This is nuts! In cash-ew aren't convinced: an institute's experience of retrieving challenging paediatric endobronchial foreign bodies using a balloon angioplasty catheter technique

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Case Report

We report the use of a balloon angioplasty catheter (BAC) technique for retrieval of a paediatric endobronchial foreign body (FB) after failure of conventional techniques including a Dormia basket.

We describe a case of cashew nut aspiration in a 16-month old boy creating a 'check-valve' mechanism with significant cardiomediastinal shift on chest x-ray (CXR) (Image A). The nut had lodged distally in the left main bronchus (LMB) and proved impossible to remove using conventional rigid bronchoscopic equipment (Image Bi).

Our institute has previously utilised a novel method involving the passage of a guidewire through a fibreoptic bronchoscope (either rigid or flexible) with subsequent railroading of a BAC for difficult FB retrievals with success (1,2).

The challenges of paediatric endobronchial FB retrieval, radiological findings, anaesthetic technique, limitations of conventional procedural equipment and our institutes' experience are discussed.

Challenges

Peak incidence of endobronchial FB aspiration occurs between the ages of one and three years old, with boys presenting most frequently.

Despite medical advances in airway management and endoscopic technology, airway FB still causes significant morbidity and poses an important cause of death in the paediatric population. Incidence of aspiration is static and will be unlikely to decline as children continue to explore their surroundings using their mouths (4).

Where the FB lodges in the airway depends on the relative size and shape of the FB to the airways. Although a preference for the right has been suggested, there is no bronchial side preponderance as demonstrated in our case (3, 4).

Missed or delayed diagnosis can result in a range of complications from chronic wheezing and recurrent pneumonia to life-threatening airway obstruction and lung abscess requiring open resection.

Radiology

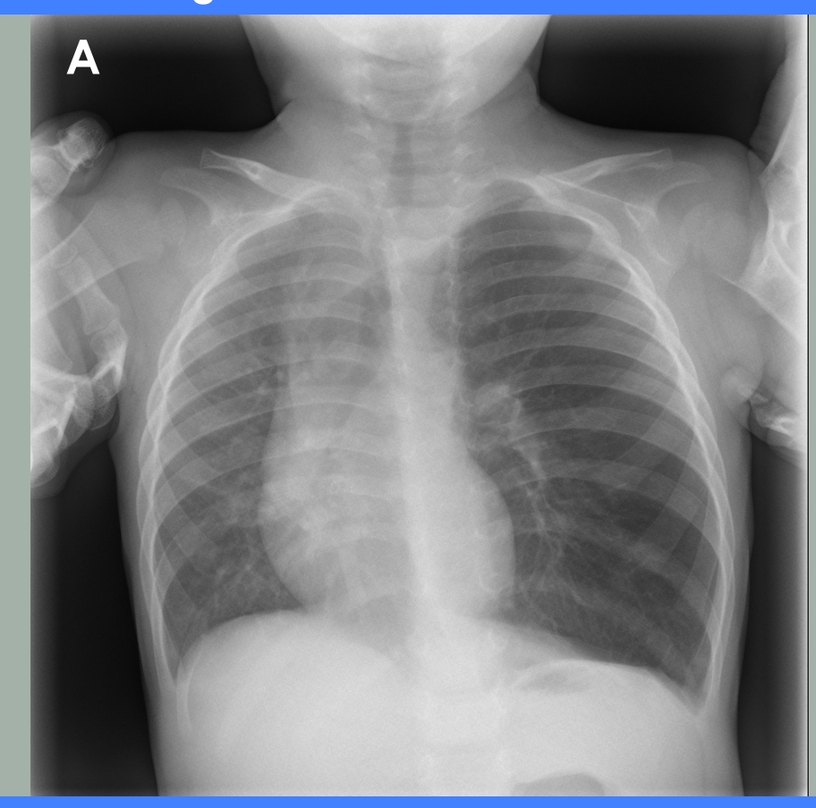
Radiological evidence of air trapping resulting from FB, as described in our case, is found in 43.9% of paediatric aspiration cases (3, 4).

The 'check-valve' mechanism of air trapping occurs when air is inhaled but cannot be expelled, causing hyperinflation distal to the FB.

Radiological findings can range from normal to atelectasis, signs of consolidation or emphysematous changes secondary to the 'check-valve' mechanism, as demonstrated in our case.

This variable radiological sensitivity reinforces the need for diagnostic bronchoscopy in all patients presenting with a clinical history of aspiration.

Case Images



A. CXR of case patient demonstrating cardiomediastinal shift, left lung hyperinflation and hyperlucency secondary to 'check-valve' mechanism air trapping resulting from LMB FB and right lung atelectasis

B. i.) Cashew Nut wedged in LMB

ii.) BAC adjacent to and beyond FB

iii.) FB dislodged into trachea following inflated balloon withdrawal

C. FB in RMB being retrieved with rigid micro-grabbers

D. Saline inflated BAC within Storz rigid bronchoscope

Anaesthetic

Intravenous access was gained prior to inhalational induction with oxygen and sevoflurane. Once sufficient depth of anaesthesia was attained, direct laryngoscopy was performed and vocal cords sprayed via a mucosal atomisation device with lignocaine (dose 3mg/kg). Dexamethasone and paracetamol were administered.

Anaesthesia was maintained throughout using a spontaneously breathing technique using a combination of propofol target controlled infusion and sevoflurane, initially through a nasopharyngeal airway and then through the side-arm of the rigid Storz ventilating bronchoscope.

Equipment

Attempts to remove the cashew nut with conventional procedural equipment proved futile. The rigid micro-grabbers were too small, whilst the Dormia basket collapsed on rigid bronchoscope withdrawal.

Similar frustrations with this equipment has been experienced at our institute whilst retrieving larger objects in older children over the last 14 years (Images E, F, G) (1, 2).

On this occasion, we successfully passed the BAC through a rigid bronchoscope under direct vision into the LMB adjacent to the FB without the use of a guidewire (Images Bii, D).

This allowed the FB to be withdrawn, following partial balloon inflation with saline, into the larger airways and in fact ended up in the right main bronchus (RMB) where rigid micro-grabbers successfully retrieved the cashew nut (Images Biii, C).

Our Institute's Experience: Royal Manchester Children's Hospital, UK

Figure 1: The angioplasty balloon is seen railroaded over the guide wire distal to the end of the endotracheal tube. The foreign body is captured in the centre of the angioplasty balloon.

Figure 2: A close up of the foreign body on the angioplasty balloon.

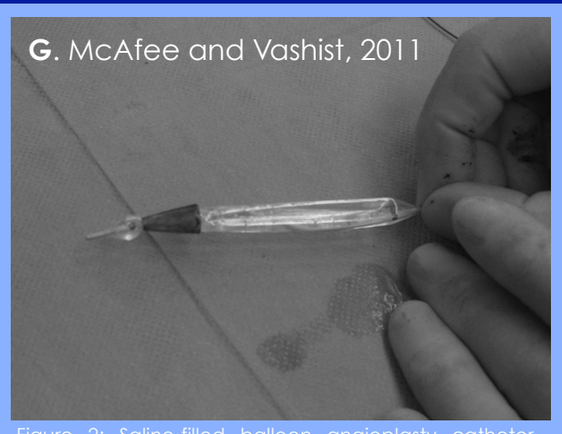


Figure 2: Saline-filled balloon angioplasty catheter passed through the foreign body.

The use of a guidewire passed through the channel of a fibreoptic scope is well described for use in paediatric fibreoptic intubation but to our knowledge, the use of a BAC for this purpose has only been described in the literature by our institute in paediatric FB retrieval – see Images E, F and G (1, 2, 5).

In conclusion, endobronchial FB may be difficult to visualise and remove in children. Should grasping equipment prove inadequate, the alternative technique we describe has been used with success in our hospital on various occasions.

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4. Tan HK, Brown K, McGill T, Kenna MA, Lund DP, Healy GB. Airway foreign bodies (FB): a 10-year review. Int J Pediatr Otorhinolaryngol 2000; 56:91-99
5. Walker RWM, Allen DL, Rothera MR. A fibreoptic intubation technique for children with mucopolysaccharidoses using the laryngeal mask airway. Paediatr Anaesth 1997; 7:421-426.