

Massive Subcutaneous Emphysema Revealing Foreign Body Inhalation

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Abstract

Case Report

Subcutaneous emphysema is a clinical condition caused by air leakage, often from the bronchial tree or the esophagus, into subcutaneous tissues, leading to progressive distension and infiltration. The most common etiologies include thoracic or cervical trauma and asthma. However, in the absence of trauma, foreign body inhalation should always be considered, particularly in children. Tracheobronchial foreign body inhalation is a frequent pediatric emergency, especially in preschool-aged children, and remains a significant cause of morbidity and mortality. We report a case of a two-year-old girl presenting with massive subcutaneous emphysema, ultimately revealing foreign body inhalation. Prompt endoscopic intervention via rigid bronchoscopy and medical treatment resulted in a favorable outcome. Delayed intervention increases the risk of complications, including prolonged air leakage, extensive tissue infiltration, and secondary infections, underscoring the importance of early diagnosis and management.

Keywords: Subcutaneous Emphysema, Foreign Body Inhalation, Bronchoscopy.

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INTRODUCTION

Subcutaneous emphysema results from air leakage, often originating from the bronchial tree or esophagus, spreading into subcutaneous tissues, and causing progressive distension and infiltration. Tracheobronchial foreign body inhalation is a frequent pediatric emergency and a significant cause of morbidity and mortality, particularly in preschool children. While common causes of subcutaneous emphysema include thoracic or cervical trauma and asthma, foreign body inhalation should be considered in the absence of trauma, especially in children [1-3].

Penetration syndrome—a sudden onset of coughing, cyanosis, and respiratory distress—is a key clinical feature for early and accurate diagnosis [4, 5]. However, this syndrome may sometimes go unnoticed, leading to diagnostic delays and increased risks of complications. Pneumomediastinum, a rare complication occurring in 1–2% of cases, can arise due to delayed recognition and treatment [2-6]. Severe air leakage may

lead to extensive emphysema, with subcutaneous emphysema being one of the most striking manifestations. Here, we report a case of undiagnosed bronchial foreign body inhalation in a two-year-old girl, ultimately revealed by massive subcutaneous emphysema.

CASE REPORT

A two-year-old girl with no significant medical history—specifically, no known asthma or prior trauma—was admitted to the pediatric emergency department due to rapidly worsening cervicofacial and thoracic swelling. Seven days before admission, she experienced a clear penetration syndrome characterized by sudden coughing and cyanosis after suspected inhalation of a peanut fragment. Although her symptoms initially improved, her parents did not seek medical attention. Two days before admission, she developed a fever of 38°C. Over the past 12 hours, she exhibited progressive swelling of the face, eyelids, neck, and thorax, accompanied by worsening dyspnea (Figure 1).



Figure 1: clinical representation of the patient showing a significant swelling of the face, neck, and thorax without signs of inflammation or skin lesions

On arrival, the child was in fair general condition but exhibited significant swelling of the face, neck, and thorax, without signs of inflammation or skin lesions. Palpation revealed diffuse crepitus across the face, eyelids, neck, and thorax. She had tachypnea at 34 breaths/min, a hoarse voice, suprasternal retractions, and bilateral rhonchi with crackles on pulmonary auscultation. Oxygen saturation (SaO₂) was 92% on ambient air. Cardiovascular examination findings were unremarkable, with a blood pressure of 110/70 mmHg.

Shortly after admission, the patient developed shock, which was promptly managed in the intensive care unit. Chest X-ray confirmed the presence of air

within the subcutaneous tissues and a pneumomediastinum. A cervico-thoracic CT scan revealed an abrupt interruption in the left main bronchus lumen, extensive pneumomediastinum, mild pneumopericardium, and significant cervicothoracic emphysema. The left lung field showed hypoventilation with a posterior-basal consolidation focus (Figure 2). The CT scan also identified an organic foreign body in the left main bronchus. Upon reviewing the history with the parents, they confirmed that their daughter had aspirated a peanut seven days earlier, presenting with an incomplete penetration syndrome (cyanosis and persistent cough), which had been overlooked.

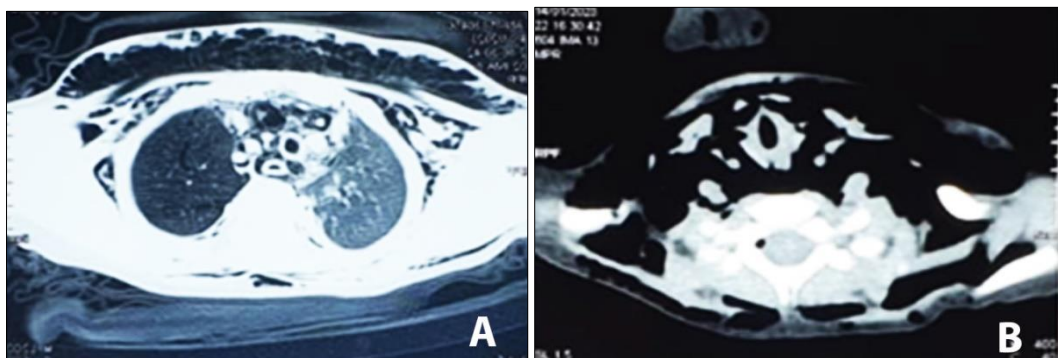


Figure 2: Axial cuts from the CT scan, A: Cut passing through the thorax showing pneumomediastinum, B: Cut passing through the cervical region showing significant subcutaneous emphysema, C: Cut passing through the facial region showing the extent of subcutaneous emphysema.

The patient underwent emergency drainage of the pneumothorax and pneumomediastinum, with close echocardiographic monitoring of the pneumopericardium.

Rigid bronchoscopy under general anesthesia revealed abundant mucopurulent secretions in the left bronchial tree and a peanut fragment lodged in the proximal left main bronchus, surrounded by granulation tissue (Figure 3). The foreign body was successfully

extracted without bronchial mucosal injury or fissures. The child received intravenous third-generation cephalosporins for 10 days to manage the secondary bacterial infection associated with the mucopurulent

secretions. Corticosteroids were administered for five days, followed by inhaled corticosteroids for one month, to reduce airway inflammation and prevent recurrent obstructive symptoms.

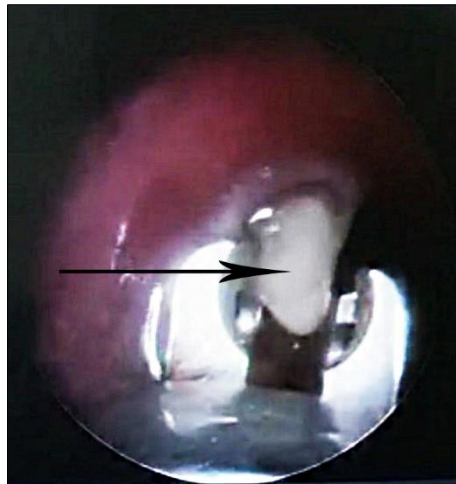


Figure 3: Rigid bronchoscopy exploration showing a foreign body (peanut fragment) lodged in the proximal left main bronchus with surrounding granulation tissue

The clinical course was favorable. Within one week of bronchoscopy, complete resolution of the pneumothorax, pneumomediastinum, pneumopericardium, and subcutaneous emphysema was observed, with normalization of respiratory function. A three-month follow-up confirmed full recovery without complications.

DISCUSSION

Subcutaneous emphysema in children is a rare and striking manifestation, often indicating an underlying severe pathology. While common causes include trauma, asthma, and infections, foreign body inhalation should always be considered, particularly in cases without an obvious precipitating event. The extensive spread of emphysema, including cervicofacial and thoracic involvement, raises concerns about airway compromise and necessitates prompt evaluation and management. Subcutaneous emphysema results from air leakage due to increased intra-alveolar pressure, leading to alveolar rupture and air tracking along peribronchial sheaths into the mediastinum and subcutaneous tissues [1, 6]. In cases of foreign body inhalation, the mechanism of air leakage may involve direct airway trauma, air trapping, forceful coughing, or secondary inflammation. The incidence of spontaneous pneumomediastinum caused by foreign body inhalation in children is reported to be between 1.5% and 2.5% [11, 16].

The clinical presentation of foreign body inhalation is highly variable and depends on the location, size, and duration of the airway obstruction. Acute cases often present with penetration syndrome—sudden coughing, cyanosis, and respiratory distress—while delayed cases may mimic infectious or allergic conditions, leading to misdiagnosis [3-10]. In this case,

the absence of immediate medical attention after the inhalation event contributed to disease progression, with massive subcutaneous emphysema developing days later. A similar case described by Gatt *et al.*, involved a 19-month-old boy misdiagnosed with anaphylaxis due to acute facial swelling and wheezing, emphasizing the importance of considering foreign body inhalation in pediatric respiratory distress [16].

Radiologic evaluation plays a crucial role in diagnosing pneumomediastinum and subcutaneous emphysema. Chest X-ray is the initial imaging modality and may show signs such as air in the mediastinum or subcutaneous tissues [2-8]. However, computed tomography (CT) provides superior detail, allowing for the identification of airway obstruction, foreign bodies, and complications like pneumopericardium or consolidation [7-16]. In our case, CT imaging confirmed an abrupt interruption in the left main bronchus, extensive pneumomediastinum, and subcutaneous emphysema, leading to the diagnosis. Given that pneumomediastinum can mimic other conditions, such as infections or asthma exacerbations, early imaging is essential for differentiating causes and guiding management [6-15].

Bronchoscopy remains the gold standard for both the diagnosis and treatment of foreign body inhalation. Rigid bronchoscopy allows for direct visualization and removal of the foreign body while assessing for mucosal damage, granulation tissue formation, or secondary infection [3-14]. In our case, the foreign body (a peanut fragment) was successfully extracted without complications, leading to rapid resolution of symptoms. Delayed removal increases the risk of chronic airway inflammation, obstruction, and

secondary infections, reinforcing the need for early intervention [13, 15]. Post-procedural management involves antibiotics to prevent secondary bacterial infections and corticosteroids to reduce airway inflammation. This approach ensures airway stabilization and prevents post-obstructive complications [10]. Oxygen therapy can also aid in the resolution of pneumomediastinum by facilitating nitrogen washout, reducing the air leak over time. Inhaled corticosteroids are often continued for several weeks to minimize residual airway reactivity [8, 9].

Foreign body inhalation should be a top differential diagnosis in children presenting with acute respiratory distress, especially when subcutaneous emphysema is present. Other potential causes include asthma exacerbations, severe infections such as necrotizing pneumonia, spontaneous pneumomediastinum, or trauma [6-16]. Unlike infectious causes, foreign body inhalation often presents with a history of sudden onset symptoms, followed by persistent cough and intermittent respiratory distress [3-11]. In cases where pneumopericardium or pneumothorax occurs alongside pneumomediastinum, drainage may be necessary to prevent complications like cardiac tamponade or respiratory failure [7, 8]. Regular monitoring with echocardiography and serial imaging ensures timely intervention when needed. Most cases, however, resolve spontaneously with conservative management [14-16].

CONCLUSION

Subcutaneous emphysema in children is a rare but significant complication of foreign body inhalation. A thorough history, including an investigation for penetration syndrome, is essential. In cases of diagnostic uncertainty, bronchoscopic exploration should be considered, as it is often revealing. Early intervention is critical for improving outcomes, preventing complications, and ensuring complete resolution.

Ethical Statement:

Compliance with Ethical Standards: The study was conducted in compliance with ethical standards.

Funding: This research received no external funding.

Conflict of Interest: There are no conflicts of interest to declare related to this research.

Ethical Approval: While formal ethical approval was not obtained for this study, we ensured that all aspects of the research were conducted ethically and with respect for the rights and well-being of the participants.

Informed Consent: Informed consent was obtained from all participants involved in the study, and this information has been appropriately included in the manuscript.

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