Findings on cryptogenic organizing pneumonia: a case report and literature review

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Abstract
A 70-year-old man presented to our hospital because of a cough with bright red blood for 1 month. A chest computed tomography (CT) scan showed that there was a patchy, dense shadow below the pleura of the upper lobe of the left lung. This shadow was approximately 2.7 x 2.2 cm in size, with rough edges, adjacent pleural traction, and localized thickening. Percutaneous pulmonary needle biopsy was performed under CT guidance. Morphological features were characterized by multifocal centrilobular distribution of fibromyxoid polyps of granulation tissue in the lumen of distal airspaces and small bronchioles. These findings supported the diagnosis of focal cryptogenic organizing pneumonia. The patient was then treated with ceftazidime and prednisone. After this treatment, the patient visited the clinic and complete resolution of his respiratory symptoms and nearly complete resolution of the mass on chest CT were observed. The findings in our case provide clinical experience to help with the diagnosis of cryptogenic organizing pneumonia, which is difficult to diagnose.

Keywords
Cryptogenic organizing pneumonia, percutaneous pulmonary needle biopsy, ceftazidime, prednisone, lungs, granulation tissue

Introduction
Organizing pneumonia (OP), formerly named bronchiolitis obliterans, is a clinical, radiological, and histological entity that is classified as an interstitial lung disease.\(^1\) This disease may be idiopathic and of an...
unknown etiology and may also have many etiologies, such as inflammatory infections, drug responses, pulmonary infarction, pleural lesions, tumor chemotherapy agents, connective tissue disease, and organ transplantation.²⁻⁵ Idiopathic OP of unknown etiology is called cryptogenic organizing pneumonia (COP) and secondary organizing pneumonia has a known etiology. The pathology of COP includes inflammatory cell infiltration, hyperplasia of interstitial fibrous tissue with increased fibroblast proliferation, and formation of granulation tissue in the alveolar space.⁶ Because the symptoms of COP are atypical or obscured by other clinical conditions, COP is difficult to diagnose clinically and is usually confirmed by pathological biopsy. In the present report, we describe the clinical manifestations and diagnosis of COP in a 70-year-old man.

Case report
A 70-year-old man presented to a local hospital for treatment of a cough with bright red blood, which he had experienced for 1 month. A pulmonary infection was initially considered, and anti-infection treatment was provided, but the effect was poor. The patient then visited the outpatient department of our hospital for treatment. A chest computed tomography (CT) examination showed a shadow in the upper lobe of the left lung (Figure 1). The patient was initially believed to be suffering from a pulmonary infection, but the symptoms did not greatly improve after antibiotic treatment. Because an abnormal lesion in the upper left lobe was found on a chest CT examination, we planned to screen for lung cancer after considering the patient’s advanced age and symptoms. On admission, the patient’s rectal temperature was 37.4°C and his heart rate was 88 beats/minute. The respiratory rate was 20 breaths/minute and blood pressure was 180/100 mmHg. A pulmonary exam showed clear bilateral breath sounds without rales or rhonchi. No obvious abnormalities were detected during pulmonary and abdominal examinations. Laboratory examinations showed that the patient had a white blood cell count of 3.96 × 10⁹/L with 61.6% neutrophils, a hemoglobin level of 131 g/L, and a platelet count of 278 × 10⁹/L. His erythrocyte sedimentation rate was 22 mm/hour (slightly increased) and a t-cell spot test for tuberculosis infection was negative. Electrolytes, creatinine levels, liver function, and urine analysis results were normal. No acid-fast bacilli
were found in a sputum smear, and growth of normal respiratory flora was detected in the sputum culture. A CT scan performed on admission showed that, below the pleura of the upper lobe of the left lung, there was a patchy, dense shadow approximately $2.7 \times 2.2$ cm in size, with rough edges, adjacent pleural traction, and localized thickening (Figure 1). Additionally, a bronchial shadow was observed in the lower portion of the lesion.

The patient was still coughing up sputum with dark blood. On the second day after admission, emergency electronic bronchoscopy was performed after the necessary blood samples were taken. Bronchoscopy showed that the bronchial mucosa in the upper lobe of the left lung was swollen and no new organisms were found. Bronchoalveolar lavage fluid collection and transbronchial biopsy were performed in the upper lobe of the left lung (posterior apex segment), and these showed nonspecific inflammation and no evidence of a malignant tumor. Percutaneous pulmonary needle biopsy was then performed under CT guidance, and tissue samples were collected for cytological acid-fast staining and pathological examinations. The morphological features of the tissue samples were characterized by a multifocal centrilobular distribution of fibromyxoid polyps of granulation tissue in the lumen of distal airspaces and small bronchioles. This finding was associated with mild lymphocytic bronchiolitis and alveolar septal infiltration of lymphocytes and plasma cells (Figure 2), which was consistent with the appearance of organizing pneumonia. Therefore, the diagnosis of focal COP was made.

After the diagnosis of focal COP, the patient was started on intravenous ceftazidime and oral prednisone. When the patient had no hemoptysis and airway secretions were reduced, ceftazidime was discontinued. The initial dose of prednisone was 0.5 mg/kg/day. After 4 weeks, this dose was gradually reduced according to the condition, and the total course of treatment was 6 months. After treatment, the patient visited the clinic and complete resolution of his respiratory symptoms and nearly complete resolution of the mass on chest CT were observed (Figure 3).

This was an individual case report with no involvement in clinical or animal research. The requirement for ethical permission was waived according to the statements regarding the application of ethical permission by the Ethical Committee of the First Affiliated Hospital of Nanchang University. Written consent was obtained from the patient for publication of his medical data, including images.

**Discussion**

OP was described as a pathological entity in the 1980s. Focal COP is an unusual entity that may generate images similar to malignant lesions, such as bronchogenic carcinoma. The clinical manifestations of COP are mainly fever, cough, excess sputum, chest and back pain, and other respiratory symptoms. Severe cases are accompanied by chest tightness, shortness of breath,
and dyspnea. COP can also be found by routine physical examinations without clinical symptoms. The imaging findings of this condition are complex and usually include pulmonary nodules, lung infiltration, consolidation, and banded shadows along the pleura. High-resolution CT can more accurately display the pathological characteristics of pulmonary nodules than conventional CT, which is helpful for the differential diagnosis of pulmonary nodules.\textsuperscript{10} The pathology of COP is characterized by inflammatory cell infiltration, interstitial fibrous tissue and fibroblast proliferation, and granulation tissue filling alveolar cavities.\textsuperscript{6,11} In COP, absorption of alveolar exudate, fibrous tissue hyperplasia of the alveolar wall, invasion of the alveolar cavity, and further development of fibrosis occur, which are accompanied by chronic inflammatory cell infiltration. Because of the patchy distribution of COP, it is difficult to diagnose on the basis of bronchoscopic biopsy specimens. Confidently diagnosing COP is difficult without performing a surgical lung biopsy. Kohno et al.\textsuperscript{9} described 18 patients with focal COP, among whom 10 were diagnosed on the basis of transbronchial biopsy. Two of the 18 patients showed complete resolution of the mass on imaging, though the treatment administered and the follow-up duration were unclear. Another study\textsuperscript{12} described 12 patients who were diagnosed with COP. The clinical complaints predominantly included shortness of breath, dyspnea on exertion, and cough with a duration of 1 to 14 weeks before presenting to their pulmonologist. All patients were treated with oral steroids, ranging from 40 to 120 mg/day, for longer than 2 months. Five patients showed radiographic resolution of their infiltration, and six patients had persistent or progressive disease at follow-up. Our patient showed considerable improvement in symptoms and pulmonary imaging findings after steroid and antibiotic therapy. However, a higher dose and a longer duration of systemic corticosteroid therapy to prevent relapse in patients with COP are still controversial.\textsuperscript{13–15}

In conclusion, COP has a wide variety of clinical manifestations, and it is difficult to accurately diagnose by only using symptoms and imaging examinations. Currently, the main diagnostic method for COP still relies on pathological biopsy through pulmonary puncture. This case report provides clinical experience to help with the diagnosis of COP. We recommend that in cases of suspected focal COP in the appropriate clinical setting, a trial of systemic

![Computed tomography scan after treatment with corticosteroids. Computed tomography shows almost complete resolution of the left upper lobe mass (arrowheads in a and b).](image_url)
corticosteroid therapy may help to avoid an invasive procedure.

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Declaration of conflicting interest
The authors declare that there is no conflict of interest.

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