



Multiple Chest Nodules on Computed Tomography Scan

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Mr. M is a 75-year-old man recently diagnosed with chronic lymphocytic leukemia. The first two courses of chemotherapy were administered without problems, and Mr. M said he was feeling well enough to continue the remodeling of his home. While undergoing his third course of chemotherapy, he returned to the outpatient clinic with neutropenia, fever, chest pain, and shortness of breath. A chest x-ray revealed a left peripheral infiltrate, initially thought to be a slow-healing left lower lobe pneumonia. Mr. M was started on antibiotics and returned home. During a follow-up visit one week later, his chest x-ray findings had improved but were not resolved. Mr. M was admitted to the hospital for IV antibiotics. He continued to be neutropenic and progressively developed a low-grade fever that reached 101°F with chills, headache, posterior nasal drainage, intermittent nosebleeds, and hemoptysis. During the course of several weeks, a macular pruritic rash also developed on his chest.

Differential diagnoses included bacterial or fungal infection and allergic pulmonary diseases of the lung. Patients with hematologic malignancies and those undergoing hematopoietic stem cell transplantation are at high risk for invasive fungal infections. In this population, these infections cause morbidity and mortality with an overall fatality rate exceeding 50% (Groll & Walsh, 2002). *Aspergillus* and *Candida* species account for a majority of documented infections, although recent trends indicate a shift toward infections of the *Aspergillus* species and nonalbicans *Candida* species.

Based on the persistence of Mr. M's symptoms, he was sent to a pulmonologist for bronchial alveolar lavage and biopsy. Cultures were negative for bacterial and fungal infections. No indication of allergic pathology was noted. A computed tomography (CT) scan of the chest was performed, and it showed a 2.8 cm rounded mass with somewhat indistinct margins involving the left lower lobe immediately posterior to the left



FIGURE 1. ASPERGILLOMA INFECTION IN AN INFLAMED CHEST CAVITY

hilum. This mass was surrounded by a "halo" or "crescent sign" of low attenuation (see Figure 1). Given the history and rapid onset of the condition, the radiologist concluded that the mass most likely represented an aspergilloma in an inflammatory cavity.

The classic "halo sign," characterized by a ground-glass opacity surrounding a nodule, results from hemorrhage and edema around the focus of a fungal infection. This is a valuable early sign of invasive aspergillosis in high-risk patients with neutropenia, although the sign is not as specific in patients at lower risk and may be found in other types of fungal infections (Soubani & Chandrasekar, 2002).

Pathophysiology

The common species of *Aspergillus* causing disease in humans is ubiquitous in the environment. *Aspergillus fumigatus* is the most common strain of the organism. However, *A. flavus*, *A. niger*, and several other species also can cause the disease. *Aspergillus* spores are found growing on dead leaves, stored grain, compost piles, hay, decaying vegetation, household dust, and building materials. Processed foods, such as cereals, powdered milk, nuts, and spices, can culture the organism as

well (Soubani & Chandrasekar, 2002). Nosocomial infections may be associated with dust exposure during building renovation or construction. Occasional nosocomial outbreaks of cutaneous infections have been traced to contaminated biomedical devices, an important consideration for nurses.

Invasive pulmonary aspergillosis (IPA) is a commonly fatal disease seen in immunocompromised patients and has increased in incidence since it first was described in 1953 (Bartlett, 2000). Researchers believe that inhalation of the spores is quite common but disease with invasion of lung tissue is rare and confined almost entirely to patients with immunosuppression. Major immunosuppressive risk factors for IPA include prolonged neutropenia, the diagnoses of hematologic malignancies or AIDS, corticosteroid therapy, transplantation, and cytotoxic therapy (Stevens et al., 2000).

Clinical Presentation

In the immunosuppressed host, the lower respiratory tract is usually the focus of infection; however, the infection may disseminate to the upper respiratory tract and other organs, including the brain, skin, gastrointestinal tract, and bone. If severe neutropenia persists, mortality can reach 100%, particularly in patients with cerebral abscesses. Presenting symptoms include fever, chills, and pleuritic chest pain (Soubani & Chandrasekar, 2002).

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