Pneumothorax in a Young Man in Brooklyn, New York
(See page 1255 for the Photo Quiz.)

Diagnosis: Pneumothorax from Rupture of a Coccidioidal Pulmonary Cavity

Biopsy specimens (Figures 1 and 2) showed necrotizing granulomata containing 30- to 40-μm thick-walled, non-budding spherules revealed on Gomori methenamine silver stain (Figure 2). Results of stains for acid-fast bacilli were negative. Coccidioides immunoglobulin G (IgG) antibody was detected by means of immunodiffusion.

Liposomal amphotericin B (AmBisome, Astellas Pharma) 5 mg/kg/day was given. On day 9 of the treatment, the patient developed right upper quadrant tenderness and elevated serum levels of transaminases. Sonogram of the liver was unremarkable, and viral hepatitis serological test results were negative. Liposomal amphotericin B was discontinued, and fluconazole 800 mg daily was started. Liver enzyme levels began to improve 2 days after discontinuation of amphotericin and were normal after 6 weeks.

DISCUSSION

The endemic region for Coccidioides species lies exclusively in the Western Hemisphere, between 40° latitudes north and south, corresponding to the deserts of the southwestern United States and northwestern Mexico [1, 2]. Our patient was from southwestern Mexico, an area not known to be endemic for coccidioidomycosis. He revealed on the day of discharge that he had spent a few days in the Arizona deserts when he had crossed the border from Mexico 3 years prior to presentation.

Coccidioidomycosis is a systemic mycosis caused by the dimorphic fungi Coccidioides immitis and Coccidioides posadasii. The infective arthroconidia live in the soil, and infection is acquired by inhalation [3]. In the lungs, arthroconidia become spherical cells called spherules [4]. As cell multiplication occurs, septae extend to transect the growing spherule into sub-compartments, each containing viable daughter cells, or endospores. As spherules mature, the outer wall thins and eventually ruptures [4].

Up to 60% of all coccidioidal infections are asymptomatic [5]. The remaining 40% of individuals with acute pulmonary coccidioidomycosis present with a syndrome similar to bacterial community-acquired pneumonia, with cough, pleuritic chest pain, and fever [1, 2, 6]. These manifestations appear between 10 and 15 days after exposure to the fungus, and the intensity of the symptoms depends directly on the infective load [2, 6, 7]. Disseminated infection occurs in <1% of all individuals infected [1, 2, 6].

Pulmonary coccidioidomycosis generally resolves spontaneously within 30–60 days, even without antifungal treatment. However, ~5% of these patients develop residual pulmonary lesions, generally solitary nodules, that are usually

Figure 1. Lung tissue, granuloma center showing thick-walled nonbudding spherule containing endospores, ~30 μm in diameter. Hematoxylin and eosin stain, original magnification, ×40.

Figure 2. Lung tissue, granuloma center with thick-walled nonbudding spherule containing endospores, ~30 μm in diameter, with adjacent released daughter spore. Gomori methenamine silver stain, ×60.
Another 5% of these patients develop thin-walled cavities, solitary and juxtapleural, that may resolve asymptomatic. Another 5% of these patients develop thin-walled cavities, solitary and juxtapleural, that may resolve asymptomatic. Another 5% of these patients develop thin-walled cavities, solitary and juxtapleural, that may resolve asymptomatic. Another 5% of these patients develop thin-walled cavities, solitary and juxtapleural, that may resolve asymptomatic. Another 5% of these patients develop thin-walled cavities, solitary and juxtapleural, that may resolve asymptomatic. Another 5% of these patients develop thin-walled cavities, solitary and juxtapleural, that may resolve asymptomatic. Another 5% of these patients develop thin-walled cavities, solitary and juxtapleural, that may resolve asymptomatic. Another 5% of these patients develop thin-walled cavities, solitary and juxtapleural, that may resolve asymptomatic. Another 5% of these patients develop thin-walled cavities, solitary and juxtapleural, that may resolve asymptomatic. Another 5% of these patients develop thin-walled cavities, solitary and juxtapleural, that may resolve asymptomatic. Another 5% of these patients develop thin-walled cavities, solitary and juxtapleural, that may resolve asymptomatic. Another 5% of these patients develop thin-walled cavities, solitary and juxtapleural, that may resolve asymptomatic. Another 5% of these patients develop thin-walled cavities, solitary and juxtapleural, that may resolve asymptomatic. Another 5% of these patients develop thin-walled cavities, solitary and juxtapleural, that may resolve asymptomatic. Another 5% of these patients develop thin-walled cavities, solitary and juxtapleural, that may resolve asymptomatic. Another 5% of these patients develop thin-walled cavities, solitary and juxtapleural, that may resolve asymptomatic. Another 5% of these patients develop thin-walled cavities, solitary and juxtapleural, that may resolve asymptomatic. Another 5% of these patients develop thin-walled cavities, solitary and juxtapleural, that may resolve asymptomatic. Another 5% of these patients develop thin-walled cavities, solitary and juxtapleural, that may resolve asymptomatic. Another 5% of these patients develop thin-walled cavities, solitary and juxtapleural, that may resolve asymptomatic. Another 5% of these patients develop thin-walled cavities, solitary and juxtapleural, that may resolve asymptomatic. Another 5% of these patients develop thin-walled cavities, solitary and juxtapleural, that may resolve asymptomatic. Another 5% of these patients develop thin-walled cavities, solitary and juxtapleural, that may resolve asymptomatic. Another 5% of these patients develop thin-walled cavities, solitary and juxtapleural, that may resolve asymptomatic. Another 5% of these patients develop thin-walled cavities, solitary and juxtapleural, that may resolve asymptomatic. Another 5% of these patients develop thin-walled cavities, solitary and juxtapleural, that may resolve asymptomatic.

When a diagnosis of coccidioidomycosis is considered, the workup should include attempting to identify spherules in, or recovering the organism from, a clinical specimen, or detecting specific antibodies in the serum, cerebrospinal fluid, or other body fluid [4]. Serologic testing may include a tube precipitin antibody test for immunoglobulin M (IgM), detected in 90% of patients if tested within the first 3 weeks of symptoms [4]. The complement-fixing antibody test detects immunoglobulin G (IgG), which can be detected in other body fluids, such as cerebrospinal fluid, for the diagnosis of coccidioidal meningitis. The antibodies that are detected by the tube precipitin and complement-fixing tests can also be detected by immunodiffusion or an enzyme-linked immunosorbent assay for coccidioidal IgM or IgG antibodies [4].

Our patient’s diagnosis was established by biopsy with Gomori methenamine silver stain showing thick-walled, non-budding spherules (Figure 2), and Coccidioides IgG antibody detection by means of the immunodiffusion test.

Patients with uncomplicated acute coccidioidal pneumonia may be periodically evaluated for symptoms and radiographic resolution without antifungal therapy. However, in patients who are immunosuppressed (ie, patients who have human immunodeficiency virus infection, have received an organ transplant, or are being treated with high doses of corticosteroids) or are pregnant, treatment may be warranted [11]. Antifungal agents recommended for the treatment of coccidioidomycosis include amphotericin B deoxycholate, lipid formulations of amphotericin B, ketoconazole, fluconazole, and itraconazole [11].

In patients with diffuse pneumonia, therapy is usually initiated with amphotericin B or high-dose fluconazole. During convalescence, amphotericin B may be discontinued and replaced with an oralazole. The total length of therapy should be at least 1 year [11].

For patients with an asymptomatic pulmonary nodule, neither antifungal therapy nor resection is recommended. However, for rupture of a coccidioidal cavity into the pleural space, surgical closure by lobectomy with decortication is the preferred management, along with antifungal treatment [11].

Our patient underwent video-assisted thoracic surgery with wedge resection and partial decortication with specific long-term antifungal therapy, initially with liposomal amphotericin B, then fluconazole. Six weeks later, the patient is doing well and reports improving exercise tolerance.

**Note**

*Potential conflicts of interest.* All authors: No reported conflicts. All authors have submitted the ICMJE Form for Disclosure of Potential Conflicts of Interest. Conflicts that the editors consider relevant to the content of the manuscript have been disclosed.

**References**