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Case Report

Symptomatic presentation of spontaneous pneumomediastinum in a young girl: a case report

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ABSTRACT

Spontaneous pneumomediastinum (SPM) is a rare and typically benign condition that involves the presence of air in the mediastinum without an obvious cause, such as trauma or surgery. It most commonly affects adolescents and young adults, with a male predominance. This case report discusses a 14-year-old girl presenting with pleuritic chest pain and persistent cough, initially misdiagnosed as asthma exacerbation or lower respiratory tract infection. Despite multiple treatments, her symptoms persisted, and a high-resolution computed tomography (HRCT) scan eventually revealed pneumomediastinum. The patient was treated conservatively with analgesics and rest, and she experienced a complete resolution of symptoms within ten days. A review of the literature reveals that SPM is often self-limiting, with conservative management sufficient in most cases. While the condition mimics more serious diseases such as pneumothorax and pulmonary embolism, accurate diagnosis through imaging is key to avoiding unnecessary interventions. This report underscores the importance of considering SPM in young patients presenting with chest pain and respiratory symptoms, especially when they do not respond to standard treatments for more common conditions.

Keywords: Spontaneous pneumomediastinum, Pleuritic chest pain, High-resolution computed tomography, Adolescent respiratory conditions, Conservative management

INTRODUCTION

Spontaneous pneumomediastinum (SPM) is a rare and generally benign condition characterized by the presence of air in the mediastinum without preceding trauma, surgery, or other obvious causes. Although SPM is uncommon, it primarily affects adolescents and young adults, with a higher incidence in males. The pathophysiology is typically explained by the Macklin effect, which involves alveolar rupture due to increased intra-alveolar pressure, leading to air leakage into the mediastinal space.[1,2]

Clinical presentation of SPM often mimics more serious conditions such as pneumothorax, myocardial infarction, or pulmonary embolism, resulting in delayed diagnosis/unnecessary interventions.[3] Early and accurate imaging, especially with HRCT, plays a crucial role in differentiating SPM from these more dangerous disorders.[4]

This case report discusses a 14-year-old girl with SPM who was initially misdiagnosed and treated for more common respiratory conditions. The objective is to emphasize the importance of considering SPM in young patients with unexplained chest pain and respiratory symptoms, as well as the critical role of HRCT in ensuring accurate diagnosis and avoiding overtreatment.

CASE REPORT

A 14-year-old female presented with a 4-day history of a dry cough and central pleuritic chest pain in a district town in Madhya Pradesh. The pain was described as

sudden onset sharp and exacerbated by deep breathing and coughing. She had previously seen three different physicians, each diagnosing her with asthma exacerbation or lower respiratory tract infection (LRTI). Despite receiving antibiotics, oral corticosteroids, bronchodilators, montelukast, and antitussive syrup, her symptoms persisted with no significant relief.

Day 1-4

Initial treatment included inhaled and nebulized bronchodilators, oral steroids, antibiotics, montelukast, and antitussives. However, the patient's symptoms remained unchanged, and her chest X-ray was unremarkable (Figure 1).

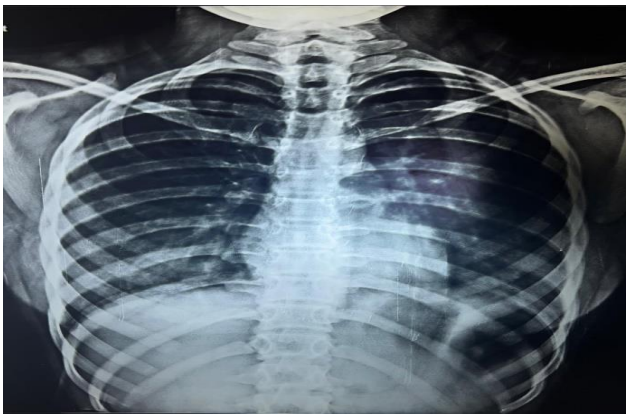

Figure 1: Initial chest X-ray showing no abnormalities.

Day 5

Patient was referred to a pulmonologist due to lack of response to treatment and worsening symptoms. HRCT scan performed, revealing pneumomediastinum, characterized by free air in mediastinal space without associated pneumothorax/parenchymal lung disease (Figure 2).

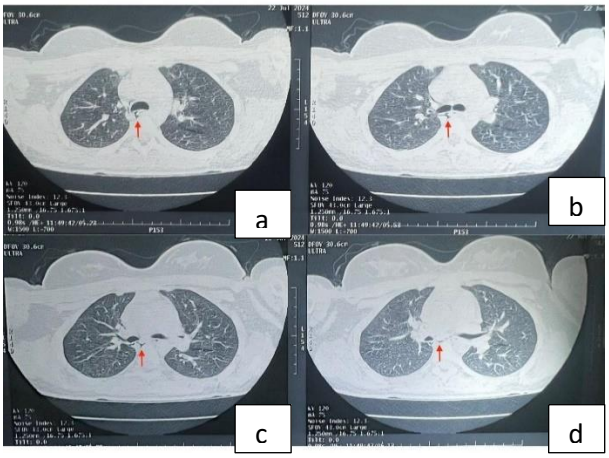

Figure 2 (a-d): HRCT revealing pneumomediastinum.

Management

The patient was reassured regarding the benign nature of her condition and was prescribed analgesics for pleuritic pain. Oxygen therapy was discussed as a potential option but was not required due to the absence of severe symptoms.

Outcome

By day 10, the patient reported complete resolution of her symptoms, and she was discharged from the clinic with no further interventions needed.

DISCUSSION

Epidemiology

SPM is a rare condition, with an estimated incidence of 1 in 44,500 emergency department visits.[1] The condition most commonly affects adolescents and young adults, particularly males, though cases in children and older adults have also been reported. The exact cause of SPM remains elusive, but it is thought to result from alveolar rupture due to increased intra-alveolar pressure, allowing air to track along the bronchovascular sheath into the mediastinum (the Macklin effect).[4]

Pathophysiology

The pathogenesis of SPM is most commonly explained by the Macklin effect, where alveolar rupture occurs following a sudden increase in intra-thoracic pressure. This increase in pressure can be triggered by a variety of factors, including: vigorous coughing, sneezing, or vomiting-physical exertion-asthma exacerbations or severe respiratory infections-illicit drug use (e.g., inhaled substances). Despite these associations, in many cases (including this patient), no clear precipitating factor is identified, leading to its classification as idiopathic or spontaneous.[2]

Clinical presentation

SPM can present with a variety of symptoms, though chest pain is the most common. Other symptoms may include dyspnoea, cough, neck pain, dysphonia, and subcutaneous emphysema.[3] Hamman's sign, a crunching sound synchronous with the heartbeat, is a rare but pathognomonic finding associated with SPM, though it was absent in this patient's case.[5]

SPM can mimic more serious conditions such as pneumothorax, myocardial infarction, or pulmonary embolism, which leads to over-investigation or misdiagnosis. The benign and self-limiting nature of SPM often allows it to be treated conservatively, but proper diagnosis is important to avoid unnecessary invasive procedures.

Diagnosis

The diagnosis of SPM is primarily based on clinical suspicion, especially in young patients with pleuritic chest pain, dyspnoea, or subcutaneous emphysema. A plain chest X-ray may be sufficient to detect air in the mediastinum, but in cases where symptoms are persistent or the diagnosis remains unclear, a high-resolution computed tomography (HRCT) scan is recommended, as it is more sensitive and can identify small amounts of mediastinal air.[6] In this case, the chest X-ray was unremarkable, and it was the HRCT scan that confirmed the diagnosis of SPM.

Differential diagnosis

SPM can mimic several life-threatening conditions, and it is crucial to differentiate it from other causes of chest pain and dyspnoea, including: Pneumothorax: Unlike SPM, pneumothorax often presents with unilateral chest pain and absent breath sounds. Pulmonary embolism: Characterized by pleuritic chest pain, dyspnoea, and often accompanied by risk factors such as immobility or hypercoagulability. -Oesophageal perforation (Boerhaave syndrome): Typically presents after forceful vomiting with sudden, severe chest pain, and can be confirmed by imaging showing air in both the mediastinum and pleural space.[7]

Management

SPM is usually self-limiting, and the management is conservative in most cases. Treatment typically consists of: analgesia: To control pleuritic chest pain-Rest: Avoiding activities that may increase intrathoracic pressure-oxygen therapy: In some cases, oxygen can hasten the absorption of air from the mediastinum, though this is reserved for more severe or persistent cases.[8] Antibiotics and corticosteroids are generally not indicated unless there is an underlying infectious process or comorbid respiratory conditions such as asthma.

In rare cases, SPM can progress to complications such as tension pneumomediastinum or pneumothorax, both of which require more aggressive intervention, including chest tube placement.[9] Fortunately, this patient's SPM resolved spontaneously with conservative management.

Prognosis

The prognosis for SPM is excellent, with most patients recovering fully within days to weeks. Recurrences are uncommon but have been documented, particularly in patients with underlying pulmonary conditions such as asthma or cystic fibrosis.[10] There are no long-term sequelae in the vast majority of cases, and follow-up is typically not required unless symptoms recur.

Case reports in literature

Several case reports and series have documented the benign nature of SPM and its typical self-limiting course:

In a review of 62 paediatric cases of SPM, Chalumeau et al found that all patients recovered fully with conservative management and only 10% required hospitalization for observation.[7] Mihos et al reported a series of 14 adult cases of SPM, all of whom were managed with analgesia and observation, with no recurrences noted during follow-up.[3] Azzopardi et al highlighted the importance of HRCT in diagnosing subtle cases of SPM, particularly in patients with an unremarkable chest X-ray, underscoring the need for early and accurate imaging in patients with persistent symptoms.[11]

CONCLUSION

This case highlights the importance of considering SPM in the differential diagnosis of pleuritic chest pain in adolescents, especially when the patient does not respond to treatments for common respiratory conditions. While SPM is rare, its benign nature and self-limiting course make it a condition that can often be managed conservatively, with a good prognosis. Expanding the literature on SPM, particularly in pediatric populations, will aid clinicians in recognizing and appropriately managing this uncommon condition.

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