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Case study

Community-Acquired Pneumonia with rapidly progressing pleural effusion within 24 hours: A case report

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ABSTRACT

Patients with Community-Acquired Pneumonia (CAP) complicated with pleural effusion mostly present with shortness of breath and pleuritic chest pain, and usually, pleural fluid (PE) progresses gradually. In this report, a case of CAP patient complicated with PE presented with left shoulder pain is discussed. The PE was found to have rapidly accumulated as a massive effusion within 24 hours of presentation. Thoracocentesis was performed and revealed an exudative picture. Patients with CAP can present with atypical symptoms on admission but may develop massive parapneumonic pleural effusion within a short time that would need definite management via urgent chest tube placement.

Keywords: Community-Acquired Pneumonia (CAP), massive pleural effusion, thoracocentesis, exudative effusion, complicated parapneumonic effusion

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BACKGROUND

Parapneumonic effusions and empyema are relatively common complications of pneumonia. However, since the advent of antibiotics, their overall incidence has declined dramatically to approximately 2-3 % of all cases of pneumonia. Pleural effusion (PE) occurs due to a disturbance in the balance between pleural fluid (PF) formation and removal[1]. It does not arise as a disease by itself; instead, it is an outcome of underlying pathology. Therefore, diagnosing PE requires a physician to determine its cause to treat PE appropriately. However, the etiology of PE remains unclear in nearly 20% of cases. Therefore, a careful history with good clinical examination should aid in diagnosing, especially in patients with atypical presentations. Thoracocentesis is the crucial step to determine the various etiologies. Considering the PF biochemistry, cytology, and signs and symptoms, PE diagnosis can be established in the vast majority of the cases[2]. PF analysis can be classified as exudative or transudative. Treating the underlying cause is the typical management strategy for transudative effusions.

Massive PE refers to an effusion that fills almost all the hemithorax. A prospective study was conducted to establish the most common causes of pleural effusions. A malignant effusion was found to be the leading cause of massive effusion, followed by PE secondary to cirrhosis. On the other hand, massive pleural effusions were far less likely to be caused by congestive heart failure or infections[3]. The lesson learned from this case is that regardless of the source of infection, symptomatic relief could be established by drainage.

CASE PRESENTATION

A 44-year-old ex-smoker with no known co-morbidities arrived at our emergency room with a one-week complaint of left-sided chest discomfort and left shoulder pain. The pain was gradual in onset and continuous in nature, radiating to the shoulder. The pain increased while deep breathing and movements. The pain was not relieved by any medications. The patient complained of fever at night and some loss of appetite but had no history of shortness of breath, productive cough, night sweats, or history of significant weight loss. He denied known TB contact and any history of TB. No other history of any traumatic event (Table 1). The patient was afebrile on examination, with a heart rate (HR) of 90 beats per minute and blood pressure (BP) of 130/73 mmHg, respiratory rate (RR) of 19 breaths per minute, and oxygen saturation (O_2 sat) of 100 percent in room air. There was no clubbing or supraclavicular lymphadenopathy. Upon the examination of the respiratory system, there was no visible deformity and no tenderness on palpation. Moreover, the percussion note was dull on the lower left side of the chest, and on the auscultation decreased air entry on the left side with left basal crackles.

The left shoulder joint examination showed no tenderness and a normal range of movements. The remaining systemic examination, including cardiovascular, neurological, and gastrointestinal exams, was unremarkable. A chest x-ray (CXR) (Figure 1) was performed, which showed a mild/moderate amount of left-sided PE with underlying atelectasis. The diagnosis of left-sided PE was made, and the patient was started on antibiotics empirically as a case of parapneumonic effusion. Diagnostic PF aspiration was done under septic conditions, and a workup was sent for PF analysis to determine the cause of the effusion without typical respiratory symptoms. The patient was kept in isolation is suspicion of TB. Within the next 24 hours, the patient developed worsening chest pain on the left side, shortness of breath, and desaturation. A repeated CXR (Figure 2) was performed and compared with the previous CXR; where there was a considerable interval increasing PE with collapse/consolidation

Table 1. Laboratory investigations upon admission

Investigation	Result	Reference range
WBC	$17.9 \times 10^3/\mu L$	$4-10 \times 10^3/\mu L$
RBC	$4.8 \times 10^6/\mu L$	$4.5-5.5 \times 10^6/\mu L$
Hb	13.4 gm/dL	13.0–17.0 gm/dL
Platelets	$226 \times 10^3/\mu L$	$150-400 \times 10^3/\mu L$
ANC	$14.6 \times 10^3/\mu L$	$2\text{-}7 \times 10^3/\mu L$
Lymphocytes	$1.9 \times 10^3/\mu L$	$1.0-3.0 \times 10^3/\mu L$
CRP	319 mg/L	0–5.0 mg/L

WBC: White Blood Cells; RBC: Red Blood Cells; Hb: Hemoglobin; ANC: Absolute Neutrophil Count; CRP: C-reactive protein

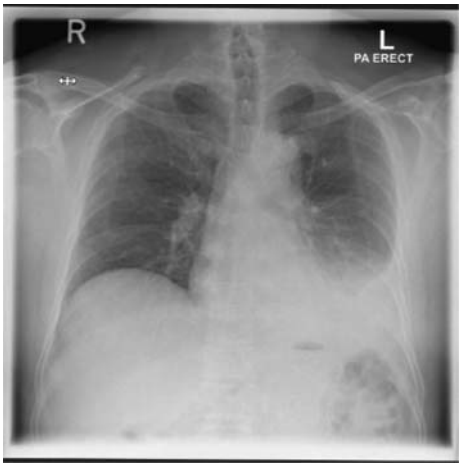

Figure 1. Left-sided pleural effusion with underlying atelectasis.

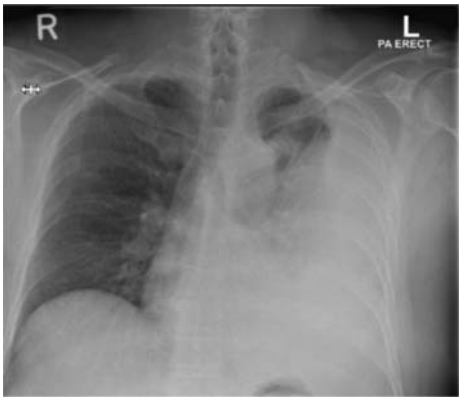

Figure 2. Large amount of pleural effusion on the left side with the collapse of lung parenchyma

left lung. Thoracocentesis was done the previous day, however; traumatic hemothorax was suspected but was ruled out as there was no drop in hemoglobin. The diagnosis of pneumonia with massive PE on the left side that had rapidly progressed over 24 hours, with worsening chest symptoms, was conducted. An urgent chest drain was inserted under ultrasound guidance, and drainage was done. Following this, a CT chest was done (Figure 3) which showed improvement in the PE and no evidence of empyema or abscess formation. The patient started feeling better with the chest drain in place. He improved clinically, and the inflammatory markers improved from admission. The PF analysis showed an exudative picture with a neutrophilic predominance (Table 2). Unfortunately, PF pH testing was not done as there was no suspicion of empyema although if done could have definitely guided in the drainage. PF cultures were negative. Work up for TB and malignancy were negative.

On Day 9, after the chest tube was inserted, the fluid drainage was nil. The CXR was repeated which showed resolution of PE. Then, the chest tube was removed, the patient was discharged on antibiotics for a total of 21 days, and an outpatient follow-up appointment with the pulmonologist was given.

DISCUSSION

Whenever CAP is complicated with PE it mostly progresses gradually. A pleural sac is a compartment typically filled with a thin layer of fluid known as pleural fluid. It acts as a lubricant and helps reduce friction between the parietal and visceral pleural lining surfaces during respiration[4]. An accumulation of fluid occurs because of an imbalance in the rate of production and drainage of fluid due to changes in many local factors[4].

The typical presentation of a case of PE may include the pleuritic type of chest pain, which indicates inflammation of the pleura, with the pain increasing on movement and respiration with some associated shortness of breath. In contrast, the patient presented with only left-sided shoulder pain

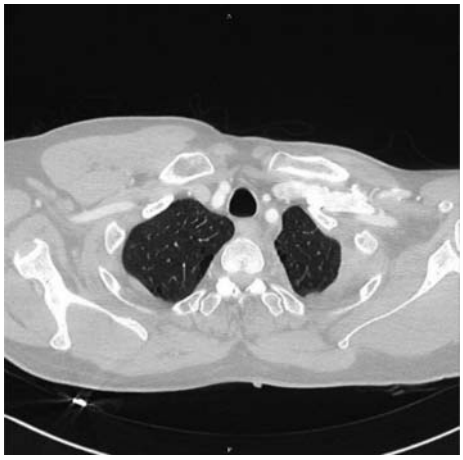

Figure 3. Mild pleural effusion on the left side no evidence of collection

Table 2. Pleural fluid analysis

Investigation	Findings
PF color	Straw colored
PF appearance	Slightly cloudy
Pleural fluid Glucose	4.8
Pleural fluid LDH	381
PF RBC	3350
PF WBC	4475
Neutrophils	97
Lymphocytes	1
Monocytes	2
Eosinophil	0
Pleural fluid protein	51.5
PF culture aerobic/anerobic	negative
PF TB PCR	Negative
PF TB MTB	negative
PF AFB Smear	negative
PF AFB Culture	negative
PF cytology	No malignant cells seen

with no respiratory symptoms in this case. As a clinician, the CAP and underlying PE may present with these atypical symptoms and should not be simply mistaken for musculoskeletal pain. CAP with PE should be on the top of the list of differentials. An underlying undiagnosed rapidly accumulating PE can, in turn, lead to rapid deterioration of the patient.

The first step in determining the cause of a PE in cases where clinical history does not correlate, but PE is evident on clinical imaging is to perform a diagnostic thoracocentesis. This shall help a clinician to differentiate if the PE is transudative or exudative. However, diagnostic thoracentesis is not required in patients with a small quantity of PF (<500 cc) and a definite diagnosis (e.g., viral pleurisy), or in patients with obvious heart failure (HF) on clinical examination but with no unusual findings[5].

In patients with an exudative PE, like the case we discussed here, further evaluation is needed to determine the underlying pathology affecting the pleura leading to the PE due to CAP. Lactic Acid Dehydrogenase (LDH) and serum protein levels in the PF are used to confirm an exudative effusion diagnosis. The Light's criteria are the most widely used criterion for distinguishing between exudative and transudative effusions[6,7].

According to the lights criteria, the following can be calculated:

- Ratio between PF protein and serum protein > 0.5;
- Ratio between PF LDH and serum LDH > 0.6;
- LDH in PF is more than two-thirds of the upper limit of serum LDH.

When one of the three conditions is satisfied, the effusion is exudative, as in this example. A variety of conditions can cause exudative effusions, and their care can be challenging since they frequently necessitate surgical interventions in addition to medical management[8].

What strikes the most, in this case, is how the patient initially on presentation had mild PE and needed only medical treatment for his underlying asymptomatic pneumonia. However, within the next 24 hours, the patient started to reaccumulate fluid in his pleural space, leading to his sudden clinical deterioration, which required the urgent need for chest tube placement and drainage under interventional radiology guidance.

Massive pleural effusions are a common manifestation of pulmonary tuberculosis[9] or underlying malignancy. It has been reported in malignancies of different origins, the most frequent being ovarian carcinoma, sarcomas, mesotheliomas, and pancreatic adenocarcinomas. Some cases of massive PE, although rare, are reported even in patients with pancreatic pleural fistulas, alcohol-induced pancreatitis, and sarcoidosis[10].

In our patient, the rapidly developing and reaccumulating PF raised the suspicion for any underlying malignancy or TB as statistics prove it to be the most common pathological cause, but the diagnostic pleural tapping in this patient ruled out these causes and the workup for any other potential cause was not supported by further investigations that were done.

Therefore, the diagnosis of massive parapneumonic effusion was made do the neutrophilic predominant picture of the thoracocentesis, which was complicated with drainage via a chest tube, although this is rare in literature to accumulate within a short time rapidly.

CONCLUSION

Clinicians and pulmonologists must be aware of the potential atypical presentations of CAP with PE for timely patient management. In addition, a high index of suspicion must be maintained for patients with left shoulder pain who can have an underlying collection of fluid in their pleural space, leading to rapid deterioration due to desaturation.

DECLARATIONS

Ethics approval and consent to participate

The article describes a case report. Therefore, no additional permission from our Ethics Committee was required.

Consent for publication

The consent for publication was obtained.

Availability of data and material

All data generated or analyzed during this study are included in this published article.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

BNA, AYA, AJN: Data Collection, Literature Search, Manuscript Preparation

All authors read and approved the final manuscript

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