Case Report

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Delayed Diagnosis of Community-Acquired Pneumonia-Associated Spontaneous Pneumomediastinum Following Nonspecific Symptoms: A Case Report

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ABSTRACT

Pneumonia is a common acute lower respiratory tract infection, whereas pneumomediastinum is uncommon and may present with nonspecific symptoms, making it easy to overlook on initial assessment. We report a 25-year-old male smoker who presented to the emergency department with a three-week history of malaise, fatigue, and loss of appetite, followed in the days before admission by chills, worsening fatigue, productive cough, retrosternal pleuritic chest pain, and nausea. On respiratory examination, fine crackles were auscultated over both upper lobes, with no palpable subcutaneous crepitus. Laboratory tests showed elevated C-reactive protein and leukocytosis. Chest radiography did not demonstrate pneumomediastinum, but computed tomography revealed bilateral upper lobe pneumonia with mediastinal and paracardiac air and cervical subcutaneous emphysema. The patient was managed conservatively with antibiotics, supportive care, analgesia, antiviral treatment, and inhaled therapies. He improved clinically and was discharged without complications or invasive intervention. The distinctive features of this case were the prolonged nonspecific symptom course, the absence of clinically palpable cervical subcutaneous emphysema, and the failure of chest radiography to demonstrate pneumomediastinum despite its detection on CT. These findings emphasize that spontaneous pneumomediastinum may be overlooked in patients with community-acquired pneumonia when clinical and radiographic findings are subtle.

Keywords: Spontaneous pneumomediastinum; subcutaneous emphysema; Community-acquired pneumonia; Chest pain; Symptoms

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1. Introduction

Pneumonia is a common acute lower respiratory tract infection involving the distal airways and alveoli. Although it is broadly categorized as community-acquired or hospital-acquired, multiple classification systems are also used. The most frequently identified causative pathogens of CAP include Streptococcus pneumoniae, respiratory viruses, Haemophilus influenzae, Mycoplasma pneumoniae, and Legionella pneumophila. Symptoms such as cough, dyspnea, pleuritic chest pain, or acute functional and cognitive decline, together with abnormal vital signs, suggestive lung examination findings, and supportive radiological imaging, are key elements that guide the diagnosis. Mild CAP is generally managed in the outpatient setting, moderate cases are treated on inpatient wards, and severe cases are managed in intensive care units. [1-3]

The mediastinum is defined as a visceral compartment bounded by the pleurae, thoracic inlet, diaphragm, sternum, and thoracic vertebral column. It contains multiple critical structures, including the heart, great vessels, the trachea, and major nerves. [4] Pneumomediastinum is a clinical entity characterized by the presence of air within the mediastinum. Although chest pain is the most common presenting symptom, dyspnea, neck swelling, cervical pain, dysphagia, odynophagia, and dysphonia may also be reported at presentation. Pneumothorax, subcutaneous emphysema, and air within the spinal canal may accompany this condition. Pneumomediastinum is mainly classified as primary or secondary. Primary spontaneous pneumomediastinum is generally self-limited and typically resolves spontaneously. In general, distinguishing primary spontaneous pneumomediastinum from secondary causes remains a diagnostic challenge. [5-7]

Pneumomediastinum is a rare complication of pneumonia, with only a limited number of pneumonia-associated cases reported in the literature. [8] Up to 30% of patients with pneumomediastinum may have a normal chest radiograph, and chest CT has therefore been suggested when clinical suspicion persists despite normal radiographic findings. [7] This diagnostic challenge is particularly relevant in the emergency setting, where prolonged nonspecific presentations, as in the present case, may delay recognition of spontaneous pneumomediastinum.

In this article, we present a case of a patient whose symptoms initially began with atypical features and who presented to our department approximately three weeks later due to clinical worsening, at which time pneumonia, pneumomediastinum, and cervical subcutaneous emphysema were identified. Through this case, we aim to provide a multidimensional discussion and to raise clinicians' awareness of the need for heightened vigilance in delayed presentations.

2. Case report

A 25-year-old male patient presented to our emergency department. He had undergone tonsillectomy during childhood. He had no other known medical history or chronic disease. He had no known allergies. He was an active smoker.

He reported malaise, fatigue, and loss of appetite that had started approximately three weeks prior to presentation. These symptoms did not fully resolve and persisted during this period. Approximately five days before presentation, chills and shivering developed. His fatigue also worsened during this time. He reported intermittent cough and sputum production in the preceding period. However, these symptoms became more prominent over the last one to two days.

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He presented primarily with retrosternal chest pain, cough, sputum, and nausea. The chest pain was described as sharp and stabbing, and it varied with inspiration and expiration. He stated that the sputum was slightly green. He also reported that his cough had worsened over the last two to three days.

On admission, his blood pressure was 109/74 mmHg, respiratory rate was 19 breaths/min, heart rate was 98 beats/min, oxygen saturation was 97% on room air, and body temperature was 36.7°C. His BMI was approximately 21.2 kg/m². He was conscious and fully oriented, with a Glasgow Coma Scale score of 15. No neck swelling or tenderness was present. On respiratory examination, fine crackles were auscultated over both upper lobes, and no palpable subcutaneous crepitus was detected. Abdominal examination was unremarkable, and peripheral pulses were palpable. Laboratory tests revealed a CRP level of 202 mg/L and a white blood cell count of 18.05 × 10^9/L. The CURB-65 score was 0 at presentation, consistent with low-severity community-acquired pneumonia.

Chest CT demonstrated findings consistent with pneumonia in both upper lobes. In addition, diffuse air densities were detected in the mediastinum and paracardiac regions. Air densities were also observed in the included cervical soft tissues. These findings were consistent with pneumomediastinum and subcutaneous emphysema.

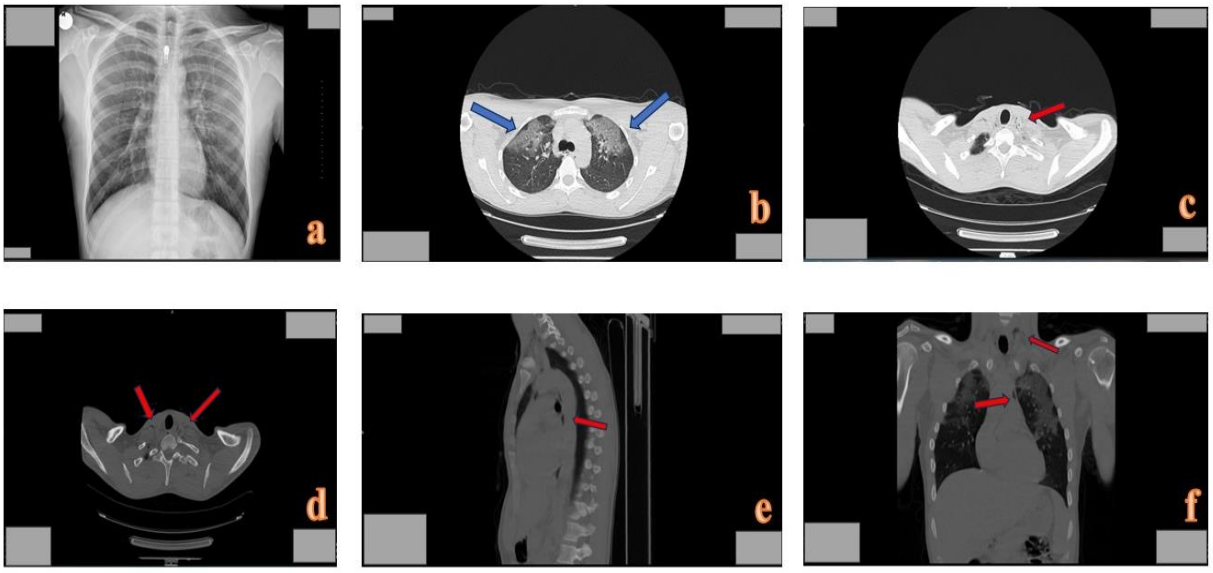

Figure 1: Radiological imaging obtained at emergency department presentation. (a) Posteroanterior (PA) chest radiography. (b) Axial chest CT (lung window) demonstrating bilateral upper-lobe parenchymal opacities consistent with pneumonia (blue arrows). (c–d) Axial CT images showing cervical soft-tissue air consistent with subcutaneous emphysema (red arrows). (e) Sagittal and (f) coronal CT reconstructions demonstrating mediastinal and cervical soft-tissue air consistent with pneumomediastinum and subcutaneous emphysema (red arrows)

No history of trauma, forceful vomiting/retching, recent invasive airway or esophageal procedures, or substance inhalation was reported, and CT did not demonstrate findings suggestive of tracheobronchial or esophageal injury. No microbiological investigations were performed; therefore, a specific causative pathogen could not be identified.

The patient was evaluated in consultation with the Pulmonology and Thoracic Surgery depart-

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ments and was admitted to the Thoracic Surgery ward for close observation. After clinical assessment and multidisciplinary evaluation with Pulmonology and Thoracic Surgery, bronchoscopy was not pursued because no clinical or CT findings raised suspicion of tracheobronchial injury. In the absence of microbiological testing, empirical antimicrobial treatment was administered during inpatient follow-up, including intravenous ceftriaxone (1 g twice daily) and oral levofloxacin (750 mg once daily), together with empirical antiviral therapy with oseltamivir (75 mg twice daily). Analgesic therapy was administered for chest pain. During follow-up, oxygenation remained stable and no clinically significant oxygen requirement developed. In the ward, inhaled ipratropium (three times daily) and budesonide (once daily) were also prescribed as supportive respiratory therapy. The patient was advised about the adverse health effects of smoking and was informed that support could be obtained from a smoking cessation clinic. The patient was monitored for six days and discharged after clinical improvement. Laboratory parameters returned to normal ranges, and follow-up imaging demonstrated regression of radiological findings without complications. No surgical intervention was required. Post-discharge follow-up data were unavailable; therefore, we could not assess subsequent symptom recurrence or smoking cessation status.

The clinical course, key diagnostic findings, and conservative management from symptom onset to discharge are summarized in Figure 2.

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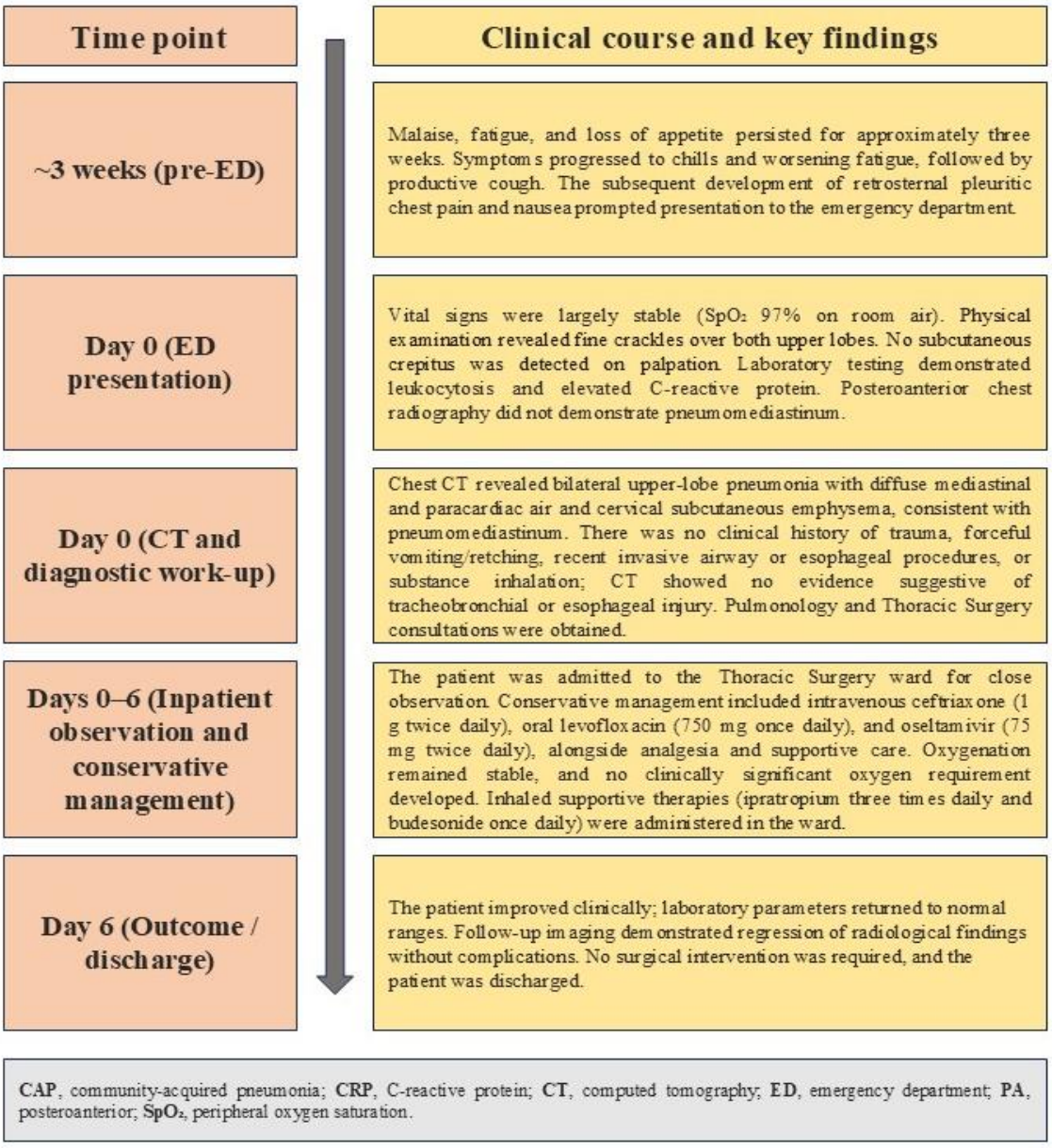

Figure 2: Timeline diagram summarizing the clinical course, key diagnostic findings, and conservative management of the presented case from symptom onset to discharge

3. Discussion

Spontaneous pneumomediastinum is a relatively uncommon condition that is most often observed in young adult males who are tall and have a slender body habitus. It typically occurs without an identifiable underlying pathology. Our patient similarly matched the commonly described young male demographic. However, given his concurrent illness, a facilitating factor such as cough was also present. Spontaneous pneumomediastinum is generally reported to be self-limited, and the mean age at presentation has been reported to be 25 years. We found that our case closely aligned with the patterns described in the literature. [9, 10]

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Spontaneous pneumomediastinum associated with respiratory infections has been reported previously; however, our case showed several distinctive features. The patient had approximately three weeks of nonspecific symptoms, while cervical subcutaneous emphysema was not clinically palpable and pneumomediastinum was not evident on chest radiography but was detected on CT. A recent clinical review also emphasized that pneumomediastinum may not be apparent on chest radiography and that CT can aid diagnosis when suspicion persists. [7] These features may complicate the diagnosis and increase the likelihood of pneumomediastinum being overlooked.

A recent comprehensive review of 1,134 patients with spontaneous pneumomediastinum reported a recent respiratory infection in 9% of cases. [11] In the same review, chest pain and dyspnea were the predominant presenting symptoms, whereas subcutaneous emphysema was the most frequent physical examination finding. [11] Against this background, the present case was notable for a prolonged period of nonspecific constitutional symptoms, the absence of clinically palpable subcutaneous emphysema, and the lack of radiographic evidence of pneumomediastinum on the initial chest radiograph, with the diagnosis subsequently established by CT. Taken together, these features distinguish the present case from the more typical clinical profile described in the broader spontaneous pneumomediastinum literature and underscore the potential for delayed recognition in atypical presentations.

Although determining the exact incidence is difficult, one report describes an incidence of approximately 1 case per 30,000 emergency department visits. This finding is important because it underscores that the condition is relatively rare. [12] The precise etiology also remains unclear. One of the proposed mechanisms is alveolar rupture that occurs after a triggering event. [13] Asthma exacerbation has been reported as one of the most common triggers. Barotrauma, increased intrathoracic pressure, and the Valsalva maneuver have also been implicated. Withdrawal symptoms related to substance use have similarly been described as potential triggers. [13, 14] Other reported associated factors include cough, mechanical ventilation, pneumonitis, emphysema, pulmonary fibrosis, acute respiratory distress, heroin, cannabis, and cocaine use, infections of the head and neck region, tracheobronchial and esophageal tears, and trauma involving the maxillary sinus wall [9, 15, 16]. In our patient, cough was present and could be considered a plausible contributing symptom. However, because of the delayed presentation, it should also be emphasized that the exact course and sequence of events cannot be reliably determined. A potential contributory role of pneumonia-associated cough in the development of pneumomediastinum cannot be excluded; however, the available findings are insufficient to establish a direct causal relationship in a single observational case.

As part of the differential diagnostic evaluation, potential secondary causes of pneumomediastinum were also systematically considered. A recent clinical review describes trauma, iatrogenic airway or thoracic interventions, mechanical ventilation, underlying pulmonary diseases, inhalational exposures, forceful vomiting or retching, and physical activity among recognized causes or precipitating factors of pneumomediastinum. [7] In the present case, there was no history of trauma, asthma or other chronic pulmonary disease, mechanical ventilation, recent invasive procedures, forceful vomiting, inhalational drug use, or strenuous physical activity.

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Furthermore, CT revealed no findings suggestive of tracheobronchial or esophageal injury.

The most common symptoms of pneumomediastinum include chest pain, neck pain, dyspnea, dysphagia, and a sense of tightness or swelling involving the face and neck. Among these, chest pain is the most frequently reported presenting symptom. [17] In our patient, chest pain was also present at the time of presentation and represented the most prominent symptom.

Physical examination findings may include subcutaneous emphysema. Crepitus may be detected on palpation, particularly when the emphysema extends more superficially. A characteristic precordial crackling sound may also be heard on cardiac auscultation. [16] In our patient, subcutaneous emphysema was detected on imaging. However, palpable crepitus was not identified on physical examination. This was considered to be related to the deeper distribution of the emphysema.

Nonspecific laboratory abnormalities such as elevated CRP and leukocytosis have been reported in pneumomediastinum, and our case similarly showed marked elevations in these parameters. [17] However, because our patient had concomitant pneumonia, it is not possible to attribute these laboratory findings solely to pneumomediastinum. [17]

From a pathophysiological perspective, an increased pressure gradient between the intraalveolar and interstitial spaces causes air to leak from small alveolar openings and ruptured alveoli into the perivascular space. This process leads to interstitial emphysema. [15] It has also been reported that this pressure gradient may extend along the vascular sheaths and cause air dissection. [15] In addition, a sudden increase in mediastinal pressure has been emphasized as a factor that may also lead to pneumothorax. [15]

In the diagnostic evaluation, radiographic imaging modalities are recommended, primarily chest radiography, as well as ultrasonography, contrast esophagography, and CT. [18] For chest radiography, an anteroposterior view together with a lateral view is recommended. It has been emphasized that PA chest radiography alone may miss the diagnosis in up to 50% of cases. This limitation has been attributed to the radiolucent appearance between the left cardiac border and the mediastinal pleura. [18] CT is more sensitive and can detect mediastinal air that may not be visible on chest radiography. For this reason, CT has been reported as the gold standard for diagnosing spontaneous pneumomediastinum. [9, 19] In our case, a similar pattern was observed. Pneumomediastinum was not detected on PA chest radiography (Figure 1) but was identified on CT imaging (Figure 1).

In general, the management of spontaneous pneumomediastinum is primarily conservative and supportive. Rest is recommended. Patients should be advised to avoid maneuvers that may increase intrathoracic pressure. Oxygen therapy and adequate analgesia are also central components of treatment. [9] If an underlying triggering condition is identified, targeted management of that condition should be planned as part of the overall approach. [9]

A recent clinical review emphasized that management largely consists of supportive care, while further invasive diagnostic evaluation should be selectively guided by clinical suspicion rather than routinely performed. [7] This approach was consistent with the present case, in which no tracheobronchial or esophageal injury was identified, and the patient improved with conservative inpatient management without surgical intervention. Regarding the concomitant community-acquired pneumonia, current CAP guidance recommends a β-lactam plus a macro-

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lide or respiratory fluoroquinolone monotherapy for hospitalized patients with non-severe CAP. In contrast, a β-lactam plus a respiratory fluoroquinolone is among the recommended options for severe CAP. [20] In the present case, ceftriaxone and levofloxacin were administered empirically during inpatient follow-up. Given the patient's low CURB-65 score and the recommended regimens for non-severe inpatient CAP, this regimen is best interpreted as an individualized inpatient treatment approach rather than a standard regimen for non-severe CAP.

After diagnosis, inpatient observation for at least the first 24 hours is recommended. This strategy aims to facilitate early recognition of potential complications and to minimize the risk of adverse outcomes.[21] The prognosis of spontaneous pneumomediastinum is generally favorable. Most cases tend to resolve spontaneously within a few days. [17] In a retrospective study, no recurrence was reported during a two-year follow-up period. [17] However, based on the currently available data, it is not possible to definitively exclude the possibility of post-discharge recurrence. [9]

4. Conclusion

The coexistence of community-acquired pneumonia and spontaneous pneumomediastinum may present a diagnostic challenge, particularly when the clinical course is prolonged and nonspecific and typical physical or radiographic findings are absent. In the present case, pneumomediastinum was not evident on initial chest radiography and cervical subcutaneous emphysema was not clinically palpable, whereas CT established the diagnosis. This case highlights the importance of maintaining clinical suspicion and considering CT when pneumomediastinum remains a diagnostic possibility despite nondiagnostic initial findings. In clinically stable patients without evidence of secondary structural injury, conservative management may result in a favorable outcome.

Abbreviations

BMI:Body mass index

CAP: Community-acquired pneumonia

CRP: C-reactive protein

CT: Computed tomography

CURB-65: Confusion, Urea, Respiratory rate, Blood pressure, and age ≥65 years

PA: Posteroanterior

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