

CASE REPORT

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The illuminated airway: flexible bronchoscopic removal of an aspirated LED bulb in an adolescent boy

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Abstract

Background: Foreign body aspiration is a common but serious pediatric medical emergency. A high index of suspicion, timely diagnosis and early bronchoscopic intervention can be life-saving in most cases.

Case presentation: We report the case of a 12-year-old boy who was symptomatic with recurrent chest infections for the last 3 years. Imaging identified a radio-opaque FB in the left mainstem bronchus. Subsequently, flexible bronchoscopic evaluation was performed under general anesthesia using laryngeal mask airway, and a light-emitting diode bulb was retrieved using flexible biopsy forceps.

Conclusion: The case highlights aspiration of a rare foreign body that went unnoticed for a long duration in a relatively higher pediatric age group child, and also emphasizes the role of bronchoscopy in managing the condition.

Keywords: Bronchoscopy, Children, Foreign body, LED bulb, Pediatric

Background

Airway foreign body (FB) aspiration is a commonly encountered situation in the emergency department. Timely diagnosis, prompt resuscitation, and meticulous FB retrieval are the cornerstones of management of this condition which, if not addressed urgently, can prove life-threatening. Since a reliable history of witnessed FB aspiration may not always be elicited, a high index of suspicion is essential to clinch the diagnosis, especially in long-standing cases which may present as non-resolving pneumonia or recurrent chest infections. FB aspiration is seen more often in the pediatric age group compared to adults. Even in the former, it is more common in younger children, mostly includes aspirated food materials, and usually presents acutely. In this context, we report the case of an adolescent boy who presented with

a chronically-impacted airway FB which was identified as a light-emitting diode (LED) bulb upon flexible bronchoscopic removal.

Case presentation

A 12-year-old boy was referred to Pulmonology from the Cardio-Thoracic Vascular Surgery Unit for consideration for bronchoscopic retrieval of a suspected airway FB. Clinical review by the Pulmonology team unraveled a three-year history of recurrent episodic cough, fever, and left-sided vague chest pain. For these complaints, the boy had received multiple courses of antibiotics and antipyretics from local practitioners for a clinically presumed diagnosis of recurrent chest infections, with transient relief. Despite repeated questioning, he and his parents denied any history of FB aspiration in the past. The boy had otherwise been previously healthy with normal growth and milestones. General physical examination and vital parameters were normal. Respiratory examination was remarkable for slightly reduced chest wall movements, impaired percussion note and decreased breath

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sounds, all on the left side mainly at the base. Occasional scattered rhonchi were also appreciable.

Chest X-ray postero-anterior view (Fig. 1A) revealed a hyperinflated right lung, partial volume loss on the left side, and a well-defined, radio-opaque FB with two curved parallel limbs and a rectangular base, in the left main bronchus. Suspecting a metallic FB, the patient was planned for its flexible bronchoscopic removal under general anesthesia (with rigid bronchoscopy as back-up). Written informed consent for the procedure was taken from the child's parents. After induction with propofol 50 mg, fentanyl 50 mcg, vecuronium 3 mg, and local anesthesia with lignocaine 2%, a supraglottic airway device (laryngeal mask airway) was used to secure the airway. Bronchoscopy was then performed with a pediatric flexible videobronchoscope (Olympus BF-P190, outer diameter 4.2 mm, Olympus Medical Systems, Japan) through the laryngeal mask airway. The left mainstem bronchus was found to be completely occluded by the FB—a LED

bulb having two metallic filaments embedded in a small rectangular base, covered by a plastic cap (Fig. 1B, D). The FB was located approximately 2 cm from the main carina in the left main bronchus. Excess muco-purulent secretions in the bronchus were suctioned out. The bulb was then carefully removed enbloc under vision by holding one of its metal filaments with a flexible biopsy forceps (Fig. 1C). Check bronchoscopic examination after FB removal showed mucosal oedema and overgrown granulation tissue at the site of its impaction. Rest of the tracheobronchial tree was normal. The patient was promptly reversed from anesthesia, initiated on chest physiotherapy and a 3-day course of oral prednisolone given the extensive airway edema, and discharged the next day. In a tele-consult 4 weeks later, the child's father informed about his symptom-free course since discharge.

Discussion

FB aspiration is an extremely common, potentially fatal medical emergency in children. It is commonly missed or misdiagnosed especially if long-standing, as the symptoms, signs, and radiological findings are non-specific. Moreover, a history of witnessed FB aspiration may be absent in as many as one-third of cases [1], as observed in our patient. Vegetative FBs like food materials are especially prone to be missed as they are radiolucent and hence difficult to detect on imaging. The latter may be normal or only show indirect radiologic signs like collapse, consolidation, hyperinflation, air trapping or mediastinal shift. Nevertheless, chest imaging is crucial to identify metallic FBs and must be performed routinely, especially if the patient is unresponsive to conventional treatment or presents with repetitive symptoms.

Pediatric FB aspiration has mostly been reported in children less than 3 years of age [2]. Older children may also get affected as in our case, though less than 15% cases of FB aspiration occur among children aged > 5 years [3]. The most commonly aspirated FBs include vegetative food materials like peanut, other nuts and seeds, etc. Small plastic/metallic toys or their parts are also often implicated. However, LED bulb aspiration has rarely been reported [4–6]. These bulbs are micro-components of modern toys commonly available nowadays for children. Awareness of the risk of aspiration of this unusual FB is crucial among toymakers, parents, and physicians alike. Being composed of both metallic and plastic parts (as illustrated earlier), it is difficult to delineate the exact morphology of an aspirated LED bulb on radioimaging. Also, the plastic portion can partly or totally occlude the bronchial lumen, thereby causing partial or complete lung atelectasis. It is further important for clinicians to realize that the metallic filament can potentially break away from the bulb assembly (as in the

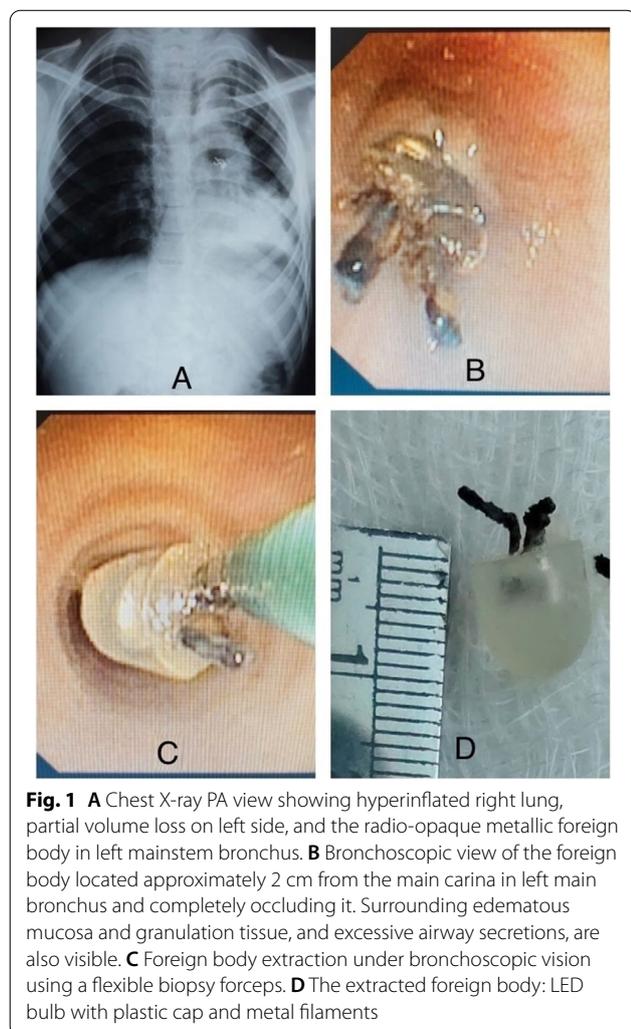


Fig. 1 **A** Chest X-ray PA view showing hyperinflated right lung, partial volume loss on left side, and the radio-opaque metallic foreign body in left mainstem bronchus. **B** Bronchoscopic view of the foreign body located approximately 2 cm from the main carina in left main bronchus and completely occluding it. Surrounding edematous mucosa and granulation tissue, and excessive airway secretions, are also visible. **C** Foreign body extraction under bronchoscopic vision using a flexible biopsy forceps. **D** The extracted foreign body: LED bulb with plastic cap and metal filaments

case reported by CT Lau et al.) [4] before/during retrieval and accidentally slip off into distal airways. Utmost care is, therefore, needed to remove the bulb as a whole.

A 2017 study describes numerous other unusual FBs in the aero-digestive tract of 35 of the 1096 (3%) included patients. Failed first attempt at bronchoscopic extraction occurred in 6 cases of unusual FBs, 4 of which required surgical retrieval and 2 were successful in the second attempt at bronchoscopy. The authors emphasized that it is important for clinicians to be aware of unusual FBs because of their rarity, a higher than usual morbidity/complication rate, and probable need for surgical intervention [7].

A relatively unexplored aspect of FB aspiration is the direction in which the FB migrates within the tracheo-bronchial tree. In a recent paper, 100 patients with FB aspiration were subjected to bronchoscopic removal, and it was found that all cases with non-metallic FBs went to the right lung whereas those with metallic FBs went to the left. The authors proposed that magnetic field lines produced from depolarization of the cardiac electrical activity act as a magnet and possibly attract metallic FBs to the left side [8].

Bronchoscopy forms the cornerstone of definitive diagnosis and treatment of suspected FB aspiration. A high index of suspicion and timely bronchoscopic intervention is life-saving in acute cases and curative in chronic ones that may present with complications like recurrent chest infections (as in our case), airway inflammation, non-resolving consolidation, lung abscess or bronchiectasis. Modern bronchoscopic retrieval techniques have dramatically reduced mortality due to FB aspiration if used judiciously by experienced operators [3, 9]. It is important for the bronchoscopist to ensure availability of various accessories used in FB removal and also be well-versed with their indications and usage. Of note and relevance to the present report of retrieving a metallic FB, Elsayad et al have proposed the use of a novel, modified rigid bronchoscopic suction catheter with double magnets attached at its tip, for safe and non-traumatic removal of metallic FBs, especially sharp ones like metallic pins [10].

Rigid bronchoscopy has historically been the standard practice of FB removal in children, but flexible bronchoscopy is an increasingly used option, with rigid as back-up [11]. Flexible bronchoscopy avoids the need for general anesthesia (which is a prerequisite for rigid bronchoscopy) and can easily access the distal airways and upper lobes. In the previously reported cases of aspirated LED bulb removal, rigid bronchoscopy [4, 5] or thoracotomy [6] was used. To the best of our knowledge, this is the first report of flexible bronchoscopic removal of an aspirated LED bulb. Patient's higher age at presentation, rarity of

this FB, and its excessively long-standing duration before diagnosis are also unusual aspects of the case.

Conclusion

FB aspiration is fairly common among children and should always be suspected in the relevant clinical context. Bronchoscopic evaluation must be done in all doubtful cases since clinico-radiographic information may be misleading. Flexible bronchoscopy performed through an artificial airway is a safe, minimally invasive technique that may obviate the need for doing rigid bronchoscopy which is more challenging and may not be universally available. Aspiration of an LED bulb, though rare, must be considered while evaluating a child suspected of FB aspiration.

Abbreviations

FB: Foreign body; LED: Light-emitting diode.

Acknowledgements

None.

Prior presentation

None.

Authors' contributions

Concept, design, and definition of intellectual content: MM, AD. Acquisition of clinical details, literature search, manuscript draft, and editing: MM, GS. Manuscript critical revision and final approval of the submitted version: MM, GS, AD. Guarantor: MM. All authors read and approved the final manuscript.

Funding

No intramural/extramural grants were obtained for conducting this study.

Availability of data and materials

Not applicable.

Declarations

Ethics approval and consent to participate

Not applicable.

Consent for publication

The patient himself being a minor, written informed consent was obtained from his father for publication of this case report and any accompanying images.

Competing interests

The authors declare that they have no competing interests.

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Received: 20 May 2022 Accepted: 30 August 2022

Published online: 10 September 2022

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