The Disappearing Act

Brittany’s Case

Brittany, an 18-month-old girl, presents to the ED with suspected ingestion of a key. She had been playing with her mother’s keys at the grocery check-out earlier that morning. The key to the filing cabinet is now missing, and her mother is worried that she may have swallowed it.

Brittany is otherwise well. She has had no vomiting and eagerly ate her snack. Past medical history reveals an unremarkable pregnancy with no complications and no past hospitalizations or surgeries.

On examination, Brittany appears well. Vitals are normal with a temperature of 37.2°C, a heart rate of 112 bpm, a respiratory rate of 26 breaths/min, and blood pressure at 90/45 mmHg. Cardiorespiratory and abdominal examinations were unremarkable.

Read on for more on Brittany.

Questions and Answers

1. *Where could it go?*

   While many searches for suspected foreign body (FB) ingestions will prove fruitless, any object that disappears down a child’s oral cavity has two possible routes: trachea or esophagus. Objects are twice as likely to enter the esophagus as the airway.¹

   Most swallowed objects will pass through the digestive system uneventfully once they reach the stomach. There are three common sites of impaction in the esophagus: the thoracic inlet, where the cricopharyngeus membrane sits at the upper esophageal sphincter (60 to 70%); the mid-esophagus, where the aortic arch and carina overlap on x-ray (10 to 20%); and the lower esophageal sphincter (20%).² Beyond the esophagus, passage of an ingested object may be held up by the pyloric sphincter, duodenal sweep, or ileocecal valve. The swallowing of button batteries and magnets is of particular concern. Button batteries impacted in the esophagus cause tissue damage due to pressure, electrical current, and caustic substances. Multiple magnets may adhere to one another at different intestinal points, creating a lead point for intussusception. Rare earth magnets, such as neodymium have been associated with perforation, peritonitis, and death.

   Between 80 and 90% of aspirations occur in the bronchus, particularly the right, due to its vertical orientation, slightly larger diameter, and greater air flow to the right lung.¹ The larynx is the least likely site for an FB, but it poses the most danger due to the risk of complete obstruction.³ About 95% of patients who aspirate experience a choking episode, regardless of symptoms at the time of presentation.
2. How common is FB ingestion?

FB ingestion is relatively common in children under three as they explore objects by putting them in their mouths. While food, such as nuts and seeds, is the most commonly aspirated material, coins are the most commonly swallowed FB.2

3. How might the child present?

Children may be asymptomatic after FB ingestion or aspiration and may only be brought in after reporting it to the caregiver, or after-the-fact when the passed object is discovered in stool (see Table 1).2 Symptom presentation may provide clues that could help localize the object.

4. What initial investigations should be done?

Appropriate investigations depend upon the child’s symptoms and object characteristics, but history and radiography are most important, as impaction can present with few acute physical signs.3 After initial management of any airway, breathing, or circulatory instability, pertinent aspects of the history include signs and symptoms of choking, persistent cough or respiratory distress, size and shape of the suspected object, time of suspected ingestion, and vomiting and bowel movements. The physical examination should include assessment of the airway and oropharynx and chest and abdominal exam.

A radiographic foreign body survey should include anteroposterior and lateral abdominal and chest radiographs that go as high as the neck. Objects in the esophagus often present en face on the AP view; objects in the trachea are often en face on the lateral view (sagittal plane).2 Orthogonal views are needed to characterize the object and detect whether more than one object is present.

Table 1

<table>
<thead>
<tr>
<th>Location</th>
<th>Symptoms</th>
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<tbody>
<tr>
<td>Esophagus</td>
<td>Dysphagia, Gagging, Drooling, Emesis</td>
</tr>
<tr>
<td>Airway</td>
<td>May be asymptomatic, Stridor, Wheeze, Cough, Hemoptysis, Increased work of breathing</td>
</tr>
<tr>
<td>Stomach and Beyond</td>
<td>Usually asymptomatic, Abdominal pain, Hematochezia, Perforation</td>
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Back to Brittany

After a thorough history and an unremarkable physical examination, including abdominal exam, Brittany was sent for plain radiographs of the chest and abdomen to determine the presence of any keys. Plain film revealed a key in the stomach. Asymptomatic, Brittany was sent home with her mother to be managed conservatively. She was advised to return for reassessment if she developed abdominal pain, vomiting, or rectal bleeding.

Figure 1: Foreign body survey demonstrating a key in the stomach
Hand-held metal detectors can be used to identify whether an ingested metallic FB, particularly a coin, is above or below the diaphragm. When a radiolucent esophageal FB is suspected, barium esophagography may be necessary. When perforation is suspected, diatrizoic acid is the contrast of choice. Ultrasound, CT, and MRI are generally unnecessary.

If aspiration is suspected, inspiratory and expiratory views are helpful to look for indirect signs of a FB. Direct visualization of an airway FB on x-ray is unusual, since most aspirated materials are organic and radiolucent. Indirect signs, such as unilateral air trapping or atelectasis, may be the only sign of a retained FB. In children, lateral decubitus views are too insensitive to be useful.

How do you manage foreign body aspiration or ingestion?

Initial management steps vary according to the location of the suspected FB. Any object localized to the airway requires more aggressive management with urgent laryngoscopy or bronchoscopic removal. The most sensitive feature of FB aspiration is the history of a choking episode. Even in the setting of a normal examination and normal x-rays, a history compatible with aspiration warrants immediate consultation with ENT.

Once beyond the duodenal sweep, 85% of swallowed FBs are cleared within three days. Objects stuck in the oropharynx can usually be removed using Magill forceps. Induced vomiting is not recommended. Asymptomatic, impacted FBs in the distal third of the esophagus can be observed up to 24 hours after ingestion. Urgent endoscopy is needed for symptomatic patients, impacted button batteries, very sharp objects (e.g., sewing needles), and prolonged esophageal impaction of a benign object, such as a coin. Successful removal of the FB should be followed by esophagography to assess for perforation. Multiple magnets are a special case warranting immediate consultation.

Techniques used in adults with esophageal food boluses (e.g., glucagon) are not effective for impacted FBs in children. Heimlich manoeuvre or finger sweeping in an asymptomatic child without respiratory distress is not recommended, as it may force the FB distally to cause complete obstruction. Chest physiotherapy and bronchodilators can also lead to obstruction.

What are some complications of foreign body ingestion?

Any retained FB may result in mucosal erosion, perforation, obstruction, abscess, stricture, fistula formation (i.e., aorto-esophageal), or peritonitis. Button batteries can lead to erosive ulcers, and magnets can lead to intussusceptions or perforation. Depending on the properties of the ingested object, complications, such as lead poisoning and appendicitis, have also been reported. Parents of children who are discharged with a gastrointestinal FB should be advised to return if fever, abdominal distension, pain, or bleeding arise.