



## Sharp Metallic Foreign Body in Bronchus : Anaesthetic Considerations And Management Options in Children.

## KEYWORDS

Foreign body aspiration; rigid bronchoscopy; pediatric

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## ABSTRACT

Foreign body (FB) aspiration is the principal cause of accidental death among children younger than 3 years. The objects most frequently aspirated are food products. Metallic FB aspiration is rare and accounts for only 4.4% of all foreign bodies found in tracheobronchial tree. Suggestive history is important in diagnosis as symptoms and radiological studies have relatively low sensitivity and specificity. The gold standard for diagnosis and management is rigid bronchoscopy under general anaesthesia. The choice of inhaled or intravenous induction and maintenance, spontaneous or controlled ventilation and use of neuromuscular blockers must be tailored to the specific circumstances. Shared management of potentially obstructed airway demands close communication between anaesthesiologist and surgeon for successful management of this problem. We hereby report a case of aspiration of unusual sharp metallic foreign body, a pencil sharpener blade, in a 5 years old male child. The blade was removed by rigid ventilating bronchoscope under general anaesthesia.

## Introduction:

Aspiration of foreign body (FB) is a common life threatening emergency in pediatric age group and accounts for an important proportion of accidental deaths in children less than 3 years of age.<sup>[1]</sup> Foreign body can only enter the air passage if there is some interference with the normal reflex action, such as sudden inspiration while eating, playing, fright or laughter. These accidents are more common in children probably because the protective reflex in them is not as effective as in adults.<sup>[2]</sup> The majority of aspirated foreign bodies are organic, nuts and seeds being the most common.<sup>[3]</sup> The incidence of metallic FB aspiration in children is 4.4%.<sup>[4]</sup> with only anecdotal case reports of pencil sharpener blade aspiration.<sup>[5]</sup>

Airway management in a child with possible history of FB inhalation taxes the skills of even experienced anaesthesiologist not only because of the paucity of optimal anaesthetic technique for managing these patients in literature, but also on account of the unpredictability in the degree of difficulty of the procedure.<sup>[6]</sup>

We hereby report successful anaesthetic management of a case of aspirated unusual sharp metallic FB, a pencil sharpener blade, in a 5 years old male child. Advantages and disadvantages of various anaesthetic techniques advocated for managing such cases have also been discussed.

## Case report:

A 5 year old male child, weighing 20 kg, presented to our emergency department with alleged history of foreign body (pencil sharpener blade) inhalation one day back. There was history of coughing and dyspnoea immediately following aspiration. Child had tachycardia and tachypnea with mild respiratory distress on presentation. There was decreased air entry and rhonchi on left side on auscultation. Chest radiography confirmed presence of foreign body in left main bronchus. (Figure 1) The child was fasting for more than 6 hours and was immediately transferred to the operating theatre for removal of the aspirated FB under general anaesthesia. He was nebulized with inhaled bronchodilators and steroids. Standard monitoring [HR, ECG, SpO<sub>2</sub>, EtCO<sub>2</sub>], was attached, intravenous access achieved and inj atropine 0.3 mg was given. Anaesthesia was induced using inhalational technique

with incremental dosages of sevoflurane and 100 % oxygen. After confirming that the ventilation is possible, iv suxamethonium 40 mg was given to facilitate introduction of ventilating rigid bronchoscope (karl Storz, Germany) by the surgeon. Breathing circuit was attached to the side port of rigid bronchoscope and anaesthesia maintained with sevoflurane in 100% oxygen. The sharpener blade was found to be located in left main bronchus. The blade was grasped with a forceps and both the forceps as well as bronchoscope was removed as a unit under vision. After removal of FB, bronchoscope was reintroduced to rule out any damage caused by it. The patient was then ventilated with mask till return of spontaneous ventilation and recovery from anaesthesia and transferred to postanesthesia recovery unit. No postoperative complication was observed. He was discharged from the hospital the next day.

## Discussion:

Tracheobronchial foreign bodies especially in children can lead to life threatening respiratory obstruction and death. Majority of foreign bodies lodge in right main bronchus but in young children there is only a slight propensity to the right because of symmetrical bronchial angles in them. The type of foreign bodies is almost endless and their enumeration is unnecessary. The prognosis and outcome depends on a number of factors like the age of the patient, the type of foreign body inhaled, the interval between inhalation and removal, the skill of the anaesthesiologist and surgeon and the equipment available.<sup>[7]</sup>

Diagnostic approach has to be systematic. Suggestive history of witnessed FB aspiration is important in diagnosis. The most common presenting symptoms are cough, dyspnea, wheezing, cyanosis or stridor. Symptoms of delayed presentation include unilateral decreased breath sounds and rhonchi, persistent cough or wheezing, recurrent or nonresolving pneumonia or rarely pneumothorax.<sup>[6,8]</sup> Chest radiographs have low sensitivity and specificity for inhaled FB.<sup>[9]</sup> The common radiographic abnormalities include localized emphysema and air trapping, atelectasis, infiltrate and mediastinal shift. Thoracic computed tomography (CT) and virtual bronchoscopy are more sensitive than conventional chest radiographs, but potential for excessive radiation exposure, cost and lim-

ited availability are the precincts for their extensive use.

Medical management by bronchodilators, pulmonary drainage and thoracic percussion, particularly of peripherally located foreign bodies, has been used<sup>[10]</sup> but the gold standard for managing FB aspiration is removal via rigid open tube bronchoscopy under general anaesthesia.<sup>[17]</sup>

A thorough preoperative assessment should ascertain what was aspirated, where it has lodged and when the aspiration occurred ("what, where, when")<sup>[6]</sup> Determining the type of FB is important because organic FB can absorb fluid and swell, oils from nuts cause localized inflammation and sharp objects can injure the airway. Location of FB is also important because proximal FB can lead to complete airway obstruction whereas the converse is true for FB lodged beyond the carina. Time since aspiration should be elicited because recently aspirated object can migrate to different position with coughing while delayed presentation can cause airway oedema, granulation tissue and infection. Time since last meal should be known to quantify risk of aspiration because the airway cannot be fully protected during the procedure. In urgent cases, the stomach can be suctioned through large bore gastric tube after induction but before bronchoscope is inserted while a pre-anaesthetic fasting is essential if bronchoscopy is not urgent as in delayed presentations. Airway patency should also be established. Urgent bronchoscopy is warranted if patient is in distress but if the patient is stable it can be performed during normal daytime operating hours to ensure optimal conditions and preparations with experienced surgeon and anaesthesiologist.<sup>[11,12]</sup> Antibiotic and steroid cover should be given to treat infection and laryngeal oedema, particularly in delayed presentations.

There is lack of consensus in literature on the choice of inhalational or intravenous induction, spontaneous or positive pressure ventilation and maintenance of anaesthesia for rigid bronchoscopy in children with inhaled FB. The choice is often based on institution's protocol and anaesthesiologist's training. However, spontaneous ventilation is maintained during induction and continued until it is certain that child can still be ventilated under anaesthesia. Spontaneous ventilation is more suitable for removal of proximal FB because of the theoretical risk of its dislodgement causing complete obstruction with positive pressure ventilation.<sup>[13]</sup> Migration of FB distally would also increase the difficulty of removal. Spontaneous ventilation also allows for continued ventilation during removal of FB and rapid assessment of airway adequacy after removal of FB. Controlled ventilation on the other hand provides immobilized airway with intermittent apnoea while manipulating the FB and is more suitable for distal FB removal. It also decreases atelectasis, improves oxygenation and overcomes the increased airway resistance after introduction of bronchoscope. Jet ventilation has been used for removal of FB but it is not advocated for use in children because of the concern of barotrauma and dislodgement of FB.<sup>[14]</sup> Halothane and sevoflurane are the two

widely used volatile anaesthetics for inhalational induction and maintenance in children. Sevoflurane is preferred to halothane because of lower incidence of cardiac arrhythmias.<sup>[15]</sup> Total iv techniques with propofol and remifentanyl infusions in combination with vocal cord topicalization with lidocaine have been reported in literature for maintenance of anaesthesia.<sup>[16]</sup> IV anaesthetic techniques have the advantage of providing fixed level of anaesthesia irrespective of ventilation but are associated with higher incidence of body movement, breath holding and laryngospasm.<sup>[17]</sup> Inhalational anaesthetics on the other hand have risk of inadequate depth of anaesthesia due to hypoventilation and leaks around the bronchoscope and theater pollution. Dropping of foreign body during retrieval is a potentially life threatening complication. Management includes pushing the FB more distally into one of the main bronchi.<sup>[14]</sup> After removal of FB by rigid bronchoscope, spontaneous ventilation assisted by mask ventilation is needed in uncomplicated cases while intubation is necessary in airway oedema or residual neuromuscular blockade. Patients can be discharged the same day in cases of uncomplicated FB removal while stay may be required to treat complications and infection.

### Conclusion:

Aspiration of foreign body is a potentially hazardous condition in pediatric age group. There is lack of agreement in literature on the choice of optimal technique of general anaesthesia for bronchoscopic removal of FB. Regardless of the management strategy, the goal should be to achieve minimal morbidity and almost no mortality in the affected children. A clear communication and good cooperation is essential between the skilled surgical and anaesthetic team to avoid potentially lethal complications of FB aspiration in children.

**Figure 1: Photograph of X-ray chest showing pencil sharpener blade in left bronchus of the patient.**



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