

## CASE REPORT

## Aspiration of a speaking valve

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[john.c.schembri@gmail.com](mailto:john.c.schembri@gmail.com)**SUMMARY**

Foreign body aspiration (FBA) is a relatively common and serious condition that can result in a spectrum of presentations ranging from incidental to acutely life-threatening. Described here is a case of aspiration of a tracheo-oesophageal speaking valve through a permanent tracheostomy that went unnoticed for a number of years, and an overview of the technique used for its removal. A 70-year-old ex-heavy smoker with a permanent tracheo-oesophageal fistula presented with a relatively recent history of increasing shortness of breath, sputum purulence and haemoptysis. Further investigation with a CT scan and bronchoscopy revealed the presence of a foreign body within his right lower lobe bronchus which was later removed by advancing a flexible bronchoscope over a rigid one.

**BACKGROUND**

Our case highlights the importance of actively investigating patients with bronchoscopy when suspicion of foreign body aspiration (FBA) is high, as routine radiography will not always demonstrate aspirated objects and permanent lung damage will ensue if these are not removed.

**CASE PRESENTATION**

The patient was a 70-year-old ex-heavy smoker with a history of locally invasive laryngeal squamous cell carcinoma, first diagnosed 15 years ago. This was initially treated with radiotherapy but follow-up direct laryngoscopy 3 years later revealed recurrence of the disease. He was therefore scheduled for a total laryngectomy. Recovery following surgery was uneventful and the patient was discharged home with a permanent tracheostomy and tracheo-oesophageal valve.

After defaulting for all follow-up, our patient was readmitted 12 years after initial surgery with deterioration of his general state of health and chronic nutritional imbalance. His respiratory reserve on admission was poor with dyspnoea on minimal exertion and he was also noted to have a chronic cough that was usually productive of whitish sputum. Plain radiography raised the possibility of lung malignancy and the case was discussed during the respiratory multidisciplinary meeting, and further imaging by CT was recommended.

**INVESTIGATIONS**

Blood work on admission was unremarkable—the serum creatinine was slightly elevated with estimated glomerular filtration rate 65 mL/min/1.73 m<sup>2</sup>, while the full blood count and inflammatory markers were normal. Sputum cultures were negative,

sputum cytology did not show any malignant cells and Ziehl-Neelsen staining was also negative.

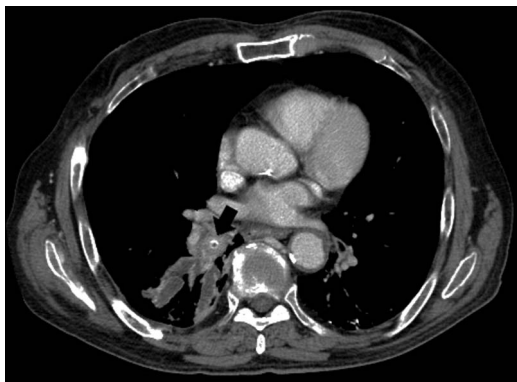
A plain anteroposterior radiograph of the chest at admission revealed a prominent right hilum and a focus of ill-defined opacification just medial to the right heart border. The horizontal fissure was shifted inferiorly, and was identified at the level of the sixth rib (this normally lies in the projection of the lower border of the fourth rib). Note was also made of longstanding healed rib fractures on both sides (figure 1).

CT showed atelectasis of the right lower lobe, with the lower lobe assuming the appearances of a complex cystic mass due to bronchocoele formation in the context of chronic obstructive bronchiectasis. An endobronchial foreign body was seen in the right lower lobe bronchus—this was composed of an outer rim of high attenuation and an inner lucent core (figures 2–4). These appearances were quite suggestive of a previously aspirated small mammalian bone and accounted for the right lower lobe atelectasis and bronchiectasis. Peripheral small centrilobular nodules of soft tissue attenuation with connecting linear branching opacities ('tree-in-bud' pattern) were also seen within the lateral segment of the middle lobe. This pattern was originally described in patients with endobronchial spread of *Mycobacterium tuberculosis*, but is now known to occur with a variety of inflammatory diseases of the small airways. It is non-specific and occurs secondarily to bronchiolar luminal impaction with pus,



**Figure 1** Plain anteroposterior radiograph of the chest shows a prominent right hilum and a focus of ill-defined opacification just medial to the right heart border. The horizontal fissure is shifted inferiorly, and is at the level of the sixth rib. The opacity seen in the middle zone of the right lung was later deemed to be due to a longstanding healed rib fracture. No radiopaque foreign bodies were evident on plain radiography.

**To cite:** Schembri J, Cortis K, Mallia Azzopardi C, et al. *BMJ Case Rep* Published online: [please include Day Month Year] doi:10.1136/bcr-2013-200066



**Figure 2** Selected axial image at the level of the right lower lobe bronchus depicting an endobronchial foreign body with an outer high-attenuation rim and an inner lucent core. These appearances raised the possibility of a previously aspirated mammalian bone, but were later confirmed to be secondary to an impacted tracheo-oesophageal valve on subsequent rigid bronchoscopy.

mucus or other material. Centrilobular emphysematous changes with upper lobe predominance were also seen on CT, in keeping with the known history of cigarette smoking.

The patient became feverish and his general state of health continued to deteriorate. At this stage, sputum cultures became positive for *Escherichia coli* and he was thus started intravenous antibiotics for treatment of hospital acquired pneumonia.

#### DIFFERENTIAL DIAGNOSIS

- ▶ Carcinoma of the lung
- ▶ FBA of a small mammalian bone

#### TREATMENT

Intravenous antibiotics—Course 1: piperacillin/tazobactam intravenously at 4.5 g 8 hourly for 10 days; course 2: ciprofloxacin intravenously at 400 mg twice daily and clindamycin orally at 300 mg four times daily.

Flexible bronchoscopy through the tracheostomy confirmed the presence of a foreign body in the lower right main bronchus, which was firmly attached to the bronchial mucosa by granulation tissue. Several attempts to remove the foreign body with a biopsy forceps turned out to be unsuccessful.

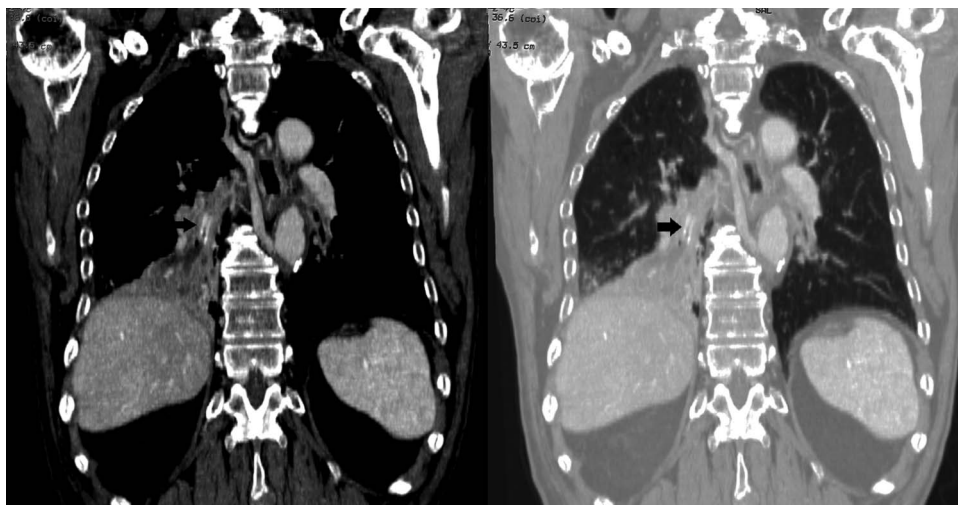
A rigid bronchoscopy confirmed the previous flexible bronchoscopic findings. The foreign body lodged in the right lower lobe bronchus was successfully removed by passing the flexible bronchoscope through the rigid bronchoscope and advancing the biopsy forceps. This utilised the stability and better ventilation of the rigid bronchoscope with the more distal access and manoeuvrability of the flexible scope. The fact that the patient was under general anaesthesia was also very helpful. The foreign body turned out to be the plastic tracheo-oesophageal valve which had in fact been missing since 1998 (figure 5).

#### OUTCOME AND FOLLOW-UP

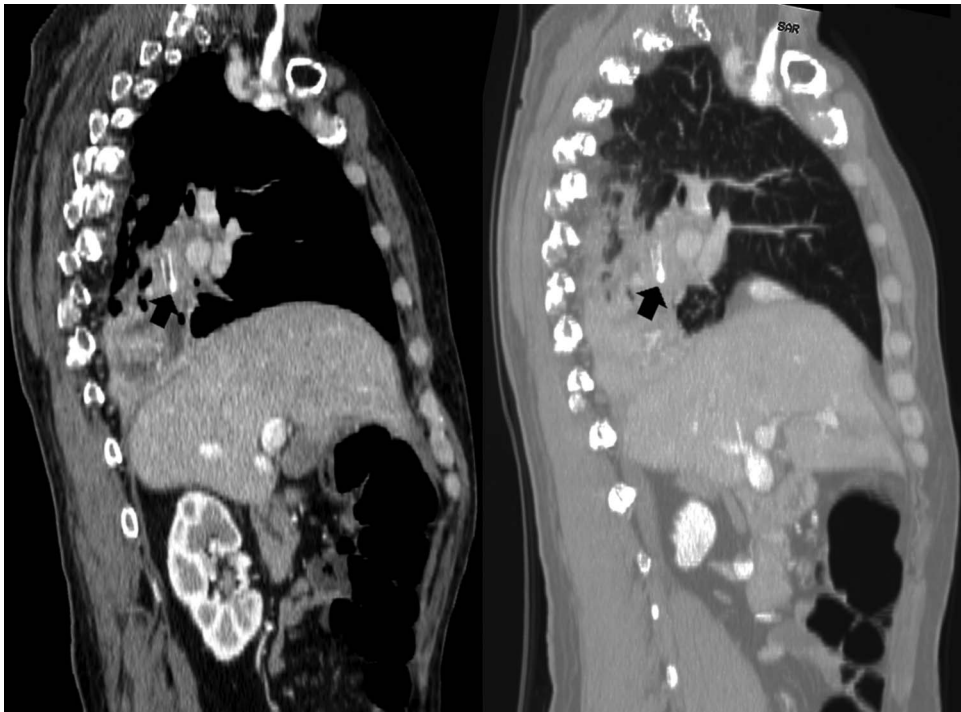
Resolution of the patient's cough and haemoptysis ensued. However, despite the successful procedure, the patient could not be discharged back home in view of lack of adequate social support and his poor general state of health and respiratory reserve. By this time he was necessitating treatment with continuous low-flow oxygen in view of hypoxia which was present even at rest. The patient was also becoming increasingly confused, restless and agitated. In view of this, the worsening shortness of breath and a rise in his inflammatory markers he was restarted on antibiotics. The patient passed away despite an initial improvement a few days following the initiation of intravenous antibiotics. By that time, he was deemed to be unfit for aggressive management, based on the premorbid poor quality of life and severity of the lung damage.

#### DISCUSSION

The above case report shows how the aspiration of a plastic voice prosthesis, which went unnoticed for 12 years. FBA is commoner in the paediatric population and adults only account for 20% of all reported cases. This might be the case because FBA is a potentially life-threatening accident in children and is



**Figure 3** Coronal multiplanar reconstructed views of the chest in mediastinal and lung window settings (left and right images, respectively). The collapsed right lower lobe is seen as a triangular heterogeneous opacity at the right cardiophrenic angle. The tracheo-oesophageal valve is visualised as an endobronchial foreign body with an outer rim of higher attenuation and an inner lucent core. It is lodged within the right lower lobe bronchus, and accounts for the chronic right lower lobe collapse. Note is also made of a tree-in-bud pattern within the lateral segment of the middle lobe. Centrilobular emphysematous changes with upper lobe predominance are also seen.



**Figure 4** Sagittal oblique multiplanar reconstructed views of the right lung in mediastinal and lung window settings (left and right images, respectively) centred along the right parahilar region. The tracheo-oesophageal valve is again seen lodged within the right lower lobe bronchus. The lower lobe shows clear chronic volume loss and assumes the appearances of a complex cystic mass secondary to cystic and tubular bronchiectasis. The horizontal fissure is again not seen in its usual location, secondary to the right lower lobe collapse.

usually suspected after a choking episode, whereas in adults, it is often subtle and may even go unnoticed. Infact, patients do not always volunteer or recall a history of choking.<sup>1 2</sup>

Presentation depends not only on the site involved, but also on the composition and period for which the foreign body has been lodged. Most aspirated foreign objects are usually composed of food matter; however, aspiration of toxic foreign bodies or even tablets can also occur resulting in local airway inflammation.<sup>3</sup> Though uncommon, apart from the oral route, patients with laryngectomy are also prone to aspiration through their permanent tracheo-oesophageal fistulas. The foreign bodies reported included a safety pin, nails, a wooden stick and

speaking valve cleaning brushes. However, bronchial aspiration of the tracheo-oesophageal prosthesis itself is very rare and has only been documented a few times earlier.<sup>4 5</sup>

Acute presentation in adults is rare since the foreign body is usually wedged more distally than in children because of larger airways. Coughing is one of the commoner presenting symptoms and is, infact found in 80% of cases. Other less common symptoms are dyspnoea, wheeze, fever, haemoptysis and chest pain.<sup>6</sup>

Peak incidence for FBA has been quoted to be in the sixth decade for adults.<sup>7</sup> Risk factors for aspiration vary with age and retrospective studies have suggested that the leading causes of FBA in adults are altered mental status from alcohol or sedative use, trauma with a decreased level of consciousness, impaired airway reflexes associated with neurological disease and dental procedures.<sup>8</sup>

Evidence with regard to diagnosis of FBA in adults is drawn from retrospective studies or case series, as no prospective studies have ever been conducted with regard to the utility of clinical and radiographic abnormalities in such cases. Chest radiography is not always useful in showing the foreign body and if clinical suspicion is high one should consider other forms of investigation. In a Chinese study, chest radiography showed the foreign body only in 21% of cases.<sup>9</sup> Infact less than 20% of aspirated foreign bodies are radiopaque. On chest radiographs adults tend to exhibit atelectasis more commonly than localised air trapping, as opposed to children. Other findings which may be associated with aspiration of radiolucent objects include lobar pneumonia and compensatory emphysema in partial bronchial obstruction. CT scanning is more sensitive at detecting aspirated foreign bodies than a plain radiography. In one particular retrospective study, CT scanning demonstrated the presence of a foreign body in 16 out of a total of 19 cases, whereas



**Figure 5** Colour photograph of cleaned out tracheo-oesophageal valve following extraction.

chest radiography was only capable of reliably showing the foreign body in only 3 of these cases. Associated findings on CT were volume loss, hyperlucency with air trapping and bronchiectasis in the affected lobe.<sup>10</sup>

In addition to its diagnostic role, flexible bronchoscopy can also be therapeutic. However, rigid bronchoscopy remains the ideal instrument for retrieval of large foreign bodies from the main bronchi as it ensures better gas exchange and coaxial passage of multiple instruments, as well as allowing better access. Fibre-optic bronchoscopy should be considered as the superior option only in cases of distally wedged foreign bodies, in mechanically ventilated patients or in the presence of fractures that prevent the manipulation required for rigid bronchoscopy.<sup>8</sup>

### Learning points

- ▶ Aspiration of foreign bodies can go undetected for many years and even present itself in an incidental manner.
- ▶ Plain radiography is not an adequate means to completely rule out aspiration of foreign objects.
- ▶ In view of their shortcomings none of the imaging methods should be solely relied upon to exclude foreign body aspiration and if clinical suspicion is high one should always proceed to perform flexible fibre-optic bronchoscopy.
- ▶ By combining both modalities of bronchoscopy one can benefit from the respective advantages of both rigid and flexible endoscopes.

**Contributors** JS and KC were responsible for literature review and manuscript preparation. CMA and SM contributed towards editing and review of the final manuscript.

**Competing interests** None.

**Patient consent** Obtained.

**Provenance and peer review** Not commissioned; externally peer reviewed.

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