Chronic *Pasteurella Multocida* Bronchitis Diagnosed 3 Years After Onset of Symptoms

Eriko OKAZAKI*, Shigeaki HATTORI*, Katsuyoshi TOMOMATSU, Shingo IIJIMA, Kohei UMEMOTO, Kai YAMAZAKI, Yukihiro HORIO, Naoki HAYAMA, Yoko ITO, Tsuyoshi OGUMA and Koichiro ASANO

Division of Pulmonary Medicine, Department of Medicine, Tokai University School of Medicine
**Contributed equally to the manuscript.*

(Received October 10, 2023; Accepted November 6, 2023)

We report a case of chronic infection with *Pasteurella multocida* in the lower respiratory tract in a man with a cat. A 77-year-old man presented with recurrent hemoptysis accompanied by bronchiectasis and an opacity in the left lung on chest computed tomography. Although the patient was seropositive for *Mycobacterium avium* complex, repeated sputum cultures were negative for any specific pathogen. Three years later, he was referred to our hospital for hemoptysis with enhanced opacity in the lower lobe of the left lung. Culture of bronchial lavage fluid obtained via bronchoscopy was positive for *P. multocida*. The patient was treated with amoxicillin-clavulanic acid for 14 days and was instructed to avoid close contact with his cat. His symptoms and chest imaging findings improved and have not recurred during more than 1 1/2 years of follow up. *P. multocida* can cause chronic lower respiratory infections.

Key words: Chronic infection, Hemoptysis, *Mycobacterium avium* complex, *Pasteurella multocida*, Zoonosis

INTRODUCTION

Pasteurella multocida is a gram-negative coccobacillus that causes zoonotic disease in humans [1]. Skin and soft tissue infections caused by *P. multocida* can occur after dog and cat bites and scratches [1, 2]. Although less common, *P. multocida* causes various respiratory infections including bronchitis, pneumonia, empyema, and lung abscesses [3–6]. Older adults with respiratory diseases, such as chronic obstructive pulmonary disease (COPD), bronchiectasis, lung cancer, and pulmonary fibrosis, are more susceptible to respiratory infections caused by *P. multocida* [3]. Lack of specific clinical or radiographic findings lead to a low rate of recognition and often lead to delayed diagnosis [5, 7]. Here, we report a case of chronic *P. multocida* bronchitis that was diagnosed 3 years after the first episode of hemoptysis.

CASE REPORT

A 77-year-old man with a smoking history of 30 pack-years presented with hemoptysis that had started 3 years previously. Chest computed tomography (CT) performed at a local hospital revealed centrilobular nodules in the lingular segment and bronchiectasis/ground-glass opacities in the lower lobe of the left lung (Fig. 1A). Serum was positive for anti-glycopeptidolipid (GPL)-core IgA antibody, suggesting the possibility of pulmonary *Mycobacterium avium* complex (MAC) infection; however, repeated sputum cultures did not detect MAC or other pathogens. Because the patient was reluctant to undergo bronchoscopic examination owing to mild symptoms, he was followed-up without specific treatment.

Chest radiographs showed no change until 3 years later, when he was referred to our hospital for multiple episodes of hemoptysis. He had a body temperature of 36.8°C, pulse rate of 77 beats/min, and peripheral capillary oxygen saturation level of 98% breathing room air. Coarse crackles were observed on auscultation of the left lung. Laboratory tests revealed a mildly elevated C-reactive protein level (1.28 mg/dL). Chest CT showed a granular shadow in the lingual region and a dense opacity around the bronchiectasis in the lower lobe of the left lung (Fig. 1B). The sputum culture results were negative. Bronchoscopy revealed a large purulent discharge in the left lower lobe of the bronchi (Fig. 2). Gram negative coccobacilli was identified in the bronchial lavage fluid, and cultures of purulent sputum and bronchial lavage fluid on 5% sheep blood agar and chocolate agar plates revealed a *P. multocida*. A re-evaluation of the patient's history revealed that he had lived with a cat for approximately 20 years, which had recently been declining in health. We treated him with amoxicillin-clavulanic acid for 14 days, based on the results of antibiotic susceptibility tests, and instructed him to avoid close contact with his cat, such as sleeping together. After the antibiotic therapy, chest CT showed improvement in the infiltrative shadow in the left lower lobe (Fig. 1C). The patient's cat died 4 months later. The patient has not experienced a recurrence of hemoptysis or deterioration of

Katsuyoshi TOMOMATSU, Division of Pulmonary Medicine, Department of Medicine, Tokai University School of Medicine, 143 Shimokasuya, Isehara, Kanagawa 259-1193, Japan Tel: +81-463-93-1121 Fax: +81-463-93-0381 E-mail: k.tomomatu@gmail.com

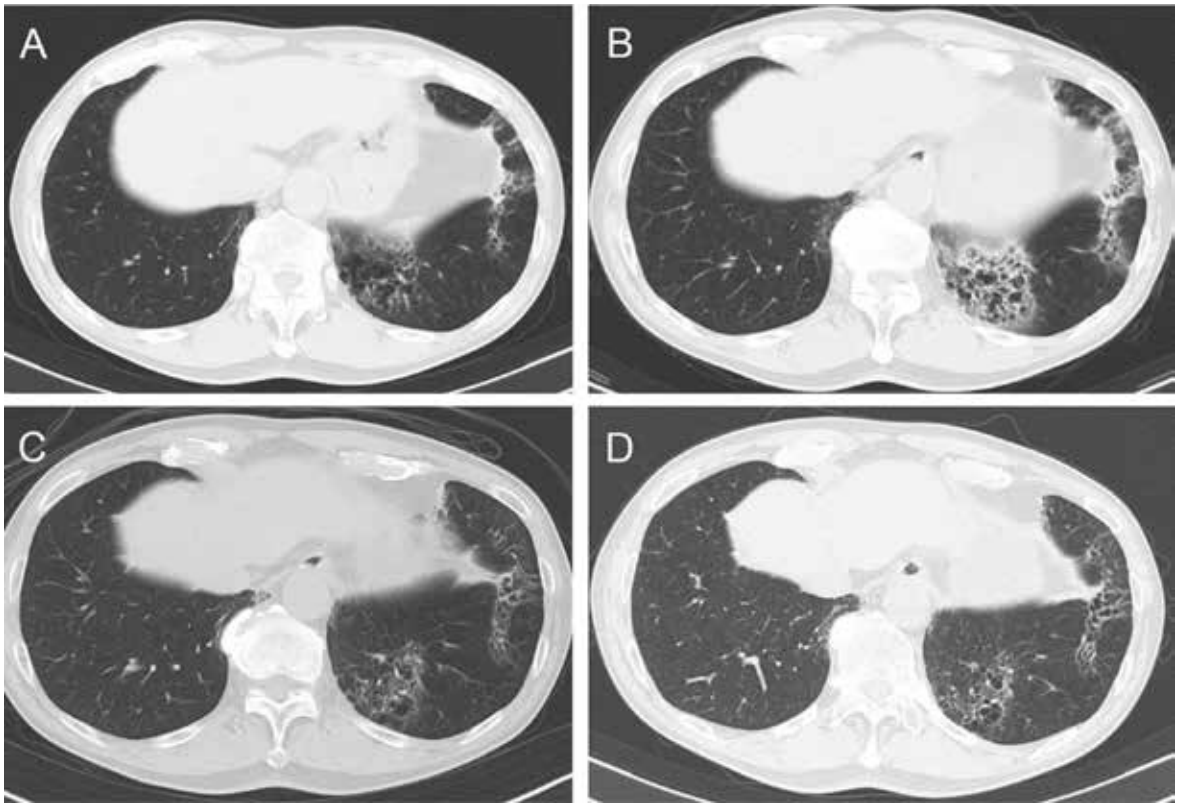

Fig. 1 Chest computed tomography findings at the first visit for hemoptysis (A), 3 years after the initial symptoms (B), directly after completing antibiotic treatment (C), and 1 1/2 years after completing treatment (D).

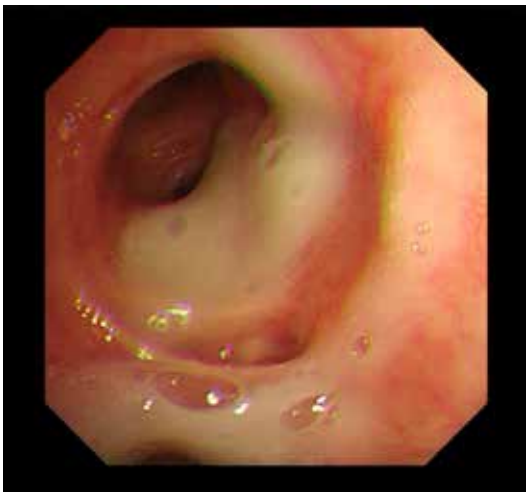

Fig. 2 Bronchoscopy showing a large amount of purulent sputum accumulated in the left main bronchus

radiographic findings during more than 1 1/2 years of follow up (Fig. 1D).

DISCUSSION

This case of pulmonary infection with *P. multocida* was diagnosed 3 years after symptom onset. The patient was initially diagnosed with MAC lung disease based on serological test results and chest CT findings of centrilobular nodules and bronchiectasis despite repeated negative sputum cultures. The diagnosis of *P. multocida* infection was confirmed 3 years later, based on a positive culture of bronchial lavage fluid. There are two possible explanations for this clinical course: *P. multocida* infection could have occurred on underlying MAC lung disease, or chronic respiratory infection with *P. multocida* could have caused the broncho-bronchiolar lesions observed on CT.

Pulmonary *P. multocida* infection often develops in patients with underlying chronic respiratory conditions, such as bronchiectasis, COPD, or malignancy [8–11]. However, to our knowledge, there have been no reports of pulmonary *P. multocida* infection secondary to MAC lung disease, except for a single possible case with positive anti-GPL-core IgA antibody serology that did not satisfy the diagnostic criteria and lacked microbiological evidence [12]. Although anti-GPL-core IgA antibody exhibit excellent sensitivity and specificity in the diagnosis of MAC lung disease [13], 19% of patients suspected of having MAC lung disease based on typical symptoms, chest radiographic imaging, and

positive anti-GPL-core IgA antibody in serum do not meet the microbiological criteria for MAC disease [14]. Therefore, there is little evidence that the patient developed pulmonary *P. multocida* infection with MAC lung disease as the underlying condition.

The patient had lived in close contact with a cat for 20 years, suggesting chronic exposure to *P. multocida*. The lack of recurrence for more than a year after avoiding animal contact suggests that chronic lower respiratory tract infection with *P. multocida* occurred because of recurrent exposure to the bacteria. Although pulmonary *P. multocida* infection is mostly reported as acute pneumonia [15], a retrospective review of more than 16,000 bronchoscopic examinations identified six incidentally diagnosed cases of lower respiratory *P. multocida* infection presenting with chronic productive cough as the main symptom. Lung opacities were absent in five of the six cases of chronic infection [6]. Therefore, *P. multocida* can cause chronic lower respiratory tract infections in people with cats or dogs as pets.

There are no specific radiographic findings or serological tests for pulmonary *P. multocida* infection; therefore, microbiological examination is essential for diagnosis. Sputum culture is often sufficient for the diagnosis of pulmonary *P. multocida* infection; however, bronchoscopic examination is required if sputum culture is negative [5, 16]. In the present case, the reluctance of the patient to undergo bronchoscopic examination, in addition to the physicians' lack of anticipation of *P. multocida* infection, delayed the diagnosis.

P. multocida is usually susceptible to antimicrobial agents, although β-lactamase production has been reported in some strains [17, 18]. In the present case, *P. multocida* was susceptible to antimicrobials and despite no maintenance antibiotic treatment, no recurrence was observed without; however, irreversible lesions remained in the airways. Therefore, early diagnosis, appropriate antibiotic treatment, and patient education are essential to prevent chronic lower respiratory tract infections and airway destruction.

CONCLUSION

Here, we report a case of *P. multocida* bronchitis diagnosed by bronchoscopic examination three years after the initial respiratory symptoms. *P. multocida* can be a causative organism of chronic respiratory infections in pet owners, and aggressive evaluation, including bronchoscopy, may be required in some cases.

CONFLICTS OF INTEREST

The authors have no conflicts of interest to declare.

REFERENCES

1) Wilson BA, Ho M. *Pasteurella multocida*: from zoonosis to cellular microbiology. Clin Microbiol Rev 2013; 26: 631–55.
2) Martin TCS, Abdelmalek J, Yee B, Lavergne S, Ritter M. *Pasteurella multocida* line infection: a case report and review of literature. BMC Infect Dis 2018; 18: 420.
3) Kopita JM, Handshoe D, Kussin PS, Kelemen M. Cat germs! Pleuropulmonary *pasteurella* infection in an old man. N C Med J 1993; 54: 308–11.
4) Kofteridis DP, Christofaki M, Mantadakis E, Maraki S, Drygiannakis I, Papadakis JA, *et al*. Bacteremic community-acquired pneumonia due to *Pasteurella multocida*. Int J Infect Dis 2009; 13: e81–3.
5) Itoh N, Kurai H. A case of *Pasteurella multocida* pneumonia needed to differentiate from non-tuberculous mycobacteriosis. IDCases 2018; 12: 136–139.
6) Piorunek M, Brajer-Luftmann B, Trafas T, Schneider A, Walkowiak J. Lower respiratory infection in humans caused by *pasteurella multocida*. Respir Physiol Neurobiol 2023; 315: 104091.
7) Yadav S. A Case of Pneumonia caused by *Pasteurella multocida* in an immunocompetent Indian male. Cureus 2022; 14: e28820.
8) Pradeepan S, Tun Min S, Lai K. Occupationally acquired *Pasteurella multocida* pneumonia in a healthy abattoir worker. Respir Med Case Rep 2016; 19: 80–2.
9) Martyn V, Swift D. *Pasteurella multocida* pneumonia complicated by *Staphylococcus aureus*. Postgrad Med J 1984; 60: 145–6.
10) Ferreira J, Treger K, Busey K. Pneumonia and disseminated bacteremia with *Pasteurella multocida* in the immune competent host: A case report and a review of the literature. Respir Med Case Rep 2015; 15: 54–6.
11) Rybolt LE, Sabunwala S, Greene JN. Zoonotic bacterial respiratory infections associated with cats and dogs: a case series and literature review. Cureus 2022; 14: e24414.
12) Daley CL, Iaccarino JM, Lange C, Cambau E, Wallace RJ, Andrejak C, *et al*. Treatment of nontuberculous mycobacterial pulmonary disease: An official ATS/ERS/ESCMID/IDSA clinical practice guideline. Clin Infect Dis 2020; 71: e1–e36.
13) Kitada S, Kobayashi K, Ichiyama S, Takakura S, Sakatani M, Suzuki K, *et al*. Serodiagnosis of *Mycobacterium avium*-complex pulmonary disease using an enzyme immunoassay kit. Am J Respir Crit Care Med 2008; 177: 793–7.
14) Iwasaki T, Yamaguchi F, Hayashi M, Kobayashi H, Hirata K, Miyo K, *et al*. Combination of anti-glycopeptidolipid-core IgA antibody and clinical features for diagnosing potential nontuberculous mycobacterium pulmonary disease in routine practice. Ther Adv Respir Dis 2022; 16: 17534666221138002.
15) Seki M, Sakata T, Toyokawa M, Nishi I, Tomono K. A Chronic respiratory *Pasteurella multocida* infection is well-controlled by long-term macrolide therapy. Intern Med 2016; 55: 307–10.
16) Drabick JJ, Gasser RA, Jr., Saunders NB, Hadfield TL, Rogers LC, Berg BW, *et al*. *Pasteurella multocida* pneumonia in a man with AIDS and nontraumatic feline exposure. Chest 1993; 103: 7–11.
17) Lion C, Lozniewski A, Rosner V, Weber M. Lung abscess due to beta-lactamase-producing Pasteurella multocida. Clin Infect Dis 1999; 29: 1345–6.
18) Naas T, Benaoudia F, Lebrun L, Nordmann P. Molecular identification of TEM-1 beta-lactamase in a Pasteurella multocida isolate of human origin. Eur J Clin Microbiol Infect Dis 2001; 20: 210–3.