Plight by Wrong Passage: A case report and review of clinical and radiological findings of aspirated foreign bodies

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Abstract
Foreign body aspiration can be a life-threatening emergency requiring immediate intervention by bronchoscopy. While foreign bodies are most common in the pediatric population and in adults with underlying risk factors, we present an interesting case of a non-debilitated adult who aspirated a corn kernel. It is necessary for the clinician to recognize the symptoms, and for the radiologist to make the correct imaging diagnosis, to expedite proper treatment. Radiographs are often not useful in identifying the location due to the radiolucent nature of most aspirated foreign bodies. However, secondary findings may be visible. Computed tomography (CT) may be used to evaluate aspiration in clinically stable adults. The timely removal of a foreign body from the respiratory tract by bronchoscopy often leads to a rapid and complete recovery.

Case presentation
A 55-year-old active male presented to the emergency department six days after coughing on a corn kernel and noticing a “rattle” in his lungs. There was no associated history of fever, chills, shortness of breath, chest pain or wheezing. Significant past medical history included acid reflux, diabetes, and hypertension, but no known risk factors for aspiration. He was also a smoker. Vitals were unremarkable including an oxygen saturation within normal range. Clinical exam was remarkable for localized wheezing in the right lung base. Labs showed normal blood counts, metabolic panel, sedimentation rate and c-reactive protein. CXR (Figure 1) did not identify any significant abnormality, however CT chest with contrast (Figure 2) revealed a retained 5 mm foreign body in the basilar bronchus of the right lower lobe associated with atelectasis and mucus plugging. The patient was hospitalized and underwent fiberoptic bronchoscopy. A corn kernel was found at the entrance of the right lower lobe basilar segment bronchus along with airway edema in the region. The foreign body was removed with a basket. The patient was prescribed a short course of prednisone to treat the airway inflammation noted on bronchoscopy. Follow-up chest CT demonstrated complete radiographic resolution of the findings (Figure 3).

Discussion
The current case highlights one of the commonly aspirated foreign bodies in a relatively asymptomatic adult individual and its successful removal via bronchoscopy. The most commonly aspirated foreign bodies are food items. Peanuts are the most common, accounting for 35-55% cases. The remaining list includes seeds, popcorn, other food particles and dental fragments. Most of the foreign bodies encountered on bronchoscopy occur on the right side in adults, due to the more vertical orientation of the right mainstem bronchus, and centrally in children.

The clinical presentation is classically described as “penetration syndrome”. Patients present with sudden choking and cough with or without vomiting. Other significant reported symptoms are shortness of breath, wheezing, fever and cyanosis. Foreign body aspiration is much more common in the pediatric population. There may be debilitating factors which predispose adults to aspiration such as alcohol intoxication, traumatic intubation, dental procedure, mental retardation, swallowing disorders, neuromuscular or neurologic disease. However, foreign body aspirations can sometimes be seen in non-debilitated adults, such as in our case. Depending on the presentation, the main clinical decision is whether or not the patient will need emergent bronchoscopy. If the patient is stable, radiological investigation should be done to diagnose the type of foreign body, its location, and any possible complications. Chest radiography is the initial imaging study of choice in non-emergent situations. Radiography results in lower radiation doses to the patient than computed

Figure 1. Chest X-ray is negative with no evidence of atelectasis, hyperinflation or consolidation.
tomography. Radiography may show the radiopaque foreign body (metal, battery, coin, etc) or secondary signs of aspiration such as air trapping. A lateral view may also help to identify tracheal versus esophageal placement. Chest radiograph can be normal given most aspirated foreign bodies are radiolucent. Examples of radiolucent foreign bodies include food particles, some bones, wood, plastic, and thin metallic fragments. Hyperinflation, obstructive emphysema, rib flaring, and flattening of the ipsilateral hemidiaphragm are radiographic findings more commonly seen in children due to increased compliance of airways and ball-valve mechanism (On inspiration, bronchi expands and air can get past the foreign body. With expiration, the airway collapses around the foreign body, leading to trapping of air in distal lung). Atelectasis is more commonly seen in adults due to the obstructed airway.

Fluoroscopy can also be performed in toddlers with high suspicion of aspiration and inconclusive chest x-ray findings. CT is generally the next step in imaging when radiography is inconclusive or there is concern for resulting complications, given its detailed anatomical spatial resolution and increased ability to identify radiolucent foreign bodies. CT findings can include lung lucency, bronchiectasis or atelectasis. While CT may be performed for more detailed evaluation of anatomy or to search for complications prior to therapeutic bronchoscopy, its performance should not delay bronchoscopic intervention in an emergent setting.

Bronchoscopy is the gold standard for diagnosis and treatment of aspirated foreign bodies, especially in the setting of life-threatening...
The foreign body may be removed using forceps or baskets. Flexible bronchoscopy has advantages over rigid bronchoscopy, including less cost, no requirement for general anesthesia, and greater accessibility. However, rigid bronchoscopy remains in use due to its better airway control and extraction capabilities. Thoracic surgical interventions are reserved for advanced pulmonary complications such as lung abscess, empyema and fistulas.

It is important for radiologists to communicate the presence of a foreign body, as well as its composition, exact location, and any resulting complications, to the referring provider. Early diagnosis is necessary to prevent complications of aspiration, as undiagnosed or retained foreign bodies can result in local mechanical adverse effects and chemical reactions which can lead to chronic pulmonary infections, bronchiectasis, lung collapse, lung abscess, airway edema resulting in stenosis, and broncho-esophageal fistula.

**Conclusion**

Foreign body aspiration, although most common in infants and children, can occur at any age even without any predisposing factor. A normal chest x-ray in a clinically asymptomatic stable patient does not rule out the diagnosis. Since undiagnosed retained aspirated foreign body can lead to serious sequelae, a familiarity with the radiologic features can help achieve early and correct diagnosis. CT scan can detect a foreign body in clinically stable patients as well as identify associated complications. In a patient with life-threatening clinical symptoms, immediate bronchoscopy serves as both diagnosis and management.

**References**