

CASE REPORTS

SUDDEN CHEST PAIN, UNEXPECTED AIR: A PEDIATRIC CASE OF PNEUMOMEDIASTINUM

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ABSTRACT

Spontaneous pneumomediastinum is an uncommon and generally benign condition that disproportionately affects adolescent males.^{1,2} It may present in isolation or alongside spontaneous pneumothorax, and its hallmark symptom is acute chest pain that brings patients to the emergency department.³ The condition is easily mistaken for a more serious cardiopulmonary pathology, which makes early recognition genuinely important.⁴

We describe the case of a 14-year-old boy whose parents brought him to the emergency department after he developed sudden severe anterior chest pain while at rest, with no preceding trauma or respiratory illness. Examination was unremarkable. The chest radiograph, ordered more to rule out cardiac or pulmonary causes than out of specific suspicion, unexpectedly revealed paratracheal air lucencies consistent with spontaneous pneumomediastinum and a small left apical pneumothorax. Computed tomography at a tertiary referral center confirmed the diagnosis. The patient was managed conservatively with supplemental oxygen and close observation, without the need for drainage, and recovered fully.

Spontaneous pneumomediastinum is likely more common than reported, as its symptoms are often nonspecific and the diagnosis is not always considered.^{1,2} Chest radiography is the appropriate first step and can be diagnostic,^{1,2} with conservative management yielding excellent outcomes in the great majority of cases.^{2,3} This case illustrates how pneumomediastinum can present without any of the typical precipitating factors and why it deserves a place in the differential diagnosis of chest pain in adolescents.

Introduction

Spontaneous pneumothorax and pneumomediastinum are both uncommon in children. Primary spontaneous pneumothorax has an estimated incidence of about 3.4 to 4 per 100,000 children per year, while spontaneous pneumomediastinum is rarer still, reported at roughly 1 in 14,000 to 1 in 42,000. Both occur more frequently in boys.⁵ Despite the alarming presentation, these entities are usually benign and self-limited, though they can mimic conditions of far greater urgency and often bring patients to the emergency department.^{3,4}

The mechanism is well established. Rupture of terminal alveoli adjacent to the bronchovascular sheath allows air to dissect along the peribronchovascular interstitium toward the mediastinum, the pathway described by Macklin and now known as the Macklin effect.⁶ Less frequently, air enters from the upper airway, tracheobronchial tree, or gastrointestinal tract.¹ From the mediastinum it can track through fascial planes into the soft tissues of the neck and chest wall, and occasionally the upper extremities.¹ This decompression

usually prevents dangerous pressure buildup, though rare complications including pneumopericardium and pneumoperitoneum have been reported.^{2,3}

Many conditions can precipitate this sequence. Respiratory triggers include asthma exacerbations, infections, cystic fibrosis, and foreign body aspiration, along with forceful Valsalva maneuvers. Gastrointestinal causes such as severe vomiting or perforation account for some cases, while strenuous exercise, seizures, and illicit drug inhalation have also been described.¹⁻³ In many cases, however, no trigger is identified.

The most frequently reported symptoms are chest pain (approximately 55%), neck pain or odynophagia (approximately 53%), and dyspnea (approximately 41%); palpable subcutaneous emphysema is the most characteristic sign, present in roughly two thirds of patients.⁷ The pain tends to be retrosternal and pleuritic, worsening with inspiration, and may radiate to the neck, shoulders, or arms.^{1,2}

Chest radiography is the appropriate starting point for investigation and is diagnostic in most cases.^{1,2} The characteristic findings include linear lucencies outlining mediastinal structures, paratracheal air stripes, the continuous diaphragm sign, subcutaneous emphysema, and associated pneumothorax.^{1,8} Adding a lateral view can improve sensitivity by making retrosternal air more visible.^{1,8}

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Case Report

A 14-year-old boy was brought to the emergency department by his parents, who had become alarmed by the severity of his chest pain. He had been sitting at rest when the pain began, suddenly and without warning, approximately two hours before arrival. There was no preceding cough, physical exertion, trauma, or respiratory illness. The pain was anterior, pleuritic in character, worsening with each deep breath, and had been intensifying since onset without any relieving factors. He had no fever, dyspnea, neck pain, or gastrointestinal complaints.

On examination, he was alert and in no acute respiratory distress. Pulmonary and cardiac auscultation were unremarkable. The sternum and costal arches were not tender on palpation, and there were no external signs of trauma.

A chest radiograph was obtained (Figure 1) to exclude cardiac or pulmonary pathology. The finding was unexpected: linear paratracheal air lucencies consistent with spontaneous pneumomediastinum, along with a small left apical pneumothorax. The radiological picture stood in clear contrast to the apparently minor clinical presentation. The patient was referred to the pediatric surgery department at a tertiary referral center, where computed tomography confirmed the diagnosis.

No thoracic drainage was required. The patient was managed conservatively with supplemental oxygen (FiO₂ 100%) for 24 hours, with complete resolution of symptoms and subsequent radiological improvement (Figure 2).

Figure 1. Posteroanterior chest radiograph demonstrating linear paratracheal lucencies and mediastinal air outlining the upper mediastinal contours, consistent with pneumomediastinum. A small left apical pneumothorax is also identified. No focal pulmonary consolidation or pleural effusion is present. The cardiomeastinal silhouette is within normal limits, and no acute osseous abnormalities are evident on these images.

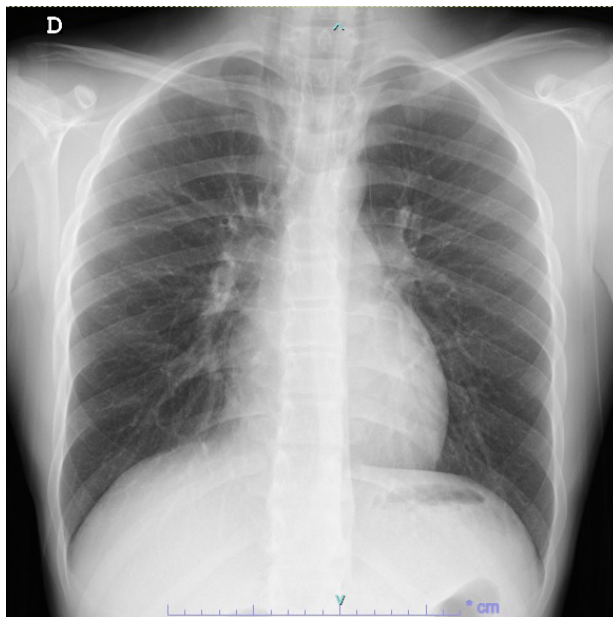


Figure 2. Follow-up posteroanterior chest radiograph after high-flow oxygen therapy demonstrating complete resolution of the previously observed pneumomediastinum, with disappearance of the paratracheal air columns.



Discussion

Chest pain is a common reason for emergency department visits in children and adolescents. Most cases are benign and noncardiac, but the symptom carries real consequences: missed school, restricted activity, and anxiety that often outlasts the episode.^{9,10} Spontaneous pneumomediastinum is probably underdiagnosed, its incidence underestimated partly because the clinical picture can be so underwhelming relative to what the imaging eventually shows.^{1,2}

This case illustrates that tension. A teenage boy at rest, with no precipitating factors and an unremarkable examination, did not suggest mediastinal air. The radiograph was ordered as a screening tool rather than from specific suspicion, and the result surprised the team. Systematic imaging of undifferentiated chest pain in this age group might reveal pneumomediastinum more often than current figures capture.^{2,3}

Identifying which patients warrant radiographic investigation requires careful clinical assessment.^{4,10} Some findings deserve a closer look: substernal pain with an anginal quality, radiation to the back, pleuritic pain accompanied by respiratory distress, exertional dyspnea, orthopnea, syncope, palpitations, fever, or symptoms consistently triggered by exercise.^{4,10} In contrast, many children with chest pain have either a normal examination or findings pointing to a musculoskeletal cause.⁹ When the clinical picture is ambiguous, or when the pain is pleuritic and unexplained, a chest radiograph is a low-risk, high-yield next step.^{1,4}

Once pneumomediastinum is identified on plain film, computed tomography can add value in equivocal cases or when a secondary cause or complication is suspected.^{2,3} In straightforward presentations like this one, however, CT serves primarily to confirm the diagnosis and reassure the clinical team before committing to conservative management.

Conservative treatment, comprising rest, analgesia, supplemental oxygen, and observation, is appropriate in the absence of significant pneumothorax or haemodynamic compromise.^{2,3} The rationale for oxygen therapy is physiological: breathing high-concentration oxygen replaces nitrogen in the alveoli, steepening the diffusion gradient and accelerating reabsorption of free mediastinal air.³ Invasive procedures are rarely needed and should be reserved for cases with tension physiology or progressive cardiorespiratory compromise.^{2,3}

Conclusion

A normal examination does not exclude pneumomediastinum. In this case, the diagnosis came from a radiograph ordered out of caution rather than conviction, and it changed management entirely. Spontaneous pneumomediastinum can develop at rest, without any identifiable trigger, and its radiological findings can be striking in a patient who appears well.¹⁻³ For any adolescent presenting with acute unexplained chest pain, particularly when pleuritic and the examination is unremarkable, a chest radiograph is warranted. Recognising the condition early avoids unnecessary investigation, allows for safe conservative management, and spares the patient and family considerable anxiety.⁴

Compliance with Ethical Standards

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