A tale of three aspirations: foreign bodies in the airway

B Pritt, M Harmon, M Schwartz, K Cooper

Tracheobronchial foreign body aspiration is a serious medical problem, with clinical manifestations ranging from acute asphyxiation to insidious lung damage, as demonstrated by the three presented cases. Patient 1 aspirated during dinner, emergency bronchoscopy retrieved pieces of food, and she fully recovered the following day. Patient 2 presented with recurrent pneumonia and a right lower lobe lung abscess. After right lower lobectomy, pathology revealed a foreign object in the right main stem bronchus, a peanut aspirated one year earlier. Patient 3 became unresponsive several days after spinal surgery. The differential diagnosis included myocardial infarction, stroke, and foreign body aspiration. The patient died and necropsy revealed a foreign body in the right main stem bronchus (cooked meat). Thus, foreign body aspiration is not always suspected clinically, and the pathologist may play an important role in making the diagnosis. Histological identification of the aspirated material may be necessary for definitive diagnosis. Therefore, sections of commonly aspirated foods are presented, together with a 10 year history of aspirated objects received by this institution’s surgical pathology department.

CASE 1
A 93 year old woman with dementia became cyanotic and apneic during dinner at her nursing home residence. The Heimlich manoeuvre was performed and suctioning of the oral pharynx retrieved the aspirated material, which was recognised as two pieces of chicken. The patient had continued respiratory distress and was immediately brought to the emergency department, where her oxygen saturation was 93% on 10 litres/minute of oxygen by nasal canula. A chest radiograph showed a collapsed left lower lobe, and emergency bronchoscopy revealed two pieces of “food stuff” from the left main stem bronchus. She promptly recovered and was discharged two days later, with a swallowing study recommended as an outpatient. Two tan/white, firm, irregular shaped soft tissues were received in surgical pathology. Microscopically, sections showed degenerated skeletal muscle admixed with adipose tissue (fig 1). Given the clinical scenario, the gross and microscopic appearances of the specimen were felt to be consistent with the aspiration of chicken.

CASE 2
A 66 year old man with endstage renal disease, diabetes mellitus, and hypertension presented with recurrent pneumonia and a right pleural effusion for several months. He was admitted to the hospital with radiological findings of a pulmonary abscess involving the right lower lobe. A right lower lobectomy was performed. The gross specimen contained a peripheral abscess measuring $1.5 \times 1.0 \times 0.9$ cm, in addition to extensive thick white/yellow exudate in most of the airways. Within the lumen of the right lower lobe bronchus was a tan/brown, firm, ovoid foreign object measuring $0.8 \times 0.6 \times 0.6$ cm. Additional history obtained at this admission revealed a possible aspiration event of a peanut M&M® one year earlier. The gross and histological appearances of the specimen retrieved from the bronchus of this patient were compared with a formalin fixed paraffin wax embedded peanut M&M® to enable definitive comparative identification and diagnosis (fig 2A,B).

CASE 3
A 91 year old woman with spinal stenosis was admitted for surgical repair of a cerebral spinal fluid leak following spinal fusion and fixation. Following repair, the patient became hypotensive, and developed changes in her mental status. Two days later, she became unresponsive while being fed. Immediate intubation and resuscitation were performed, but the patient remained unresponsive, and support was withdrawn the following day. Postmortem examination revealed a 500 ml serosanguinous right pleural effusion with bilateral pulmonary congestion. The right lower lobe was consolidated and a...
A tan/yellow, firm, irregular shaped foreign object measuring 1.0 × 1.0 × 0.8 cm was identified in the right main stem bronchus. Microscopically, the object comprised necrotic smooth and skeletal muscle with numerous associated yeast forms, consistent with unidentified cooked meat (fig 3A). The right lower lobe also contained smaller fragments of necrotic muscle fibres within scattered alveolar spaces (fig 3B). These smaller fragments were accompanied by squamous epithelial cells and acute bronchopneumonia.

DISCUSSION
Tracheobronchial foreign body aspiration has a range of possible outcomes, including immediate resolution, recurrent pulmonary disease, and death. Not uncommonly, there is no
history of aspiration and positive identification of the foreign body is necessary for diagnosis. Confirming the occurrence of aspiration is important for patient management so that steps can be taken to prevent recurrence. Confirmation and specific identification of the foreign body may also be important for medicolegal purposes.

In the first case described above, the aspiration event was witnessed, and histological examination of the aspirated material served to confirm the diagnosis. As a result, the patient was recommended for swallowing studies, with possibly future dietary modifications.

The second case presented a considerably greater diagnostic dilemma because the history of aspiration was not known initially. The surgical specimen demonstrated features of longstanding infection and inflammation, but because of in vivo degeneration, the material located within the bronchus was not readily identified as foreign. Histological examination was necessary to recognise the object as plant material, and comparison with sections of a known formalin fixed peanut was useful for definitive comparative identification. It is interesting to note the histological similarities of the two specimens, despite the specimen being in the patient’s bronchus for several months.

Case 3 also presented a diagnostic challenge because of the abrupt nature of the patient’s presentation. The clinical differential diagnosis included asphyxia from aspiration, acute

Table 1

<table>
<thead>
<tr>
<th>Aspirated object</th>
<th>Age (years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pen cap</td>
<td>13</td>
</tr>
<tr>
<td>Peanut</td>
<td>1</td>
</tr>
<tr>
<td>Food, unspecified</td>
<td>1</td>
</tr>
<tr>
<td>Popcorn kernel</td>
<td>1</td>
</tr>
<tr>
<td>Popcorn piece</td>
<td>1</td>
</tr>
<tr>
<td>Peanut</td>
<td>1</td>
</tr>
<tr>
<td>Peanut</td>
<td>1</td>
</tr>
<tr>
<td>Peanut</td>
<td>1</td>
</tr>
<tr>
<td>Candy, unspecified</td>
<td>1</td>
</tr>
<tr>
<td>Barium</td>
<td>78</td>
</tr>
<tr>
<td>Razor blade</td>
<td>26</td>
</tr>
<tr>
<td>Nut, unspecified</td>
<td>57</td>
</tr>
<tr>
<td>Chicken bone</td>
<td>1</td>
</tr>
<tr>
<td>Plastic wrapping</td>
<td>8</td>
</tr>
<tr>
<td>Chicken</td>
<td>16</td>
</tr>
<tr>
<td>Chicken</td>
<td>93</td>
</tr>
<tr>
<td>Peanut</td>
<td>66</td>
</tr>
</tbody>
</table>

Between 1992 and 2002, 17 foreign bodies were received by the surgical pathology department, from patients ranging from 1 to 93 years of age. They are listed here in chronological order. It is probable that some retrieved foreign bodies were discarded and not submitted to pathology examination.
aspirated foodstuffs, several items including a peanut M®
contain starch and are periodic acid Schiff positive.

5). The clear spaces within cell partitions in the lentil (fig 4)
rigid regular partitions containing nutrient material (figs 4,
as foreign because of its unique rigid double cell walls. Seeds,
(figs 2B, 4, 5A,B, and 6).

hotdog were fixed in 10% formalin for 24 to 48 hours, and then
cooked lentil, fresh blueberry and melon seeds, and cooked

chial aspiration.

comprise the largest population of patients with tracheobron-
be the most commonly aspirated object in children, who

The results coincide with published data, showing the peanut
institution's pathology department within the past 10 years.

5. The pathologist can greatly assist the clinician in making the cor-
rect diagnosis by identifying the retrieved foreign bronchial
material. This necessitates a basic knowledge of the histologi-
cal appearance of commonly aspirated foods. In certain
instances, such as in medicolegal cases, the pathologist may be
called upon for an accurate identification of the aspirated
food.

“The pathologist can greatly assist the clinician in making the correct diagnosis by identifying the retrieved foreign bronchial material”

Table 1 outlines the aspirated foreign bodies received in this
institution’s pathology department within the past 10 years. The results coincide with published data, showing the peanut
to be the most commonly aspirated object in children, who

5). Vegetable matter and inorganic objects such as
 treasons are also commonly aspirated objects in children,
whereas adults aspirate food particles, medication tablets,
dental pieces, and a variety of other inorganic substances.

To examine the histological appearance of these commonly
aspirated foodstuffs, several items including a peanut M&M®,
cooked lentil, fresh blueberry and melon seeds, and cooked
hotdog were fixed in 10% formalin for 24 to 48 hours, and then
processed routinely and stained with haematoxylin and eosin
(figs 2B, 4, 5A,B, and 6).

As seen in fig 6 (hotdog), plant material is easily recognised
as foreign because of its unique rigid double cell walls. Seeds,
beans, and fruits also have a characteristic appearance, with
rigid regular partitions containing nutrient material (figs 4,
5). The clear spaces within cell partitions in the lentil (fig 4)
contain starch and are periodic acid Schiff positive. An atlas
containing histological sections of many other food items is
currently available.

Striated muscle, bone, and cartilage may be recognised as
foreign when combined with the clinical scenario, including
location of the material (for example, within a bronchus) and
a history of suspected aspiration. The presence of oral mucosa,
colonising yeast, and/or oral flora may support the diagnosis of
aspiration, when present in the airways and alveoli. This is
possible with both conventional histology and cytology. These
above features assist the pathologist in the diagnosis of
foreign body aspiration.

In summary, foreign body aspiration may present a
 diagnostic challenge for the clinician and pathologist alike.
Therefore, it must be included in the differential diagnosis
when a patient has a history of recurrent lung disease or acute
apnea. Furthermore, pathologists in surgical or postmortem
practice may be well served by a general knowledge of
commonly aspirated food histology. Through awareness and
familiarity, the pathologist may play a crucial role in diagnosis
and aid in subsequent patient management.

Take home messages

• Tracheobronchial foreign body aspiration is a serious
 medical problem, with clinical manifestations ranging
 from acute asphyxiation to insidious lung damage
• Foreign body aspiration is not always suspected
 clinically, and the pathologist may play an important
 role in making the diagnosis
• Histological identification of the aspirated material
 may be necessary for definitive diagnosis

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