Radiologic examination - first choice for investigating swallowed foreign objects

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Learning objectives

To discuss the utility of plain radiography and contrast esophagogram in the evaluation of patients suspected of foreign body ingestion. To discuss the prevalence, pathophysiologic features and complications associated with foreign body ingestion.

Background

Foreign body ingestion is a frequent occurrence with both children and adults; however, the type of foreign body differs depending on the patient's age and eating habits. In the case of adult subjects, it can be correlated with predisposing factors, preexisting pathological conditions or injurious situational problems (e.g. drugs or alcohol abuse, engaging in criminal activities or in extreme sporting activities, victims of child or spousal abuse)[1].

Accidental ingestion accounts for most cases and is commonly seen in children and elderly people, patients with dentures, mentally handicapped individuals, and alcohol abusers. Intentional foreign body ingestion occurs in prisoners, patients with underlying psychosis, and persons who attempt suicide [2].

Most of all swallowed objects pass through the gastrointestinal tract without a problem [3]. Elongated or sharp objects are more likely to become entrapped at areas of esophageal narrowing (upper/lower esophageal sphincter, the level of the aortic arch) or to impinge at regions of anatomic acute angulation [1]. After reaching the stomach, a foreign body has greater than a 90% chance of passage. [4]

Plain radiographs are indicated for every patient with a known or suspected radiopaque foreign body in the oropharynx, esophagus, stomach, or small intestine. If the presence of a nonradiopaque object is suspected after the initial series of radiographs is obtained, contrast material studies with barium sulfate suspension are indicated to rule out a radiolucent foreign body. Further evaluation with CT may be required to determine the presence and extent of complications (mediastinitis versus mediastinal abscess formation, peritonitis) [4, 5].

Findings and procedure details

Between January 2011 and May 2013, 193 adult patients were investigated in our department. In 135 patients a foreign body was identified, with radiopaque foreign
bodies being found in 94 patients. 33 patients had preexisting esophageal pathological conditions. 57 patients had complete esophageal obstruction.

The types of foreign bodies found in the upper GI tract varied greatly, mainly including fish bones (Fig. 1, 2, 3), food-bolus impactions, chicken bones (Fig. 4) and dental prostheses (Fig. 5). Most of them were sharp and smaller than 5 cm (Table 1) (Fig 6).

<table>
<thead>
<tr>
<th>Category</th>
<th># of cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fish bone</td>
<td>43</td>
</tr>
<tr>
<td>Food bolus</td>
<td>32</td>
</tr>
<tr>
<td>Chicken bone</td>
<td>28</td>
</tr>
<tr>
<td>Dentures</td>
<td>15</td>
</tr>
<tr>
<td>Fruit kernels</td>
<td>9</td>
</tr>
<tr>
<td>Needle</td>
<td>5</td>
</tr>
<tr>
<td>Pig bone</td>
<td>2</td>
</tr>
<tr>
<td>Unidentified</td>
<td>1</td>
</tr>
</tbody>
</table>

**Table 1:** Types of foreign bodies

The majority of foreign bodies are located in the upper GI tract, mostly as a direct consequence of the patients presenting themselves to the clinic immediately after the incident. There are, however, cases where the foreign body may travel the entire digestive system and has reached the colon (Fig. 7, 8, 9, 10) by the time it is identified on radiographic examination (Fig. 21).
Large food boluses may lead to complete obstruction of the oropharynx or esophagus (Fig 11). Other foreign objects, depending on their specific characteristic (such as shape and size) may cause partial obstructions in the pharynx or esophagus (Fig. 12, 13, 14, Fig. 22). Elongated or sharp objects, such as fish bones, needles, bobby pins, or razor blades, are more likely to lodge at areas of narrowing (from bowel adhesions or strictures) or to impinge at regions of anatomic acute angulation (Fig. 15). Large spherical or cylindrical objects may pass through the esophagus only to be halted at the pylorus.
Benign strictures (Fig. 16, 17), malignancies (Fig. 18) or previous oropharyngeal or esophageal surgery (Fig. 19) were considered a predisposing factor for food impaction in 33 of our patients (Fig. 20). One of the study patients had an established diagnosis of psychiatric disease, but claimed that the ingestion was accidental.

Laryngoscopy and endoscopic intervention are the main course of action. Nevertheless, there are cases when endoscopy fails to visualize a small impacted fish bone, especially if it is surrounded by mucosal oedema. Sometimes several examinations are performed in order to remove it, yet the failure rate can be up to 7.5% depending on the patient's compliance [6]. The proposed management in this situation is 'watch and wait' - wait for the bone to dislodge, thoroughly watch for complications.

Images for this section:
Fig. 1: Linear radiopaque 15/2mm fish bone probably lodged into the left lateral pharyngeal wall.
Fig. 2: Thread-like radiopaque foreign body, 10-12mm in length, in the aryepiglottic fold.
**Fig. 3:** Fine linear radiopaque body in a patient with exuberant anterior cervical osteophytosis.

**Fig. 4:** 2.5x1cm esophageal radiopaque chicken bone.
**Fig. 5:** Dental prosthesis stuck in the hypopharynx.

**Fig. 6:** Radiotransparent oval foreign body positioned vertically in the esophagus (plum kernel).
Fig. 7: 2cm linear radiopaque object in the right iliac fossa (needle in the cecum).
Fig. 8: Radiopaque foreign body with a smooth curved contour (denture) located in the inferior abdomen, to the left of the spine (stomach/small intestine).
Fig. 9: Mobile radiopaque foreign body (dentures) at the pyloric antrum.
Fig. 10: Patient with indication for lumbar spine radiography, no history of foreign body ingestion. On lateral view, a metallic foreign body at the L2-L3 intervertebral space is identified. Thirty minutes later, on the antero-posterior view the pin appears to have travelled to the level of the L4 vertebrae (descending colon).
Fig. 11: Complete esophageal obstruction at the aortic arch level with discrete overlying stasis.
Fig. 12: Radiotransparent foreign body in the pharyngo-esophageal junction (food bolus).
**Fig. 13:** 6cm radiotransparent foreign body with overlying stasis and restricted flow of contrast medium (food bolus).

**Fig. 14:** Almost total obstruction of the esophagus (2.4x1.3cm food bolus).
Fig. 15: 1.5mm radiotransparent foreign body lodged at the cardia level with partial obstruction.

Fig. 16: Radiotransparent foreign body with complete obstruction, in a patient with benign esophageal stenosis.
**Fig. 17:** Patient with a history of post-caustic stenosis. Complete obstruction caused by food bolus.
**Fig. 18:** Patient with a history of laryngeal neoplasm surgery and tracheostomy tube. Food bolus lodged in the hypopharynx with restricted flow of contrast medium.
Fig. 19: Patient with esophagoplasty with colon. 4x2cm radiotransparent foreign body with complete obstruction.

Fig. 20: Radiotransparent foreign body at the bronchial narrowing of the esophagus; reduced esophageal lumen (as narrow as 6mm) starting at the level of the aortic arch - caudal extension could not be determined due to patient's lack of compliance.
Conclusion

Early recognition and treatment of foreign body ingestion is imperative due to serious and potentially life-threatening complications. It is therefore important that the patient’s medical history be available for the radiologist to assist in the diagnostic evaluation.

Radiographic examination is a rapid initial screening method that directs the course of treatment for these patients. It is essential in the evaluation of patients with ingested foreign bodies, especially in cases where endoscopy fails to identify the object (due to mucosal edema, laceration, bleeding).

Personal information

References