

## Interventional Pulmonological Removal of a Foreign Body from Right Lower Lobar Bronchus in a Young Male by Repeated Attempts: Avoiding Surgery

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### Abstract

**Background:** Tracheobronchial foreign body (FB) aspiration is an uncommon but potentially life-threatening event in adults. Symptoms typically consist of a choking event followed by cough and dyspnea, however, these findings are inconsistent and symptoms may mimic more chronic lung diseases such as asthma or chronic obstructive pulmonary disease. Chest radiography and computed tomography can provide information regarding the location and characteristics of foreign bodies and aid in diagnosis. Bronchoscopy remains the gold standard for diagnosis and management of FB aspiration. The authors describe the typical clinical presentation, diagnostic evaluation, and bronchoscopic management of foreign bodies in adult airways with a focus on bronchoscopic techniques and potential complications of FB extraction.

**Keywords:** Adult, Aspiration, Complication, Bronchoscopy, Foreign Body (FB), Fiber Optic Bronchoscopy (FOB).

### INTRODUCTION

Foreign body removal from the respiratory tract is usually achieved using a combination of physiotherapy, flexible or rigid bronchoscopy. Open thoracotomy may be required when these methods fail.<sup>[1]</sup> Interventional pulmonological methods in conjunction with bronchoscopy have been described.<sup>[2]</sup> We have identified very few previously described cases of foreign body removal in adults using pulmonological methods alone.<sup>[3,4]</sup> The

method described here differs in the use of an extraction basket and occlusion balloon to prevent distal migration of FB. The first successful FB extraction was performed by Gustav Killian in 1897. He extracted a bone from the right main stem bronchus of a 63-year-old man using an esophagoscope heralding a new era in medical procedures.<sup>[5]</sup> Following this, rigid bronchoscopy became the procedure of choice for removal of airway FBs, virtually eliminating the high mortality rate previously

associated with this condition, and remained the most common indication for bronchoscopy until the advent of flexible bronchoscopy in the early 1970s. Flexible bronchoscopy broadened the scope of bronchoscopic interventions to the peripheral airway, allowing removal of foreign bodies lodged more distally with a large variety of dedicated retrieval flexible instruments. Albeit rigid bronchoscopy remains the traditional gold standard, particularly in children.<sup>[6]</sup>

### CASE REPORT



**Figure 1: A repeat radiographic post showing migrated nail**

A 16 years old boy was admitted in district hospital and then referred to NIDCH Thoracic Surgery department following accidental aspiration of a nail. Removal of the inhaled nail was attempted in the Thoracic surgery operation theatre on the next day using rigid bronchoscopy. Due to poor visualization and firm adhesion of the nail, that attempt was abandoned and the patient referred to respiratory

medicine department for flexible bronchoscopy. The nail was identified within one of the lower lobar bronchus of the right lung where it had become impacted within the mucosa. Several attempts were made to remove the nail using graspers, an extraction basket, and distal occlusion and elevation with a balloon catheter. The procedure was abandoned due to the development of bronchospasm and perilesional edema. A repeat chest radiograph post procedure showed the nail had migrated further distally.



**Figure 2: Interventional Pulmonological removal procedure of Nail**



**Figure 3: Removed Nail**



The patient was given injectable steroids and advised physiotherapy for the next 3 days. Finally, he was shifted to the FOB room 3 days later. This time the nail was discovered within the right lower lobar bronchus at the commencement of a segmental bronchus lumen in an upside down position and then snared with a fish net extraction basket (Cook Ireland Ltd, Limerick, Ireland). During withdrawal, the nail became re-impacted proximally and worked itself loose from the basket. An occlusion balloon (Boston Scientific, St Albans, Herts, UK) was therefore introduced via the catheter mount inlet into the bronchus beyond the nail and used to pull it back into the right lower lobar bronchus. With the balloon still inflated to prevent distal migration, the extraction basket was re-introduced and the nail snared again. Following successful snaring, the nail was withdrawn to the tip of the catheter in the right main stem bronchus. The snare, basket, balloon, catheter, nail was withdrawn one by one. Tracheobronchial toileting was done. Repeat chest examination showed no pneumothorax. Following a period of stability, the patient underwent chest x-ray P/A view which was completely normal. Finally, he was shifted to medical ward. He was discharged home having made a full recovery and has subsequently returned to his studies.

## DISCUSSION

Aspiration of foreign bodies is an uncommon phenomenon. Aspiration may occur when protective airway

reflexes are impaired. This impairment may occur with primary neurological conditions, trauma with reduced levels of consciousness, sedatives and excessive alcohol. Failure to remove an impacted endobronchial foreign body may lead to recurrent respiratory tract infections and the development of localized bronchiectasis. Physiotherapy, flexible bronchoscopy and rigid bronchoscopy are the usual methods used for removal of a foreign body from the respiratory tract.<sup>[7]</sup> Inhalation of bronchodilators, followed by postural drainage (lateral decubitus and Trendelenburg), may be useful in a minority of asymptomatic, otherwise healthy adult patients, particularly if the inhaled body is smooth. Bronchoscopy (flexible, rigid or combined approach) has an overall success rate of 95-97% in case series. The traditional approach, rigid bronchoscopic removal, has claimed a success rate of 98% and for many years allowed easier instrumentation and ventilation of the patient than the use of flexible bronchoscopy.<sup>[8]</sup> Interventional pulmonological methods in conjunction with bronchoscopy have also been described.<sup>[2,9]</sup> This requires, however, a general anaesthetic and carries the risks of pneumothorax and bleeding. Recent improvements in flexible bronchoscopic techniques have made it a viable alternative, with extraction rates of 86% at some centres.<sup>[10]</sup> The need for a general anaesthetic is avoided and flexible bronchoscopy may also be preferable in cases of maxillofacial and cervical spine trauma. The relative frequency with which bleeding and pneumothorax occur with



these improved techniques compared to rigid bronchoscopy is not known. Both end bronchial techniques carry the risk of worsening respiratory compromise through loss of the foreign body into another airway during extraction, which may necessitate surgical intervention. Open thoracotomy is reserved for the rare cases when endobronchial methods fail and for the extraction of sharp and pointed objects (e.g. safety pin, electronic diode, some broken teeth) whose attempted endoscopic removal could incur high risks of bleeding and bronchospasm.<sup>[1,11]</sup> The disadvantages of an open surgical approach lie in the inherent risks of thoracotomy. These include bleeding, wound infection, air leak with chest drain insertion, broncho-pleural fistula and death.<sup>[12]</sup> Postoperative pain may require regional anaesthesia with its associated risks. Pain may lead to atelectasis, sputum retention and subsequent pneumonia. An in-patient stay of 7-10 days would also be expected. Specific to the above case, general anaesthesia with pre-existing ischaemic heart disease may increase morbidity and mortality.<sup>[13]</sup> The method we describe, using a combination of an extraction basket and occlusion balloon to prevent distal migration has been used to solve a problem in which the standard endoscopic approach was unsuccessful. This technique may achieve greater success with smooth objects compared to the techniques described above. The interventional radiological method described is minimally invasive and less likely to cause airway trauma or a significant presser response. It may be

used when there is concern over cervical spine integrity or a 'difficult to intubate' airway. When used with appropriate sedation and local anaesthesia, future cases may be dealt with on a day case basis. This has benefits for the patient and hospital resources. No published data exist regarding the risks of pneumothorax and bleeding using the 'basket technique' described here. There also remains a risk of equipment failure and creation of further endobronchial foreign bodies. In summary, we describe a new interventional radiological technique for the extraction of a foreign body, which may prove useful in cases where bronchoscopic approaches have been unsuccessful and an open surgical approach is contra-indicated or undesirable.

## CONCLUSION

Tracheobronchial foreign body (FB) aspiration is an uncommon but potentially life-threatening event in adults. In this case report a new interventional radiological technique for the extraction of a foreign body in adult airways had been stated which may prove useful in cases where bronchoscopic approaches have been unsuccessful and an open surgical approach is contra-indicated or undesirable.



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