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## FOREIGN BODY BRONCHUS - CHALLENGE FOR ALL; CASE SERIES

### ABSTRACT

Tracheobronchial foreign body is an emergency situation with serious life threatening complications commonly seen in children. Early diagnosis and removal of the inhaled foreign material are associated with effective reduction in complications and mortality. We present a case series of four cases each with its own distinct issues requiring unique modifications in the anaesthetic techniques. Based upon the time after aspiration, type and location, the foreign body airway can have a wide range of clinical symptoms from asymptomatic to severe respiratory distress. Imaging modalities may often fail to visualize the foreign body with only features of partial obstruction (hyperinflation) or complete obstruction (atelectasis and collapse). The sensitivity of plain chest X-ray in detecting an actual foreign body or signs of it is around 62-68%. Bronchoscopy should be performed under optimal conditions after planning by experienced and well coordinated ENT and Anaesthesiologist teams.

**Keywords:** Anaesthetic Management, Foreign Body Bronchus, Paediatric, Rigid bronchoscopy

### INTRODUCTION

Tracheobronchial foreign body is an emergency situation with serious life threatening complications commonly seen in children.<sup>1,2</sup> Early diagnosis and removal of the inhaled foreign material are associated with effective reduction in complications and mortality. Rigid bronchoscopy performed under general anesthesia is the most common and effective method used for removal.<sup>1,2,3</sup> However, a myriad of complications may arise during the procedure. We present a case series of four cases each with its own distinct issues requiring unique modifications in the anaesthetic techniques.

#### Case 1

A 15 months male weighing nine kilograms with a

history of persistent cough and noisy breathing for five days was initially treated as a case respiratory tract infection with oral antibiotics at a local health center. He was referred to another center after no improvement in following few days. A chest X-ray (Image 1) was performed there, which showed hyperinflation of the left lung. The patient was further managed as case of pneumonia with antibiotics and supportive treatment. Finally he was referred to our center for further evaluation and management. A detailed history revealed an abrupt onset of the cough following a spell of choking while he was eating green peas. A repeat chest X-ray (Image 2) showed gross hyperinflation. A CT scan chest was performed with the clinical suspicion of foreign body airway which revealed left lung lower lobe hyperinflation



Image 1: X-ray chest, AP and lateral showing hyperinflation of the left lower lobe.



Image 2: Repeat X-ray chest of after to days of the first X-ray showing gross hyperinflation.

without visualization of any foreign body. A clinical diagnosis of foreign body airway was made and the patient was planned for rigid bronchoscopy.

After counseling and taking consent, the patient was prepared for Rigid Bronchoscopy. Detailed anesthetic plan was made after coordinating with the ENT Surgery team. Premedication with Inj. Glycopyrrolate 0.1mg was done. Patient was shifted to the operating room and standard ASA monitoring was established.

After pre-oxygenation, gaseous induction with Sevoflurane was done. Inj. Fentanyl 20mcg and Inj. Succinylcholine 15mg were administered for muscle relaxation for the introduction of the rigid bronchoscope under direct laryngoscopic visualization. Side port ventilation was instituted and supplemental oxygen was administered via a suction catheter placed at the nasopharynx. Anesthesia was maintained with oxygen and intermittent boluses of propofol. ENT team was handed over the bronchoscope. The foreign body was visualized on the left lower secondary bronchus and was removed on third attempt. Positive pressure ventilation was intermittently stopped during the three attempts at removal. Throughout the procedure, the vitals of patient were within normal limits without any episodes of hypotension or hypoxaemia. The rigid bronchoscope was removed and the patient was intubated with a 3.5mm internal diameter endotracheal tube after which injection vecuronium 1.5mg and intermittent positive pressure ventilation were continued. After reversal of muscle relaxation, awake extubation was done and patient was shifted to paediatric intensive care unit for monitoring. With an uneventful overnight stay, the patient was transferred to the pediatrics ward the next day. The child was discharged on the third post operative day.

### Case 2

A six year old child with a history of aspiration of a pen cap for 15 days was referred from a remote district of Nepal for management. The patient had a history of choking and bouts of cough while playing with a pen in his mouth. On arrival, the patient was comfortable with no signs of respiratory distress and no abnormal findings were noted on clinical examination. Chest X-ray and neck showed no abnormal findings. Rigid bronchoscopy and removal of foreign body was planned under general anaesthesia. The patient

was premedicated with Inj. Glycopyrrolate 0.2mg and nebulised with topical lignocaine 4% for three minutes. Pre-oxygenation was done for five minutes with 100% oxygen at eight litres per min. Induction was done with Sevoflurane and Inj. Fentanyl 50mcg. The bronchoscope was introduced after further blunting the airway reflexes with Inj. Xylocard 30mg without the use of muscle relaxant. Throughout, oxygen supplementation at 5 L/min from an auxiliary source was continued with a suction catheter placed at the nasopharynx. Ventilation and anaesthesia was maintained with spontaneous breathing with occasional intermittent positive pressure ventilation through the side port of the bronchoscope during times of desaturation to <92%. The ENT team attempted multiple times at removal of the foreign body which was visualized just below the level of vocal cords. However the foreign body could not be removed through the vocal cords. The plan was then made for a tracheotomy from which the foreign body was removed. The patient was kept intubated under mechanical ventilation in view of the airway oedema resulting from multiple airway instrumentation. Luckily, the pen cap had a hole from which the airway was maintained during both the spontaneous and assisted breathing. In case the pen cap had been solid, its position just below the vocal chords would have proven instantly fatal after aspiration or during manipulation during removal. The patient was extubated the next morning in the PICU and later discharged home on the fifth day with just a scar on the neck midline.

### Case 3

An 11 month female child with history of aspiration of a mouthful of peas presented to the emergency at another centre where she was managed with oxygen supplementation and observation. She was referred to our center following inability to maintain saturation even on oxygen where she was intubated and kept under mechanical ventilation. On our evaluation child was intubated, alert and responsive with decreased air entry over left side. Her saturation at 80% fraction of inspired oxygen was in the range of 92-95%. X ray chest showed opaque shadows over the left hilar region. A clinical diagnosis of foreign body airway was made based upon history given by mother, examination of patient and imaging investigation.

Rigid bronchoscopy and foreign body removal was planned under general anaesthesia. After counseling and written informed consent about intraoperative events including inability to remove foreign body, trauma to airway and probable hypoxia and cardiac events, the patient was prepared for rigid bronchoscopy. Detailed anesthetic plan was made after coordinating with the ENT team. Premedication with Inj. Glycopyrrolate 0.1mg was done. Patient was shifted to the operating room, standard ASA monitoring was established and intravenous induction was done.

As patient was already intubated, gaseous induction with Sevoflurane was done. Inj. Fentanyl 20mcg and Inj. Vecuronium 1mg were administered. Under direct laryngoscopic visualization, endotracheal tube was removed and rigid bronchoscope was inserted. Side port ventilation was instituted and supplemental oxygen was administered via a suction catheter placed at the nasopharynx. Anesthesia was maintained with intermittent boluses of propofol. The ENT team was handed over the bronchoscope. Multiple peas were visualized on the left lower bronchus. First two attempts lead to removal of pieces of peas. At third attempt, patient Spo2 started to decrease upto 85%. The bronchoscope was removed and patient was intubated with an endotracheal tube and manual ventilation attempted. We were unable to ventilate and the saturation decreased further, with decrease of heart rate up to 60 from baseline of 120-130/bpm. Inj Adrenaline 10 mcg bolus was administered and rigid bronchoscope was reinserted pushing foreign body. As we were able to ventilate, the heart rate and saturation picked up and stabilized. The procedure was abandoned and the patient was kept intubated, started on antibiotics, steroids and managed in PICU. After 48 hours next attempt was made and this time procedure was uneventful with complete removal of multiple pieces of peas. Awake extubation was done and patient was shifted to PICU. With an uneventful overnight stay, patient was transferred to pediatrics ward the next day.

#### Case 4

A two year child with a history of aspiration of a pen cap five days prior was referred to our center. The patient, after accidental inhalation of pen cap had choking and cough. On arrival, the patient was comfortable with no signs of respiratory distress and no abnormal findings on clinical

examination. Rigid bronchoscopy and removal of foreign body was planned under general anaesthesia after proper counseling and written consent. Induction was done with Sevoflurane and Inj. Fentanyl 50mcg. The bronchoscope was introduced after further blunting the airway reflexes with Inj. Xylocard 30mg without the use of muscle relaxant. Throughout, oxygen supplementation at 5 L/min from an auxiliary source was continued with a suction catheter placed at the nasopharynx. Ventilation and anaesthesia was maintained with spontaneous breathing by the patient with occasional intermittent positive pressure ventilation through the side port of the bronchoscope during times of desaturation to <92%. The ENT team attempted multiple times but was unable to visualize the foreign body though granulation tissue was observed over right middle bronchus. The patient was kept intubated and mechanically ventilation in view of the airway edema resulting from multiple airway instrumentation. Post procedure CT chest was done which showed foreign body at distal part of right middle bronchus. After consultation with CTVS team, right thoracotomy was done and foreign was removed. Patient was shifted to the ward after five days of PICU monitoring.

#### DISCUSSION

Based upon the time after aspiration, type and location, the foreign body airway can have a wide range of clinical symptoms from asymptomatic to severe respiratory distress.<sup>1</sup>

Imaging modalities may often fail to visualize the foreign body with only features of partial obstruction (hyperinflation) or complete obstruction (atelectasis and collapse). The sensitivity of plain chest X-ray in detecting an actual foreign body or signs of it have been quoted to be around 62-68%.<sup>4-6</sup> Very subtle signs may be visible and sometimes none at all. Hyperinflation of the chest which was easily evident in the repeat X-ray in our first case could have easily been missed in the first X-ray to an inattentive eye. An expiratory film may be more useful to detect hyperinflation.<sup>4-6</sup> CT-scan with virtual bronchoscopy (axial 3D reconstruction) of the chest has higher sensitivity of 96%. This however has the disadvantage of availability, cost and radiation hazard.<sup>10</sup>

Furthermore, depending on the duration and type of foreign body, the patient may develop pneumonia, lung abscess, bleeding, sepsis or even death.<sup>5</sup>

Through history, relevant clinical examination and appropriate investigation leads to correct diagnosis and management.<sup>6</sup> Clinical scoring systems and algorithms have been devised to help aid the management of a case of suspected foreign body for bronchoscopy and removal.<sup>6,11</sup>

Induction and maintenance of safe anesthesia especially the methods of ventilation is a serious challenge as the airway is shared by not only the anesthesiologist and the surgeon, but also an important third party- the foreign body. Intra operative mortalities have been reported due to complete obstruction of the airway during removal of the foreign body.<sup>2</sup> Difficulty in the removal through the vocal cords may require a tracheotomy as reported in some case reports and as we have experienced in our center as well.<sup>8</sup> Not infrequently, the foreign body cannot be removed due to various causes like granulation tissues and difficulty in visualization due to pus and may require another attempt after adequate antibiotic treatment or sometimes even thoracotomy.<sup>2</sup>

The choice of anaesthesia, intravenous vs inhalational and spontaneous vs mechanical ventilation is always challenging requiring decision based upon risk-benefit that differs with individual cases.<sup>9</sup> Maintenance of anaesthesia has classically been advocated to be better with spontaneous ventilation in order to avoid migration leading to complete loss of airway.<sup>12</sup> The disadvantage of preservation of spontaneous ventilation has been found to be a higher incidence of laryngospasm and incidences of coughing/bucking. However meta-analysis have shown that there has been similar incidences with the use of paralyzing agents and frequent conversions from spontaneous to controlled ventilation during time of desaturation.<sup>13</sup> In all the cases we however supplemented oxygen via a catheter in the nasopharynx for apnoeic oxygenation which might had lead to lower incidences of desaturation.

## CONCLUSION

Tracheobronchial foreign bodies are frequently seen in pediatric population with serious life threatening effects. Bronchoscopy should be performed under optimal conditions after planning by experienced and well coordinated surgical and anaesthetic teams.

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