

A BULB EXPELLED OUT FROM THE BRONCHUS BY NATURE-A CASE REPORT

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ABSTRACT

The cough reflex is one of the most protective reflexes of the airway. Here we present a 8 year old male child with foreign body right bronchus being expelled out by cough reflex. This article describes the importance of the cough reflex. The reflexes that protect the lower airway include cough reflex, sneezing, reflex bronchoconstriction, laryngeal narrowing, and airway mucous secretion.

KEYWORDS : bronchus; foreign body; bronchospasm; cough; receptors

INTRODUCTION:

Cough is one of the most common symptoms accounting for 40% of outpatient care. It is a mostdefensive and protective reflex that clears the secretions and protects the airway from foreign bodies' aspiration due to inhalation or aspiration of pathogens, foreign bodies, secretions, and particulate matter. Vigorous coughing raises the intrathoracic pressure to a maximum of 300 mm Hg and expiratory velocities of 800 kilometres/hour. Cough is usually associated with reflux bronchoconstriction. Both cough and reflux broncho constriction are mediated by distinct afferent pathways even though the same stimuli can induce both reflexes.

CASE HISTORY:

A 7-year-old male child came to a pediatric casualty with a history of accidental aspiration of a Light Emitting Diode (LED) bulb while playing. There was no history of breathing difficulty or swallowing difficulty. On examination, the child was stable with no audible stridor. He was not dyspnoeic, maintaining saturation in room air with no intercostal/subcostal/suprasternal retractions. On auscultation, right side air entry was minimally reduced with no added sounds. On palpation, there was no tracheal tug to rule out the tracheal foreign body. X-ray chest showed a radio-opaque foreign body in the right main bronchus, probably the parts of the LED bulb (Figure 1a).

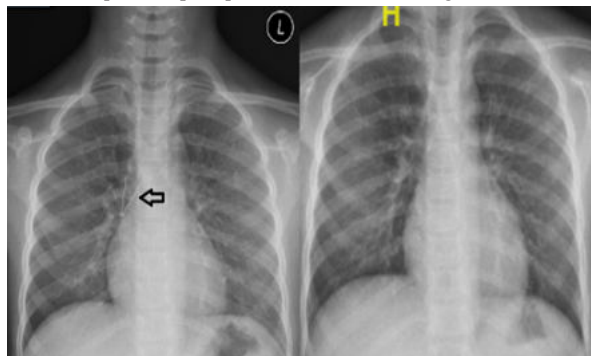


Fig 1 X-ray chest PA view
 (a) On admission- Radio opaque foreign body in right main bronchus (black arrow)
 (b) Following foreign body expulsion
 HRCT thorax showed a hyper-dense foreign body in the right main bronchi (Figure 2).



Fig 2 HRCT thorax coronal view showing foreign body in right bronchus (grey arrow)

The patient planned for rigid bronchoscopy with foreign body removal under GA. The patient was getting prepared for the procedure, but in the meantime, he suddenly developed a vigorous cough. After a strong cough, the patient expelled the foreign body. Then the foreign body was an LED bulb with two metallic wires (Figure 3).



Fig 3 LED bulb with two metallic wires

On auscultation, air entry improved, and a repeat x-ray chest showed no foreign body (Figure 1b). After observing the patient for 24 hours, the patient was discharged. This history implies the importance of the lower airway's natural defence mechanism (i.e.,) Cough reflex.

DISCUSSION:

Foreign body bronchus occurs more commonly in the pediatric age group because of the immature dentition and uncoordinated swallowing mechanism. It remains a diagnostic challenge to surgeons because it may lead to life-threatening complications. It is a very rare occurrence of foreign body being expelled out by cough reflex. The larynx is a structure that is critically placed to initiate protective reflexes and has abundant sensory innervation. Various receptors are distributed and present throughout the airway, i.e., pharynx, trachea, main carina, bronchus, and alveoli. Different impulses initiate the cough reflex via the vagus nerve to the cough centre in the medulla. From there, efferent signals pass through the vagus, phrenic and spinal motor nerves to expiratory muscles to initiate cough. The cough sequence started at large airways and large lung volume; large central airways will be cleared off first, and smaller airways will be cleared later as the lung volume reduces.

With cough reflex, sometimes foreign body may get stuck at the level of glottis, sub glottis or pharynx. This results in subglottic edema, mucosal injury or bleeding resulting in increased risk of intraoperative and postoperative complications.

COUGH REFLEX ARC: Cough is an explosive burst of high-velocity expiratory airflow [1].

Nucleus retroambigualis sends impulses to inspiratory and expiratory muscles via Phrenic and spinal nerves, whereas Nucleus ambiguus sends impulses to the larynx via laryngeal branches of the vagus.

AFFERENT: Sensory vagal nerve endings in upper airways including pulmonary, auricular, pharyngeal, and gastric; cardiac and oesophageal branches from the diaphragm.

CENTER: Cough centre in the dorsal medulla (Upper brain stem and Pons)

EFFERENT: Vagus, phrenic, and spinal motor nerves to larynx, diaphragm, abdominal wall, and muscles respectively.

The mechanism of a cough has four phases: [2]

Inspiration: In this phase, the glottis abducts, and a variable amount of air is inspired. The expiratory muscles produce maximal intrathoracic pressures that increase airway diameter, resulting in the highest airflow velocity in the central airways.

Compression: During this phase, the glottis closes for 0.2 seconds, and the supraglottic airway narrows. This phase is followed by active abduction of the glottis and the diaphragm's relaxation, increasing intrathoracic pressure. This results in an explosive decompression of the airways.

Expiration: The combination of high intrathoracic and low intra-airway pressure leads to dynamic compression of central airways with encroachment on the posterior membrane and, finally, coughing sound. This phase helps in clearing the secretions and dislodging the foreign body present if any.

CESSATION: This phase has cessation of muscle activity and is sometimes associated with the glottis closure.

Three types of receptors are identified, all of which are involved in cough reflex mechanisms.

Rapidly adapting stretch receptors (RAR): These are myelinated axons with rapid adaptation (1-2 seconds) and conduction velocity (4 to 18 m/s) [1, 3, 4]. These respond to the dynamic receptors that respond to the changes in mechanical properties of the airway. They terminate at mostly intrapulmonary and also extrapulmonary, within or beneath the epithelium. Bronchospasm stimulates RAR, whereas its activation itself causes reflex bronchospasm and mucous secretion through parasympathetic activity. So, reflex bronchoconstriction itself is being an integral part of the efferent limb of the cough reflex.

Slowly adapting stretch receptors (SAR): They are myelinated nerve fibres terminating primarily in intrapulmonary airways. These respond to mechanical forces on the lung during breathing. That means its activity increases during inspiration and peaks just before the initiation of expiration [5]. It is associated with Herring-Breuer reflex.

C-fibre endings or Nociceptors: They are slow conducting, unmyelinated nerve fibres present throughout the lung. They respond to noxious mechanical and chemical stimulation like Bradykinin and Capsaicin [6]. They are divided into bronchial and pulmonary (J-receptors); both receiving the blood supply from the bronchial circulation) receptors.

CONCLUSION:

Since it's a very rare occurrence, surgeons should not wait for natural expulsion. That will increase the morbidity and mortality. Without cough reflex, there are more devastating life-threatening complications that increase morbidity and mortality. But sometimes, the cough may be troublesome and harmful to the airways. The disadvantage of inspiring a large volume during the inspiratory phase is that it may expose the airway to noxious stimuli or foreign bodies. An inadequate and ineffective cough may warrant a need for a tracheostomy to clear secretions and prevent aspirations.

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