Use of flexible endoscope during evaluation of swallowing

Zastosowanie endoskopu giętkiego w diagnostyce zaburzeń połykania

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ABSTRACT: FEES (fiberoptic endoscopic examination of swallowing) is a modern diagnostic tool for the evaluation of patients with swallowing disorders. It allows for the assessment of structure and function of the nose, pharynx, and larynx as well as for the evaluation of swallowing of foods differing in consistency (during the examination at least three consistencies are tested—liquids, puree, solids). The possibility to assess the degree of residue and to estimate the risk of aspiration is essential for the subsequent planning of rehabilitation and dietary recommendations that are suited to individual patients. FEES is safe and well tolerated by patients, and together with videofluoroscopy, should be routinely applied in the diagnostic work-up of dysphagia.

KEY WORDS: dysphagia, FEES, swallowing problems, aspiration, penetration, residues

INTRODUCTION
Disorders of swallowing are an interdisciplinary problem that is found in the clinical practice of laryngologists as well as neurorologists, gastroenterologists, pulmonologists, and surgeons. Patients with swallowing disorders are often malnourished, which may result in a less favorable treatment outcome of the underlying disease. Moreover, some of those patients are at risk of aspiration pneumonia.

In Poland, the barium swallow test constitutes an integral part of the routine diagnostic workup. However, elsewhere in the world, the fiberoptic endoscopic examination of swallowing (FEES) has become the gold standard in such cases. This endoscopic procedure was first described in 1988 by Susan Langmore (1), but the complete protocol was not established until 2001 (2). The protocol divides the examination into three parts: I—evaluation of the structure and function of the pharynx and larynx; II—evaluation of swallowing of saliva and foods of different consistency; III—evaluation of the efficacy of therapeutic interventions. One of the most important goals of FEES is to look for “silent dysfunctions” that increase the risk of aspiration pneumonia. These are:

- Premature swallowing—bolus enters the base of the tongue or goes below it before the initiation of swallowing;
- Delayed or absent swallow reflex;
- Aspiration—bolus moves below the vocal cords;
- Residue—bolus remains in the pharynx after swallowing.
The aim of this article is to describe FEES the way it is performed in patients with disorders of swallowing in the Department of Otolaryngology, Medical University of Warsaw.

PART I: EVALUATION OF STRUCTURE AND FUNCTION OF THE PHARYNX AND LARYNX

While performing FEES, a flexible endoscope is inserted through the nose and nasopharynx to the oropharynx where the base of the tongue, larynx, and piriform sinuses are seen. During the procedure, local anesthetics (e.g. lidocaine gel) should not be used as by numbing the examined structures they can interfere with the evaluation (2,3). First, the following abnormalities are looked for:

- Structural abnormalities of the nose, nasopharynx, oropharynx, laryngopharynx and larynx (Fig. 1)
- Nasopharyngeal insufficiency during swallowing and phonation
- Disorders of the constrictive function of the larynx during cough, Valsalva maneuver, and swallowing
- Abnormal movements of the vocal cords during breathing and phonation
- Abnormal squeeze maneuver (closure of the side walls of the pharynx on loud phonation, Fig. 2 and 3)

Subsequently, the number of spontaneous swallows within one minute is counted. The rate of one swallow per 2 minutes is considered to be normal. However, due to the presence of fiberscope at least 2 or 3 swallows should be observed within 1 minute, and at least 1 swallow in the elderly.

PART II: EVALUATION OF SWALLOWING OF SALIVA AND FOODS OF DIFFERENT CONSISTENCY

The next part of FEES is the evaluation of swallowing of saliva and foods of different consistency: liquid, purée, and solid (Fig. 4-8). The patient swallows each type of food 15 times, which gives approximately 60-70 swallows during the entire examination. This is important because some abnormalities will not be evident until certain time has elapsed since the commencement of swallowing.

First, the patient swallows saliva followed by boluses of liquids, purée, and solids (2,3). At the same time, the examining physician looks for “silent dysfunctions” including bolus residue in the piriform sinuses, epiglottic valleculae, and in the larynx. Kelly et al. (4) propose that bolus residue can be graded on the following scale used during videofluoroscopy: N (none) – no
residue; C (coating) – no reside but food present on the mucous membranes; Mi – mild residue; Mo – moderate residue; and S – severe residue of clinical significance.

Subsequently, the risk of aspiration is assessed with the use of the Penetration-Aspiration Scale (PAS) created by Rosenbeck et al. in 1996 (2, 5). They defined penetration and aspiration as bolus advancing to the larynx above or below the level of vocal cords, respectively. PAS is an eight-grade scale where grade 1 is assigned when a bolus does not advance to the airways, whereas grade 8 means that the bolus advances below the level of vocal cords without any attempt to expectorate (Table 1). For full PAS assessment, the clearance function according to Murray’s criteria should be evaluated as well (2,6). The clearance function is described as effective, partially effective, or ineffective (criteria a-c, Table 2).
depending on the location of residue and whether the bolus is expectorated. In both cases the worst score observed on FEES is assigned.

The last step of FEES is the FEDSS-based (Fibreoptic Endoscopic Dysphagia Severity Scale) determination of the severity of dysphagia (2, 3). Depending on the size of residue, presence of bolus aspiration or bolus penetration, and bolus consistency, patients are assigned to appropriate groups (level 1 to 6) for which different diets are recommended. Because the scale (Table 3) was originally created for neurological patients (primarily stroke patients), its application in different types of patients (e.g. in patients who undergo neck surgery) is not always possible. However, the scale is helpful when planning the rehabilitation program or making dietary recommendations.

Table 1: Penetration-aspiration Scale

<table>
<thead>
<tr>
<th>LEVEL</th>
<th>EFFECTIVENESS OF CLEARANCE</th>
<th>DESCRIPTION</th>
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<tbody>
<tr>
<td>1</td>
<td>Material does not enter airway.</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Material enters the airway, remains above the vocal folds, and is ejected from the airway.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Material enters the airway, remains above the vocal folds, and is not ejected from the airway.</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Material enters the airway, contacts the vocal folds, and is ejected from the airway.</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Material enters the airway, contacts the vocal folds, and is not ejected from the airway.</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Material enters the airway, passes below the vocal folds, and is ejected from the larynx or out of the airway.</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Material enters the airway, passes below the vocal folds, and is not ejected from the trachea despite effort.</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Material enters the airway, passes below the vocal folds, and no effort is made to eject.</td>
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Table 3: Fiberoptic Endoscopic Dysphagia Severity Scale (FEDSS)

<table>
<thead>
<tr>
<th>FEDSS PROTOCOL</th>
<th>MAJOR ABNORMALITIES</th>
<th>CLINICAL CONSEQUENCES</th>
</tr>
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<tbody>
<tr>
<td>Saliva</td>
<td>Penetration / aspiration</td>
<td>Level 6 Oral feeding impossible, gastrostomy, consider intubation</td>
</tr>
<tr>
<td>Puree</td>
<td>Penetration / aspiration with or without ineffective defense reflexes</td>
<td>Level 5 Oral feeding impossible, gastrostomy</td>
</tr>
<tr>
<td>Puree</td>
<td>Penetration / aspiration with effective defense reflexes</td>
<td>Level 4 Gastrostomy, oral feeding during speech therapy</td>
</tr>
<tr>
<td>Liquid</td>
<td>Penetration / aspiration with or without effective defense reflexes</td>
<td>Level 4 Gastrostomy, oral feeding during speech therapy</td>
</tr>
<tr>
<td>Liquid</td>
<td>Penetration / aspiration with effective defense reflexes</td>
<td>Level 3 Oral feeding with puree, intravenous fluids</td>
</tr>
<tr>
<td>Solid</td>
<td>Penetration / aspiration with massive residue in epiglottic vellaculae and/or in piriform sinuses</td>
<td>Level 2 Oral feeding with puree and fluids</td>
</tr>
<tr>
<td>Solid</td>
<td>No penetration / aspiration and mild or moderate residue in epiglottic vellaculae and/or in piriform sinuses</td>
<td>Level 1 Oral feeding with light foods and fluids</td>
</tr>
</tbody>
</table>

All patients with disorders of swallowing should undergo physiotherapy as well as neurological speech therapy, which involve teaching patients to use maneuvers that facilitate swallowing as well as additional feeding techniques, manual therapy, and posture therapy. Patients should also be provided with specialist dietary recommendations. The rehabilitation program and dietary recommendations should be tailored to individual patients’ needs taking into consideration their specific structural and neurological dysfunctions as well as general condition.

PART III: EVALUATION OF EFFICACY OF THERAPEUTIC INTERVENTIONS

FEES can be used in order to evaluate the efficacy of therapeutic interventions in patients with swallowing disorders. FEES allows to determine the effectiveness of speech therapy as well as physiotherapy that are indispensable to the treatment of such patients.

CONCLUSIONS:

FEES is a modern diagnostic tool that can be used by the laryngologist-phoniatrist. It allows to evaluate not only the structure and function of the nose, pharynx, and larynx, but also to assess the effectiveness of swallowing of foods differing in consistency. FEES enables one to determine the risk of silent aspiration, that can be life-threatening. For that reason,
FEES should become a part of the workup in all patients with difficulties in swallowing.

Not only is FEES useful in the evaluation of rehabilitative efficacy, but it also aids in the preparation of dietary recommendation for patients with dysphagia. Malnourishment is a risk factor for serious complications such as an impaired healing of surgical wounds.

FEES is safe and well tolerated by patients. Nose bleeding occurs only in approximately 6% of cases but it does not require any intervention (2).

References