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CHEST

A 21-Year-Old Immunocompetent Man With Hemoptysis and Rash

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CASE PRESENTATION: A 21-year-old man presented to the ED of The George Washington University Hospital complaining of chills, shortness of breath, hemoptysis, and a generalized rash. Three days before admission, he noticed a productive cough, severe sore throat, and subjective fever. He also experienced extreme fatigue, generalized sweating, and chest pain with coughing. On the day before admission, he experienced a nonpruritic rash on his neck, palms, and dorsal surfaces of his feet and sputum with streaks of blood. The patient had no significant medical or family history. He had no sick contacts, and his only recent travel was to an outdoor concert in a woody area of the northeastern United States about a month earlier. He did not report recent contact with birds or visits to caves. He is single, lives alone in an apartment, and consumes about 4 alcoholic beverages a week. Occasionally, he smokes cannabis and e-cigarettes. He is sexually active with men, and his last unprotected sexual encounter was a month earlier. He denied photophobia, rhinorrhea, ear pain, nasal congestion, abdominal pain, nausea, vomiting, diarrhea, or dysuria.

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Physical Examination Findings

The patient was a healthy-looking young man who complained of right-sided pleuritic chest pain with cough productive of blood-streaked sputum. His temperature was 39.4° C; BP, 144/75 mm Hg; heart rate, 120 beats/min; and oxygen saturation 95% on room air. Pupils were equal, round, and reactive to light with normal conjunctiva. The pharynx was erythematous with no exudates. No oral lesions were present, and the mucous membranes were dry. Bilateral cervical lymphadenopathy was present. Lungs were clear to auscultation bilaterally with no wheezing, rales, or rhonchi. Cardiovascular examination revealed increased rate and normal rhythm, no murmurs. The abdomen was not tender and not distended with normal bowel sounds and no hepatosplenomegaly. The bladder was not distended, and there was no costovertebral tenderness. There was full range of motion in all joints without swelling, tenderness, or edema. There were no focal neurologic deficits or meningeal signs. Several erythematous blanching macules were observed on base of the neck, elbows, and antecubital fossa, coalescing into large patches on the back (Fig 1). There were 1-mm raised erythematous papules on the hands and dorsal aspects of the feet bilaterally.

Diagnostic Studies

A CBC count was significant for WBC count of 14.75 × 10^3/μL (76% neutrophils, 14% lymphocytes, 9% monocytes, 0.3% immature granulocytes, 0% eosinophils, 0% basophils) with hemoglobin level

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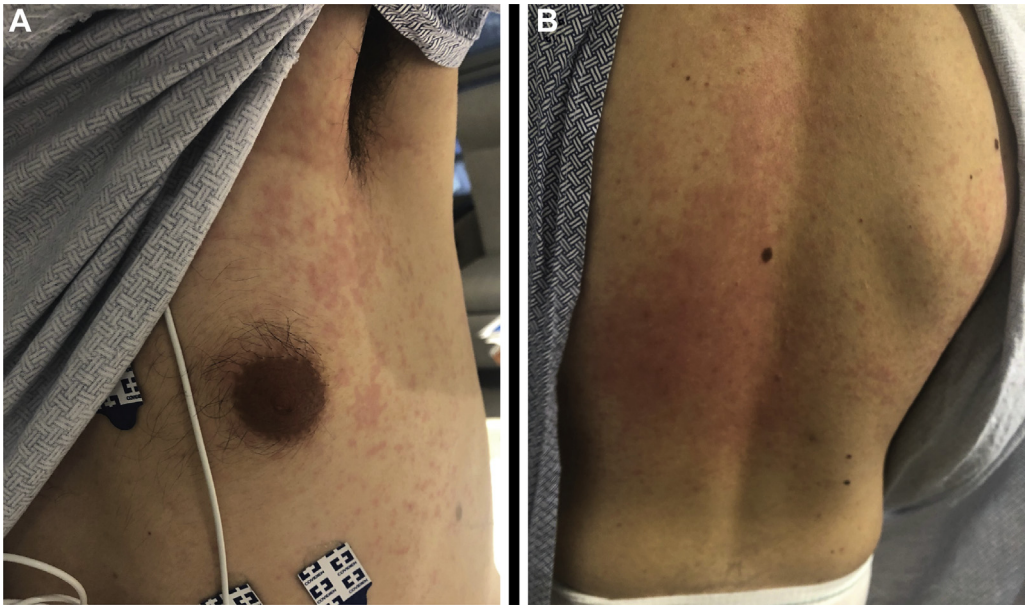

Figure 1 – *A, Rash on lateral chest and periaxillary area. B, Rash on back.*

14.2 g/dL and platelets 227 × 10^3/μL. The basic metabolic panel was unremarkable, except for BUN level of 8 mg/dL. Urinalysis showed ketones level at 20 mg/dL.

Respiratory BioFire Diagnostics (Salt Lake City, UT) polymerase chain reaction (PCR) was negative for adenovirus, coronavirus HKU1, HL63, and OC43, human metapneumovirus, rhinovirus/enterovirus, influenza A/B, parainfluenza 1 through 4, respiratory syncytial virus, *Bordetella pertussis*, *Chlamydia pneumoniae*, and *Mycoplasma pneumoniae*. Also negative were *Streptococcus pneumonia* and *Legionella pneumophila* urine antigens, mononucleosis, rapid HIV, HIV viral load, rapid plasma regain, chlamydia/gonorrhea PCR, Coxsackievirus, and *Histoplasma capsulatum*. Sputum cultures were negative for infectious bacteria and acid-fast bacilli. Cytoplasmic antineutrophil cytoplasmic antibodies and perinuclear antineutrophil cytoplasmic antibody tests were negative.

Chest radiography on admission showed a wedge-shaped cavitary density in the posterior segment of the right upper lobe with no pleural effusion or pneumothorax (Fig 2A). CT scan of the chest with contrast showed right upper lobe cavitation and scattered foci of air with necrotizing components extending into the right lower lobe (Fig 2B).

Flexible bronchoscopy was performed. No thick yellow secretions were seen, and normal mucosa with patent airways were appreciated. The BAL was negative for infectious organisms, including mycobacteria. BAL showed 68% segmented neutrophils, 26% macrophages, 3% lymphocytes, and 3% eosinophils.

M pneumoniae IgM and IgG results were reported two days after the patient was discharged from the hospital (patient was hospitalized for four days). They showed an elevated *M pneumoniae* IgM level of 827 units/mL (negative <769 units/mL) and IgG level of 1,597 (negative <99 units/mL)

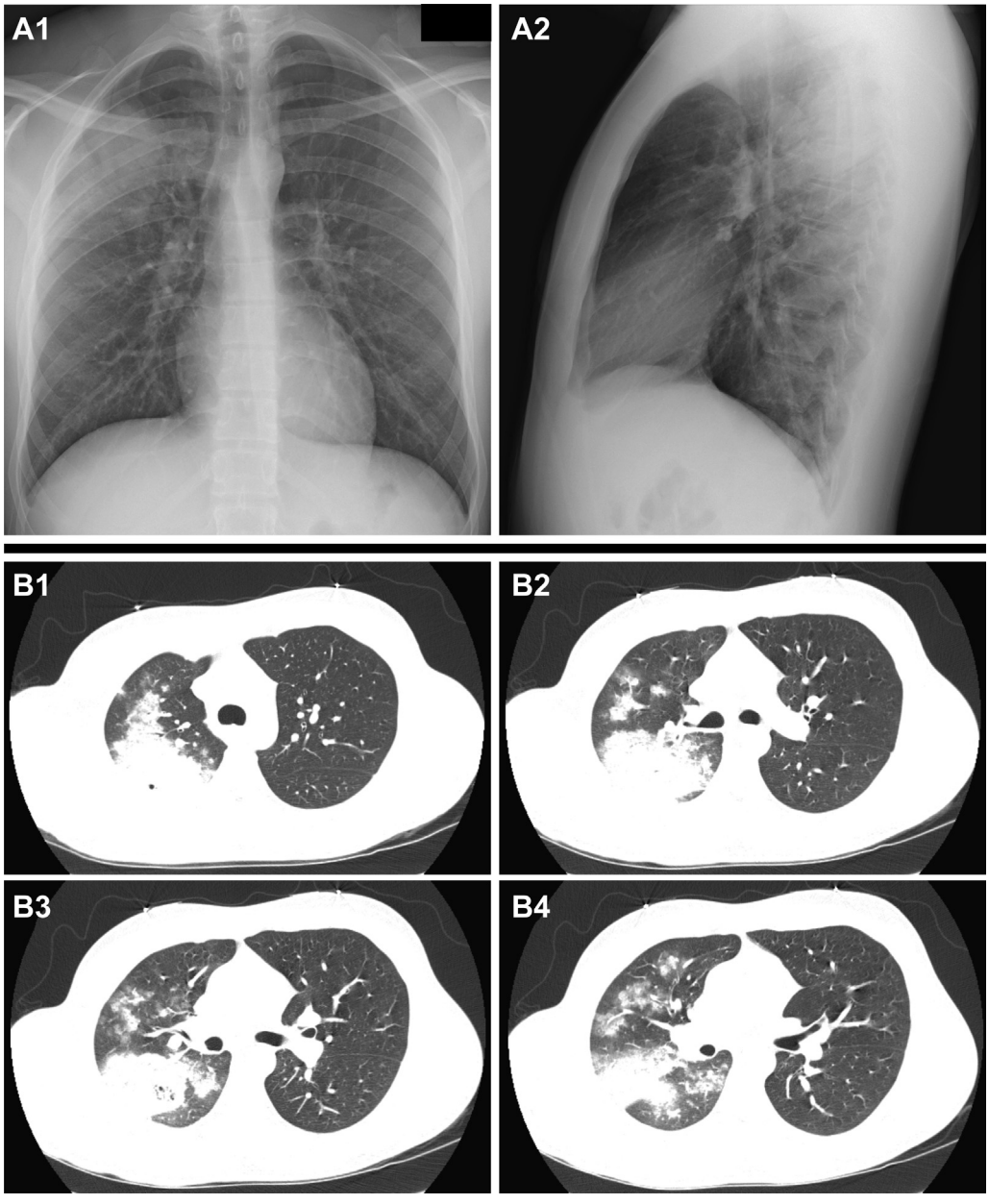

Figure 2 – *A1-A2, Anteroposterior and lateral chest radiographs on admission. B1-B4, Chest CT scan on admission.*

What is the diagnosis?

Diagnosis: M pneumoniae necrotizing pneumonia

Discussion

Atypical pneumonia has been used as a broad diagnosis to refer to nontraditional presentations of pneumonia, specifically those with symptoms that juxtapose conventional pneumococcal pneumonia. The most common pathogen responsible for atypical pneumonia is *M pneumoniae*. Although only 3% to 10% of patients who are infected with *M pneumoniae* will experience pneumonia, this organism may account for 30% of pneumonia in the general population. The average incubation period is two to three weeks before symptom onset; however, an asymptomatic carrier phase can persist for months. In the acute phase of infection, a dry cough develops that represents tracheobronchitis. Other common upper respiratory infection symptoms such as sore throat, rhinorrhea, and ear pain may be present. Chest auscultation may be unremarkable or may reveal nonspecific findings such as rales and expiratory wheezes. Chest radiography typically shows diffuse reticulonodular or patchy opacities.

Cavitary lesions due to *M pneumoniae* are extremely rare, with only one case (an immunocompetent patient) previously reported in the literature. The most common bacterial pathogens known to cause cavitary lesions in the acute (<12 weeks) setting are *Streptococcus* species and *Klebsiella pneumoniae*; the most common fungal pathogen is *Cryptococcus neoformans*. Impressively, approximately 50% of patients with reactivation of *Mycobacterium tuberculosis* may have pulmonary cavitary lesions. For a detailed clinical-radiologic overview that includes an algorithmic approach to the evaluation of cavitary lung diseases, we direct our readers to this *CHEST* review (Gafoor et al, 2018).

There are no distinguishing histories, physical examinations, or radiographic features that are sensitive or specific for *M pneumoniae* pneumonia, thus only laboratory results can provide a definitive diagnosis. Although nucleic acid amplification tests or PCR is used commonly as a first-line test when mycoplasma is suspected, these DNA-based tests can miss up to one-third of cases because of their lower sensitivity when compared with serology.

Non-respiratory tract symptoms of *M pneumoniae* may include CNS conditions (encephalitis, meningitis, Guillain-Barre), dermatologic conditions (maculopapular and/or vesicular rashes and Steven-Johnson syndrome), and hematologic conditions (hemolytic anemia). Exanthema such as maculopapular and vesicular rash is found in 17% of patients with pneumonia caused by *M pneumoniae* and is usually self-limiting. Importantly, whether the cause of these nonrespiratory symptoms is the pathogenicity of the mycoplasma or a result of a systemic immune response can be determined only by investigating the respective site of infection (eg, a skin biopsy of the exanthema). However, this was not pursued due to our suspicion of the exanthema being caused by a systemic immune response, rather than its direct pathogenicity. The mainstay of treatment for *M pneumoniae* is macrolides, doxycycline, or fluoroquinolones. Notably, a recent study identified macrolide resistance in approximately 10% of *M pneumoniae* infections in the United States.

Clinical Course

The patient was admitted to an isolation room, given IV fluids, and started on linezolid, piperacillin-tazobactam, and levofloxacin. Because of the original negative infectious workup, a BAL was performed. Acetaminophen and nonsteroidal antiinflammatory drugs were used to reduce the patient's pain and fever. On the second day of admission, the patient was no longer febrile, and his shortness of breath and fatigue gradually improved. On the fourth hospital day, the rash resolved, and the patient was discharged home on a 28-day course of moxifloxacin with a follow-up appointment scheduled in the outpatient pulmonology clinic. On the day of discharge, his WBC count was $9.79 \times 10^3/\mu L$ ($14.75 \times 10^3/\mu L$ on admission), and chest radiography revealed a right upper lobe airspace opacity that was worse compared with his chest radiograph on admission (Fig 2A vs 3A). However, because of his remarkable clinical improvement, this was not seen as a barrier to discharge. Notably, the specific pathogen that had been responsible for the patient's condition was not identified until two days after discharge. Four days after discharge the patient was seen in the outpatient pulmonology clinic. He admitted feeling well and was back to attending work and school. He denied cough, sputum production, fever, or pleuritic pain. There was complete resolution of the rash, and a chest radiograph at the outpatient clinic showed significant improvement of the right upper lobe pneumonia and accompanying lung cavity (Fig 3B).

Clinical Pearls

1. *Rash can be present in 17% of patients with pneumonia due to M pneumoniae. A negative respiratory*

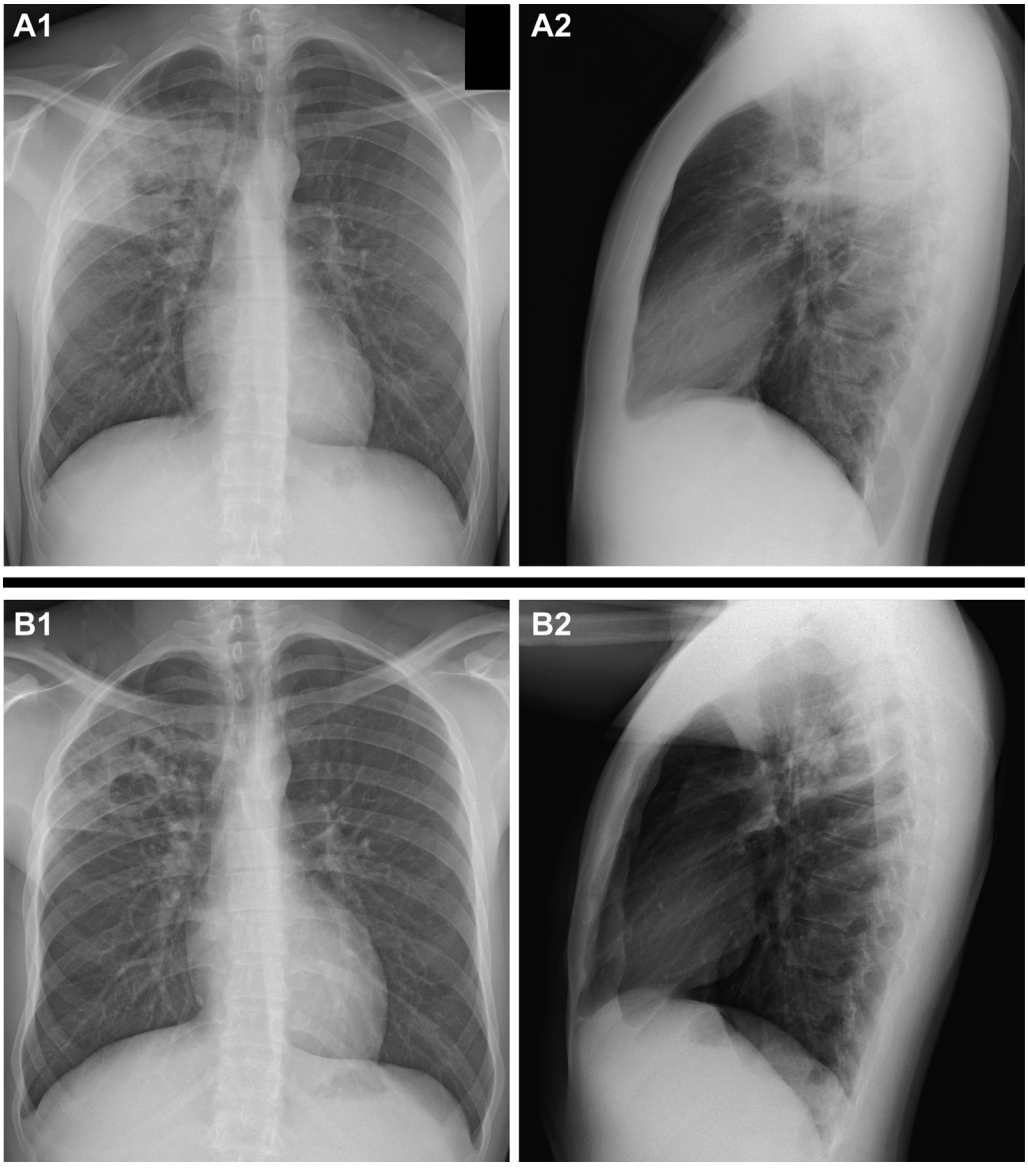

Figure 3 – *A1-A2, Anteroposterior and lateral chest radiographs on discharge. B1-B2, AP and lateral chest radiographs four days after discharge.*

PCR does not preclude mycoplasma infection; serology and cold agglutinins are beneficial to definitively rule out disease.

2. *The degree of consolidation on chest radiography may be deceiving in respect to the presence and/or extent of cavitary lesions observed on CT scan.*
3. *Clinical improvement may be accompanied with worsening of the consolidation observed on chest radiography. Chest radiography alone should not be used as a criterion for discharge or measure of disease progression.*

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Suggested Readings

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