A case of pulmonary actinomycosis diagnosed by transbronchial lung biopsy

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1. Introduction

Pulmonary actinomycosis is one of the rare, slowly-progressing infectious diseases [1,3,4]. Although some specific clinical features have been reported in the literature [2,5], its diagnosis requires bacterial evidence and characteristic pathological findings. However, it is difficult to make a diagnosis with flexible bronchoscopy. We report on a case of pulmonary actinomycosis for which we performed flexible bronchoscopy and were subsequently able to make a diagnosis through pathological examination.

2. Case report

The patient was a previously healthy 73-year-old man who had been experiencing left chest pain for several days. The pain subsequently worsened, so he visited a primary care clinic and underwent chest radiography. It revealed left pleural effusion and a consolidation in the left upper lung. He underwent a chest tube insertion and was treated with clindamycin but the consolidation remained after the treatment. We subsequently performed flexible bronchoscopy but it was impossible to make a diagnosis. Three months later, the consolidation had worsened so we performed another bronchoscopy. Finally, we were able to diagnose the consolidation as pulmonary actinomycosis, and to treat the condition appropriately. Pulmonary actinomycosis is a rare and difficult condition to diagnose. There are many conditions with similar clinical features, such as tuberculosis, fungal infections, lung abscesses, and lung malignancy. Respiratory physicians should consider the possibility of pulmonary actinomycosis when investigating patients with persistent pulmonary infiltrations. Early diagnosis and correct treatment may lead to a good prognosis and prevent unnecessary surgery.

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of complicated effusion and underwent chest tube insertion into the left thoracic cavity (Fig.1). Additionally, we administered 600 mg of clindamycin twice daily for 14 days. In spite of the treatment, the consolidation in the left upper lung remained. A chest CT scan confirmed the consolidation with an air bronchogram and a cavity in the left upper lobe. Flexible bronchoscopy was performed in order to make a diagnosis of the consolidation though nothing particular was noted during this procedure. Gram stain, Ziehl-Neelsen stain, polymerase chain reaction for *Mycobacterium tuberculosis*, and cultures for common bacteria, acid-fast bacilli, and fungi were all negative. A transbronchial lung biopsy (TBLB) was performed in apicoposterior segment of left upper lobe (B1/2) but we were unable make a diagnosis of the lesion. We planned a follow-up chest radiography examination and the patient was discharged from hospital.

Three months after discharge, the consolidation in the left upper lung had worsened (Fig.1) and we again tried to investigate its etiology. Physical examination findings were still normal. The previously existing consolidation in the left upper lung had worsened on chest CT, showing marked expansion in the left B1/2 (Fig.2), and the left plural effusion had decreased. Hemogram results were normal. The C-reactive protein level was <0.02 mg/dl and the erythrocyte sedimentation rate was 3 mm per hour. Aspergillus antigen and cryptococcal antigen were both negative and β-D-glucan was 19.4 pg/ml. Flexible bronchoscopy was performed again. A Gram stain of bronchoalveolar lavage (BAL) showed profuse polymorphonuclear cells with a few GNR and GPR, and cultures grew *Streptococcus constellatus/milleri*. The biopsy specimen from the left B1/2 showed a mass of bacteria in the center with neutrophil infiltration, which was a round basophilic mass with a radiating arrangement of eosinophilic clubs on the surface (Fig.3). Grocott stain of the specimen showed filamentous bacteria. There was no malignancy in the specimen. Due to the characteristic findings of the pathological examination, the patient was eventually diagnosed with pulmonary actinomycosis.

Oral sultamicillin administration was initiated but this was changed to high-dose intravenous penicillin therapy, which was the usual method of treatment for actinomycosis, 35 days after starting antibiotics. Eighteen million units of penicillin per day were given for 4 weeks followed by oral therapy with amoxicillin. Four months after starting antibiotics, the consolidation in the left upper lung had improved without any side effects of amoxicillin. According to the conventional therapy, treatment with oral amoxicillin was continued for twelve months. His condition remained good on follow-up every 3 months.

### 3. Discussion

Actinomycosis is a chronic suppurative infection caused by *Actinomyces* species, most frequently *Actinomyces israelii*, a gram-positive anaerobic saprophytic organism in the oral cavity that is considered to be a branching filamentous bacterium. It is...
characterized by the formation of multiple abscesses, draining sinuses, and abundant granulation tissue [1,4]. Pulmonary actinomycosis usually leads to the development of chronic pneumonia with or without associated pleural effusion. Cheon et al. have reported that chronic segmental air-space consolidations which contain low-attenuation with peripheral enhancement and adjacent pleural thickening are typical CT findings of pulmonary actinomycosis [5]. However, thoracic actinomycosis shares many similar features with other conditions such as tuberculosis, bacterial or fungal pneumonia and lung carcinoma.

Pulmonary actinomycosis is thought to be caused by aspiration of oral debris containing organisms that normally inhabit the oral cavity. Several studies have reported that the underlying conditions in actinomycosis patients include dental caries, periodontitis, diabetes and alcoholism. Other studies have reported that there is a higher incidence of pulmonary actinomycosis in patients with underlying respiratory disorders, such as emphysema, chronic bronchitis and bronchiectasis. Therefore, it is important to evaluate the patient’s underlying status.

In the actinomycosis patient, there is usually a mild leukocytosis, predominantly polymorphonuclear, and the erythrocyte sedimentation rate (ESR) and C-reactive protein (CRP) may be moderately raised. The laboratory tests reflect the nonspecific inflammation. In this case, it is not clear that serum inflammatory responses were negative in spite of the extensive consolidation and pleural effusion.

It is difficult to make a diagnosis of pulmonary actinomycosis for the following reasons. First, Actinomyces are difficult to culture because cultures require brain/heart-enriched agar and the organisms grow best at a temperature of 37 °C in an atmosphere of 6–10% ambient carbon dioxide [1]. Moreover, cultures of Actinomyces should be observed for up to 21 days to allow for adequate growth. In our case, the left pleural effusion may have been the finding that was associated with actinomycosis. Correct techniques for collecting and delivering tissue specimens are important. Second, the histological diagnosis requires the presence of actinomyces filaments or sulphur granules in purulent matter from infected tissue. However, Actinomyces induces thick inflammatory granulation around it and biopsies by bronchoscopy have not usually been successful. Mabeza et al. summarized a number of cases of pulmonary actinomycosis from the preceding two decades and reported that more than 50% of patients were diagnosed by surgery while fewer than 20% were by bronchoscopy [2]. Even if sulphur granules are present in purulent matter, thoracotomy is often performed to exclude the diagnosis of lung carcinoma because lung carcinoma may be co-existent with pulmonary actinomycosis. Therefore the diagnosis requires a combination of several factors, including a positive culture and demonstration of sulphur granules from infected tissue, correlation with the clinical and radiological features, and the response to antibiotic treatment.

Mabeza et al. [2] emphasized that the main principle of treatment is the use of high-dose intravenous penicillin for a long duration, and that generally 18–24 million units of penicillin per day are given for 2–6 weeks followed by oral therapy with penicillin V or amoxicillin for 6–12 months. In the present case, we initially administered clindamycin for 14 days which is normally effective in actinomycosis. However, since we decided to follow the classical treatment in the literature, the effect of short-term clindamycin treatment could not be determined in this subject.

We were able to make our diagnosis by bronchoscopy and start the appropriate treatment. Although actinomycosis is a rare condition compared to malignancy, investigation by bronchoscopy might prevent both the considerable physical morbidity and unnecessary surgery associated with delayed diagnosis.

Conflict of interest statement

The authors do not have any conflict of interest

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References

[1] R.A. Smego Jr., G. Foglia, Actinomycosis. Clin. Infect. Dis. 26 (6) (1998) 62–63, 1255–61; quiz.
[2] G.F. Mabeza, J. Macfarlane, Pulmonary actinomycosis, Eur. Respir. J. 21 (3) (2003) 545–551.
[3] S.H. Heo, S.S. Shin, J.W. Kim, H.S. Lim, H.J. Seon, S.I. Jung, et al., Imaging of actinomycosis in various organs: a comprehensive review, Radiographics 34 (1) (2014) 19–33.
[4] S.M. Moskowitz, R. Shailam, E.J. Mark, CASE records of the Massachusetts general hospital, Case 25-2015. An 8-year-old girl with a chest-wall mass and a pleural effusion, N. Engl. J. Med. 373 (7) (2015) 657–667.
[5] J.E. Cheon, J.G. Im, M.Y. Kim, J.S. Lee, G.M. Choi, K.M. Yeon, Thoracic actinomycosis: CT findings, Radiology 209 (1) (1998) 229–233.