to tolerate barium (e.g., potential allergy or aversion to barium).
- Safety issues associated with radiation exposure (e.g., women with confirmed or possible pregnancy).
- Difficulty transporting patients to the radiology suite (e.g., bedridden or weak patients; patients with open wounds, contractures, or pain; patients who are quadriplegic or wearing a halo; patients with obesity or positioning difficulties; patients on Intensive Care Unit monitors or ventilators; patients in isolation units).
- Limited access to radiologic assessment.

Certain patients may require clearance from their medical team prior to the examination.

- Severe agitation and possible inability to cooperate with the examination.
- Cardiac disorder.
- History of vasovagal episodes or a history of fainting.¹
- Severe movement disorders (dyskinesia).
- Severe bleeding disorders and/or recent severe epistaxis (nosebleed).
- History of recent trauma to the nasal cavity or surrounding tissue and structures secondary to surgery or injury.
- Bilateral obstruction of the nasal passages.

The performance of the examination requires the passage of the endoscope through the nasal cavity, nasopharynx, and pharynx. With this action, the SLP may, on rare occasions, encounter adverse effects. These may include, but are not limited to, discomfort, gagging and/or vomiting, nose bleed, mucosal perforation, allergic reaction/hypersensitivity to topical anesthesia or nasal spray, laryngospasm, and vasovagal response.²

Discomfort has been cited as the most frequently reported adverse effect (Cohen, et al., 2003). The use of topical anesthesia may reduce the occurrence of discomfort (see Special Issues, *Use of Anesthesia and Vasoconstrictors*). Some adverse

¹ A vasovagal response can result from mechanical stimulation of the vagal afferent pathway or from emotional stimuli, such as fear or anxiety. The physical response can include an increased heart rate (tachycardia) or decreased heart rate (bradycardia) with resulting syncope.

² A laryngospasm can occur in response to mechanical stimulation of the supraglottis, aspiration of food, liquid or refluxed stomach contents with resulting vocal fold adductor spasm and tight supraglottic closure.)

**Recommended
Equipment and
Supplies**

effects, such as changes in heart rate, epistaxis, laryngospasm, and vasovagal response, may present health risks to the patient; however, studies have shown that these events are infrequent. A study of 500 consecutive flexible endoscopic swallowing assessments in patients with various underlying diagnoses, including stroke and chronic neurological disease, was performed in a tertiary care setting (Aviv et al., 2000). In that study, minor epistaxis with spontaneous cessation of bleeding occurred in 0.6% of the cohort; additionally, there was no incidence of laryngospasm and no incidence of vasovagal responses. Similar results were found in 305 outpatients examined in an office setting (Cohen et al., 2003). Two parameters for safety were monitored, airway compromise (0%) and epistaxis (1.1%). In addition, heart rate changes were monitored with no clinically significant difference in pre- and post-procedure heart rates.

The overall risk is minimal, but it is recommended that clinicians be well trained in the signs and symptoms of adverse reactions and be ready to take appropriate action if they occur. In developing a FEES program, clinicians should review their facility's response to adverse reactions and develop a plan for reaction and intervention should one occur.

Suggested equipment for the performance of fiberoptic swallow evaluations includes —

- nasolaryngoscope,
- chip camera,
- light source,
- color monitor,
- digital or analog recorder of moving image,
- microphone.

Optional equipment may include an air generator for sensory testing and specially fitted endoscope with an additional channel (see Special Issues, *Sensory Testing*).

Food coloring as contrast can be mixed into the presented food (see Special Issues section on *Use of Food Coloring*). Care should be given to ensure safe food handling procedures are followed.

**Universal Precaution
Considerations
(Body Substance
Isolation)**

As with all procedures, universal precautions should be utilized according to the facility's policies and procedures. Equipment used for the FEES may include but is not limited to —

- gloves,
- gown,
- mask,
- eye protection,
- endosheath for nasolaryngoscope as per the manufacturer's recommendations.

Care should be taken not to contaminate equipment. Contaminated equipment should be disinfected according to the manufacturer's recommendations.

FEES Protocol

The following protocol should serve as a guideline for individuals performing FEES. It is recommended that clinicians tailor their examinations to the needs of their individual patients, including linguistic, cultural, and dietary preferences or

needs. The endoscopic swallow assessment is used to identify specific signs and symptoms of dysphagia localized to the nasopharynx and pharynx. Depending on the position and placement, the endoscope is capable of providing a view of the anatomy and physiology of the swallow as it occurs directly in the visual plane of the instrument. Differing anatomic and physiologic events are observed as the endoscope is successively advanced through the nasal cavity, nasopharynx, and proximal and mid-pharynx. During the height of the pharyngeal stage of the swallow, the light emitted from the endoscope is contained by the apposition of tissue (sometimes referred to as “white-out”) as the oropharynx is compressed and the bolus is propelled through the pharynx and upper esophageal sphincter. This brief period of containment partitions the observable physiologic movements of the swallow into pre-swallow and post-swallow segments. The following description is not intended to be a complete inventory of observable physiologic events. Because of the variability in the onset and offset of physiological events during the swallow, not all of the events listed will be observed with every swallow. In addition to specific signs and symptoms that can be directly visualized, other physiologic events can be inferred, including those associated with improving the safety of the swallow (e.g., coughing, breath holding).

A. Patient preparation and positioning.

1. Educate the patient and/or caregiver regarding the FEES and the rationale for the exam (see Special Issues, *Consent*).
2. Individuals are seated upright or in typical eating position to simulate normal ingestion.
3. FEES may be performed at bedside with the patient's head elevated as appropriate.
4. Determine which nasal passage will best accommodate the endoscope.
5. Apply topical anesthesia, as appropriate, to nasal passage (see Special Issues, *Anesthesia and Vasoconstrictors*).
6. Apply lubricant gel to endoscope, if required to facilitate passage of the endoscope.

B. Clinical/anatomical observation of the hypopharynx prior to bolus presentation.

1. Anatomic observation: The examination begins with observation of the following anatomic structures in order to identify potential bolus obstruction and natural bolus flow and containment. Suspected anatomical abnormality should trigger a referral to the appropriate medical specialist. The following structures should be observed:
 - a. Velopharyngeal port.
 - b. Base of tongue.
 - c. Epiglottis.
 - d. Vallecular space.
 - e. Posterior pharyngeal wall.
 - f. Lateral pharyngeal walls.
 - g. Pyriform sinuses.
 - h. Post-cricoid area.
 - i. Aryepiglottic folds.
 - j. Lateral channels (pyriform fossa).
 - k. Arytenoid cartilages.
 - l. Interarytenoid space.
 - m. False vocal folds.

- n. True vocal folds.
- o. Cricothyroid membrane (subglottic shelf).
- p. Anterior tracheal wall.
- 2. Physiologic observation prior to bolus presentation.
 - a. Nasopharynx.
 - (1) Positioning: the endoscope is placed in a position superior to the nasopharyngeal sphincter.
 - b. Velopharyngeal closure.
 - (1) Alternate oral plosive and nasal phonemes (d^n^ d^n^ d^n^).
 - (2) Use phrasing with alternate oral plosive and nasal phonemes (e.g., “Buy Mommy a poppy.”).
 - (3) Use phrasing with oral plosive load (e.g., “Buy Bobby a poppy.”).
 - c. Observation of secretions.
 - (1) Presence of secretions in the endolarynx is highly predictive of subsequent aspiration later in the exam (Murray, Langmore, Ginsberg, & Dostie, 1996; Link et al., 2000; Donzelli, Brady, Wesling, & Craney, 2003) and poor outcome (e.g., pneumonia) (Link et al., 2000).
 - (2) Amount and location should be noted.
 - d. Presence of movement abnormalities at rest (e.g., tremor, myoclonus).
 - (1) Laryngeal function during respiration, phonation, and airway protection/breath hold.
 - e. Swallow frequency.
 - (1) Less than one per minute with endoscope in place was found to be a higher risk for aspiration later in the examination (Murray et al., 1996).
- C. Bolus presentation.
 - 1. A standard protocol is not provided in this document as bolus presentation should be guided by performance, aspiration risk, abnormalities, patient tolerance/fatigue, and clinical judgment.
 - a. Consistency, viscosity, and volume of liquid and solid boluses should represent the range of possible variations of consistencies as deemed appropriate by the clinician.
 - b. Method and rate of presentation may be varied based on individual need of the patient and clinical judgment (e.g., fed by examiner, self-fed).
 - c. Evaluation of swallowing physiology, coordination, and associated events.
 - (1) Pre-swallow segment observations.
 - (a) Associated anatomic observations.
 - i. Presence of anatomic obstruction (e.g., tissue mass, edema).
 - ii. Absence of natural protective anatomy (e.g., supraglottic laryngectomy, epiglottectomy).
 - (b) Airway protection.
 - i. Arytenoid approximation.
 - ii. True vocal fold approximation.
 - iii. False vocal fold approximation.
 - iv. Anterior movement of arytenoids.
 - v. Initial posterior movement of the epiglottis.

**Therapeutic Intervention/
Biofeedback**

- vi. Epiglottal retroflexion to horizontal.
- (c) Lateral pharyngeal wall movement to medial position.
- (d) Depth of bolus passage into the pharynx/larynx (e.g., vallecular space, pyriform sinus).
- (e) Duration of bolus passage into the pharynx/larynx.
- (2) Post-swallow segment observations.
 - (a) Return of the epiglottis to resting position.
 - (b) Return of arytenoids to abduction.
 - (c) Return of lateral pharyngeal walls from medial to resting position.
- (3) Identify and interpret the impact of abnormal swallowing physiology.
 - (a) Penetration/aspiration: cause, timing, and approximate severity.
 - i. The penetration/aspiration scale (Rosenbek, Robbins, Roecker, Coyle, & Wood, 1996) differentiates events of penetration or aspiration and describes the patient's reaction to the varying events. While this scale has not been validated with the FEES, reliability of judges' use of the scale indicates the potential for adaptation to the endoscopic procedure (Colodny, 2002).
 - (b) Residue.
 - i. Cause, approximate percentage, and location.
 - ii. Spontaneous reaction to residue (e.g., re-swallow).
 - iii. Effect of reaction to the presence of residue, penetration, and/or aspiration (e.g., reduction in percent residue, effectiveness of cough, and expectoration of material from airway).
- (4) Associated physiological observations.
 - (a) Cough/airway clearance.
 - i. Spontaneous and cued.
 - ii. Adequacy of clearance and effort.

Once abnormal swallowing anatomy/physiology has been determined, the SLP should evaluate the effect of postures, maneuvers, bolus modifications, compensatory techniques, and sensory enhancements that may positively affect swallowing safety and efficiency. In some cases, the intervention and the resulting effect will be directly visualized during the pre-swallow and post-swallow segment. In other cases, direct imaging of the intervention will be prevented due to the constraints on the visualization of events that occur between these segments. In these instances, the clinician must rely on inferences drawn from the visualization of the presence or absence of the targeted symptom during the post-swallow segment (i.e., the presence or absence of aspirate in the subglottis, or the presence or absence of residuals in the pharynx.)

Patients may benefit from the use of biofeedback during FEES and subsequent treatment by viewing a monitor while the endoscope is in place (Bastian, 1991). A randomized control trial compared conventional treatment alone and conventional treatment in conjunction with pharyngeal imaging biofeedback with the endoscope for patients following head and neck surgery (Denk & Kaider, 1997). Even though the ultimate success rate for the restoration of oral feeding was

not statistically significant between the two treatment groups, the results showed that within the first 40 days of treatment, patients with videoendoscopic biofeedback had a 2.3 times better chance of restoration to oral feeding. Denk & Kaider further concluded that videoendoscopic biofeedback was successful in instructing patients in laryngeal valving, improving pharyngeal wall movement, and reducing aspiration and pharyngeal residue.

The following is a compilation of possible intervention techniques that may be performed alone or in combination. Application of these techniques is dependent upon the age, ability, and cognitive status of the patient.

It is important that the clinician be vigilant during the examination and attend to the variation of visual signs of dysphagia during the pre- and post-swallow segments. The clinician must determine if the desired effect of the intervention was achieved by comparing the modified swallow to the unmodified swallow. In some cases, the recorded examination must be reviewed to determine if subtle changes were present.

A. Postures.

1. Chin tuck: This posture reduces the distance between the thyroid and the hyoid and the distance between the mandible and the hyoid. It is frequently used to reduce the effect of premature spillage of a bolus into the pharynx before the swallow is initiated. It was found to reduce significantly the depth of contrast penetration into the larynx and trachea (Bulow, Olsson, & Ekberg, 2001). While many clinicians use this technique to reduce pharyngeal retention, Bulow et al. (2001) found that there was no significant improvement in pharyngeal retention when employing the chin tuck. (Additional description of the use of the chin tuck can be found in the following articles: Rasley et al., 1993; Shanahan, Logemann, Rademaker, Pauloski, & Kahrilas, 1993; Welch, Logemann, Rademaker, & Kahrilas, 1993; Logemann, Rademaker, Pauloski, & Kahrilas, 1994.) This technique is employed when the early arrival of the bolus into the pharynx prior to the onset of the swallow is judged to be of a depth and duration that makes the swallow unsafe. Once employed, the chin tuck is deemed to be effective if the duration of the onset of the swallow is shortened and/or the depth of bolus travel is altered in a way that makes the swallow safer. These changes are likely to be viewed in the pre-swallow segment. During the post-swallow segment, the clinician may be able to discern the presence or absence of residuals in the pharynx and make an inference as to whether the desired effect was achieved by implementing this maneuver.
2. Head rotation: This posture may be utilized in individuals with unilateral pharyngeal weakness either to close off the weaker side of the pharynx or to enhance the opening of the upper esophageal sphincter with a resultant decrease in pharyngeal retention. (Logemann, Kahrilas, Kobara, & Vakil, 1989; Logemann et al., 1994).
 - a. The changes to the configuration of the pharynx and the bolus flow during the pre-swallow segment will be well visualized using flexible endoscopy.

- b. During the post-swallow segment, the clinician may be able to discern the presence or absence of residuals in the pharynx and make an inference as to whether the desired effect was achieved by implementing this maneuver.

B. Maneuvers.

1. Supraglottic swallow and super supraglottic swallow: These maneuvers are designed to improve glottal closure to prevent aspiration before, during, and after the swallow (Bisch, Logemann, Rademaker, Kahrilas, & Lazarus, 1994; Logemann et al., 1995). The super supraglottic swallow provides additional airway protection by using a breath hold with increased effort (Ohmae et al., 1996). The flexible endoscope provides an outstanding view of the patient's ability to achieve tight supraglottic closure during these maneuvers (Donzelli & Brady, 2004; Hirst et al., 1998; Martin et al., 1993; Mendelsohn & Martin, 1993).
 - a. The clinician will be able to visualize the effect of the maneuver during both the pre-swallow and post-swallow segments.
 - b. During "white-out," events of aspiration will not be visualized due to tissue apposition with the objective lens at the height of the swallow.
 - c. During the post-swallow segment, the clinician may be able to discern the presence or absence of aspirate in the subglottis and make an inference as to whether the desired effect was achieved by implementing this maneuver.
2. Mendelsohn maneuver: This technique may increase vertical and anterior laryngeal motion and the width and duration of the upper esophageal sphincter opening (Kahrilas, Logemann, Krugler, & Flanagan, 1991; Lazarus, Logemann, & Gibbons, 1993; Logemann & Kahrilas, 1990).
 - a. This maneuver will not be well visualized with the flexible endoscope due to tissue apposition with the objective lens at the height of the swallow.
 - b. During the post-swallow segment, the clinician may be able to discern the presence or absence of residuals in the pharynx and make an inference as to whether the desired effect was achieved by implementing this maneuver.
3. Effortful swallow: Clinicians may utilize this technique to improve tongue base motion and reduce residuals in the proximal pharynx. Bulow et al. (2001) found that the effortful swallow reduced the depth of contrast penetration into the larynx and trachea but did not necessarily reduce residuals. Nonetheless, some patients may benefit from the intended effects of this maneuver (Lazarus, Logemann, Song, Rademaker, & Kahrilas, 2002; Poudroux & Kahrilas, 1995).
 - a. This maneuver will not be well visualized with the flexible endoscope due to tissue apposition with the objective lens at the height of the swallow.
 - b. During the post-swallow segment, the clinician may be able to discern the presence or absence of residuals in the pharynx and make an inference as to whether the desired effect was achieved by implementing this maneuver.

4. Double or multiple swallows: This compensatory strategy may be used to eliminate residue following the initial swallow.
 - a. During the post-swallow segment, the clinician may be able to discern the presence or absence of residuals in the pharynx and make an inference as to whether the desired effect was achieved by implementing this maneuver.
 5. Alternating liquids and solids: Alternating liquids may assist in reducing residue from the solid bolus.
 - a. During the post-swallow segment, the clinician may be able to discern the presence or absence of residuals in the pharynx and make an inference as to whether the desired effect was achieved by implementing this maneuver.
 6. Throat clearing/volitional cough: This strategy may assist clearing laryngeal penetration or tracheal aspiration and should be well visualized if the aspirate is in the field of view.
- C. Bolus modifications.
1. Volume change: The quantity of the bolus is modified to determine any preferential effect on swallowing physiology (Bisch et al., 1994; Lazarus et al., 1993; Logemann et al., 1995).
 - a. Visualization of positive or negative effects of volume change may be visualized during the pre-swallow and post-swallow segments.
 - b. Smaller volumes of thin liquids may not overflow the pyriform sinuses and spill into the laryngeal vestibule prior to the initiation of the swallow.
 2. Viscosity change: The consistency of the bolus is modified to determine any preferential effect on swallowing physiology (Bisch et al., 1994; Lazarus et al., 1993).
 - a. Visualization of positive or negative effects of viscosity change may be visualized during the pre-swallow segment.
 - b. Thickened liquids may be noted to flow more slowly and may not spill into the distal pharynx or laryngeal vestibule prior to the initiation of the swallow.
 3. Sensory enhancement.
 - a. Flavor change: Different flavors (i.e., sour, sweet, spicy) are utilized to facilitate lingual motion and/or improve the triggering of the pharyngeal swallow (Logemann et al., 1995, Pelletier & Lawless, 2003).
 - b. Temperature change: The temperature of the bolus may be modified to facilitate lingual motion and/or improve the triggering of the pharyngeal swallow (Bisch et al., 1994).
 - c. Visualization of positive or negative effects of flavor and temperature changes may be visualized during the pre-swallow segment.
 - (1) Sour boluses may be noted to stimulate the pharyngeal swallow more quickly and the bolus may not spill into the laryngeal vestibule or distal pharynx prior to the initiation of the swallow.

Documentation

The FEES report is a medical legal document that requires a thorough description of the entire exam and may also include a record of consent, administration of anesthesia and/or vasoconstrictors, and the presence or absence of adverse events. The report should describe a rationale for recommendations for follow up, including referrals and/or formulation of a treatment plan following the

examination. The documentation will vary depending on the facility or state medical/ legal requirements. The form and style of the report can vary while still satisfying the aforementioned conditions. Checklists and narratives, or a combination of the two, are used most frequently. The report should include an introductory statement, a results section where an objective description of the findings is recorded, an impressions section, and a section for recommendations.

A. Introductory statement.

The introductory statement may include the patient's history, current subjective complaints, and the reason for consultation. The clinician may discuss the pertinent medical and surgical history that is believed to be related to the swallowing disorder and the technical parameters of the examination.

1. Statement of the problem.
2. Reason for consultation.
3. Consent (if required).
4. Pertinent history.
 - a. Medical/surgical.
 - b. Weight and weight history.
 - c. Swallowing.
5. Topical anesthesia/vasoconstrictors (if used) and the type and amount.
6. Type and parameters of endoscope used.
7. Location of examination and position of the patient.

B. Results.

The results section should contain objective statements only. Refer to the protocol section for the range of observable events. Additionally, document the effectiveness of compensatory techniques, postures, maneuvers, sensory enhancements, and bolus modifications.

C. Impressions.

The impressions section should contain subjective statements and should integrate the information that was objectively observed and reported in the results section. The reader expects a full analysis of what can be inferred from the observations, with a diagnostic statement and rationale to support the impression. The impression should project the impact of intervention based on the patient's medical condition, nutrition, and hydration, as well as the impact of differing interventions on the patient's quality of life.

D. Recommendations.

The recommendations section should describe the interventions that are projected to serve the patient best. These may include the following:

1. Method(s) to support nutrition/hydration.
 - Oral, non-oral, combination.
2. Consistency and/or volume of oral intake.
3. Use of compensatory techniques, maneuvers or positioning and supervision, if appropriate.
4. Plan for the use of various techniques to improve swallow function.
5. Plan for re-evaluation.
6. Referrals to other subspecialties.

E. Patient education should be included at the close of the document.

1. Describe the review of the feeding or exercise guidelines and safety issues.
2. Indicate the patient's level of understanding of instructions.
3. Provide information to a caregiver or other surrogate.

Special Issues

4. Describe barriers to education and how they were addressed.

Use of Food Coloring

Some clinicians choose to add blue or green food coloring to test materials used during the FEES (Langmore et al., 1991; Perlman & VanDaele, 1993; Murray et al., 1996; Rao, Brady, Chaudhuri, Donzelli, & Wesling, 2003). One commonly used dye, FD&C Blue No. 1, is a water-soluble dye allowed by the FDA for use in foods, drugs, and cosmetics. Data from life-exposure animal studies support an acceptable daily intake of FD&C Blue No. 1 of 12.0 milligrams/kilogram body weight/day (Food & Drug Administration, 1982). Based upon the acceptable daily intake values, a patient of 120-lb (54-kg) would be permitted 648 mg per day. The dye is batch-certified by the FDA and is widely used in food products (e.g., candies, confections, beverages). During the FEES exam, the dye is employed for the purpose of enhancing the clinician's ability to discern the bolus from surrounding oropharyngeal mucosa or secretions. However, recent research suggests the presence or absence of dye in the bolus material does not affect the reliability of judgments made by clinicians viewing FEES examinations (Leder, Acton, Lisitano, & Murray, in press).

Recently, concerns have been raised regarding the use of blue dye to assist in the detection and/or monitoring of pulmonary aspiration in patients being fed via enteral feeding tubes (Lucarelli, Shirk, Julian & Crouser, 2004). An advisory published by the Food and Drug Administration (2003) cited reports of blue discoloration of the skin, urine, feces, or serum, and other serious complications such as refractory hypotension, metabolic acidosis, and death following the use of blue dye in enteral feedings (Ehrig, Waller, Misra and Twardowski, 1999; Carpenito and Kurtz, 2002; Maloney et al., 2000; Czop & Herr, 2002). Additional concern is raised by reports suggesting that blue dye vials might become contaminated with pathogens that are potentially dangerous to patients. Knoll (1993) reported gram-negative and gram-positive rods were found in open and unopened bottles of dye. In another study, 19 of 20 patients with pseudomonas aeruginosa had received tube feedings that had been tinted from the same common-use bottle of blue dye (File, Tan, Thomson, Stephens & Thompson, 1995). When the hospital replaced the common-use bottle with single use vials, the outbreak cycle stopped.

The amount of blue dye added to test materials used in the FEES is relatively small (1–2 ml) compared to the amount of dye used to stain enteral feeding (up to 5–10 ml), and there have been no reports of adverse outcomes with the use of dye during a FEES (ASHA, 2003). However, before considering the use of FD&C Blue Dye #1, clinicians should review the patient's medical records and determine if the patient has increased risk of absorbing FD&C Blue Dye #1 from the test materials.

Patients at risk include those with —

- sepsis,
- burns,
- trauma,
- shock,
- renal failure,
- celiac sprue,
- inflammatory bowel disease.

Patient Consent

While there have been no reports of adverse reactions associated with the use of dye during the FEES in the aforementioned patient populations, clinicians may choose to use light colored foods with reflective properties in place of the dye. Further, if clinicians do decide to use blue dye, it is strongly suggested that sterile procedures are employed for the storage and administration of the dye to avoid contamination.

Patient consent (as distinguished from “informed” consent) is required for all procedures and is usually obtained during the admission process to a facility or program. The SLP has an ethical responsibility to obtain the patient's consent (either written documentation or oral communication) prior to any treatment or procedure as outlined in the ASHA Code of Ethics (ASHA, 2003). Since legislation and regulations governing the conditions under which informed consent is required vary from state to state, individual facilities should determine if informed consent is required for the FEES procedure and develop policies for obtaining consent. It is important to differentiate “informed consent” from “consent,” since informed consent is not required for all medical treatment. Informed consent is not required for the performance of “simple and common” procedures when the related risks are commonly understood. Informed consent is required for procedures that are complex, invasive, and/or involve the risk of serious injury. The process of obtaining informed consent is one way to ensure that the patient understands the risks and benefits of a treatment or medical intervention (Edwards et al., 1998).

Sensory Testing

Clinicians and researchers alike have struggled with understanding sensory input and its relationship to airway protection and swallowing ability (Langmore, 1998). Researchers have found an association between laryngeal sensation and changes in swallowing physiology (Sulica, Hembree & Blitzer, 2002; Kidd, Lawson, Nesbitt & MacMahon, 1993; Aviv et al., 1998a; Bastian & Riggs, 1999; Jafari, Prince, Kim, and Paydarfar, 2003.) The role of sensation in swallowing remains an important clinical question.

During a FEES examination, sensation is inferred from the patient's response to the presence of residuals in the pharynx and/or penetrated or aspirated materials. Aviv et al., (1998b) introduced an additional component to assess laryngopharyngeal sensation. The fiberoptic endoscopic evaluation of swallowing with sensory testing (FEESST) assesses sensation, followed by the standard swallowing protocol for FEES, and has been used with children (Link et al., 2000) and adults (Cohen et al., 2003).

During the FEESST, the sensory testing is completed by using a flexible fiberoptic endoscope with an instrument channel that allows for the delivery of calibrated puffs of air to the mucosa of the larynx. Sensation is inferred by monitoring the laryngeal adductor reflex (LAR) that is elicited following the delivery of air. The LAR is an involuntary reflex characterized by a brief closure of the true vocal folds. The type of vocal fold movement/closure taking place in response to the air pulse stimulation will be a brief, rapid, nonrhythmic vocal fold adduction. This reflexive vocal cord movement is different from the rhythmic vocal fold movement seen

Presence of a Physician

during normal respiration. The degree of laryngopharyngeal sensory deficit is inferred by the amount of air pressure that is required to elicit the LAR (Aviv et al., 1999).

The Role of the Speech-Language Pathologist in the Performance and Interpretation of Endoscopic Evaluation of Swallowing: Position Statement (ASHA, 2004a) states: “Speech-language pathologists with expertise in dysphagia and specialized training in fiberoptic endoscopy are professionals qualified to use this procedure independently for the purpose of assessing swallowing function and related functions of structures within the aerodigestive tract.” It identifies the role of the physician as “...functional evaluation of swallowing and/or to assess the integrity of the laryngeal and pharyngeal structures in order to render a medical diagnosis.” In addition to ASHA policies, SLPs should be aware of their state laws and regulations regarding the presence of a physician, as well as thirdparty payer requirements.

Use of Anesthesia and Vasoconstrictors

Clinicians may choose to use topical nasal anesthetics alone or in combination with vasoconstrictors to facilitate more comfortable transnasal passage of the flexible endoscope. Topical anesthetics cause reversible interruption of the conduction of impulses in peripheral nerves to the area where the preparation is applied. There are two classes of topical anesthetics, esters and amides. The ester group of anesthetics, such as Pontocaine, (tetracaine) and cocaine, are rapidly broken down in the blood stream. This results in breakdown products that are associated with allergic phenomenon and hypersensitivity reactions. The amide group of anesthetics, such as Xylocaine, (lidocaine), are slowly broken down and metabolized by the liver. This results in extremely rare hypersensitivity reactions (Fisher & Bowey, 1997). In current clinical practice, the use of esters has largely been superseded by the use of amide products.

Vasoconstrictors refer to decongestants such as oxymetazoline hydrochloride, epinephrine (adrenaline), and other over-the-counter products. Vasoconstrictors result in the constriction of small blood vessels to the area of application, causing tissue to shrink and, to a lesser degree, lengthening the effect of topical anesthetic.

Topical anesthesia may be administered as a gel or aerosol spray, and vasoconstrictors are administered as an aerosol spray. It is important to apply the topical nasal anesthesia only to the nasal passages and not to the pharynx. The use of aerosol spray may increase the potential for postnasal drainage into the pharynx, which may compromise the sensory component of the swallow. Appropriate provisions should be available for medical treatment in the case of an adverse patient reaction.

The use of topical nasal anesthesia and/or a vasoconstrictor has been investigated to determine the degree to which it affects patient comfort. There is evidence supporting the use of topical nasal anesthesia alone, topical anesthesia in combination with a vasoconstrictor, and a vasoconstrictor alone as potential ways to increase the patient's comfort during an exam. Although some evidence supports the use of topical nasal anesthesia (Johnson, Belafsky, & Postma, 2003) or a vasoconstrictor for patient comfort (Sadek et al., 2001), other studies showed that topical anesthesia made no difference in patient comfort (Leder, Ross, Briskin, &

Use of FEES in the Pediatric Population

Sasaki, 1997; Sadek et al., 2001; Singh, Brockbank & Todd, 2002), or actually increased the patient's discomfort (Frosh, Jayaraj, Porter, & Almeyda, 1998). In spite of the mixed data, topical nasal anesthesia and/or a vasoconstrictor may facilitate increased comfort or reduced anxiety for some patients in order to allow completion of the examination.

SLPs should be aware of their state licensing board's and local medical facility's policy on administering topical anesthetics/vasoconstrictors. According to ASHA's 1992 technical report, "Sedation and Topical Anesthetics in Audiology and Speech-Language Pathology," collaboration with appropriate medical professionals is required, as topical anesthetics and vasoconstrictors may have undesirable side effects that place patients at risk for adverse medical complications (ASHA, 1992b). Prior to administering any anesthetic or vasoconstrictor, SLPs should review patients' medical records and specifically ask them about any drug allergies and/or sensitivities.

The use of FEES in the pediatric population is proving to be a credible tool in the evaluation of infants and children (Willging, 1995). A study by Leder & Karas (2000) compared swallowing diagnosis and therapy recommendations for pediatric patients based on FEES and VFSS. The investigators, who were blinded to the results of the other procedure (either FEES or VFSS), demonstrated 100% agreement in their diagnosis and recommendations. Pediatric feeding and swallowing problems typically result from a combination of factors.

Gastrointestinal (GI) issues such as gastroesophageal reflux and dysmotility can be responsible for a number of symptoms such as food refusal, poor intake, volume limiting, and dysphagia. The use of FEES is not appropriate for the evaluation of GI problems. Several issues should be considered when adapting the test for pediatric use to optimize results.

- A. Protocol: The following is a listing of aspects of the FEES protocol that are specific to the pediatric population.
 1. Positioning.
 - a. Children need to be positioned in a manner that would avoid spontaneous or reflex movements that could interfere with the safety of the examination (Manrique et al., 2002). Children who are unable to sit unassisted may be stabilized by a parent or caregiver.
 - b. Modification to positioning should be made as needed. Standard infant feeding positions include semi-upright or sidelying and require head, neck, and trunk support. Older children typically will be positioned upright, but positioning will depend on the child's medical status, diagnosis, and overall motor control.
 2. Bolus presentation/feeding.
 - a. Age and developmentally appropriate foods should be provided.

- b. When possible, the child's caregiver should be asked to bring the child's usual formula, foods, bottle and nipple, and utensils as appropriate (Hartnick et al., 2000).
 - c. When needed, adaptive equipment should be utilized. Determine best presentation and delivery (e.g., single swallows vs. sequence of multiple swallows; best utensil).
 - 3. Compensatory strategies.
 - a. Strategies similar to those used in adults may be introduced during the examination with special consideration for developmental appropriateness (see *Therapeutic Intervention/Biofeedback* for further discussion of compensatory strategies).
 - b. Common strategies may include introducing positional alterations to maximize postural support and facilitate swallowing, altering flow rate of liquids, increasing the viscosity of liquids, varying texture, and modifying nipples and bottles (Hartnick et al., 2000).
 - c. The presence of gastrointestinal (GI) symptoms should be noted.
- B. Special Considerations.
 - 1. Instrumentation.

Basic instrumentation for pediatrics is similar to that used with adults (see *Recommended Equipment and Supplies*, above). However, special consideration should be given to smaller nares in this population. The diameter of endoscopes designed for adults ranges from 3.2 to 3.7 mm, while the diameter of endoscopes designed for infants and children is 1.4 to 1.7 mm.
 - 2. Patient and caregiver preparation.
 - a. Children who are cognitively able to understand and their parents and/or caregivers should be educated about the examination and dysphagia. Prior to the FEES, it may be helpful to delay scheduled feedings to maximize feeding readiness and cooperation with the examination. Clinicians are encouraged to collaborate with the medical team on the scheduling of feedings.
 - b. Anxiety and crying may be an expected reaction to the procedure. Anxiety may be reduced by allowing the child to sit on the parent's lap, using distraction (e.g., video) during scope passing, decreasing the number of observers in the room, and giving the child some control over aspects of the examination (Hartnick et al., 2000). Models or toys may also be used for training and/or desensitization. However, if a natural feeding process cannot be achieved, the results may not represent typical swallow function, and the study may need to be terminated.
 - 3. Infants

Because infants are obligate nasal breathers, compromised breathing may result from the placement of an endoscope in one nostril when a nasogastric tube is in place in the other nostril. Clinicians should discuss this with the medical team in order to determine options, including temporary removal of the feeding tube and/or use of another means of swallowing assessment.
 - 4. Topical anesthesia

Concerns regarding the use of topical anesthesia in the pediatric population are similar to those found in adults (see Special Issues, *Use of Anesthesia and Vasoconstrictors* for a more complete discussion on the

use of topical anesthesia). Special care should be taken with medically fragile infants and children. Clinicians are encouraged to consult with the child's medical team prior to using anesthesia with these children.

5. Safety.

A study completed with 68 infants with chronic encephalopathy revealed no complications from the FEES examination (Manrique et al., 2002).

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