Nonasphyxiating foreign-body aspiration in adults can be difficult to diagnose because the symptoms are nonspecific and chest x-rays may be normal due to organic composition of the foreign bodies. The diagnosis is often made via flexible bronchoscopy; however, debate remains as to whether rigid or flexible bronchoscopy is the optimal method of extraction. The authors describe a patient who was initially referred for assessment of a calcified left mainstem bronchus mass identified only on computed tomography scan of the thorax. The patient underwent flexible bronchoscopy and was discovered to have a bone fragment wedged in the bronchus for a duration of 22 years, which was successfully removed via rigid bronchoscope.

Key Words: Aspiration; Bronchoscopy; Corticosteroid; Foreign body

Learning objectives

- To highlight the clinical presentation of foreign-body aspiration (FBA) in an adult.
- To recognize that rigid bronchoscopy remains the best method for extraction of asphyxiating foreign bodies, despite the increasing prevalence of flexible bronchoscopy for therapeutic applications.

CanMEDS Competency: Medical Expert

Pretest

- What key aspects of patient history and clinical presentation in the adult should raise suspicion of FBA?
- How should flexible versus rigid bronchoscopy be applied in the diagnosis and management of FBA?

CASE PRESENTATION

A 54-year-old woman was referred for assessment of a calcified left mainstem mass visualized on computed tomography (CT) scan of the thorax that had been performed to evaluate a persistent cough.

On clinical grounds, the patient had been previously suspected to have adult-onset asthma. She experienced cough, episodic chest tightness, wheezing, and aggravation of her symptoms with exercise and cold air. Her symptoms had only partially improved on appropriate asthma therapy. A chest x-ray was unremarkable (Figure 1); however, CT scan of the chest (Figure 2) demonstrated the presence of a calcified lesion 4 mm × 12 mm in size in the left mainstem bronchus. Further history revealed an event 22 years previously during which the patient experienced a sensation of the food “going down the wrong way”, while eating either chicken or fish. Her current symptoms started after this event, but because they were initially mild, she did not seek medical care. Recent worsening of her cough and chest discomfort had prompted her to attend her family physician.

On examination, she exhibited high-pitched inspiratory and expiratory wheezes bilaterally but no other abnormalities. Flexible bronchoscopy was performed to evaluate the lesion. The upper airway, trachea and carina were normal. The right main stem bronchus was unusually long, and bifurcated into the right middle and right lower lobes. The right upper lobe bronchus arose from the medial wall of an elongated right middle lobe bronchus. A black oblong mass was apparent in the distal left mainstem bronchus. There was near-total obliteration of the airway and polypoid reaction in the mucosa surrounding the mass.

The abnormal mucosa and the mass were biopsied. The bronchoscope was being withdrawn when the patient began coughing, dislodging the mass from the left mainstem bronchus into the right, occluding the right mainstem bronchus proximal to all lobar bronchi. The left side was also nearly occluded by the combination of postbiopsy edema, bleeding and chronic mucosal reaction at the site of the dislodged mass.

The patient thus presented a near ‘cannot ventilate’ situation and was therefore brought immediately, in a sedated state, to the operating room. Rigid bronchoscopy was then performed under a general anesthetic and the mass removed with difficulty. The final fragments measured 1.2 cm × 0.8 cm × 0.3 cm, and 0.6 × 0.3 × 0.3 cm.

Examination revealed the mass to be a bone fragment surrounded by tissue; subsequent tissue cultures demonstrated growth of Pseudomonas, Proteus and Enterococcus.

Immediately on awakening, the patient spontaneously reported disappearance of left chest discomfort. At follow-up 10 days later, she believed her cough was much improved and her dyspnea had nearly resolved.

DISCUSSION

The first case of FBA was reported in 1897, when a pork bone was extracted from a trachea using an esophagoscope, marking the debut of the bronchoscopy procedure (1). Eighty per cent of FBAs occur in children; in adults, FBA is often associated with impairment of consciousness or swallowing (2,3). Nonasphyxiating FBA in adults usually presents with cough (81% of cases); hemoptysis, wheezing and dyspnea may occur (2,3), or the patient may remain asymptomatic. Symptoms ultimately referable to a nonasphyxiating FBA are frequently attributed to other conditions such as asthma (4), and up to 80% of foreign bodies are not visible on chest x-ray. CT findings include unilateral lung hyperfunction, bronchiectasis, atelectasis, lobar consolidation and/or pleural effusion (5). Unless the patient clearly recalls an antecedent aspiration event, the diagnosis of nonasphyxiating FBA is typically delayed by weeks to months (2,3).
The present case was unusual because of the very long delay to diagnosis (22 years; exceeded only by a case of an aspirated thorn retained for 25 years [6]) and the later development of asthma. She had spirometric obstruction, a positive bronchodilator response, improvement of some symptoms on asthma-specific therapy, and aggravation of cough and wheeze with cold air and exercise. Although she had a classic history for FBA, as well as increased cough and chest discomfort with recumbancy, the presence of asthma may have obscured and delayed the diagnosis of FBA.

Flexible bronchoscopy is increasingly used for the diagnosis and extraction of nonasphyxiating foreign bodies, which may be removed using forceps, snares or baskets (4). Flexible bronchoscopy is more accessible and less expensive, and general anesthetic is not required compared with rigid bronchoscopy. Preservation of the cough reflex is potentially helpful in the removal of a dislodged foreign body. However, as in our case, the foreign body can migrate unpredictably and cause asphyxiation.

When dealing with longer-standing organic foreign bodies that induce formation of granulation tissue, case series report that the use of systemic glucocorticoids 12 h to 24 h before removal (7) may aid in extraction by reducing inflammation; however, prospective controlled trials are lacking. Glucocorticoids have also been administered by intraluminal injection (8). Argon plasma coagulation or cryotherapy have been used to obliterate granulation tissue immediately before foreign body extraction (9). In our case, steroids were not administered because the diagnosis of FBA had not been confirmed before bronchoscopy and the subsequent migration of the body generating a near ‘cannot ventilate’ scenario necessitated its immediate removal.

Rigid bronchoscopy remains the procedure of choice for asphyxiating foreign bodies because it offers superior airway control, suction and extraction capabilities (4). It also becomes the procedure of choice should significant hemorrhage occur during extraction because it is impossible to simultaneously suction and manipulate the object with flexible bronchoscopy. The potential for foreign body migration and subsequent asphyxiation should be considered before foreign body extraction using a flexible bronchoscope. We suggest that the ability to convert to rigid bronchoscopy in an emergency should be a consideration when planning procedures involving the removal of foreign bodies from the distal airways.

Due to bacterial growth in the bronchoscopy specimens, postprocedure treatment with antibiotics was initiated. Antibiotic use in the management of FBA is not routinely recommended but is indicated in postobstructive pneumonia or bronchitis.

**AUTHOR CONTRIBUTIONS:** A Bain performed the research and cowrote the manuscript. A Barthos managed the case and revised the manuscript. V Hoffstein identified and managed the case, and revised the manuscript. J Batt cowrote and revised the manuscript, and managed the case.

**REFERENCES**