Title : Anaesthesia For Foreign Body Removal From Airway In Children

*Dr. (Col) H.S. Rawat, **Dr. S.A. Bhopale, ***Dr. P.N.Jadhav

*Prof and head, **Senior resident, ***Junior resident

Address for Correspondence : PDVVPF's Medical College and Hospital, department of anaesthesia, Ahmednagar.

Abstract :

Foreign body in paediatric airway is a common and a potentially life threatening situation. Presenting symptoms of an inhaled foreign body depends on time since aspiration. Immediately after inhalation the child may show symptoms of airway obstruction like cough, wheeze, or have laboured breathing. If the early signs are missed, the child usually presents with fever and other signs and symptoms of chest infection.

The removal of foreign body presents considerable problems both to the endoscopist and the anaesthesiologist. It is a challenging procedure for the anaesthesiologist to maintain airway for adequate ventilation and oxygenation in patients whose pulmonary gas exchange is already compromised. Children below 3 years of age are found to be very vulnerable for aspiration. Airway surgery demands a high level of cooperation between surgical and anaesthetic teams.

The gold standard for diagnosis and management of foreign body airway is rigid bronchoscopy under general anaesthesia. For late presentations, time should be taken for fasting the child and to complete a thorough evaluation before bronchoscopy. The procedure should be performed in a well-equipped room with at least two experienced anaesthesiologists. Preferred choice of anaesthetic induction is inhalational rather than intravenous induction and using a ventilating bronchoscope rather than endotracheal intubation.

However, anaesthetic goals focus on adequate oxygenation and ventilation, controlled cardio-respiratory reflexes during bronchoscopy, rapid return of upper airway reflexes, prevention of pulmonary aspiration and meticulous monitoring in intra operative and post operative period.

Keywords : Foreign body, airway, bronchoscopy.

Introduction : Foreign body aspiration into the trachea and larynx is the commonest reason for bronchoscopy in the 1-3 yr age group [1,2,3]. It may cause life threatening airway obstruction presenting as an emergency in the MI room/operation theatre. 95% foreign bodies get lodged in the right main bronchus, because of its more vertical angle of origin and greater width. Foreign body aspiration is leading cause of death in these children[4]. Some foreign bodies lodge in the trachea, but the majority are found in the proximal airways. Small, sharp objects can lodge in the subglottic area, where they can be difficult to diagnose [5].

Type of foreign body : [1,2,3]

Most commonly inhaled objects are : Organic foods-seeds, nuts, chunks of carrot, bones.

Less commonly aspirated : Coins, toy parts, jewels, batteries, needles and pins.

Nature of foreign body [1,2,3]

Organic foreign body swells up and obstructs the bronchial passage. Swollen foreign body gets easily fragmented when grasped, fragments may occlude both main stem bronchi leading to inability to ventilate.

Organic foreign body =>irritation => inflammation => oedema =>granulation =>pneumonia

Metallic foreign body=> less initial inflammation => oxidizes =>rough edges =>penetrates wall.

Types of obstruction and their effects : There are four types of obstruction;

- Check valve – Air can be inhaled but not exhaled (emphysema).
- Ball valve – Air can be exhaled but not inhaled (broncho-pulmonary segment collapse).
- Bypass valve—Foreign body partially obstructs both inspiration and expiration.
- Stop valve—Total obstruction, airway collapse and consolidation.

Symptoms And Signs : [6,7,8,9]

These depend on the site, degree and duration of airway obstruction. Large foreign body with laryngeal obstruction presents as bidirectional stridor and/or aphonia.

- Foreign body in trachea presents with brassy cough.
- Foreign body in bronchus presents as coughing, wheezing, dyspnoea & ipsilateral decreased air entry.

- Chest x-ray provides direct evidence if foreign body is opaque. Radio-lucent foreign bodies show indirect evidence by demonstrating hyperinflation of the affected lung after 24 to 48 hours with distal atelectasis. Hyperinflation gets prominent during expiration.
- Infection which is usually superadded.
- Bronchiectasis may be a late complication.

Important Considerations:

- Coughing, gagging , laryngo-bronchospasm, hypertension ,arrhythmias and secretions must be controlled.
- Anticholinergics reduce secretions and attenuate vagal mediated bradycardia and reflex bronchoconstriction.
- Local anaesthetics (lignocaine IV/spray) diminish airway reflexes secondary to endoscopic manipulations.
- Opioid analgesics (fentanyl 1mcg/kg) suppresses airway reflexes and is administered only after the airway is secured.
- Nitrous oxide to be withheld to limit further pulmonary inflation and potential rupture.
- Airway is to be shared with endoscopist while maintaining alveolar ventilation and providing an unobstructed surgical access.
- Rigid ventilating bronchoscope equipped with an additional optical telescope and fibre-optic light source is essential.

Goals :

- Adequate oxygenation and ventilation.
- Controlled cardio-respiratory reflexes during bronchoscopy.
- Rapid return of upper airway reflexes.
- Prevention of pulmonary aspiration.
- Meticulous monitoring.

Pre-operative Considerations:

- Assessment for severity of airway obstruction, gas exchange and level of consciousness.
- Nature and location of foreign body, degree and duration of obstruction.
- Adequate pre-induction fasting—delayed intervention must be balanced against potential functional impairment, adequate oxygenation.
- Latest chest x-ray (inspiratory and expiratory) for atelectasis, air trapping, mediastinal shift or pneumonitis.
- IV Atropine 10mcg/kg is administered to decrease secretions and obtund autonomic reflexes during airway instrumentation.
- IV Metoclopramide 0.15mg/kg hastens gastric emptying and increases tone of the oesophageal sphincter.
- Secure good IV access and ensure adequate hydration.
- Heimlich maneuver may be a life saving emergency procedure for foreign body trachea.

Monitoring:

- Precordial stethoscope, inspection of chest movements,Spo2,EtCo2, ECG,NIBP.
- Neuromuscular transmission with TOF nerve stimulator.

Anaesthetic Management :

- An experienced anaesthesiologists presence is mandatory.
- General anaesthesia is always required because of fighting irritable child, removal of distally lodged invisible foreign body and if prolonged bronchoscopic procedure is contemplated.
- Induction can be with inhalational or IV technique based on feeding history.
- Spontaneous technique is safer than apnoeic technique to avoid pushing the object further in. 100% oxygen with Sevoflurane (3 to 5%) or Halothane (1 to 2%) is used.[10]
- Deep inhalational maintenance with Halothane (Sevoflurane gives too rapid an awakening)
- Topical anaesthesia with lignocaine (3 to 4mg/kg) is applied to vocal cords to prevent laryngospasm.
- Rigid bronchoscopy done with Storz bronchoscope which has an attachment for T piece. During instrumentation or extraction of foreign body if the child coughs, small increments of Propofol or Fentanyl are administered.[11]
- If the foreign body is in the lower airway, then use IPPV with a muscle relaxant since the object will be pushed distally by the bronchoscope until it can be grasped by forceps. Intermittent suxamethonium may be used. Assisted

ventilation is given via a T-piece or high frequency jet ventilation.

- Propofol based IV anaesthesia supplemented with topical spray of lignocaine can alternatively be used to maintain a steady level of anaesthesia ,independent of ventilation or OT pollution [12].

Intra-Operative Complications:

- Laryngospasm,bronchospasm,pneumothorax and cardiac arrhythmias may occur.

Post-operative Management:

- Close monitoring is required in case of bronchospasm or laryngospasm.
- Humidified oxygen is administered by mask
- If bronchoscopy is traumatic,give dexamethasone 0.25mg/kg IV followed by two doses 8 hourly of 0.125 mg/kg. 24 to 48 hours intubation may be necessary till oedema subsides.
- In recovery, staff should look for signs of stridor secondary to subglottic oedema.In this event, nebulized epinephrine 1:1000 should be administered in a dose of 0.5 ml/kg, maximum 5 ml per administration [12].
- Chest physiotherapy for those presenting late with infections and pneumonia.

Conclusion : There is no strong evidence for choosing one approach to general anaesthesia over another for bronchoscopy for inhaled foreign body. What the literature does show is that there should be almost no mortality and minimal morbidity when foreign bodies are removed by an experienced endoscopic team and that if the airway is not acutely compromised, then the risk of suffocation is low. Thus it is recommended that these children are cared for by the most skilled team available, which usually means referral to a paediatric centre. In addition, taking time to fast the child and complete thorough evaluations before the procedure, are key elements for successful management of this problem.

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