Received: 16 April 2024 | Accepted: 15 May 2024

DOI: 10.1002/rcr2.1392

CASE REPORT

Respirology Case Reports OPEN ACCESS APSR WILEY

Cytomegalovirus cavitary pneumonia in a human immunodeficiency virus-infected patient

Yusuke Sunanaga | **Takayuki Suetsugu** | **Yusuke Nagata** | **Marina Miyata** | **Kiyotaka Kondo** | **Hideo Mitsuyama** | **Shingo Kubota** | **Keiko Mizuno** | **Kentaro Tanaka** | **Hiromasa Inoue**

Department of Pulmonary Medicine, Graduate School of Medical and Dental Sciences, Kagoshima University, Kagoshima, Japan

Correspondence
Yusuke Sunanaga, Department of Pulmonary Medicine, Graduate School of Medical and Dental Sciences, Kagoshima University, 8-35-1 Sakuragaoka, Kagoshima City, Kagoshima 890-8520, Japan.
Email: sysigoto@gmail.com

Associate Editor: Wei Shen Lim

Abstract

Cavitary lung lesions are uncommon radiological findings in cytomegalovirus pneumonia, and tissue biopsy is rarely performed for diagnosis. A 67-year-old man presented with a wet cough. Extensive white moss in the oral cavity was found on physical examination, and chest computed tomography revealed an approximately 4 cm cavitary lesion in the upper lobe of the right lung. Blood tests showed a critically low $CD4^+$ T lymphocyte count and positivity for human immunodeficiency virus type 1 antibodies. A transbronchial biopsy of the cavitary lung lesion was performed, and inclusion bodies in the nuclei of enlarged alveolar epithelial cells were seen in the histopathological findings. Immunohistochemistry staining for cytomegalovirus was positive, and cytomegalovirus pneumonia was diagnosed. Ganciclovir treatment was initiated, and the symptoms and imaging findings resolved. Cytomegalovirus pneumonia can present as cavitary lung lesions in patients with acquired immunodeficiency syndrome, and a transbronchial biopsy is essentially useful for a definitive diagnosis.

KEYWORDS

acquired immunodeficiency syndrome, cavitary lung lesion, cytomegalovirus infection, human immunodeficiency virus, transbronchial biopsy

INTRODUCTION

Cytomegalovirus (CMV) infections, particularly pneumonia, are fatal opportunistic infections in immunocompromised patients such as those with acquired immunodeficiency syndrome (AIDS), and prompt diagnosis and therapy are important. Typical radiological findings of CMV pneumonia include bilateral interstitial infiltrates. Cavitary lung lesions are rare, especially in AIDS patients.[1,2] Biopsy is the gold standard for the diagnosis of CMV infection.[3] However, bronchoscopic biopsy is often not performed because of its invasiveness.[2] We describe a case of CMV pneumonia with a cavitary lung lesion in a patient with AIDS, which could have been diagnosed and treated early by transbronchial biopsy.

CASE REPORT

A 67-year-old man, who had never been diagnosed with immunodeficiency, presented to the hospital with a wet cough. Neither fever nor desaturation were observed. Extensive white moss was found in the oral cavity on physical examination. Chest radiography revealed a cavitary lung lesion in the right upper lung field, and chest computed tomography (CT) showed a 40 mm cavitary lung lesion with surrounding nodular, granular, and frosted shadows in the anterior segment of the right upper lobe (Figure 1A,B). Blood samples revealed a critically low $CD4^+$ T lymphocyte count of 5 cells/mm^3 and a positive human immunodeficiency virus (HIV) screening test. Other blood tests were all negative, including interferon-gamma release assay, anti-

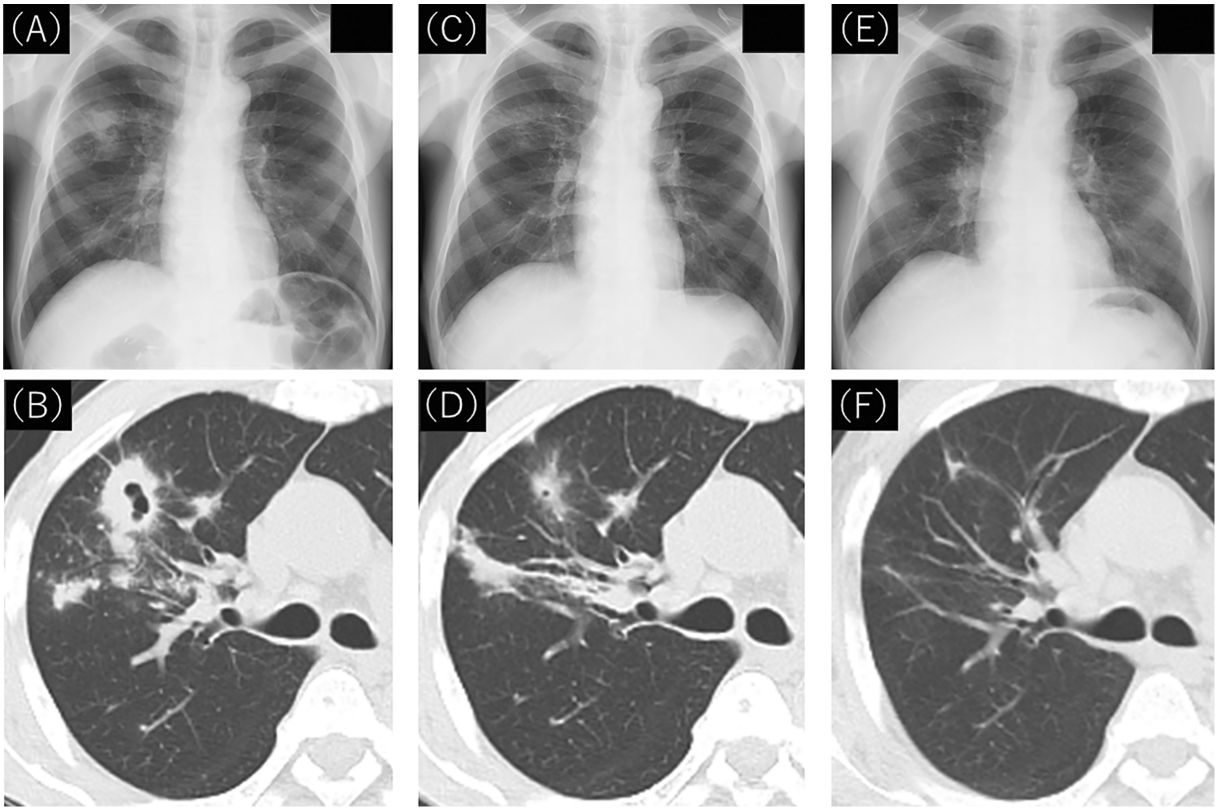

FIGURE 1 Imaging course of a cavitary lesion in the right lung upon admission (A, B), after 1 month showing a significant decrease in size (C, D), and after 3 months, nearly disappeared (E, F).

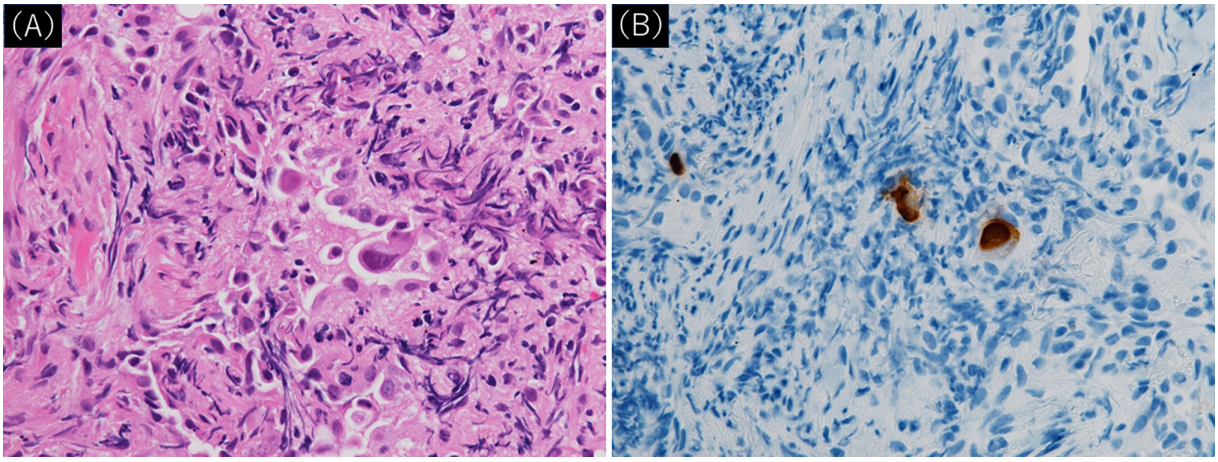

FIGURE 2 Histopathological findings of transbronchial biopsy specimens for cavity lung lesions. Haematoxylin and eosin staining with high magnification (×400) revealed inclusion bodies in the nucleus of enlarged alveolar epithelial cells (A). Immunohistochemistry staining with high magnification (×400) demonstrated positivity for cytomegalovirus (B).

glycopeptidolipid-core immunoglobulin A antibody for *Mycobacterium avium* complex assay, (1,3)-β-D-glucan test, *Aspergillus* galactomannan antigen detection assay, and *Aspergillus* IgG antibody detection assay. Differential diseases considered were tuberculosis, non-tuberculosis mycobacterial infection, mycoses such as aspergillosis, and malignant diseases such as lung cancer. Bronchoscopy with transbronchial biopsy and bronchial lavage were performed from the anterior segmental bronchus in the upper lobe of the right lung. Bronchial fluid washing revealed no significant findings. Histopathological findings showed inflammatory granulation tissue with infiltration of neutrophils and lymphocytes and some inclusion bodies in the nuclei of the enlarged alveolar epithelial cells (Figure 2A). There were no

findings of malignancy, bacterial infections such as *Pseudomonas aeruginosa*, *Pneumocystis jirovecii* infection, or tuberculosis. Immunohistochemistry staining for CMV revealed scattered positive cells (Figure 2B). The CMV pp65 antigenemia assay was also positive, and a cytomegalovirus pneumonia was diagnosed. Subsequently, the HIV type 1 western blot confirmatory test confirmed the HIV infection, leading to the final diagnosis of AIDS with cytomegalovirus infection as an AIDS-defining illness. Ganciclovir was administered for 3 weeks. The cavitary lung lesion was significantly reduced within 1 month of the initiation of treatment and almost disappeared 3 months after the end of treatment, leaving only a small linear opacity (Figure 1C–F). Antiretroviral therapy was initiated for HIV infection after completing treatment for CMV infection.

DISCUSSION

CMV pneumonia is fatal in immunocompromised hosts, such as patients with AIDS described in this case. End-organ disease caused by CMV typically occurs in patients with HIV those with $CD4^+$ T lymphocyte cell counts <50 cells/mm^3 who are not receiving antiretroviral therapy.[4] Delayed diagnosis and treatment could result in death in up to 70% of patients with AIDS complicated with CMV pneumonia.[2] Therefore, prompt diagnosis and initiation of appropriate treatment are quite important. In our case, we decided to perform transbronchial biopsy of cavitary lung lesions because the patient was diagnosed as AIDS. This could lead to prompt and accurate diagnosis as well as successful treatment.

Radiological findings in CMV pneumonia typically show bilateral interstitial infiltrates and other features such as ground-glass attenuation, consolidation, and pulmonary nodules; however, cavitary lesions are reported to be extremely rare.[1] A comparative study of high-resolution CT images of pneumocystis pneumonia (78 cases) and CMV pneumonia (34 cases) in patients with AIDS did not find a single case of CMV with cavitary lesions.[2] There have been a few case reports of CMV cavitary pneumonia in non-HIV patients on steroid and immunosuppressive drugs.[5,6] Especially, Ayyappan AP et al. reported an impressive case of CMV pneumonia in a patient on steroids and immunosuppressive drugs for collagen lung disease who presented with multiple cavitary lung lesions.[6] As for the mechanism by which CMV causes cavitary lung lesions, it has been speculated that CMV produces thrombin, which leads to thrombus formation in the smaller vessels, resulting in endothelial cell damage and necrosis of the lung parenchyma.[5] However, evidence is lacking, and it is unclear whether the same mechanism occurs in patients with HIV infection like our case.

In immunocompromised hosts, common differential diagnoses of cavitary lung lesions include bacterial, tuberculous, nontuberculous mycobacterial, fungal, and *Pneumocystis jirovecii* infection, septic embolism, and malignancy.[1] Tuberculosis is the most common first-episode manifestation in HIV-infected patients and is associated with a high risk of mortality.[7] The concomitant use of antituberculosis and antiretroviral drugs must be carefully determined because of several management issues, including drug interactions, overlapping toxicities, and the risk of immune reconstitution inflammatory syndrome. Hence, it is important to differentiate tuberculosis from cavitary lung lesions in patients with AIDS, as in the present case. Biopsy is the gold standard for diagnosing CMV disease, either by identifying the owl-eye inclusion body or by detecting the viral nucleic acid in the specimen.[3] However, bronchoscopic tissue biopsy is often not performed because of its invasiveness.[2] In this case, prompt treatment for CMV pneumonia was initiated after a bronchoscopic tissue biopsy excluded tuberculosis and confirmed the diagnosis of CMV pneumonia, resulting in improvement.

In conclusion, CMV pneumonia should be included in the differential diagnosis of patients with AIDS presenting with cavitary lung lesions. Transbronchial biopsy should be considered to differentiate it from other diseases, such as tuberculosis, and early treatment for CMV pneumonia should be initiated.

AUTHOR CONTRIBUTIONS

Y.S contributed to the literature review and manuscript preparation. Y.S, Y.N, M.M, K.K, H.M and S.K were the attending physicians involved in data collection. Y.S, T.S, K. M, K.T and H.I contributed to the conceptualization and revision of the final manuscript. All the authors have read and approved the final version of the manuscript.

ACKNOWLEDGMENTS

We are grateful to Dr. Teruto Hashiguchi for providing anti-HIV treatment and to Dr. Tsubasa Hiraki for conducting histopathological evaluation. We would also like to thank Editage (www.editage.jp) for English language editing. This case report was presented at the 84th Annual Meeting of the Japanese Respiratory Society, Kyushu Branch.

FUNDING INFORMATION

No funding support was received for this paper.

CONFLICT OF INTEREST STATEMENT

None declared.

DATA AVAILABILITY STATEMENT

Data sharing is not applicable to this article as no new data were created or analyzed in this study.

ETHICS STATEMENT

The authors declare that appropriate written informed consent was obtained for the publication of this manuscript and accompanying images.

ORCID

Yusuke Sunanaga https://orcid.org/0009-0007-5873-7717

REFERENCES

1. Najjar M, Siddiqui AK, Rossoff L, Cohen RI. Cavitary lung masses in SLE patients: an unusual manifestation of CMV infection. Eur Resp J. 2004;24:182–4.
2. Du CJ, Liu JY, Chen H, Yan S, Pu L, Xiong HF, et al. Differences and similarities of high-resolution computed tomography features between pneumocystis pneumonia and cytomegalovirus pneumonia in AIDS patients. Infect Dis Poverty. 2020;9:149.
3. Kotton CN. CMV: prevention, diagnosis and therapy. Am J Transplant. 2013;13:24–40.
4. Panel on Guidelines for the Prevention and Treatment of Opportunistic Infections in Adults and Adolescents with HIV. Guidelines for the Prevention and Treatment of Opportunistic Infections in Adults and Adolescents with HIV. National Institutes of Health, Centers for Disease Control and Prevention, HIV Medicine Association, and Infectious Diseases Society of America. Accessed 30, April 2024 https://clinicalinfo.hiv.gov/en/guidelines/adult-andadolescent-opportunistic-infection
5. Saraya T, Ohkuma K, Kikuchi K, Tamura M, Honda K, Yamada A, et al. Cytomegalovirus pneumonia in a patient with interstitial pneumonia and *Nocardia asiatica* presenting as cavitary lung lesions. Intern Med. 2013;52:593–7.
6. Ayyappan AP, Thomas R, Kurian S, Christopher DJ, Cherian R. Multiple cavitating masses in an immunocompromised host with rheumatoid arthritis-related interstitial lung disease: an unusual expression of cytomegalovirus pneumonitis. Br J Radiol. 2006;79:e174–6.
7. Padmapriyadarsini C, Narendran G, Swaminathan S. Diagnosis & treatment of tuberculosis in HIV co-infected patients. Indian J Med Res. 2011;134:850–65.

How to cite this article: Sunanaga Y, Suetsugu T, Nagata Y, Miyata M, Kondo K, Mitsuyama H, et al. Cytomegalovirus cavitary pneumonia in a human immunodeficiency virus-infected patient. Respirology Case Reports. 2024;12(5):e01392. https://doi.org/10.1002/rcr2.1392