

CASE REPORT

Collapse due to acute aspiration of a foreign body

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Abstract

An acute collapse calls for urgent and appropriate action. Yet, it is difficult to have a comprehensive differential diagnosis in such a situation. Foreign body aspiration is a major cause of collapse that should be considered. Prompt diagnosis and early focused intervention are crucial for outcome.

In the two cases described here, there was a collapse due to foreign body aspiration. In the first case, a 56-year-old female was found while losing consciousness. The cause of her collapse was not immediately clear and extensive diagnostics did not reveal the cause. After extubation the anamnesis eventually brought clarification and yielded the diagnosis of aspiration. In the second case, an 83-year-old female was suddenly seen motionless in her chair. Her family told attending paramedics that she often choked on food so that they could remove the obstructing food remnants from the pharynx.

Collapse as presentation of a foreign body aspiration is rare. In a complete closure of the airway, there is no possibility for speaking or breathing and unconsciousness soon follows. Confusion with a cardiac event, known as the cafe coronary, frequently occurs. More commonly a partial obstruction of the airway occurs and symptoms mostly include cough, dyspnoea, vomiting and wheezing.

In an asphyxiating foreign body aspiration immediate actions are vital, however, the possibility of choking in collapse is not always considered. When suspecting a foreign body aspiration in a case of collapse, removing the object that obstructs the airway and re-establishing an airway has priority. The gold standard in treating an asphyxiating foreign body aspiration is rigid bronchoscopy.

Introduction

An acute collapse calls for urgent and appropriate action by the clinician. However, the list of differential diagnoses is long and it is often difficult to determine the underlying cause. Acute

foreign body aspiration is an uncommon, yet severe cause of collapse that has to be considered. Prompt diagnosis is crucial and early focused intervention is the key to survival. The following cases are two examples.

Case 1

Patient A, a 56-year-old woman, collapsed in front of her neighbour's door. She had rang the doorbell breathless and in a panic after which she had collapsed. On arrival the paramedics saw a restless, cyanotic and respiratory insufficient woman with impaired consciousness. The peripheral oxygen saturation was 72% and she was incontinent for urine. They sedated her and after an uncomplicated endotracheal intubation transported her to the hospital.

Upon arrival at the Emergency Department (ED) a (hetero) anamnesis was not possible as the patient came without relatives or neighbours. Physical examination revealed, except for distended neck veins, no abnormalities. The patient was easily ventilated and haemodynamically stable without vasopressive medication (RR 130/65 mmHg and heart rate 60 bpm). The Glasgow Coma Score was E1M1Vt and she had normal pupillary reflexes without further sedation. The electrocardiogram (ECG) did not show ischemia and the laboratory results were normal. A computed tomography (CT) scan of thorax/brain and echocardiography revealed no abnormalities. Bronchoscopy was not performed because no abnormalities had been seen at intubation, ventilation was unimpaired and radiologic studies showed no signs of a corpus alienum, so aspiration was not considered a likely cause. At this time, we did not know the cause of the acute collapse despite extensive diagnostic testing.

In the Intensive Care Unit (ICU) the patient did not need haemodynamic support and hardly any ventilatory support. After discontinuation of sedation the patient awoke to a

maximal Glasgow Coma Score and gesticulated that she wanted to be taken off the ventilator. "No more liquorice for me!" were the first words of the patient immediately after extubation. She told doctors that she had suddenly choked on a 'liquorice smiley' (*figure 1*). Acutely short of breath she had run to her neighbour's door, rang the doorbell and then lost consciousness. Afterwards the neighbour told us that the patient had yelled, "I'm suffocating!" After detubation the patient never showed any symptoms of dyspnoea or stridor. The following day the patient was transferred to the Department of Internal Medicine and could be discharged home shortly afterwards. A few weeks later the patient was seen at the Internal Medicine outpatient clinic. She had no further health complaints. The liquorice smiley was never found.

Case 2

Patient B, an 83-year-old woman, suddenly showed signs of choking during a family dinner and then became motionless in her chair. The family called the emergency services, but did not start BLS (basic life support). The paramedics arrived after seven minutes and found the patient in asystole. They were told by the family that the patient often choked on her food. During inspection of the mouth and pharynx by the ambulance paramedics large obstructing food remnants were found. These were removed with a Magill forceps (*figure 2*). After endotracheal intubation, the patient could be ventilated without difficulty. After 4 minutes of advanced cardiac life support (with a total 2 mg of epinephrine) the heart rate and circulation restored. The first end tidal pCO₂ measured by capnography was 14 kPa, which soon decreased to 7 kPa with adequate ventilation (normal: 4.7 to 6.0 kPa).

After arrival at the hospital, the patient received low ventilatory pressures and did not need any hemodynamic support (RR 180/90 mmHg and heart rate 110 bpm). Physical examination

Figure 1. Example of liquorice smiley



Figure 2. Removed food remains from the mouth and pharynx of patient B



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revealed no further abnormalities. Her Glasgow Coma Score was 3 (E1M1Vt) without sedation. An ECG showed an irregular sinus rhythm with no significant signs of ischemia and cardiac enzymes remained negative. An echocardiography was not performed. The chest X-ray showed a good tube position and no signs of atelectasis. The first laboratory tests showed a severe metabolic acidosis, probably due to prolonged circulatory arrest: pH 6.96 (normal: 7.35 to 7.45) and lactate 9.0 mmol/l (normal: up to 2.0 mmol/l). Her hemodynamic and respiratory condition quickly recovered. However, despite therapeutic hypothermia, she had a poor neurological outcome and died two and a half weeks later.

Discussion

Collapse as presentation of a foreign body aspiration is not common. Only in seven to ten percent of cases is an acute foreign body aspiration associated with choking, acute severe respiratory distress or sudden collapse.^{1,2} The diagnosis of aspiration can be complicated as the presenting symptoms are variable and can resemble other diseases.

Epidemiology

Aspiration among adults is rare. It mostly occurs in the first years of life and in older age groups. Risk factors include male sex, neurological disease, dental abnormalities and intoxication with alcohol or medication (sedatives, anticholinergics, antipsychotics).^{3,4} In 2011, in the Netherlands, 4 children and 50 adults died as a result of choking of which 51 by the aspiration of food. More than 50% of this population was older than 70 years of age.⁵ However, the exact incidence of foreign body aspiration is probably higher as many cases remain undiagnosed. In a Finnish study six percent of the non-cardiac originated cardiac arrests (34% of the cardiac arrests) were due to choking.⁶ The majority of the aspirated foreign bodies consist of food remains (organic matter). In several studies peanuts and other nuts are the most common aspirated items in the Western diet.^{1,4} This is different from the animal bone fragments and fish bones in non-Western world studies.^{2,7}

Symptoms

The location of the foreign body in the tracheobronchial tree has a major influence on the presenting symptoms. Collapse can be caused by foreign bodies in larynx or trachea. These are relatively uncommon (5-10% of the aspirated foreign bodies), but are asphyxiating and acutely life threatening. With a complete closure of the airway a person has no ability to speak or breathe and loss of consciousness and cyanosis often develops rapidly (within 2-5 minutes).^{8,9,10} This is illustrated in both cases described here. In adults, confusion with a cardiac event frequently occurs. This common mistake is known as the 'cafe coronary': after collapse in a restaurant, coronary ischemia is suspected, while in fact foreign body aspiration is the cause. The food which obstructs the airway mostly consists of meat.¹¹

The majority of the foreign bodies will pass through the larynx and trachea and become lodged in the more peripheral airways, mostly (40-50%) into the right main bronchus. Frequently reported symptoms of foreign body aspiration, also known as the penetration syndrome, are cough, dyspnoea, vomiting and wheezing. These aspirations are not acutely life threatening because of merely partial obstruction. Since they are non-asphyxiating (and often less symptomatic or even asymptomatic) these lower aspirations tend to be discovered late, varying from days or weeks to even years.^{1,2,4,8,9,10}

Diagnosis

When an asphyxiating foreign body aspiration is suspected immediate airway control is needed. Pre-treatment diagnostics will delay intervention and may worsen the outcome. Immediate rigid bronchoscopy is the primary diagnostic and therapeutic choice. This is discussed more extensively later on. When suspecting a foreign body aspiration in the less acute presentation, a conventional chest X-ray is the first imaging

modality of choice. A standard frontal view and lateral view has to be obtained. Still, the clinician has to realize that an aspirated foreign body is often not visible on the X-ray (5-50%). Organic materials in particular are either not or reduced radio-opaque. Air trapping or atelectasis can then be suggestive of aspiration. Reliance on a negative X-ray can lead to increased morbidity.^{1,12-14}

CT scans have been demonstrated effective for detecting foreign bodies. If a patient is suspected of having a foreign body aspiration and has a negative chest X-ray, a thoracic CT is justifiable. The correct diagnosis is made initially in 85% and retrospectively in 100%. The most reliable sign is a demonstrated foreign body within the lumen. Radiologists should also look for the compromise of patency of the bronchi, atelectasis, bronchiectasis, hyperlucency and air trapping which suggest aspiration.^{13,15}

Diagnostic flexible bronchoscopy has been suggested as the procedure of choice when foreign body aspiration is still suspected or unexplained respiratory failure persists. Flexible bronchoscopy allows precise identification and localization of foreign bodies. Foreign body removal should not be attempted during a diagnostic bronchoscopy unless the appropriate equipment and personnel are available.⁹

Treatment

The primary goal with any aspiration is airway support and control. Often the conscious patient will clear the airway by coughing. Occasionally a visible object may be removed with the fingers, however this has the risk of transforming a partial obstruction into a complete obstruction. If the aspiration persists, a blow between the shoulder blades and/or the Heimlich manoeuvre can be applied.^{3,10,12}

When asphyxiation occurs (mostly due to complete obstruction) mouth-to-mouth, bag valve mask ventilation or endotracheal intubation should be attempted initially. Sometimes intubation can push the obstructing foreign body into the right main bronchus, allowing only the left lung to be ventilated.^{3,10,16}

When a victim loses consciousness and has a cardiac arrest, the airway may become accessible again by applying the jaw thrust or as a result of BLS and the occurrence of muscle relaxation. In a recent Japanese study, 78% of the cardiac arrests due to food asphyxiation had return of spontaneous circulation (ROSC) after CPR, yet only 7% survived to discharge. The interval between asphyxiation and ROSC was in all survivors 10 minutes or less.¹⁷ Further treatment should be dependent on the location of the object, clinical presentation and degree of obstruction.¹⁰

Acute complete airway obstruction, usually laryngeal or tracheal and asphyxiating, demands prompt treatment by early removal of the obstructing object or on re-establishing an airway. In advanced life support (ALS) and having the aid of a laryngoscope or a gripping tool (for example the Magill

forceps), residues deeper in the hypopharynx can be obtained. However, when the acute obstruction persists a cricothyroidotomy or emergency tracheotomy will be needed. This is only useful when the obstruction is located above the level of the true vocal cords (cricothyroidotomy) or slightly lower when a tracheotomy can be placed some cartilage rings below the glottis. Emergency cricothyroidotomy is performed in approximately 1% of all emergency airway cases in the ED. The success rate for the acute cricothyroidotomy is 66-100%. This is significantly higher than the needle cricothyroidotomy.^{18,19}

Foreign bodies in the trachea are less accessible. Sometimes the foreign body may be grasped with forceps, but generally an immediate rigid bronchoscopy is required. Rigid bronchoscope offers, especially in the upper tracheobronchial tree, better access for more extensive diagnostics, rapid intervention and airway control (endotracheal ventilation possibilities). The large working channel and variety of instruments leads to a successful extraction rate of 95-98%. A disadvantage is the need for general anaesthesia and relaxation.^{4,9,12,14} In both our patients, we did not perform rigid bronchoscopy, because on arrival at the hospital the airway obstruction had already been resolved.

Bronchial foreign bodies are generally less acute in presentation and radiological assessment is warranted first. When the location of the foreign body has been established, extraction through flexible bronchoscopy must ensue without delay. Early bronchoscopy is essential to reduce complications.^{9,12} Based on the literature, there is increasing preference for flexible bronchoscopy in a less urgent aspiration given the relative ease and safety. Furthermore, flexible bronchoscopy can be performed under local anaesthesia and can extend beyond the main bronchi. It has a success rate of 60-100%.^{4,7,8} If flexible bronchoscopy (diagnostic or therapeutic) is attempted, it has to be performed in a room equipped for resuscitation, definitive airway management, mechanical ventilation and rigid bronchoscopy in case a complete central airway obstruction occurs. A disadvantage of the flexible bronchoscope is the smaller working channel and thus more difficulty with removal of bigger objects.^{3,4,7,9,12,14}

Extraction can be complicated when a foreign body is encased by granulation tissue. In these cases it may be useful to postpone the extraction for 12-24 hours and start intravenous corticosteroids, but controversy still exists. Some studies also suggest putting patients on a regime of antibiotics, bronchodilators and corticosteroids after removal of the foreign body.^{8,9}

Surgery, mostly a lobectomy, should be performed only as a last resort but is sometimes unavoidable. This is generally caused by a delay in treatment resulting in severe bronchiectasis and bronchoscopic failure.¹²

Conclusion

Acute foreign body aspiration should be considered in the differential diagnosis of an acute collapse eci. When asphyxiation occurs immediate actions are vital, however the possibility of foreign body aspiration in collapse is not always considered. The primary goal of any aspiration is removing the object that obstructs the airway and re-establishing an airway as soon as possible. The gold standard in treating an asphyxiating foreign body aspiration is rigid bronchoscopy.

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