Pulmonary Aspergillus chest wall involvement in chronic granulomatous disease: CT and MRI findings

Akira Kawashima, M.D. 1, Janet E. Kuhlman, M.D. 1, Elliot K. Fishman, M.D. 1, Clare M. Tempany, M.D. 1, Donna Magid, M.D. 1, Howard M. Lederman, M.D., Ph.D. 2, Jerry A. Winkelstein, M.D. 2, and Elias A. Zerhouni, M.D. 1

1 The Russell H. Morgan Department of Radiology and Radiological Science, and 2 Eudowood Division of Pediatric Immunology, Department of Pediatrics, The Johns Hopkins Medical Institutions, Baltimore, Maryland, USA

Abstract. Pulmonary Aspergillus infection in patients with chronic granulomatous disease tends to involve the chest wall and consequently carries a high mortality rate. We report the findings of computed tomography (CT) and magnetic resonance imaging (MRI) in three such cases. One patient underwent both CT and MRI, one, CT only, and one, MRI only. In all three, both CT and MRI demonstrated pulmonary consolidations with direct extension to the adjacent chest wall. In both patients who were examined by CT, scans revealed permeative osteolytic changes of adjacent rib or spine compatible with osteomyelitis. In both patients who were examined by MRI, adjacent chest wall involvement was depicted on T1-weighted images and showed increased signal intensity on T2-weighted images. In one of these patients, the chest wall lesion was well defined on T2-weighted images, an appearance compatible with abscess. Epidural extension was demonstrated on MRI in the other patient, who later developed paraparesis. We suggest that CT and MRI have a complementary role in evaluating chest wall invasion by pulmonary Aspergillus infection in chronic granulomatous disease.

Key words: Chronic granulomatous disease – Chest wall invasion – Pulmonary Aspergillus infection – Computed tomography – Magnetic resonance imaging

The hallmark of chronic granulomatous disease is defective phagocytic killing of ingested microorganisms. Phagocytes from affected patients have normal chemotactic activity and normal ability to engulf microorganisms but are deficient in the generation of superoxide and toxic oxygen [14].

Aspergillus is the second most common organism cultured from patients with chronic granulomatous disease, accounting for 16% of all infections [13]. Aspergillus infections in these patients usually produce pneumonia with local extension to tissues throughout the thoracic cavity [9, 16]. The mortality rate for pulmonary or disseminated Aspergillus infection is approximately 50% in all series regardless of management [5, 6, 9, 13].

Local extension of disease from the lungs to the pleura, soft tissue, and/or bony structures of the chest wall has been reported in almost one-third of the patients with chronic granulomatous disease and Aspergillus pneumonia [1, 5, 9, 11]. The detection of chest wall invasion is difficult by conventional radiography, but extension of Aspergillus infection can be identified and monitored effectively with cross-sectional imaging techniques. Based on our experience we report the computed tomography (CT) and magnetic resonance imaging (MRI) findings of chest wall invasion by pulmonary Aspergillus infection in patients with chronic granulomatous disease.

Each of these cases has been previously reported without the specific focus on the CT and MRI findings of chest wall invasion by Aspergillus infection provided herein.

Materials and methods

Case 1. P.G. is a Hispanic male with X-linked chronic granulomatous disease diagnosed at the age of 6 months by the findings of diminished nitroblue tetrazolium (NBT) reduction and reduced white blood cell bacteriocidal activity (the mother had intermediate results in both tests). At 5 years, a chest radiograph at another institution revealed infiltrates in the right upper lung and, to a lesser degree, in the left lower lung. He was transferred to our institution for further evaluation and exhibited persistent infiltrates in the right upper lung and, to a lesser degree, in the left lower lung. He was transferred to our institution for further evaluation and exhibited persistent infiltrates in the right upper lung and left lower lung (Fig. 1A). Two separate percutaneous needle aspirations with stain and culture were not diagnostic. CT examination revealed infiltrates in the right upper lobe and left lower lobe as well as right hilar and mediastinal adenopathy (Fig. 1B). The patient had a history of bacille Calmette-Guérin (BCG) immunization in infancy, and his mother had recently become purified protein derivative (PPD) positive. Therefore, he was treated presumptively with antituberculous chemotherapy.
Fig. 1A–G. See next page for corresponding legend.