A 76-year-old woman was admitted with a 2-day history of altered mental status. She denied dyspnea, cough, or chest pain. Although she had a long-term diagnosis of schizophrenia, her medical health had been generally excellent. The patient did not smoke or drink and did not have access to prescription medications.

**Physical Examination**

Vital signs: temperature, 37.2°C; pulse, 80/min; respirations, 18/min; BP, 124/76 mm Hg. General: confused, oriented only to person. Chest: diffuse inspiratory rales, without evidence of consolidation; no rubs or wheezes. Cardiac: no murmurs. Abdomen: benign.

**Laboratory Findings**

WBC, 10,300/μl, with 94 percent polymorphonuclear leukocytes, 1 percent band forms, and 5 percent lymphocytes; hematocrit, 27 percent; platelet count, 71,000/μl. Electrolytes: normal. Liver and renal function tests: normal. Sputum Gram-stain: polymorphonuclear leukocytes without organisms. Chest radiograph is shown in Figure 1.

**Hospital Course**

After blood and sputum had been obtained for culture, the patient was started on intravenous ampicillin and gentamicin. She rapidly deteriorated, with respiratory distress requiring intubation and mechanical ventilation. On the third hospital day, admission blood cultures were reported positive for a weakly acid-fast, Gram-positive rod.

What is the most likely diagnosis?
Diagnosis: Rhodococcus equi pneumonia and bacteremia

Pulmonary infections with R equi typically present with a slowly progressive pneumonia that is frequently complicated by cavitation and abscess formation. A common cause of suppurative lymphadenitis in farm and ranch animals, R equi is an aerobic, nonmotile, non-spore-forming, pleomorphic bacillus. Its Gram-positive, bacillary staining characteristics frequently promote misclassification of clinical specimens as diphteroids, Bacillus species, or other Gram-positive rods unless a high index of suspicion for R equi is maintained by the microbiology laboratory. It can also appear weakly acid-fast, especially in isolates of less than 1 week of age grown on Lowenstein-Jensen medium. Rhodococcus equi is an intracellular pathogen commonly found within phagocytic cells in clinical specimens.

Soil is the natural reservoir for R equi, which infects domestic animals as well as humans by way of respiratory tract inhalation. Although usually a disease of the immunocompromised host, R equi infection also rarely occurs in immunocompetent individuals. In one series of 20 non-HIV-infected patients with R equi infections, 17 patients had an underlying immunosuppressive disorder, and 3 had no detectable abnormalities of immune defenses. Infection with HIV is a predisposing condition for R equi pneumonia; the incidence of R equi infection appears to be increasing with the progression of the AIDS epidemic.

Fever, cough, and dyspnea are the most common presenting manifestations in patients with R equi pneumonia. The course is usually indolent and can simulate anaerobic suppuration or an intrathoracic malignancy. The pulmonary infiltrate may have a dense, masslike appearance, with the majority of patients having radiographic evidence of cavitation. Pulmonary suppurative with abscess formation may be observed in surgical or autopsy lung specimens even when cavitation was not radiographically apparent. Pleural effusions and empyema formation frequently accompany the pulmonary infiltrates. Diagnosis depends on isolation of the pathogen from blood, sputum, lung tissue, or pleural fluid. Surgical specimens of masslike infiltrates may continue to mimic an intrathoracic malignancy because of the neoplastic appearance of the dense, round-cell inflammatory response occasionally associated with R equi pneumonia.

Rhodococcus equi infection should always be considered in the differential diagnosis of an HIV-infected patient who presents with a cavitary pneumonia. The majority of HIV-infected patients reported with R equi infections have progressed to AIDS. The most common presenting symptoms in this patient population are fever, cough, and pleuritic chest pain. In one series of 10 HIV-infected patients with pulmonary R equi infection, 9 of 10 had pneumonia on chest radiograph and 67 percent had pulmonary cavitation. Positive cultures for R equi were found in 9 of 9 sputum specimens, 3 of 4 pleural fluid specimens, and 7 of 9 blood cultures.

Therapy for R equi pulmonary infection requires long-term administration of multiple antibiotics. Resistance to β-lactam agents frequently develops during therapy in spite of in vitro sensitivity to these drugs. Penicillins and cephalosporins should not be used, therefore, to treat this infection. Since R equi is often found intracellularly, patients should receive multiple antibiotics that penetrate phagocytic cells (eg, erythromycin, rifampin, and trimethoprim/sulfamethoxazole); vancomycin and gentamicin have also been used. Although no firm guidelines exist, it seems prudent to continue parenteral therapy until the clinical condition and pulmonary infiltrates stabilize and to continue oral antibiotics until the infiltrates resolve. Repeat cultures of blood and pulmonary secretions should be obtained during therapy; if positive, a change of the antibiotic regimen may be warranted.

Despite aggressive multidrug regimens, relapses are common after discontinuation of antibiotic therapy. Non-HIV-infected patients may have a recurrence of disseminated disease characterized by subcutaneous abscesses, multiple brain abscesses, and osteomyelitis. Patients often require lung resection for cure of the disease. In one series, 4 of 9 HIV-infected patients and 9 of 20 non-HIV-infected patients with persistent R equi lung infections required surgical resection despite antibiotic therapy.

The overall mortality rate in HIV-infected patients directly attributable to R equi infection approaches 60 percent in patients receiving antibiotics alone and 50 percent in those undergoing pulmonary resection in conjunction with antibiotic therapy. The overall mortality in non-HIV-infected patients is 20 percent.

The present patient presented with altered mental status due to pneumonia that was characterized by a radiographic nodular, cavitary infiltrate in the right middle and lower lung fields and the left upper lobe (Fig 1). After identification of R equi in blood cultures, her antibiotic regimen was changed to intravenous erythromycin and gentamicin and oral rifampin. She was weaned within the first week from mechanical ventilation and continued on triple antibiotic therapy for 4 weeks until the radiographically visualized infiltrate stabilized. Therapy was then changed to oral erythromycin and rifampin for a total duration of 3 months, when the chest radiograph became normal. She tested negative for HIV and has remained well during 2 months of observation.
CLINICAL PEARLS

1. *Rhodococcus equi* is a weakly acid-fast, Gram-positive rod that causes progressive and frequently cavitary pulmonary infiltrates in immunocompromised and occasionally immunocompetent patients. This organism is an emerging pathogen in HIV-infected patients.

2. Infections caused by *R. equi* are notoriously difficult to treat and penicillins and cephalosporins should be avoided in spite of in vitro sensitivity of the organism to these antimicrobial agents. Combination therapy employing agents such as erythromycin and rifampin that achieve excellent intracellular levels should be used and continued until the pulmonary infiltrates resolve.

3. Relapse of pulmonary infection with *R. equi* is frequent after termination of antimicrobial therapy. Surgical resection of involved lung tissue may be required to obtain a cure.

SUGGESTED READING

