A New Trend in the Management of Esophageal Foreign Body: Transnasal Esophagoscopy

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Abstract

Objectives. (1) To analyze the outcomes of patients with esophageal foreign body managed by transnasal esophagoscopy. (2) To review the value of lateral neck X-ray.

Study Design. Case series with chart review.

Setting. Tertiary referral center, Shin Kong Wu Ho-Su Memorial Hospital, Taipei, Taiwan.

Subjects and Methods. Lateral neck X-ray was used for initial screening in patients suspected of having an esophageal foreign body between 2007 and 2013. Rigid esophagoscopy was used as standard for further investigations before July 2010 and transnasal esophagoscopy after July 2010.

Results. From January 2007 to June 2010, 43 patients who were suspected of having an esophageal foreign body underwent lateral neck X-ray, of whom 31 (72.1%) were found to have an esophageal foreign body. From July 2010 to December 2013, 302 patients underwent transnasal esophagoscopy, and an esophageal foreign body was noted in only 52 (17.2%) of these patients. In the 302 patients who underwent transnasal esophagoscopy, the sensitivity and specificity of having an esophageal foreign body by lateral neck X-ray were 59% and 83%, respectively.

Conclusion. The introduction of transnasal esophagoscopy has changed the diagnosis and management for an esophageal foreign body. Transnasal esophagoscopy is a quick and safe procedure that can be performed under local anesthesia. Transnasal esophagoscopy could replace lateral neck X-ray to become the initial screening procedure and a useful treatment for patients with an esophageal foreign body.

Keywords
esophageal foreign body, transnasal esophagoscopy, rigid esophagoscopy, lateral neck X-ray

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the local findings for each case. Mirror examination or laryngoscopy was used for each case to evaluate the pharynx and the larynx to see if a FB was present.

Patients received rigid esophagoscopy for a suspected EFB before June 2010. However, after the introduction of TNE, the policy for the management of an EFB changed. As before, each patient who presented with a suspected EFB received a lateral neck X-ray in the emergency room and was then evaluated by an otolaryngologist. If no FB was found in the pharynx or larynx, the patient then received TNE instead of rigid esophagoscopy to see if an EFB was present. We reviewed all patients’ files with full notations for the following data: age, sex, type of FB, anatomic location of the FB, treatments, and outcomes (complications and success and mortality rates). All statistics were analyzed by chi-square test.

**Transnasal Esophagoscopy Technique**

Intranasal anesthesia and decongestion were achieved using a solution comprising half 2% lidocaine and half 0.1% epinephrine, followed by a short spray of 10% lidocaine to the oropharynx. During each examination, the patients were fully awake and sitting upright. In this study, all TNE procedures were performed with a Pentax flexible endoscope (VE-1580K, Pentax Precision Instrument Co, Orangeburg, New York). A lidocaine gel was used as a lubricant on the endoscope.

As the examination began, the endoscope was advanced along the patent side of the common meatus into the nasopharynx and turned inferiorly to allow visualization of the oropharynx and supraglottic area. The endoscope was guided into the pyriform sinus; the patient was then asked to burp and swallow the endoscope to examine the postcricoid area; and the endoscope was finally gently pushed into the esophagus. The entire length of the esophagus was evaluated until the gastroesophageal junction. Slow withdrawal of the endoscope allowed for reevaluation of the esophagus and the postcricoid area.

If an EFB was observed under TNE, it was removed by grasping with forceps via the walking channel. In cases where the EFB was too large or sharp or where esophageal laceration was observed with suspected possible perforation, rigid esophagoscopy was arranged to remove the EFB (Figure 1).

**Results**

From January 2007 to June 2010, 43 patients who were suspected of having an EFB after examination by an otolaryngologist and lateral neck X-ray (27 men and 16 women; mean age, 53.26 years; range, 18 to 74 years) received rigid esophagoscopy. All lateral neck X-rays showed a suspected EFB, and 72.1% (31 of 43) of the patients were found to have an EFB, all of which were removed successfully via rigid esophagoscopy. No major complications (eg, mediastinitis, perforated esophagus) were noted after rigid esophagoscopy. Under rigid esophagoscopy, 21 EFBs were found in the cervical esophagus and 10 in the intrathoracic esophagus. Under TNE, 24 EFBs were found in the cervical esophagus, 19 in the intrathoracic esophagus, and 9 in the abdominal esophagus near the gastroesophageal junction. There was a significant difference in the location of the EFB before and after TNE ($\chi^2 = 7.1367, df = 2, P = .0282$).

All 345 patients received lateral neck X-rays. The reports from the radiologist were reviewed and compared to the

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**Table 1.** Type of Foreign Body.

<table>
<thead>
<tr>
<th>Type</th>
<th>n</th>
<th>%</th>
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</thead>
<tbody>
<tr>
<td>Fish bone</td>
<td>41</td>
<td>49.4</td>
</tr>
<tr>
<td>Chicken bone</td>
<td>20</td>
<td>24.1</td>
</tr>
<tr>
<td>Pork bone</td>
<td>12</td>
<td>14.5</td>
</tr>
<tr>
<td>Food bolus</td>
<td>4</td>
<td>4.8</td>
</tr>
<tr>
<td>Pill with wrapper</td>
<td>3</td>
<td>3.6</td>
</tr>
<tr>
<td>Tooth</td>
<td>1</td>
<td>1.2</td>
</tr>
<tr>
<td>Tablet</td>
<td>1</td>
<td>1.2</td>
</tr>
<tr>
<td>Coin</td>
<td>1</td>
<td>1.2</td>
</tr>
<tr>
<td>Total</td>
<td>83</td>
<td>100</td>
</tr>
</tbody>
</table>

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July 2010 to December 2013. All 302 patients underwent TNE because there was no evidence of an FB seen in the pharynx or larynx either by local findings or by lateral neck X-ray. Of these 302 patients, 52 (17.2%) were found to have an EFB, 36 (69.2%) of whom had the EFB removed directly under TNE either by forceps removal ($n = 21$) or by advancement down into the stomach ($n = 15$). The remaining 16 (31.8%) patients had the EFB removed via rigid esophagoscopy because of a large or sharp EFB or a possibly perforated esophagus; these EFBs included 8 fish bones, 3 chicken bones, 2 pork bones, and 3 pills (Table 1). None of the patients who received TNE or rigid esophagoscopy had any major complications.

Under rigid esophagoscopy, 21 EFBs were found in the cervical esophagus and 10 in the intrathoracic esophagus. Under TNE, 24 EFBs were found in the cervical esophagus, 19 in the intrathoracic esophagus, and 9 in the abdominal esophagus near the gastroesophageal junction. There was a significant difference in the location of the EFB before and after TNE ($\chi^2 = 7.1367, df = 2, P = .0282$).

All 345 patients received lateral neck X-rays. The reports from the radiologist were reviewed and compared to the
results of TNE or rigid esophagoscopy. The sensitivity of lateral neck X-rays was 59.0%, meaning that 49 patients presented with true EFBs according to lateral neck X-rays (a total of 83 EFBs). Most true EFBs not seen in lateral neck X-ray were radiolucent fish bones (29 of 34). Ninety-four cases of an EFB were seen in lateral neck X-rays, 49 of which were true EFBs. The positive predictive value of lateral neck X-ray was 52.1% (49 of 94), with a specificity of 82.8% (217 of 262). There was a significant statistical difference between lateral neck X-ray and esophagoscopy (P < .0001; Table 2). In addition, among the 302 patients who received TNE, an EFB was not found in 251 lateral neck X-rays; however, 34 of these 251 (13.5%) were found to have an EFB in TNE.

**Discussion**

FB ingestion and food bolus impaction are common. The majority of ingested FBs will pass spontaneously, and preendoscopic studies have shown that ≥80% of foreign objects will likely pass without the need for an intervention.

The esophagus is divided into 3 parts anatomically: the cervical, intrathoracic, and abdominal esophagus. There are 3 external compressions of the esophagus relative to the nasal ala: the aortic arch at 24 to 26 cm, the left mainstem bronchus at 29 to 30 cm, and the diaphragmatic hiatus at 41 to 43 cm. In the current study, most EFBs were found in the cervical esophagus (45 of 83), and there was a significant difference in the location of the EFB before and after the introduction of TNE (P = .0282). Before the era of TNE, it was difficult to evaluate the intrathoracic and abdominal esophagus because of a lack of suitable instruments and because the patients would visit a gastroenterologist for further evaluation. After the introduction of TNE, an EFB in the intrathoracic and abdominal esophagus can easily be diagnosed and managed.

In the current study, 302 patients were suspected of having ingested an FB but did not have evidence of a pharyngeal or laryngeal FB in local findings or lateral neck X-ray. Of these 302 patients, 52 (17.2%) were found to have an EFB by TNE.

When a patient presented with suspected FB ingestion, an otolaryngologist was first consulted to evaluate the patient’s upper aerodigestive tract. Traditionally, local findings, laryngoscopy, and lateral neck X-ray are used to initially evaluate the patient. If an EFB was suspected from the lateral neck X-ray, rigid esophagoscopy was suggested. However, the patient would have to be placed under general anesthesia and would not be allowed to consume anything for 8 hours. In addition, sophisticated patient monitoring and skillful assistants would be required in the operation room. If a lower-third EFB was suspected, we suggested that the patient should visit a gastroenterologist for further endoscopic evaluation. The limitation of rigid esophagoscopy is that it is hard to reach the abdominal esophagus. Some patients choose observation first even if an EFB is present on lateral neck X-ray. After the introduction of TNE, otolaryngologists were able to save time and costs not only when evaluating the esophagus but also in managing the EFB directly. Although the number of patients who received TNE increased and 17.2% were found to have an EFB, the misdiagnosis rate decreased, and potentially prolonged EFB, esophageal perforations, and mediastinitis were prevented. In Taiwan, potential legal disputes can arise if an EFB is not found at the first visit, and TNE can help prevent this.

The advantages of TNE include the use of topical anesthesia, its being an office-based and cost-saving procedure, and the time of fasting being reduced to 2 hours or less, if done immediately. The patients are placed in an upright position, and it is possible to secure the airway and prevent secretion or food aspiration. Patient discomfort was encountered, including nausea, vomiting, epistaxis, and blood-tinged sputum; however, all patients tolerated the procedure, and all symptoms were relieved within 1 hour after the examination.

The majority of EFBs can be removed directly under TNE either by forceps through the nose or throat or by advancement down into the stomach. However, 31.8% of the EFBs diagnosed from TNE required removed via rigid esophagoscopy owing to a large or sharp FB or possibly perforated esophagus. TNE reduced the rate of rigid esophagoscopy from 100% to 31.8%.

Several studies discussed complications with regard to EFB, and a few studies reported major complications, such as mediastinitis and esophageal perforation. In our study, there were no major complications in the patients who received either TNE or rigid esophagoscopy. In our experience of TNE, minor complications such as epistaxis and pharyngeal or laryngeal mucosal erosion are most commonly encountered. However, all of the patients tolerated them, and the symptoms improved within 1 hour before leaving the hospital.

Although some studies emphasized the importance of imaging studies for an EFB, we found that the majority of EFBs were radiolucent, and the sensitivity and positive predictive value of lateral neck X-rays were only 59.0% and 52.1%, respectively. People in Taiwan like to eat freshwater fish such as *Chanos chanos* and *Oreochromis mossambicus*, which contain numerous thin, tiny, and radiolucent bones that may result in an increased risk of fish bone ingestion compared to other studies.

The location of the EFB reflects the diagnostic difficulty from an X-ray point of view. Most EFBs are seen in lateral neck X-rays at the cervical esophagus, presenting as either a

### Table 2. Lateral Neck X-ray Findings, n (%).

<table>
<thead>
<tr>
<th></th>
<th>True EFB</th>
<th>No EFB</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>EFB in X-ray</td>
<td>49</td>
<td>45</td>
<td>94 (27.2)</td>
</tr>
<tr>
<td>No EFB in X-ray</td>
<td>34</td>
<td>217</td>
<td>251 (72.8)</td>
</tr>
<tr>
<td>Total</td>
<td>83 (24.1)</td>
<td>262 (75.9)</td>
<td>345 (100)</td>
</tr>
</tbody>
</table>

Abbreviation: EFB, esophageal foreign body.

*Lateral neck X-ray compared to esophagoscopy: χ² = 53.628, df = 1, P < .0001.*
radiopaque lesion or an air column. A thoracic EFB often hides behind the mediastinal organ and is difficult to detect on an X-ray. Computed tomography provides more information for thoracic EFBs; however, it is more expensive and not cost-effective, because of the low positive rate. The cost of TNE is about US $33, and the cost of lateral neck X-ray about US $20 according to the National Health Insurance Bureau in Taiwan; however, the diagnostic value of TNE is much higher than lateral neck X-ray.

**Conclusion**

FB ingestion is a common problem in otolaryngology daily practice. It was difficult for otolaryngologists to evaluate the esophagus before the era of TNE; however, TNE now offers a direct and immediate solution to help evaluate the esophagus for the patients presenting without an FB in their upper aerodigestive tract. Patients need to receive only topical anesthesia, and they spend less fasting time than that before the introduction of TNE. In this study, TNE reduced the rate of rigid esophagoscopy from 100% to 31.8%, and it was found to be superior to lateral neck X-rays because of their low sensitivity and specificity. Because of the common habit of eating freshwater fish in Taiwan, most FB ingestion is fish bone related, and the majority of cases are radiolucent. Therefore, TNE is a more efficient and effective method that can be a first-line tool to evaluate an EFB.

**Author Contributions**

Chun-Wen Shih, wrote article, collected data, and conducted analysis; Chung-Yu Hao, interpreted data, drafted article; Yu-Jung Wang, collected data, conducted analysis, revised article; Sheng-Po Hao, revised article, designed study, gave final approval.

**Disclosures**

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**References**