Paediatric Spontaneous Pneumomediastinum 'Ruptured Alveoli for Observation': A Case Report

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SUMMARY

Children rarely experience spontaneous pneumomediastinum (SPM), 2 Because these cases are typically self-limiting, most patients will be admitted for observation. Regarding the treatment of paediatric patients who present to the emergency department (ED) with spontaneous pneumomediastinum, whether primary or secondary SPM, there is currently no agreement regarding their management. This case study describes a patient who had asthma-like symptoms for one day before being brought to the emergency room of Hospital Raja Perempuan Zainab II on January 15, 2024. Otherwise, the child was well before this event. Interestingly, chest X-ray after multiple nebuliser administration revealed pneumomediastinum. This case report highlights the overall management of spontaneous pneumomediastinum in paediatric patients.

INTRODUCTION

The pneumomediastinum is the accumulation of air or gas in the mediastinum. It is also referred to as mediastinal emphysema. It can be classified as either spontaneous or traumatic pneumomediastinum. Spontaneous pneumomediastinum (SPM) refers to the occurrence of air in the mediastinum that is not caused by trauma or medical procedures. Traumatic pneumomediastinum is secondary to blunt or piercing chest trauma, iatrogenic damage or complications from thoracic surgery or mechanical breathing.

Incidence of SPM was documented ranging from 1 in 800 to 1 in 42,000 hospitalised adult and paediatric patients.[1,2] The prevalence of SPM among children seeking emergency care for asthma varies between 0.3 to 5%.[3]

Paediatric SPM resolves on its own and is considered a reasonably harmless condition. Therefore, paediatric patients with SPM, whether primary or secondary, are typically admitted for observation in the emergency department and undergo further diagnostic tests due to the lack of consensus on definitive care.

CASE PRESENTATION

A 9-year-old girl with underlying bronchial asthma who did not receive proper medical supervision presented with fast breathing for 1 day. It is associated with fever, productive cough and post tussive vomiting. She denied any recent history of illness, interaction with sick individuals, falls, or trauma. No recent travel or aquatic activities. Upon arrival at the emergency department, normal blood pressure with pulse rate of 86, mild tachypnoea was noted with a respiratory rate of 26 breaths per minute, oxygen saturation of 97% on room air, and low-grade temperature of 37.5°C. She was triaged to the asthma bay and received nebulised salbutamol due to widespread rhonchi with equal air entry detected during lung auscultation. She received an additional two nebulised doses of salbutamol and Combivent due to persistent rhonchi in the lungs and reported no improvement in symptoms before undergoing a chest X-ray.

The X-ray of the patient revealed pneumomediastinum and soft tissue emphysema (Figure 1 A). Bedside ultrasonography did not find any features suggestive for pneumomediastinum in this case. The patient's septic condition was indicated by a total white blood cell count of 16.24 (predominantly neutrophils at 83% and lymphocytes at 8.7%), haemoglobin of 12, haematocrit of 34 and platelet count of 694. C-reactive protein level is 12.2. The patient was referred to the paediatric team for admission because of persistent tachypnoea despite resolution of bronchospasm and for further pneumomediastinum management.

The patient was initially assessed in the asthma bay due to a known case of bronchial asthma and stable condition. She received two doses of nebulised salbutamol and one dose of nebulised Combivent due to lack of improvement and persistent bronchospasm during each cycle of complete nebulised inhaler. She later conducted a Chest X-ray and administered Intravenous Hydrocortisone at a dosage of 4 mg/kg due to the patient's persistent tachypnoea despite improvement in bronchospasm. The patient was moved to the yellow zone for nasal prong oxygen at a rate of 3 L/min due to tachypnoea and the need for proper monitoring.

She was admitted to the ward for treatment of moderate acute exacerbation of bronchial asthma caused by atypical pneumonia, along with mild persistent asthma worsened by pneumomediastinum.

The patient in the ward received nebulised salbutamol every 2 hours, alternating with nebulised Combivent every 4 hours before transitioning to Metered Dose Inhaler (MDI) salbutamol 10 puffs every 3 hours then every 4 hours, in addition to MDI beclomethasone two puffs twice a day. The patient was administered intravenous hydrocortisone 120 mg four times a day for 1 day before switching to oral prednisolone 30 mg once a day for 3 days. She was initially

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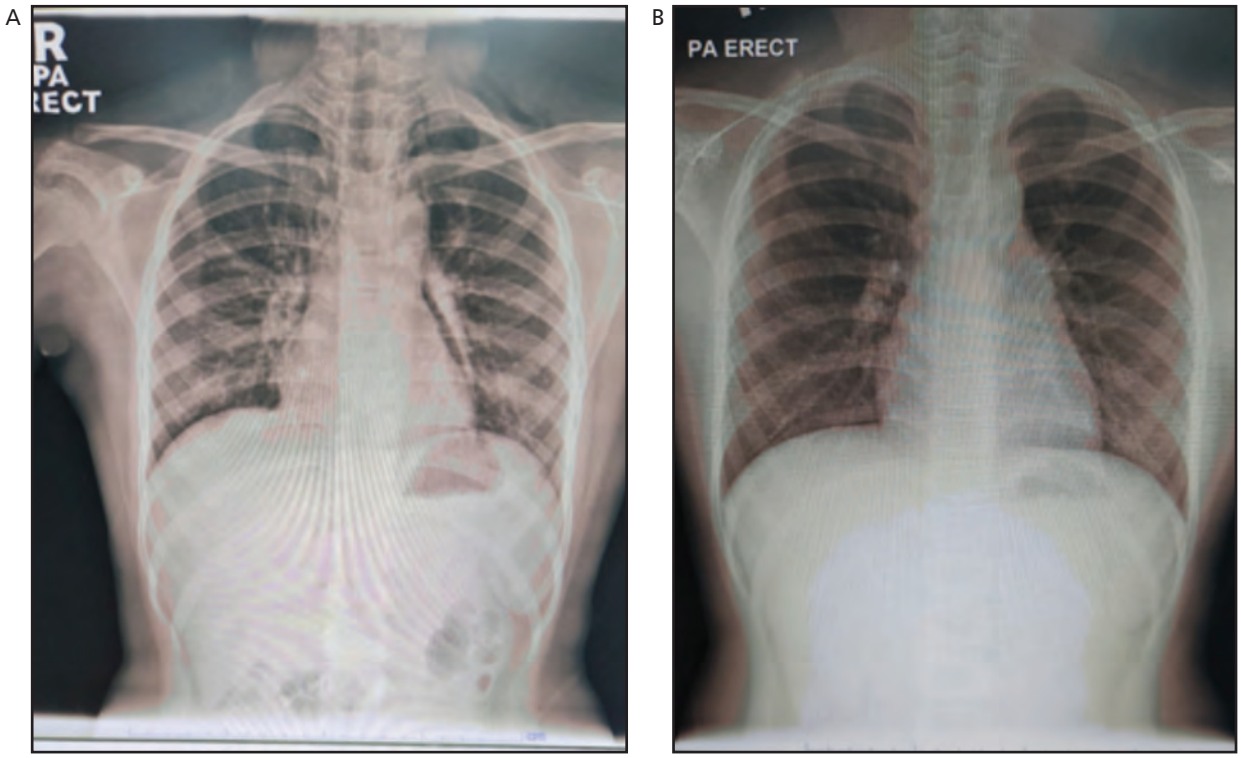

Fig. 1: Sequential chest Xray (A) on admission day and (B)discharge day showed improvement of pneumomediastinum and subcutaneous emphysema (red arrow).

administered intravenous C-Penicillin 1.5 million units four times a day for one day before transitioning to oral azithromycin 300 mg once daily for 2 days, followed by switching to oral azithromycin 250 mg once daily for 1 day. The case was reviewed with a respiratory paediatrician regarding the patient's health and X-ray results. The diagnosis was pneumopericardium along with concurrent pneumonia. Because the patient was clinically stable, conservative therapy was selected, with vigilant monitoring for signs of respiratory distress or desaturation and septic parameters.

The patient was discharged from the ward after 4 days because they were not experiencing rapid breathing and were able to maintain good oxygen saturation without the need for supplemental oxygen besides improving septic parameters. Chest X-ray results indicate resolving pneumonia and pneumomediastinum (Figure 1 B). She was scheduled for an appointment at the pulmonary clinic within 2 weeks to repeat the X-ray and reassess her symptoms.

DISCUSSION

Forced exhalation against a closed glottis is the main cause of spontaneous pneumomediastinum.[4,5] It is further classified as primary or secondary SPM. Primary SPM occurs in healthy children without pulmonary diseases, whereas secondary SPM is associated with underlying pulmonary pathologies, such as asthma, viral respiratory infections and pneumonia[4,5] where can be seen in my case report.

Individuals with primary SPM often experience symptoms such as chest pain, coughing and difficulty swallowing.[5,6] Most patients do not have a specific triggering event, such as vomiting, choking, coughing, athletic effort or puffing, that may be identified.

Pneumomediastinum is hypothesised to result from alveolar rupture due to inhalation against a closed glottis and can occur in individuals who are coughing, vomiting or engaging in intense activities.[3,4] The highest incidence of SPM in paediatric patients occurs during the neonatal period, followed by late infancy and early childhood, likely because of the high prevalence of respiratory infections in this age range. SPM's connection to respiratory infections may be influenced by elevated pressure in blocked airways or by tissue death resulting from parenchymal infection.

The examinations involved numerous repeated chest radiographs, as well as radiographs of the neck and abdomen. In a previous study, more than one-third of patients underwent Computed Tomography (CT) scan of the neck, chest and/or abdomen. However, CT imaging in patients with pneumomediastinum did not affect clinical care or outcomes. Routine CT imaging is not indicated for juvenile patients with SPM who appear healthy because radiation exposure is a particular concern in this population. Point of care ultrasonography is a quick evaluation tool for pneumomediastinum that minimises radiation exposure and aids in the early detection of mediastinal or free peritoneal air or subcutaneous emphysema. In Küng et als report, they characterise the typical appearance of pneumomediastinum

on ultrasonography as the 'angel-wing' or 'spinnaker sail' pattern, which is caused by air trapped in the front part of the mediastinum.[9] In the parasternal view of a lung ultrasound, a pattern of horizontal hyperechogenic reflections resembling a stairway may be observed when air becomes trapped behind the thymus.

Possible follow-up procedures include esophagogastroscopy, direct laryngoscopy, bronchoscopy, echocardiography and upper extremity Doppler scan, depending on the patient's symptoms. No specific therapeutic measures were identified, and no problems were noted in any patient with primary SPM who was admitted to the hospital, as reported in a previous study.[7,8] A study including 28 individuals with asthma and pneumomediastinum found that children with pneumomediastinum had comparable clinical outcomes during asthma exacerbations to children without pneumomediastinum suffering asthma attacks.[3] Most participants in this trial showed improvement on successive chest X-rays. A few individuals had deteriorating pneumomediastinum on chest X-rays, but none advanced to pneumothorax.[3]

Previous research indicates that patients without a history of trauma, respiratory infection, asthma exacerbation or vomiting and in whom the cause of pneumomediastinum is believed to be genuinely primary spontaneous should have a comprehensive history and examination.[7] Patients without respiratory distress, with normal vital signs, normal oxygen saturation and adequate pain control should be observed in the emergency department for 2 to 4 hours. If patients remain stable, they can be discharged with a follow-up appointment with their primary care physician on the next day to assess their general condition.

Typically, additional imaging does not offer more information than secondary spontaneous respiratory-associated pneumomediastinum. Therefore, clinical care should consider symptoms and clinical appearance. Chest X-ray is advised based on the specific respiratory disease. CT scan of the chest can be performed to assess respiratory conditions; however, it is not advisable for further examination of pneumomediastinum.

CONCLUSION

Spontaneous pneumomediastinum (SPM) is a rare, self-limiting illness that often leads to benign progression in children and healthy teenagers. Precise analysis of the initial chest X-ray findings is crucial to prevent needless investigations such as CT scans.

Patients with SPM who are clinically stable can be managed conservatively via clinical surveillance without the need for radiation exposure or invasive procedures. Patients with primary SPM should receive symptomatic therapy and be observed in the emergency department with close follow-up in an outpatient setting.

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DECLARATION

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