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Foreign Body Aspiration as A Rare Cause of Pneumomediastinum and Subcutaneous Emphysema: A Case Report

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HIGHLIGHTS

1. Foreign body aspiration can lead to pneumomediastinum.
2. Subcutaneous emphysema may also occur concurrently.
3. This case highlights rare respiratory complications.
4. Early diagnosis is crucial for effective treatment.
5. Prompt intervention can prevent serious outcomes.

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ABSTRACT

Introduction: Foreign body aspiration (FBA) is a critical emergency, especially in pediatric patients, due to their anatomical vulnerability. It can lead to serious complications like pneumomediastinum and subcutaneous emphysema, which are rare outcomes. This case report discusses the unusual case of a one-year-old child presenting with these conditions after foreign body aspiration. **Case Presentation**: A one-year-old boy presented with a five-day history of respiratory distress, cough, and swelling in the face, neck, and chest. Initially treated as community-acquired pneumonia, the patient's condition deteriorated with signs of subcutaneous emphysema. Imaging revealed pneumomediastinum and a foreign body in the right main bronchus. A black chickpea was successfully removed using rigid bronchoscopy, resolving the obstruction and associated symptoms. **Discussion**: This case highlights the rare but severe complications of FBA, such as pneumomediastinum and subcutaneous emphysema, which are commonly associated with the Macklin effect. Diagnosis can be delayed, as symptoms often mimic common respiratory infections. Early recognition through imaging and a multidisciplinary approach is crucial for prompt intervention and minimizing morbidity. **Conclusion**: Foreign body aspiration, though common in children, can lead to rare complications like pneumomediastinum and subcutaneous emphysema. A high index of suspicion, especially in pediatric patients with nonspecific respiratory symptoms, can facilitate timely diagnosis and treatment, preventing life-threatening outcomes.

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INTRODUCTION

Foreign body aspiration (FBA) represents a critical medical emergency, particularly in pediatric populations, owing to the anatomical and developmental vulnerabilities of young children. The inhalation of foreign objects, especially food items, can lead to life-threatening complications, including airway obstruction, pneumomediastinum, and subcutaneous emphysema [1]. This case report sheds light on the rare occurrence of pneumo mediastinum and subcutaneous emphysema resulting from foreign body aspiration in a one-year-old child, underscoring the importance of early diagnosis, timely intervention, and multidisciplinary management [2].

The aspiration of foreign objects remains a common cause of respiratory distress in children under five years of age, as they tend to explore their surroundings orally. However, FBA may go unnoticed in certain cases, leading to a delay in diagnosis and, consequently, a higher risk of complications [3]. The clinical presentation of FBA can range from acute airway obstruction to insidious respiratory distress, depending on the size, location, and nature of the foreign body. While most foreign bodies are found in the bronchial tree, rarely, they can result in more severe outcomes, such as pneumomediastinum and emphysema [4].

Pneumomediastinum refers to the presence of free air in the mediastinum, the central compartment of the thoracic cavity. In children, this condition is rare and is most often secondary to trauma, severe asthma, or infection [5]. However, FBA-induced pneumomediastinum is an uncommon phenomenon. The underlying mechanism, known as the Macklin effect, involves the rupture of alveoli due to chronic air trapping, leading to the leakage of air along the perivascular sheath into the mediastinum. Subcutaneous emphysema, the accumulation of air beneath the skin, often accompanies pneumomediastinum and presents with noticeable swelling in the face, neck, and chest [6].

In this case report, a one-year-old boy presented to the emergency department with respiratory distress, cough, and swelling in the face, neck, and chest after a five-day history of respiratory symptoms.

CASE PRESENTATION

A one-year-old boy from Patna presented to the emergency department with a five-day history of respiratory distress and cough. His symptoms were initially managed with a provisional diagnosis of community-acquired pneumonia made by a pediatrician. In addition to respiratory distress, the patient had a three-day history of fever, and during the course of illness, he developed facial puffiness, neck swelling, and chest swelling. He was fully immunized for his age, with no significant past medical history.

Upon admission, the child appeared tachypneic and dyspneic, with a respiratory rate of 60 breaths per minute, a pulse of 130 beats per minute, blood pressure of 110/60 mmHg, and an oxygen saturation of 80% on room air. Physical examination revealed noticeable swelling over the face, chest, and neck, which indicated the presence of subcutaneous emphysema. Upon further inquiry, the child's parents reported that the patient had been playing with an object shortly before the onset of symptoms. This crucial detail led to the suspicion of foreign body aspiration.

A chest X-ray and contrast-enhanced computed tomography (CECT) of the chest were performed, revealing subcutaneous emphysema and pneumomediastinum. The imaging studies identified a hyperdense foreign body, approximately 7.0 x 4.0 mm in size, lodged in the right main bronchus, just distal to the carina. There was mild air trapping in the right lung and partial collapse of the left lung. Additionally, extensive pneumomediastinum and surgical emphysema were observed, with poorly defined tracheal walls. No significant lymphadenopathy or pleural effusion was noted, and the heart and major vessels appeared normal. The CT scan findings were consistent with foreign body aspiration, leading to air trapping and mediastinal emphysema. The radiological opinion also suggested a possible tracheal rupture as a contributing factor to the emphysema.

A rigid bronchoscopy was planned under total intravenous anesthesia (TIVA) to retrieve the foreign body. During the procedure, a 1 cm black chana (chickpea) was successfully removed from the right main bronchus using a dormia basket. The foreign body was retrieved from the bronchus intermedius, and its size was approximately 0.8 cm.

Figure 2: Chest X-Ray Showing Subcutaneous Emphysema and Pneumomediatinum

(A) (B)

Figure 1: (A) Figure Showing Black Chana Grasped by Dormia Basket and (B) Figure Showing Black Chana of Size of Approx. 0.8cm Retrieved From Right Main Bronchus.

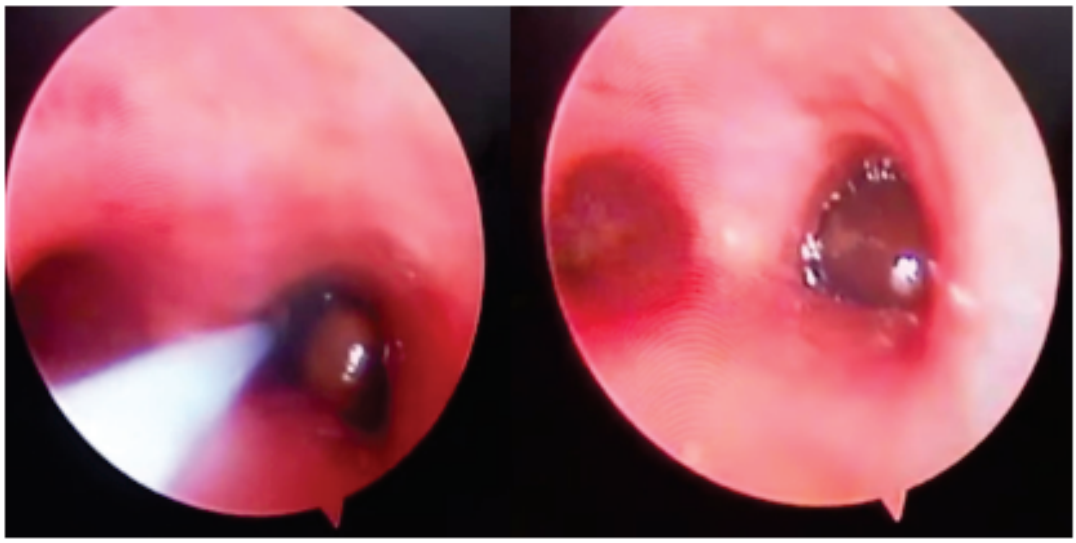

Figure 3: Foreign Body Present in Right Main Bronchus.

DISCUSSION

This case report presents a rare but clinically significant complication of foreign body aspiration (FBA) in a one-year-old boy who developed pneumomediastinum and subcutaneous emphysema, emphasizing the critical need for timely diagnosis and management of FBA, particularly in pediatric populations [7]. FBA in young children is common, primarily because of their developmental tendency to explore objects orally. However, what makes this case stand out is the progression of FBA to more severe and uncommon complications-pneumomediastinum and subcutaneous emphysema [8].

The mechanism behind pneumomediastinum in this case can be attributed to the Macklin effect, which is characterized by alveolar rupture due to increased intrapulmonary pressure or air trapping. When the foreign body becomes lodged in the airway, it leads to obstruction, resulting in a build-up of air behind the obstruction [9]. Over time, this air causes alveolar rupture, allowing air to escape into the interstitial tissues surrounding the bronchovascular bundle. Subsequently, this air dissects its way into the mediastinum. Subcutaneous emphysema, which often accompanies pneumomediastinum, results from the spread of this free air into the soft tissues of the neck, chest, and face [10].

In this case presentation, the patient's initial presentation was similar to that of common pediatric respiratory infections such as community-acquired pneumonia. The initial misdiagnosis underscores the difficulty in identifying FBA, particularly in cases where there is no clear history of aspiration or when symptoms develop insidiously over time [11]. The progressive development of respiratory distress, coupled with new findings of facial and neck swelling, shifted the clinical suspicion towards FBA [12].

The diagnostic challenge lies in the variability of clinical presentations in FBA cases. While some cases present with acute airway obstruction, others, like this case, may show delayed or atypical symptoms such as pneumomediastinum or subcutaneous emphysema [13]. In this patient, key clinical clues, including a five-day history of respiratory distress and cough coupled with the late onset of swelling in the face, neck, and chest, helped steer the clinical team towards suspecting FBA. The detailed history provided by the parents, specifically that the child had been playing with an object prior to the onset of symptoms, proved crucial in the differential diagnosis [14].

Radiological evaluation played a pivotal role in diagnosing the foreign body and associated complications. The chest X-ray and contrast-enhanced CT (CECT) scan of the chest revealed subcutaneous emphysema and pneumomediastinum, which are rare consequences of FBA [15]. Moreover, the identification of a hyperdense object in the right main bronchus, just distal to the carina, confirmed the diagnosis. The imaging findings of mild air trapping and partial lung collapse further illustrated the severity of airway obstruction and its consequences on pulmonary dynamics [16].

Once diagnosed, timely intervention in the form of rigid bronchoscopy under total intravenous anesthesia (TIVA) was critical. The successful removal of the foreign body, a 1 cm black chickpea, from the bronchus intermedius not only relieved the obstruction but also prevented further complications such as prolonged air trapping, infection, or chronic airway damage. This highlights the importance of rigid bronchoscopy as both a diagnostic and therapeutic tool in managing FBA [17].

This case shows the need for a multidisciplinary approach to managing complex FBA cases. The pediatric, radiology, anesthesiology, and surgical teams worked in coordination to ensure rapid diagnosis and prompt intervention. The use of TIVA allowed for a controlled and safe environment during the bronchoscopy, minimizing the risk of further airway trauma or complications [18]. The prognosis for this child appears favorable, given the prompt retrieval of the foreign body and resolution of the acute symptoms. However, the long-term outcomes will depend on the extent of any residual lung injury, tracheal damage, or secondary infection. Follow-up imaging and clinical evaluation will be essential in monitoring recovery [19].

CONCLUSION

This case report presents the rare but serious complications of FBA, particularly pneumomediastinum and subcutaneous emphysema. It emphasizes the need for a high index of suspicion in pediatric patients presenting with respiratory distress, especially when there is a history or possibility of foreign body aspiration. Early diagnosis through imaging and timely intervention with bronchoscopy can significantly reduce morbidity and prevent life-threatening outcomes. This case serves as a reminder of the importance of thorough clinical assessment, especially in young children with nonspecific respiratory symptoms.

CONFLICTS OF INTEREST

Authors declared that there is no conflict of interest.

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REFERENCES

1. Sultan TA, van As AB. Review of tracheobronchial foreign body aspiration in the South African paediatric age group. Journal of thoracic disease. 2016 Dec;8(12):3787.
2. Chowdhary A, Nirwan L, Abi-Ghanem AS, Arif U, Lahori S, Kassab MB, Karout S, Itani RM, Abdalla R, Naffaa L, Karout L. Spontaneous pneumomediastinum in patients diagnosed with COVID-19: a case series with review of literature. Academic Radiology. 2021 Nov 1;28(11):1586-98.
3. Boufersaoui A, Smati L, Benhalla KN, Boukari R, Smail S, Anik K, Aouameur R, Chaouche H, Baghriche M. Foreign body aspiration in children: experience from 2624 patients. International journal of pediatric otorhinolaryngology. 2013 Oct 1;77(10):1683-8.
4. Kara K, Ozdemir C, Onur ST, Satici C, Akyil FT, Sokucu SN. Late Diagnosis of Foreign Body Aspiration in Adults: Case Series and Review of the Literature. Respiratory Care. 2024 Mar 1;69(3):317-24.
5. Bilir O, Yavasi O, Ersunan G, Kayayurt K, Giakoup B. Pneumomediastinum associated with pneumopericardium and epidural pneumatosis. Case reports in emergency medicine. 2014;2014(1) :275490.
6. Duarte RV, Duarte EV, Ochoa JG, Leiva MC, Pimentel-Hayashi JA. Pneumoperitoneum in a COVID-19 patient due to the Macklin effect. Cureus. 2021 Feb;13(2).
7. Zhu Y, Fan Q, Cheng L, Chen B. Diagnostic errors in initial misdiagnosis of foreign body aspiration in children: a retrospective observational study in a tertiary care hospital in China. Frontiers in Pediatrics. 2021 Oct 15;9:694211.
8. Alisauskiene S, Grigenaite J. Functional behaviour assessment of children with autism spectrum disorder based on family & speech language therapist collaboration. InEDULEARN20 Proceedings 2020 (pp. 1814-1823). IATED.
9. Karim S, Nugent K. Presentation and management of pneumomediastinum in patients with COVID-19 infection. The Southwest Respiratory and Critical Care Chronicles. 2023 Oct 19;11(49):10-8.
10. Hsia CC, Hyde DM, Weibel ER. Lung structure and the intrinsic challenges of gas exchange. Comprehensive physiology. 2016 Apr;6(2):827.
11. Rhedin S, Lindstrand A, Hjelmgren A, Ryd-Rinder M, Öhrmalm L, Tolfvenstam T, Örtqvist Å, Rotzén-Östlund M, Zweygberg-Wirgart B, Henriques-Normark B, Broliden K. Respiratory viruses associated with community-acquired pneumonia in children: matched case–control study. Thorax. 2015 Sep 1;70(9):847-53.
12. Capps EF, Kinsella JJ, Gupta M, Bhatki AM, Opatowsky MJ. Emergency imaging assessment of acute, nontraumatic conditions of the head and neck. Radiographics. 2010 Sep;30(5):1335-52.
13. Fakhoury K. Evaluation of wheezing in infants and children. UpToDate. Waltham, MA: UpToDate. 2018.
14. Cole TS, Cant AJ. Clinical experience in T cell deficient patients. Allergy, Asthma & Clinical Immunology. 2010 Dec;6:1-0.
15. Birk M, Bauerfeind P, Deprez PH, Häfner M, Hartmann D, Hassan C, Hucl T, Lesur G, Aabakken L, Meining A. Removal of foreign bodies in the upper gastrointestinal tract in adults: European Society of Gastrointestinal Endoscopy (ESGE) Clinical Guideline. Endoscopy. 2016 May;48(05):4 89-96.
16. Valente T. Airway Disease. Emergency Radiology of the Chest and Cardiovascular System. 2017:213-58.
17. Moore BA, Turner Jr JF, Wang KP. Anesthetic Management for Diagnostic and Therapeutic Bronchoscopy. Flexible Bronchoscopy. 2020 May 8:63-79.
18. Gardner L, Hangauer J, Whitaker T, Espinal R. Psychology and Developmental-Behavioral Pediatrics: Interprofessio na l Collaboration in Clinical Practice. Pediatric Clinics of North America. 2022 Oct 1;69(5):895-904.

19. Malogolowkin MH, Katzenstein HM, Meyers RL, Krailo MD, Rowland JM, Haas J, Finegold MJ. Complete surgical resection is curative for children with hepatoblastoma with pure fetal histology: a report from the Children's Oncology Group. Journal of clinical oncology. 2011 Aug 20;29(24):33
01-6.

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