TENSION PNEUMOTHORAX WITH CARDIAC ARREST COMPLICATING BRONCHOSCOPY IN A NUT-ASPIRATED CHILD

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ABSTRACT

Tension pneumothorax is one of the most disastrous complications of rigid bronchoscopy. Despite being rare, it can be fatal. We present a case of a one-year-old child who aspirated a hazelnut and underwent rigid bronchoscopy for removal. Intraoperatively, he developed tension pneumothorax resulting in cardiac arrest. The procedure was discontinued however completed safely the day after. Subsequently, he developed severe hypoxic brain injury post cardiac arrest, aspiration pneumonia, kidney failure, and requiring high ventilatory and inotropic support. The child succumbed to death seven days later due to multiorgan failure.

Keywords: Bronchoscopy, tension pneumothorax, foreign body

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Introduction

Foreign body aspiration can lead to significant morbidity. It is one of the important causes of death among the pediatric population. Delay in diagnosis may increase the risk of complications such as recurrent pneumonia and lung abscess. Younger children have a higher risk for accidental foreign body aspiration. This is due to several factors, including their tendency to put tiny objects into their oral cavity and they tend to run and play with particles in their mouth. Besides, they do not have molar teeth to help them chew certain foods properly [1]. The best way to diagnose and treat this is by rigid bronchoscopy [2]. However, this procedure comes with many risks [3], including tension pneumothorax, a rare but life-threatening complication [4].

Case Report

A one-year-old child presented to the emergency department (ED) with two days history of cough, shortness of breath, and vomiting following hazelnut ingestion. He was initially brought to a nearby clinic and was diagnosed with bronchospasm secondary to possible allergic reaction to nuts and was referred to the ED at our centre. On examination, he was tachypneic with a respiratory rate of 52/minute. Oxygen saturation (SpO2) was 93% under room air, afebrile, with ronchi on lungs auscultation. His chest radiograph showed mild bilateral perihilar haziness with no foreign body seen. He was initially diagnosed to have bronchospasm secondary to an allergic reaction to nuts. At this time, they did not suspect a foreign body aspiration, hence the child was not kept nil by mouth. While waiting for admission to the pediatrics ward, he was breastfed by his mother when suddenly he became cyanosed and developed a generalized seizure. He was intubated by the ED team, but his SpO2 was only 75% with...
manual bagging of 15 litres/minute. There was reduced air entry on the right side. His repeated chest radiograph revealed right lung collapse. The diagnosis of foreign body airway was then made, and he was referred to our team for rigid bronchoscopy.

We then proceeded with rigid bronchoscopy and pink, frothy secretion was seen from the lower end of the trachea. While we were trying to manipulate the bronchoscope to visualize the bronchus, the anaesthetist team continued to manually bag the patient, and the patient suddenly developed right pneumothorax, and subsequently cardiac arrest. Cardiopulmonary resuscitation was commenced for 15 minutes. A right chest tube was inserted and the procedure was discontinued. The patient was sent to the intensive care unit for close monitoring. He underwent rigid bronchoscopy again the next day. A piece of nut was identified in the right main bronchus. It was removed completely using peanut grasper optical forceps. Unfortunately, the child developed severe hypoxic brain injury due to the prolonged duration of cardiac arrest which occurred during the first operation, with multiorgan failure and succumbed to death seven days later.

Discussion
A foreign body is not uncommon among children, especially those below three years old. It is 1.7 times more common in boys than in girls due to their more active and inquisitive nature [5]. There were more than 5000 deaths related to choking in the USA alone in 2017 and it was the fourth-leading cause of preventable injury-related death in the home and community [6]. Sixty-four percent of airway foreign bodies in younger children were
food particles, often nuts and seeds. The most common symptoms are coughing and wheezing, and generally, coughing, wheezing, and/or choking are seen in 95% of cases [7].

In diagnosing foreign body in children's airways, it is very important to have accurate history from the witness. Unfortunately, there might be no witness to the event in some cases. Hence it is crucial to have a high index of suspicion, with a thorough history and physical examination. A history of cough and vomiting following nuts or small pieces of food ingestion should raise a suspicion of foreign body in the airway. Only 16% of aspirated foreign bodies are spot diagnosed on chest radiography while others may go undetected as they can be radiolucent [8], as seen in our case initially. It is important to note that a negative chest radiograph does not exclude foreign body aspiration. Unilateral atelectasis, local hyperinflation, or obstructive emphysema was seen in 72% of cases [9].

The timely diagnosis and management of foreign body aspiration are extremely crucial. Missed or delayed diagnosis can lead to respiratory complications such as chronic wheezing or recurrent cases of pneumonia to fatal airway obstruction or lung abscess [10]. In our case, the child was misdiagnosed as having bronchospasm secondary to an allergic reaction to nuts, as there was no foreign body seen on the chest radiography. He was also allowed orally, and we think that this could possibly cause the child to aspirate the foreign body further to lower airway, causing airway obstruction. It is important to keep the patient nil by mouth in cases of foreign body airway, to prevent further aspiration. Rigid bronchoscopy is the gold standard for foreign body airway removal [11]. However, it has risks of severe complications including pneumothorax, laryngospasm, laryngeal edema, infection, bronchospasm, and pneumomediastinum. Tension pneumothorax is a rare but fatal complication [12]. The risk of pneumothorax during rigid bronchoscopy for foreign body removal is around 1% [13]. It may happen, as there is air trapping due to post-stenotic bronchial obstruction, which causes increased transpulmonary pressure gradient. Positive pressure ventilation results in further pressure gradient which leads to alveolar rupture. Pneumothorax then happens when the air enters the interstitial tissue of the lung and the pleural space [11]. If acute deterioration of ventilation and gas exchange occurs, we must think of pneumothorax, despite it being rare [14]. However, it is not so easy to diagnose it early as the symptoms may be masked by anesthesia [15].

Excessive positive pressure can turn a pneumothorax into tension pneumothorax as air is trapped in the tracheobronchial tree following constant instrumentation [16], as seen in our case. We think that the instrumentation itself and the positive-pressure ventilation caused the foreign body to be dislodged and completely obstructed the right bronchus. This resulted in air-trapping in the right lung. If the airway is blocked for long due to instrumentation, air can enter the pleural cavity during positive pressure ventilation but it cannot escape during expiration [17]. Timely chest auscultation and percussion may help to detect pneumothorax early before a cardiac compromise can occur [18].

Conclusion

Prompt diagnosis of foreign body aspiration is important to prevent serious complications. A history suggestive of foreign body airway justifies diagnostic rigid bronchoscopy with or without radiologic confirmation. Complications may arise during operation, including tension pneumothorax, which may cause cardiac arrest and can be life-threatening.

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References

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