Introduction

Foreign body aspiration is a major cause of fatality and morbidity in children. The child may present acutely with signs of respiratory distress or chronically with symptoms suggestive of respiratory infection. Variable presentations make it difficult to diagnose a case of foreign body aspiration, especially in the absence of a clear history of aspiration. Subcutaneous emphysema and pneumomediastinum are rare presentations. Here, we report a case of 2-year-old child who presented with non-traumatic extensive neck and upper chest subcutaneous emphysema. Computed tomography revealed there was presence of foreign body in left bronchus. Emergency bronchoscopy found a piece of peanut in the left main bronchus. It was successfully removed and the patient was discharged well after three days.

Keywords: Foreign Body Airway; Paediatric; Pneumomediastinum; Rigid Bronchoscopy; Subcutaneous Emphysema

ABSTRACT

Foreign body aspiration is a major cause of fatality and morbidity in children. The child may present acutely with signs of respiratory distress or chronically with symptoms suggestive of respiratory infection. Variable presentations make it difficult to diagnose a case of foreign body aspiration, especially in the absence of a clear history of aspiration. Subcutaneous emphysema and pneumomediastinum are rare presentations. Here, we report a case of 2-year-old child who presented with non-traumatic extensive neck and upper chest subcutaneous emphysema. Computed tomography revealed there was presence of foreign body in left bronchus. Emergency bronchoscopy found a piece of peanut in the left main bronchus. It was successfully removed and the patient was discharged well after three days.

Received: 13 June 2021; Accepted revised manuscript: 30 November 2021; Published online: 12 April 2022

Case Summary

A 2-year-old boy was brought to emergency department with complaint of fever, cough, runny nose and fullness over anterior neck. The anterior neck fullness extended to bilateral jaws, upper chest, back and abdomen mainly on the left side. Initially the caretaker denied any history of choking or aspiration. Upon further questioning mother admitted that child had history of eating peanut about two months prior. Since then, he had noisy breathing for one week then symptom resolved by itself without seeking any treatment. He was admitted to Paediatric Intensive Care Unit for close observation.

Physical examination revealed that the child was conscious but mildly tachypnoeic. Subcutaneous emphysema was present over bilateral jaws, bilateral neck, left upper chest and extending to left back and abdomen (Figure 1). Auscultation revealed reduced
air entry on left lung with no rhonchi. Chest radiograph showed left sided subcutaneous emphysema with mild pneumomediastinum and pneumopericardium with no visible radio-opaque foreign body (Figure 2). An urgent computed tomography (CT) neck and thorax done revealed an intraluminal soft tissue lesion within the distal aspect of left main bronchus (1.5 cm from carina) suspicious of foreign body (Figure 3).

Figure 1. Subcutaneous emphysema involving bilateral jaw, neck, left side of chest wall. Crepitus felt on palpation over the area.

Figure 2A. Chest radiograph showed hyperinflated left lung field; extensive subcutaneous emphysema involving bilateral neck (red arrow), mediastinum (black arrow) and left lateral chest wall (white arrow).
Direct bronchoscopy and removal of foreign body done under general anaesthesia revealed piece of peanut at left main bronchus measuring 0.8 cm x 0.7 cm with granulation tissue at proximal of peanut (Figure 4). The surrounding mucosa of the left main bronchus was very inflamed and oedematous post removal. The piece of peanut was successfully removed by using grasping forceps after multiple attempts. The patient was successfully extubated the following day. Post operatively patient condition was improved, subcutaneous emphysema was fully resolved. Child was discharged well after day 3 post extubation. Patient was seen one week later during outpatient clinic, child was well and was discharged.
Figure 4. Bronchoscopy showed foreign body (peanut) at left main bronchus (A). Piece of peanut measuring 0.7 cm x 0.8 cm successfully removed (B).

Discussion

Foreign body aspiration may be missed in a child if the incident is unwitnessed, and some children may not disclose information for fear of punishment. In this case, we encountered some difficulty because initially parents denied any history of foreign body. However, after many occasions of history taking, parents said that they used to feed their child with peanut two months prior to the presentation. The parents noticed the child developed noisy breathing since then. His symptoms however resolved spontaneously a week later and parents assumed that their child was well. Therefore, detailed history and clinical suspicion is the most important thing in the diagnosis of foreign body inhalation.

There are three distinct clinical phases that occur after a foreign body aspiration [3]. The first phase occurs immediately after the incident. The patient usually experiences coughing, gagging, choking, wheezing, and stridor. There may also be an associated transient cyanotic episode, usually perioral area. The occurrence of death is very high in this first phase of aspiration. The second phase is the asymptomatic period, which may last from minutes to months or even years after the incident. The duration of this period depends on the location of the foreign body, the severity of airway obstruction, and the type of material aspirated. The ease with which the foreign body can change its position is also a factor in the duration of this period. The third clinical phase is the renewed symptomatic period due to the presence of complications secondary to the aspirated foreign body. Airway inflammation or infection from the foreign body will cause symptoms of fever, cough, sputum production, wheezing, and occasionally haemoptysis.

For this case, the child experienced cough and reduced air entry on left side as the foreign body dislodged further down. The classic findings on physical examination consist of cough, unilateral decreased breath sounds, and unilateral monophonic wheezing. Although 75% of patients have one or more of these findings, only 40% have all three [4].
In addition, despite of thorough physical examination, radiological evaluation is crucial to reach the diagnosis. Radiopaque foreign bodies are relatively easy to detect on chest radiograph. Nonetheless, secondary radiographic signs, such as obstructive emphysema, atelectasis, pneumonia and a mediastinal shift, may help in diagnosing foreign body aspiration with radiolucent foreign bodies. Importantly, a normal chest radiograph does not rule out foreign body aspiration [5]. Despite plain radiography, CT scan is another useful modality to demonstrate better anatomical changes, showing characteristics of foreign bodies. This is important for us as a guide before embark to surgical intervention. Thus, it became very significant imaging modality in our case.

The possible pathophysiology underlying development subcutaneous emphysema and pneumomediastinum following foreign body aspiration can be due to persistent airway obstruction during expiration, causing a build-up of pressure in distal alveoli owing to a ball-valve effect. Hyperventilation of the involved lung occurs, which results in formation of high-pressure gradient between intra-alveolar air and perivascular interstitial connective tissue. Alveolar rupture ensues, and air leak occurs from the alveoli along fascial planes to the mediastinum [6]. From here, the air tracks upward to the neck, and can potentially extend to subcutaneous tissues of chest, back, abdomen and face. Air may also extend into retroperitoneal and epidural spaces [6].

Due to extreme rarity of this presentation, we feel that children with foreign body aspiration who have subcutaneous emphysema as a presenting feature may be diagnosed late. The longer the foreign body remains in situ, the greater the chance of granulation tissue formation, resulting in a smaller lumen and the symptoms usually become more pronounced. The time since the inhalation should be established because airway edema, granulation tissue, infection as well as high tendency of bleeding may make removal of foreign bodies more difficult with delayed presentation.

Bronchoscopy is the cornerstone of diagnosis and treatment in foreign body aspiration. Rigid bronchoscopy is generally preferred, as the success rate of foreign body retrieval is 94.5%, which is higher as compared with flexible bronchoscopy [7]. There are some limitations in which flexible bronchoscopy is unsuccessful in foreign body extraction, including foreign bodies that are impacted in extensive granulation tissue or excessive tissue scarring, a large foreign body that cannot be gripped with flexible forceps, foreign bodies with a smooth surface, sharp foreign body, and several failed attempts by flexible bronchoscopy to retrieve a foreign body [8]. In these cases, rigid bronchoscopy remains the procedure of choice. However, there are few disadvantages of rigid bronchoscopy include the need for general anesthesia, an increased risk of airway trauma, and the inability to access upper lobes and segmental bronchi [9].

**Conclusion**

Foreign body aspiration is a common, preventable condition in children. Despite well-known presentations, physician should be aware of the complications associated with foreign body aspiration such as subcutaneous emphysema, which are relatively rare in this regard. Furthermore, a high suspicion index must be considered in all the infants and children with and without the history of foreign body aspiration, who present with subcutaneous emphysema.

**References**

[1] Itasca, IL. National Safety Council: Injury Facts, 2001 Edition. pp. 8-11, 16-18, 30, 152.

[2] Mu, L., He, P., & Sun, D. Inhalation of foreign bodies in Chinese children. The Laryngoscope, 1991: 101(6): 657-60.

[3] Bressler KL, Green CG, Holinger LD. Chapter 27- Foreign body aspiration. In: Taussig LM, Landau LI (eds). Pediatric Respiratory Medicine. 1999, Carlsbad: St. Louis: Mosby, pp. 430-5.

[4] Cotton RT. Chapter 34-Foreign body aspiration. In: Chernick V, Boat TF (eds). Kendig's Disorders of the Respiratory Tract in Children, sixth edition. 1998, Philadelphia: WB Saunders Company, pp. 601-7.

[5] Sahin A, Meteroglu F, Eren S, Celik Y. Inhalation of foreign bodies in children: experience of 22 years. J Trauma Acute Care Surg 2013;74(2):658-63.

[6] Sattar A, Ahmad I, Javed AM, Anjum S. Diagnostic accuracy of chest x-ray in tracheobronchial foreign body aspiration in pediatric patients. J Ayub Med Coll Abbottabad 2011;23(4):103-5.
[7] Findlay CA, Morrissey S, Paton JY. Subcutaneous emphysema secondary to foreign body aspiration. Pediatr Pulmonol 2003;36(1):81-2.

[8] Nakhosteen JA. Tracheobronchial foreign bodies. Eur Respir J 1994;7(3):429–30.

[9] Ganie FA, Wani ML. The efficacy of rigid bronchoscopy for foreign body aspiration. Bull Emergency Trauma 2014;2(1):52-4.