

## Pulmonary *Mycobacterium avium* infection demonstrating unusual lobar caseous pneumonia

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### Keywords

Caseous granuloma, lobar pneumonia, *Mycobacterium avium*, *Mycobacterium avium* complex.

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Received: 28 April 2016; Revised: 7 June 2016;

Accepted: 8 June 2016.

*Respirology Case Reports*, 4 (5), 2016, e00176

doi: 10.1002/rcr2.176

### Abstract

*Mycobacterium avium* complex (MAC) infection is a major medical concern in Japan because of its increased prevalence and associated mortality. A common radiological feature in pulmonary MAC infection is a mixture of two basic patterns: fibrocavitary and nodular bronchiectatic; however, lobar consolidation is rare. We report an 83-year-old man with lobar caseous pneumonia caused by pulmonary MAC infection. Radiological findings were predominantly composed of dense lobar consolidation and ground-glass opacity. A diagnosis was made in accordance with the clinical and microbiological criteria set by the American Thoracic Society. A histological examination of lung specimens obtained by using a bronchoscope revealed a caseous granulomatous inflammation with an appearance of Langhans cells. The patient was treated using combined mycobacterium chemotherapy with an initial positive response for 6 months; however, the disease progressed later. We suggest that an awareness of lobar pneumonic consolidation as a rare radiological finding in pulmonary MAC infection is important.

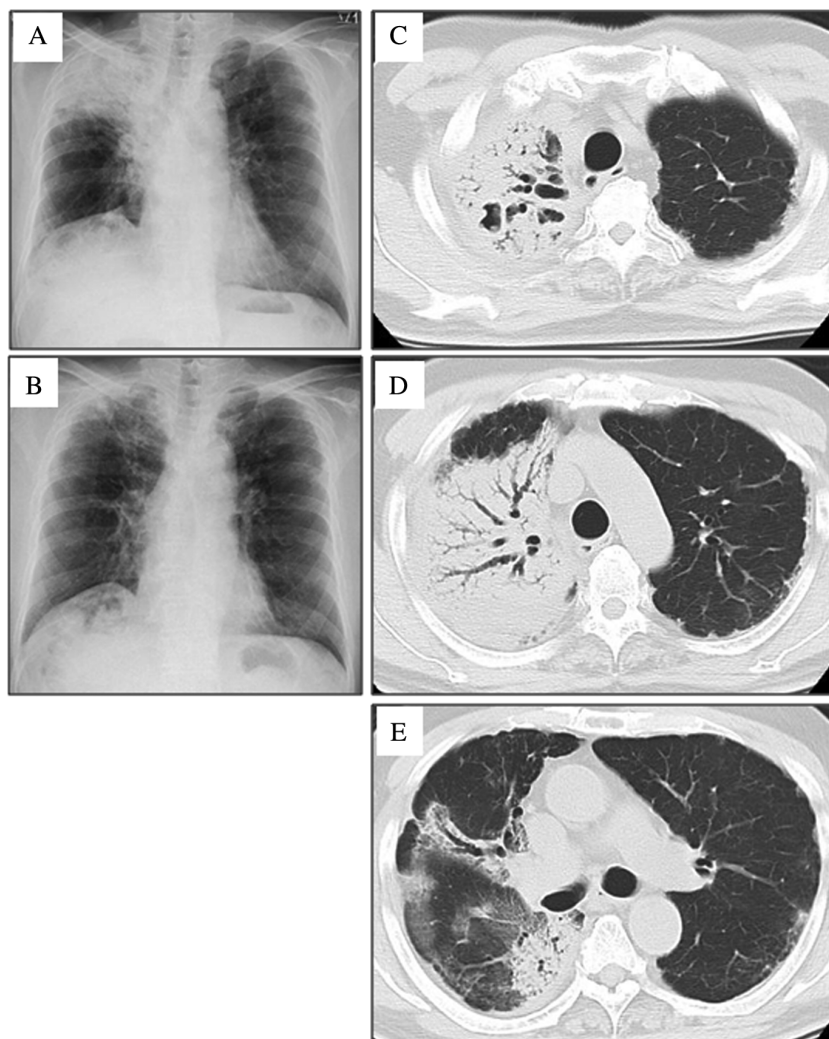
### Introduction

*Mycobacterium avium* complex (MAC) accounts for 80–85% of pulmonary non-tuberculous mycobacteria (NTM) infections and is a major medical concern in Japan because of its increased prevalence and associated mortality. Pulmonary MAC infection in immunocompetent patients is radiologically characterized by two basic patterns: fibrocavitary (FC) and nodular bronchiectatic (NB); however, lobar consolidation is rare. We report a unique case of pulmonary *M. avium* infection with lobar caseous pneumonia in an immunocompetent patient.

### Case Report

An 83-year-old man was admitted to our hospital because of productive cough and intermittent blood-stained sputum. He had no history of illness and was not exposed to cigarette smoking. Chest radiography revealed dense infiltration in the right upper lung field accompanied by an elevated right diaphragm position (Fig. 1A). A retrospective evaluation of a chest radiograph, obtained 10 months

before admission, revealed a patchy infiltration in the right upper lung field (Fig. 1B). A chest computed tomography (CT) scan, obtained on admission, revealed a dense consolidation occupying the whole right upper lobe and a mixed dense and ground-glass opacity in a portion of the right lower lobe (Fig. 1C–E). The upper lobe consolidation was accompanied by an air bronchogram with mild bronchiectasis and bubble-like small cavities. Unlike a typical case of pulmonary MAC infection, no remarkable finding was evident in the middle lobe or lingular segment. The radiological findings were similar to those observed for tuberculous caseous pneumonia. The laboratory findings were as follows: white blood cells, 8600/mm<sup>3</sup> with normal differentiation; aspartate transaminase, 28 IU/L; alanine transaminase, 18 IU/L; lactate dehydrogenase, 221 IU/L; creatinine, 1.41 mg/dL; and C-reactive protein, 6.7 mg/dL. The serum immunoglobulin levels were normal. The patient was tested negative for diabetes and for human immunodeficiency virus infection. The result of an interferon- $\gamma$  releasing assay for *M. tuberculosis* was negative. The results of acid-fast bacterium (AFB) smears and cultures of sputum samples were repeatedly positive, and a



**Figure 1.** (A) Chest radiograph on admission showing dense infiltration in the right upper lung field along with an elevated right diaphragm position. (B) Patchy infiltration retrospectively pointed out 10 months before admission. (C–E) Chest computed tomography scan on admission showing a lobar consolidation in the whole right upper lobe with an air bronchogram and microabscess. Mixed dense and ground glass opacity can be observed in the right lower lobe.

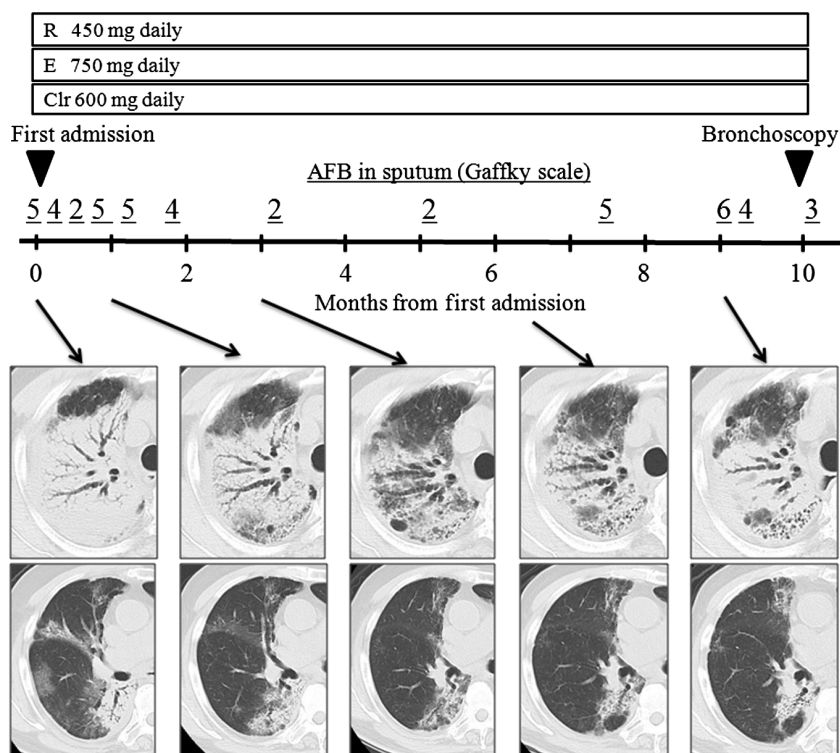
nucleic acid amplification test confirmed the presence of *M. avium*. We finally established a diagnosis of pulmonary *M. avium* infection manifesting as lobar pneumonic consolidation based on the criteria set by the American Thoracic Society [1]. Informed consent was obtained, and appropriate mycobacterium chemotherapy comprising rifampicin (450 mg daily), clarithromycin (600 mg daily), and ethambutol (500 mg daily) [1,2] was administered. We subsequently discovered that the *M. avium* strain isolated at the initial evaluation was resistant to clarithromycin (minimal inhibitory concentration > 32 µg/mL).

After initiating the chemotherapy, the patient's condition stabilized for about 6 months, with lesser respiratory symptoms and decreased AFB burden in the sputum. The lobar consolidation was ameliorated in the first 3 months and stabilized until 6 months as observed on the chest CT scan (Fig. 2). However, the clinical, radiological, and microbiological test results worsened thereafter, and a re-evaluation was needed. The screening for fungal infection

was negative. In addition, the result of a DNA–DNA hybridization test of the cultured colonies was positive only for *M. avium* among the 20 comprehensive types of *Mycobacterium* species. Finally, bronchoscopy was performed, and lung biopsy specimens showed granulomatous inflammation and caseous necrosis along with Langhans cells. While the result of Ziehl–Neelsen staining was histologically negative, the AFB smear and culture of the lavage fluid were positive for *M. avium*. None of the histological features of organizing pneumonia, vasculitis, or neoplasm was evident. Based on these findings, we conclusively reconfirmed the diagnosis of pulmonary MAC infection.

## Discussion

The common radiological feature of pulmonary MAC infection in immunocompetent patients is a mixture of basic patterns: FC and NB. FC-MAC shows CT-based



**Figure 2.** Clinical course and radiological findings are shown. After initiating chemotherapy, the burden of acid-fast bacterium (AFB) smear in sputum had decreased at 6 months but worsened thereafter. The lobar consolidation on chest computed tomography (CT) scan was ameliorated in the first 3 months and stabilized until 6 months. However, chest CT scan revealed deteriorated infiltration at 9 months. R, rifampicin; E, ethambutol; Clr, clarithromycin.

findings similar to those of pulmonary tuberculosis, with nodules and cavities predominantly presenting in the upper lobes; NB-MAC involves centriacinar nodules and bronchiectasis in the middle lobe/lingual segment. While a consolidation was detectable on a CT scan in 11% of the cases [3], it is usually small in size and accompanies to a basic pattern. The present case is unique because the MAC infection manifested as large lobar consolidation without a basic pattern. The slow-growth tendency and distinct host immune response may explain the unlikelihood of developing a large caseous pneumonia in pulmonary MAC infection. MAC is known to cause various diseases in subjects with different immune status, including chronic pulmonary infection, disseminated systemic infection, immune reconstitution syndrome, and hypersensitive pneumonia, implying that host immunity plays pivotal roles to determine disease phenotypes. A recent report indicated that non-human immunodeficiency virus immunocompromised patients with pulmonary MAC infection were likely to have larger consolidations than immunocompetent patients [4]. Although the patient was immunocompetent with regard to general examination, we could not deny the possibility that a hidden immunocompromised status might have contributed to the infection.

Owing to the unusual radiological findings that indicated a pulmonary MAC infection, we carefully excluded the conditions related to co-infection with other pathogens and accompanying non-infectious diseases. Various

pathogens are known to chronically co-infect with MAC, including *M. tuberculosis*, non-MAC NTM, *Aspergillus* species, and *Nocardia* species. Patients with organizing pneumonia occurring secondary to NTM infections were reported to demonstrate similar radiological findings [5]. Thus, we performed a histological assessment of lung specimens and confirmed MAC infection without the coexistence of organizing pneumonia or other non-infectious diseases that potentially manifest a similar radiological finding (vasculitis, lymphoma, or invasive mucinous adenocarcinoma).

In summary, we report a unique case of pulmonary MAC infection with lobar caseous pneumonia. This case emphasizes the importance of awareness of lobar pneumonic consolidation as a rare radiological finding in pulmonary MAC infection.

### Disclosure Statements

No conflict of interest declared.

Appropriate written informed consent was obtained for publication of this case report and accompanying images.

### References

1. Griffith DE, Aksamit T, Brown-Elliott BA, et al. 2007. ATS Mycobacterial Diseases Subcommittee; American Thoracic Society; Infectious Disease Society of America. An official

- ATS/IDSA statement: diagnosis, treatment, and prevention of nontuberculous mycobacterial diseases. *Am. J. Respir. Crit Care Med.* 175:367–416.
2. Kwon YS, and Koh WJ 2016. Diagnosis and treatment of nontuberculous mycobacterial lung disease. *J. Korean Med. Sci.* 31:649–659.
  3. Wittram C, and Weisbrod GL 2002. *Mycobacterium avium* complex lung disease in immunocompetent patients: radiography–CT correlation. *Br. J. Radiol.* 75:340–344.
  4. Lee Y, Song JW, Chae EJ, et al. 2013. CT findings of pulmonary non-tuberculous mycobacterial infection in non-AIDS immunocompromised patients: a case-controlled comparison with immunocompetent patients. *Br. J. Radiol.* 86. doi:10.1259/bjr.20120209.
  5. Nakahara Y, Oonishi Y, Takiguchi J, et al. 2015. Nontuberculous mycobacterial lung disease accompanied by organizing pneumonia. *Intern. Med.* 54:945–951.