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Organizing pneumonia associated with *Mycobacterium tuberculosis* infection

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Abstract

Organizing pneumonia is an inflammatory lung disease involving the distal bronchioles, respiratory bronchioles, bronchiolar ducts, and alveoli. A number of viral and bacterial organisms have been identified as causative agents of organizing pneumonia. However, *Mycobacterium tuberculosis* has rarely been reported as a causative agent. Herein, we report our experience with two patients diagnosed with pulmonary tuberculosis, whose biopsies showed patterns associated with organizing pneumonia. Both patients showed positive results for bacteriological tests and presence of acid fast bacilli. Hence, we could successfully treat both patients with anti-tuberculosis medications. Our report suggests that *M. tuberculosis* infection could be added to the list of infectious conditions associated with organizing pneumonia.

Introduction

Organizing pneumonia is an inflammatory lung disease involving the distal bronchioles, respiratory bronchioles, bronchiolar ducts, and alveoli. A number of viral and bacterial organisms, including *Mycoplasma pneumoniae* and the herpes virus, have been identified as infectious causes of organizing pneumonia [1]. However, *Mycobacterium tuberculosis* has rarely been reported as a causative factor of organizing pneumonia. Herein, we describe two cases of patients diagnosed with pulmonary tuberculosis that presented as organizing pneumonia patterns in their biopsies.

Case Report

Case 1

A 78-year-old woman with no previous significant medical history presented with a 4-week history of cough with sputum production. A chest radiograph showed multifocal consolidation in the right upper, right lower, and left lower lung fields (Fig. 1A). High-resolution computed tomography of the chest showed multifocal consolidation in the right upper, right lower, and left lower lobes, with small nodules (Fig. 1B). The bronchoscopic washing specimens were negative for the acid fast bacilli (AFB) smear; however, polymerase chain reaction (PCR) for *M. tuberculosis* showed positive results. Percutaneous needle aspiration biopsy was also performed at the right upper lobe. The pathological findings showed interstitial fibroblast infiltration with collagen depositions and multiple foci of fibroblastic plug, obstructing the air spaces. These findings corresponded to an organizing pneumonia pattern (Fig. 1C).

She was started on anti-tuberculosis treatment comprising once daily doses of 225 mg of isoniazid, 450 mg of rifampicin, 825 mg of ethambutol, and 1200 mg of pyrazinamide, without systemic steroid treatment, as the PCR for *M. tuberculosis* was positive. She responded very well to treatment, and the extent of the pulmonary opacities in the chest radiography decreased by the 2-month follow-up (Fig. 1D). After 2 months, *M. tuberculosis* without drug resistance was identified in a tuberculosis

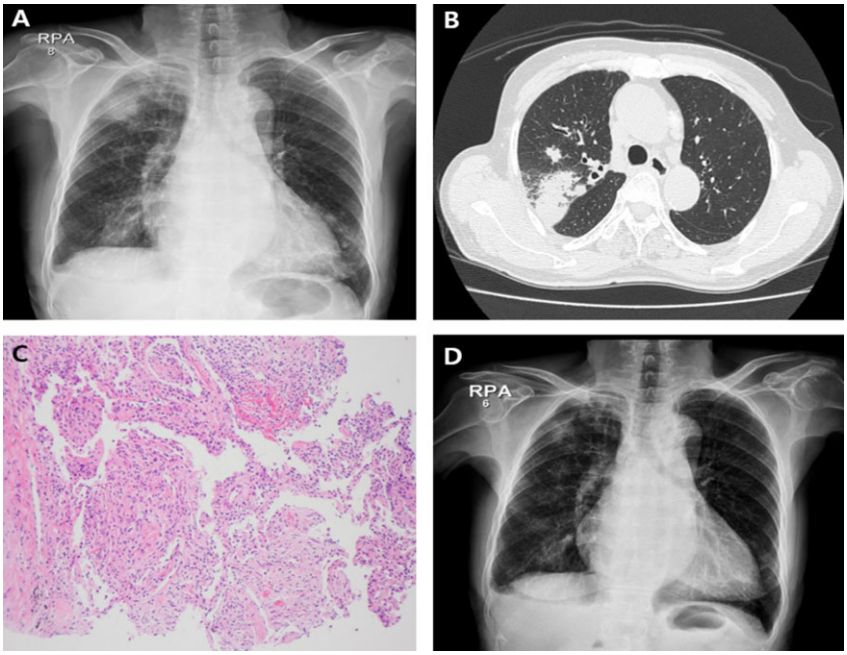

Figure 1. In case 1, (A) chest radiography showed multifocal consolidation in the right upper, right lower, and left lower lung fields on admission. (B) High-resolution computed tomography showed multifocal consolidation in the right upper, right lower, and left lower lobe with small nodules. (C) Percutaneous needle aspiration lung biopsy revealed interstitial fibroblast infiltrations with collagen depositions and multiple foci of fibroblastic plug, obstructing air spaces (hematoxylin and eosin stain ×100). (D) Follow-up chest radiography after a 2-month steroid treatment showed a decreased extent of patch consolidation in both lung fields.

culture and drug sensitivity test. Following completion of the 6-month anti-tuberculosis drug regimen, her symptoms and radiologic findings had significantly improved.

Case 2

A previously healthy, non-smoking 75-year-old woman presented to our hospital with chief complaints of cough with yellowish sputum production and chest pain of 1-month duration. A chest radiograph showed a consolidation in the right upper lung field (Fig. 2A), and high-resolution computed tomography of the chest showed ground-glass opacities and multifocal consolidation with air bronchogram in the posterior segment of the right upper lobe (Fig. 2B). Bronchoscopy with transbronchial lung biopsy was performed at the posterior segment of the right upper lobe. The bronchoscopic washing specimen was positive for an AFB smear but was negative for the *M. tuberculosis*-specific PCR. The transbronchial lung biopsy specimen revealed interstitial fibroblastic infiltrations with interstitial thickening and several intra-alveolar fibrinoid materials (Fig. 2C). These pathological findings corresponded to an organizing pneumonia pattern.

She was started on anti-tuberculosis medication comprising once daily doses of 300 mg of isoniazid, 450 mg of rifampicin, 800 mg of ethambutol, and 1000 mg of pyrazinamide, without systemic steroids, as the AFB stain was positive. She responded well to treatment; the extent of the pulmonary consolidation in the chest radiography decreased at the 2-month follow-up (Fig. 2D). We replaced isoniazid with moxifloxacin (400 mg once daily) after identifying isoniazid-resistant tuberculosis in a tuberculosis culture and drug sensitivity test. After 8 months of the aforementioned anti-tuberculosis therapy, there was an interval improvement in the right upper lobe consolidation.

Discussion

Organizing pneumonia is a pulmonary inflammatory process characterized by the presence of granulation tissue that fills the distal bronchioles, respiratory bronchioles, bronchiolar ducts, and alveoli. The pathogenesis of organizing pneumonia is that of an inflammatory lung disease, rather than of a fibrosing process, such as that seen in interstitial pneumonia [2, 3]. Thus, the majority of patients with organizing pneumonia generally respond to steroid therapy [1]. However, we should suspect that unresolved pneumonia with the histological features of organizing pneumonia might have resulted from organization of any other type of bacterial or viral infection.

One of the common causes of organizing pneumonia is infection. A variety of unrelated miscellaneous infectious pathogens have been reported to cause organizing pneumo-

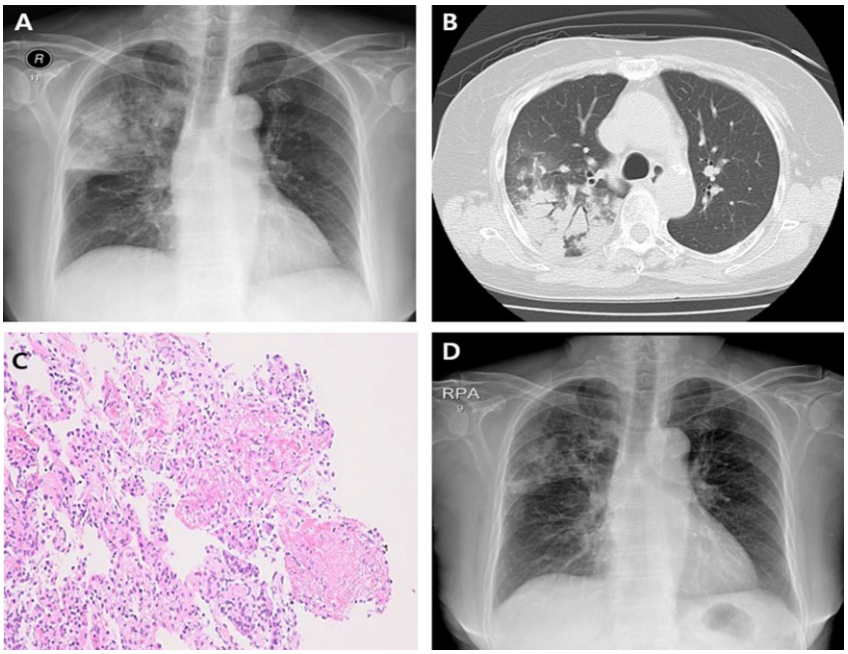

Figure 2. In case 2, (A) chest radiography demonstrated multifocal consolidation with an air bronchogram in the right upper lung field on admission. (B) High-resolution computed tomography revealed multifocal consolidation with air bronchogram and ground-glass opacities in the posterior segment of the right upper lobe on admission. (C) Transbronchial lung biopsy revealed a few interstitial fibroblastic infiltrations with interstitial thickening and several intra-alveolar fibrinoid materials (hematoxylin and eosin stain ×100). (D) Follow-up chest radiography after 2-month anti-tuberculosis treatments showed a decrease of patch consolidation in the right lung field.

nia, including both bacteria and viruses [1]. *M. tuberculosis* may also be considered as a cause of organizing pneumonia. Hsieh and Lin recently reported a case of pulmonary tuberculosis presenting as organizing pneumonia [4]. Histological analysis of the specimen yielded the typical histological features of organizing pneumonia, and isoniazid-resistant tuberculosis was identified in a tuberculosis culture. Kim et al. found that a patient with symptoms and signs compatible with pulmonary tuberculosis had patchy consolidation in the periphery of the lung and the lower lung zones, as demonstrated on chest radiographs [5]. Histological analysis of the specimen yielded the typical histological features of organizing pneumonia. Furthermore, *M. tuberculosis* was identified in an AFB culture. The patient's clinical symptoms and radiologic findings responded well to corticosteroid therapy and anti-tuberculosis medication; however, the report was limited by the fact that it can be difficult to determine whether clinical improvement was due to tuberculosis medication or steroid therapy.

Our report indicates tuberculosis could be an infectious cause of organizing pneumonia, particularly due to the fact that our patients were successfully treated with anti-tuberculosis medications only. Our patients were diagnosed with organizing pneumonia associated with *M. tuberculosis* by both lung biopsy and microbiological examinations for tuberculosis. Therefore, we presume that tuberculosis induced organizing pneumonia patterns at the same site through inflammation as both patients were successfully treated using only anti-tuberculosis medication. Although this may be a rare situation, we conclusively assert that pulmonary tuberculosis should be considered as a differential diagnosis when the histology suggests organizing pneumonia.

Disclosure Statements

No conflict of interest declared.

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

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