Disseminated *Mycobacterium intracellulare* Infection in an Immunocompetent Host

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Disseminated *Mycobacterium avium* complex (MAC) infection can occur in immunocompromised patients, and rarely in immunocompetent subjects. Due to the extensive distribution of the disease, clinical presentation of disseminated MAC may mimic malignancies, and thorough examinations are required in order to make accurate diagnosis. We report a case of disseminated *Mycobacterium intracellulare* disease in an immunocompetent patient, which involved the lung, lymph nodes, spleen, and multiple bones. F-18 fluorodeoxyglucose positron-emission tomography imaging showed multiple hypermetabolic lesions, which are suggestive of typical hematogenous metastasis. However, there was no evidence of malignancy in serial biopsies, and *M. intracellulare* was repeatedly cultured from respiratory specimens and bones. Herein, we should know that disseminated infection can occur in the immunocompetent subjects, and it can mimic malignancies.

**Key Words:** Nontuberculous Mycobacteria; Immunocompetence; Positron-Emission Tomography; Hybridization, Genetic

### Case Report

A 71-year-old man was referred to our hospital for the evaluation of recurrent fever, cough, sputum, shortness of breath, and recent weight loss of 3 kg (5% weight loss). Seven months ago, the patient was admit-
Figure 1. Chest X-ray showed the ill-defined patchy mass opacity with surrounding ground-glass opacity in left mid-lung field.

Figure 2. Contrast enhanced computed tomography showed consolidation in the lingual segment of left upper lobe (A) and bilateral mediastinal lymph nodes swelling (B).

Findings of laboratory studies showed a white-blood-cell count of 18,000/mm³ with 76.6% neutrophils, hemoglobin 10.8 g/dL, and platelet count 462,000/mm³. Electrolytes, measures of renal function, and liver enzymes were within normal limits. C-reactive protein (CRP) was elevated to 15.34 mg/dL. Serologic test for human immunodeficiency virus gave negative result. Initial blood and sputum cultures remained negative, but the patient was started on piperacillin/tazobactam (18 g per day) and ciprofloxacin (800 mg per day) as an empirical antibacterial therapy. Chest X-ray showed the ill-defined patchy mass opacity with surrounding ground-glass opacity in left mid-lung field (Figure 1). Chest CT showed huge mass-like consolidation in the lingular segment of left upper lobe and enlarged bilateral supraclavicular and mediastinal lymph nodes, suggestive of malignancy or inflammatory disease (Figure 2).

During five days of antibiotic treatment, neither clinical nor radiologic improvement was observed. Bronchoalveolar lavage (BAL) and endobronchial ultrasound-guided transbronchial needle aspiration (EBUS-TBNA) for paratracheal and subcarinal lymph nodes were performed, and the findings were unremarkable. The patient remained febrile after seven days of initial antibiotic therapy, and the regimen was changed to meropenem (3 g per day) and vancomycin (2 g per day). In addition to respiratory symptoms, the patient complained of back pain. Magnetic resonance imaging (MRI) of the thoracic and lumbar spine was performed and showed diffuse heterogenous low signal change with heterogenous enhancement (Figure 3). From this
Figure 3, Magnetic resonance imaging of the thoracic (A) and lumbar (B) spine showed diffuse heterogeneous low signal change with heterogeneous enhancement.

Figure 4, Maximum intensity projection image of F-18 fluorodeoxyglucose positron-emission tomography on admission showed multifocal hypermetabolic lesions in the left upper lung, lymph nodes, spleen, and multiple bones, spine, right humerus, both scapula, left clavicle, sternum, sacrum, both pelvic bones, both femurs, and both side ribs (Figure 4). At this point, we had a high suspicion of hidden malignancy and performed percutaneous needle biopsy (PCNB) in the left upper lobe consolidation and left supravacular lymph node. However, both pathologies revealed nonspecific chronic inflammation and interstitial fibrosis and there was no evidence of malignancy or granulomas. Then, CT-guided bone biopsy was performed in the first lumbar vertebrae, and the pathology showed myeloid hyperplasia with marked plasmacytosis, without the evidence of malignant cell infiltration.

From the day of admission, serial sputum specimens were collected and cultured for mycobacteria using both mycobacteria growth indicator tuve (MGIT; Becton Dickinson Diagnostic Systems, Sparks, MD, USA) and Ogawa (Korean Institute of Tuberculosis, Seoul, Korea) media. On the day 30 of admission, acid-fast bacilli were repeatedly cultured in MGIT media and then in Ogawa media, which were identified as nontuberculous mycobacteria. Subsequent cultures from previous BAL and PCNB of left upper lobe consolidation specimens also were identified as nontuberculous mycobacterium. On the day 37 of admission, *M. intracellulare* was identified, and anti-MAC treatment was initiated with clarithromycin (1 g per day), rifampicin (600 mg per day),
ethambutol (800 mg per day), and streptomycin (1 g per day). Even though the bone biopsy specimen did not reveal acid-fast bacilli, the reverse blot hybridization assay (REBA Myco-ID®; Molecules and Diagnostics, Wonju, Korea) using bone biopsy specimen revealed M. intracellulare. Later, M. intracellulare was also identified from bone biopsy specimen.

From these radiological and microbiological findings, the diagnosis of disseminated M. intracellulare infection was made. Anti-MAC therapy was continued and the patient was discharged with improved symptoms on the day 63 of admission. The drug sensitivity test revealed that the organism was susceptible to clarithromycin. The minimum inhibitory concentration of clarithromycin was 1 mg/L (susceptible). Unfortunately, additional information after discharge was not available due to transfer to another hospital.

Discussion

Disseminated MAC disease primarily occurs in immunocompromised patients, like those with acquired immunodeficiency syndrome, renal or cardiac transplantation, leukemia, or history of immunosuppressive therapy. Recently, numerous disseminated MAC infection cases have been reported in immunocompetent hosts. The clinical symptoms of disseminated NTM infection include fever (>80%), night sweats (>35%), and weight loss (25%). The most commonly identified laboratory abnormalities include anemia and elevated levels of alkaline phosphatase, aspartate aminotransferase, lactate dehydrogenase, and CRP. In our case, mild anemia and CRP elevation were observed. The most commonly involved organs are the spleen, lymph nodes, liver, intestines, and bone marrow; the lungs are less commonly involved. However, in a recent Taiwanese study by Chou et al., many patients (42.5%) with disseminated NTM infection had lung involvement and they explained that increased suspicion for pulmonary NTM infection and improved culture techniques may be the reason of increasing incidence. In our case, we also had positive cultures of M. intracellulare in sputum, BAL fluid, and lung parenchyma.

CT and MRI can well demonstrate multiple lesions of disseminated disease such as lymph nodes enlargement, splenomegaly, and bone marrow involvement. On the other hand, FDG PET can recognize whole body distribution more easily and importantly, can recognize lesions which show as normal in other imaging modalities. In our case of disseminated disease, CT finding of spleen was unremarkable, although FDG PET revealed a focal hypermetabolic lesion, FDG uptake increases when metabolic activity is increased by the presence of inflammatory cells, and there are several reports related to FDG accumulation in MAC infection. Moreover, FDG PET can well demonstrate the activity of disseminated MAC, assess the treatment response after anti-MAC therapy, and provide suitable biopsy sites.

The distribution of FDG accumulation is similar between disseminated MAC and other systemic diseases, such as malignancies and other granulomatous diseases. Therefore, histopathologic diagnosis is essential for further treatment. We performed four core needle biopsies in lung parenchyma, supraclavicular lymph node, and spines and EBUS-TBNA in enlarged mediastinal lymph nodes and there was no evidence of malignancy in any of these specimens.

In conclusion, our report indicates that the clinical presentations of disseminated MAC infection can mimic those of malignancies. Thorough examinations, including histopathologic and microbiologic diagnosis, are required. FDG PET is a useful diagnostic tool to assess the exact extent of disease and provide suitable biopsy sites.
sites. Along with culture method, REBA is an improved rapid molecular diagnostic tool in identification of mycobacterium.

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