



Case report

A case of pulmonary *Mycobacterium avium* infection in an immunocompetent patient who showed a huge consolidation with a high FDG uptake on PET/CT



Akane Kato^a, Hiroshi Yamamoto^{a,*}, Mariko Ikeda^a, Kazunari Tateishi^a, Atsuhito Ushiki^a, Masanori Yasuo^a, Satoshi Kawakami^b, Shiho Asaka^c, Kazuhiro Oguchi^d, Masayuki Hanaoka^a

^a First Department of Internal Medicine, Shinshu University School of Medicine, Matsumoto, Japan

^b Department of Radiology, Shinshu University School of Medicine, Matsumoto, Japan

^c Department of Laboratory Medicine, Shinshu University School of Medicine, Matsumoto, Japan

^d Positron Imaging Center, Aizawa Hospital, Matsumoto, Japan

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ABSTRACT

We encountered a middle-aged afebrile immunocompetent woman with a slight cough. Positron emission tomography (PET)/computed tomography (CT) revealed a broad left upper-lobe consolidation without cavity lesions, small nodules, or bronchiectasis showing a positive fluorodeoxyglucose (FDG) uptake with a maximum standardized uptake value (SUVmax) of 26.9. Percutaneous needle lung biopsy specimens showed caseous granulomas without atypical cells and *Mycobacterium avium* was cultured from left pleural effusion, which developed after the biopsy. The consolidation significantly decreased following combination chemotherapy for approximately 2 years. Clinicians should remember that pulmonary *M. avium* infection could result in a large consolidation without other typical radiological findings.

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1. Introduction

Nontuberculous mycobacteria (NTM), especially *Mycobacterium (M.) avium* complex (MAC), are being recognized with increasing frequency as clinical pathogens of chronic lung disease in immunocompetent patients [1,2]. The common findings of immunocompetent patients with NTM infection in chest computed tomography (CT) are cavity lesions, endobronchial spread or randomly distributed small nodules with bronchiectasis, and consolidation [1–4]. The maximum standardized uptake values (SUVmax) of fluorodeoxyglucose (FDG) in positron emission tomography (PET) were approximately 5–10 in the lesions of NTM infection [5,6].

We herein report a case of pulmonary *M. avium* infection in an immunocompetent woman with a non-disseminated broad consolidation on chest CT and a high FDG uptake (SUVmax: 26.9) in this consolidation on PET/CT.

2. Case presentation

A 41-year-old Korean woman complained of a slight cough without dyspnea or a fever. She was referred to our department by her primary care physician. She was affected by tuberculosis when she was 34 years of age in Korea and treated with unspecified chemotherapy; no signs of relapses occurred until 41 years of age. The precise data regarding her past clinical history in Korea were unavailable. Her hearing ability was lost completely due to unknown reasons. She had no history of diabetes mellitus or other immunosuppressive diseases. Physical examinations at the initial visit showed a height of 162.0 cm, body weight of 58.0 kg, arterial blood pressure of 102/58 mmHg, pulse rate of 74/min, and body temperature of 36.5 °C. The breath sounds were decreased in the left lung. No lymphadenopathy was found. Her laboratory

* Corresponding author. First Department of Internal Medicine, Shinshu University School of Medicine, 3-1-1 Asahi, Matsumoto, 390-8621, Japan.

E-mail addresses: akanekat@shinshu-u.ac.jp (A. Kato), yama5252@shinshu-u.ac.jp (H. Yamamoto), mikeda@shinshu-u.ac.jp (M. Ikeda), tateishi@shinshu-u.ac.jp (K. Tateishi), atsuhito@shinshu-u.ac.jp (A. Ushiki), yasumasa@shinshu-u.ac.jp (M. Yasuo), kawasato@shinshu-u.ac.jp (S. Kawakami), ydash831@gmail.com (S. Asaka), pet-dr@ai-hosp.or.jp (K. Oguchi), masayuki@shinshu-u.ac.jp (M. Hanaoka).

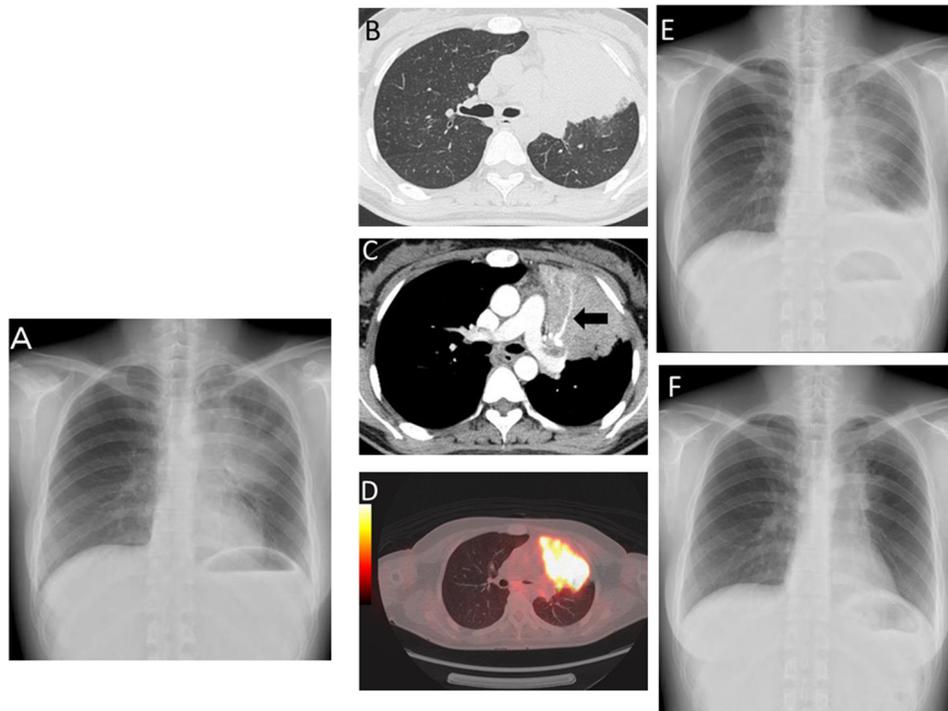


Fig. 1. A chest X-ray (A) and CT (B, C) scan at the initial visit revealed broad consolidation with a positive angiogram sign (arrow) throughout the upper-lobe of the left lung. PET/CT showed a high SUVmax of 26.9 on the consolidation of the left lung (D). A subsequent chest X-ray one week after the percutaneous lung biopsy showed the consolidation getting broader and the development of left pleural effusion (E). A chest X-ray taken two years after chemotherapy revealed a significant improvement in the consolidation and pleural effusion (F).

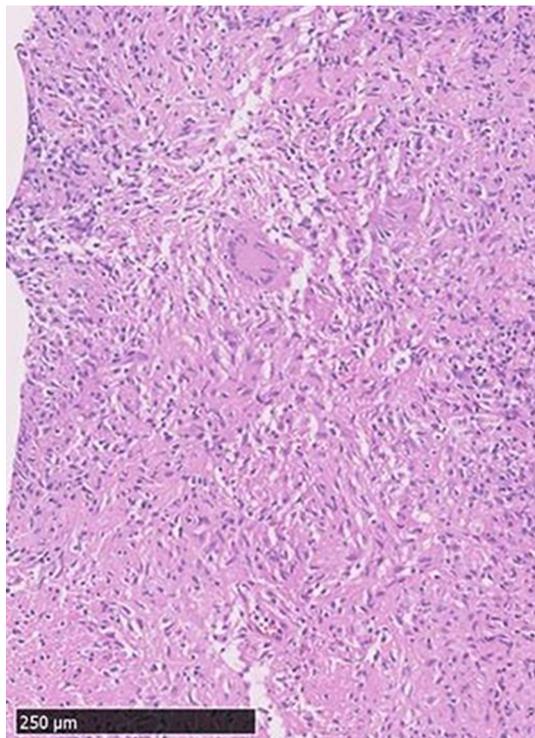


Fig. 2. Percutaneous lung biopsy specimens showed caseous granulomas without atypical cells on hematoxylin and eosin (H&E) staining. Scale bar = 250 μ m.

consolidation. To the best of our knowledge, this SUVmax value is the highest value observed on chest CT of the lesions in NTM infection.

Although acid-fast bacillus infections could be suspected according to the evidence of caseous granulomas from percutaneous biopsies specimens, acid-fast bacilli were not detected in the smear of the biopsy specimen or PCR tests. Although tuberculous pleural effusion may occur in up to 30% of patients with tuberculosis [11], the incidence of pleural effusion in NTM infection is relatively low [8]. Combination chemotherapy for tuberculosis in this patient was administered primarily regarding her history of tuberculosis and high levels of ADA in the pleural effusion, which were suitable markers in the diagnosis of tuberculous pleuritis [11–14]. *M. avium* was cultured from the gastric fluid, which is not listed in the diagnostic criteria of NTM infection approved by the American Thoracic Society (ATS)/Infectious Diseases Society of America (IDSA) [1], and we eventually observed *M. avium* in the pleural effusion culture as well. The present case was diagnosed with pulmonary infection and pleurisy due to *M. avium* infection according to the strong laboratory evidence of *M. avium* culture. A previous report showed that a patient with *M. avium* pleuritis had a normal level of ADA in the pleural effusion [15]. Conversely, several cases with NTM infections revealed high ADA concentrations in the pleural effusion [16], such as in our case. Thus, our case reaffirms that ADA concentrations in the pleural effusion of patients with NTM infections could be high.

4. Conclusion

We presented an immunocompetent afebrile patient with *M. avium* infection showing a non-disseminated broad consolidation without other typical signs of NTM infection in chest CT images. Furthermore, *M. avium* infection may reveal a large consolidation with high FDG uptake in chest PET/CT images.

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Conflict of interest

The authors declare that they have no conflicts of interest.

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References

- [1] D.E. Griffith, T. Aksamit, B.A. Brown-Elliott, A. Catanzaro, C. Daley, F. Gordin, S.M. Holland, R. Horsburgh, G. Huitt, M.F. Iademarco, M. Iseman, K. Olivier, S. Ruoss, C.F. von Reyn, R.J. Wallace Jr., K. Winthrop, 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 (4) (2007) 367–416.
- [2] M.T. Henry, L. Inamdar, D. O'Riordain, M. Schweiger, J.P. Watson, Nontuberculous mycobacteria in non-HIV patients: epidemiology, treatment and response, *Eur. Respir. J.* 23 (5) (2004) 741–746.
- [3] S. Martinez, H.P. McAdams, C.S. Batchu, The many faces of pulmonary nontuberculous mycobacterial infection, *AJR Am. J. Roentgenol.* 189 (1) (2007) 177–186.
- [4] Y.J. Jeong, K.S. Lee, W.J. Koh, J. Han, T.S. Kim, O.J. Kwon, Nontuberculous mycobacterial pulmonary infection in immunocompetent patients: comparison of thin-section CT and histopathologic findings, *Radiology* 231 (3) (2004) 880–886.
- [5] Y. Demura, T. Tsuchida, D. Uesaka, Y. Umeda, M. Morikawa, S. Ameshima, T. Ishizaki, Y. Fujibayashi, H. Okazawa, Usefulness of 18F-fluorodeoxyglucose positron emission tomography for diagnosing disease activity and monitoring therapeutic response in patients with pulmonary mycobacteriosis, *Eur. J. Nucl. Med. Mol. Imaging* 36 (4) (2009) 632–639.
- [6] K. Kaneko, E. Sadashima, K. Irie, A. Hayashi, S. Masunari, T. Yoshida, J. Omagari, Assessment of FDG retention differences between the FDG-avid benign pulmonary lesion and primary lung cancer using dual-time-point FDG-PET imaging, *Ann. Nucl. Med.* 27 (4) (2013) 392–399.
- [7] Y. Lee, J.W. Song, E.J. Chae, H.J. Lee, C.W. Lee, K.H. Do, J.B. Seo, M.Y. Kim, J.S. Lee, K.S. Song, T.S. Shim, CT findings of pulmonary non-tuberculous mycobacterial infection in non-AIDS immunocompromised patients: a case-controlled comparison with immunocompetent patients, *Br. J. Radiol.* 86 (1024) (2013) 20120209.
- [8] S. Kuroishi, Y. Nakamura, H. Hayakawa, M. Shirai, Y. Nakano, K. Yasuda, T. Suda, H. Nakamura, K. Chida, Mycobacterium avium complex disease: prognostic implication of high-resolution computed tomography findings, *Eur. Respir. J.* 32 (1) (2008) 147–152.
- [9] A.A. El-Solh, J. Nopper, M.R. Abdul-Khoudoud, S.M. Sherif, A.T. Aquilina, B.J. Grant, Clinical and radiographic manifestations of uncommon pulmonary nontuberculous mycobacterial disease in AIDS patients, *Chest* 114 (1) (1998) 138–145.
- [10] R.M. Shah, A.C. Friedman, CT angiogram sign: incidence and significance in lobar consolidations evaluated by contrast-enhanced CT, *AJR Am. J. Roentgenol.* 170 (3) (1998) 719–721.
- [11] J. Ferrer, Pleural tuberculosis, *Eur. Respir. J.* 10 (4) (1997) 942–947.
- [12] J.M. Porcel, Tuberculous pleural effusion, *Lung* 187 (5) (2009) 263–270.
- [13] Q.L. Liang, H.Z. Shi, K. Wang, S.M. Qin, X.J. Qin, Diagnostic accuracy of adenosine deaminase in tuberculous pleurisy: a meta-analysis, *Respir. Med.* 102 (5) (2008) 744–754.
- [14] A. Trajman, M. Pai, K. Dheda, et al., Novel tests for diagnosing tuberculous pleural effusion: what works and what does not? *Eur. Respir. J.* 31 (2008) 1098–1106.
- [15] T. Kakugawa, H. Mukae, S. Kajiki, A. Tanaka, T. Yamayoshi, M. Inoue, H. Ohtani, N. Sakamoto, K. Izumikawa, H. Tasaki, N. Ooe, S. Kohno, Mycobacterium avium pleuritis in a non-immunocompromised patient, *Intern Med.* 47 (19) (2008) 1727–1731.
- [16] T. Sado, Y. Nakamura, H. Kita, Clinical analysis of nontuberculous mycobacterial infection complicated by pleurisy, *Kekkaku* 89 (12) (2014) 821–824. Japanese.