

CASE REPORT

Mechanized Pneumonia Secondary to Legionella Infection with Diarrhea as the First Manifestation: a Case Report

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SUMMARY

Background: Legionella is a Gram-negative bacterium, and Legionella pneumonia is an atypical pneumonia, clinically similar to *Streptococcus pneumoniae* or other bacterial pneumonia, with respiratory symptoms as the most common clinical manifestation, but very few patients have a predominantly GI symptom presentation, which often leads to delayed treatment; timely and effective standardized treatment has a good prognosis, and individual patients can develop mechanized pneumonia. Therefore, we report a case of Legionella infection with diarrhea as the first manifestation secondary to mechanized pneumonia.

Methods: bronchoscopy, percutaneous lung aspiration biopsy, infection pathogen macrogenomics next-generation assay (mNGS).

Results: The patient was examined by bronchoscopy and NGS was performed suggesting the presence of Legionella and poorly absorbed by the treated pulmonary lesion condition. Therefore, we further improved the pathology of percutaneous lung puncture biopsy suggesting the presence of mechanized pneumonia and gave the patient symptomatic treatment.

Conclusions: For severe pneumonia with non-respiratory symptoms as the first manifestation, we need to clarify the infecting pathogen as early as possible, and we also need to evaluate the anti-infective efficacy in a timely manner. After a full course of treatment with active pathogen coverage and imaging suggesting poor absorption, bronchoscopy or percutaneous lung biopsy should be perfected in a timely manner to obtain pathological tissue to further clarify the condition.

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KEYWORDS

legionella infection, organizing pneumonia, Coxiella burnetii, bronchoscopy, percutaneous lung aspiration, next-generation sequencing

CASE REPORT

A 55-year-old middle-aged male was admitted to the hospital with the main cause of diarrhea for 1 week and fever for 3 days. The patient started to have diarrhea with no apparent cause 1 week before admission, with a thin stool, the color of which could not be described by the patient and his family, about 2 times/day, and was treated with self-administered medication (specific medication and dosage unknown), and the diarrhea re-

solved after treatment. Three days before admission, he had a fever with no obvious cause, with a maximum temperature of 39.5°C, accompanied by muscle and joint pain, without any special treatment, no headache, no chest pain, no dyspnea or other discomfort. The patient had a previous history of "hypertension" for more than 2 years, the maximum blood pressure value was not known, no regular treatment was given, and blood pressure was not monitored. The patient denied any history of food or drug allergy. On admission: temperature: 39.0°C pulse: 112 breaths/minute, respiration: 22 breaths/minute blood pressure: 112/65 mmHg, coarse breath sounds in both lungs, wet rales can be heard in the right lower lung. After admission, the laboratory tests related to infection indicators were completed: CRP 371.21 mg/L (reference value 0 mg/L - 8 mg/L), PCT 14.58 ng/mL (reference value 0 ng/mL - 0.05 ng/mL), fibrinogen 10.83 g/L (reference value 2 g/L - 4 g/L) and routine blood tests: WBC 9.55×10^9 /L (reference value 4×10^9 /L - 10×10^9 /L), NEU 9.22×10^9 /L (reference value 1.8×10^9 /L - 6.3×10^9 /L), biochemical tests: potassium 3.44 mmol/L (reference value 3.5 mmol/L - 5.5 mmol/L), sodium 132.9 mmol/L (reference value 135 mmol/L - 145 mmol/L), chloride 88.5 mmol/L (reference value 96 mmol/L - 106 mmol/L), calcium 1.85 mmol/L (reference value 2.25 mmol/L - 2.75 mmol/L), and phosphorus 0.64 mmol/L (reference value 0.97 mmol/L - 1.61 mmol/L). Chest CT scan showed scattered multiple patchy flocculent shadows in both lungs, predominantly in the lower lobe of the right lung, with some localized solid lung tissue, and inflammatory lesions were considered (Figure 1, 2). We initially diagnosed severe pneumonia, so the patient was given empirical antibiotic therapy: intravenous (IV) imipenem cistatin with a dose of 2 g three times a day combined with intravenous (IV) moxifloxacin with a dose of 0.4 g once daily. In addition, due to the presence of psychiatric symptoms in the patient, we did not exclude the presence of intracranial infection, and no significant abnormalities were seen after perfecting cranial CT and lumbar puncture. The patient was treated with anti-infection for 48 hours, but still had recurrent fever, during which relevant tests such as virus series, G test, GM test, sputum smear, sputum culture, and blood culture were all suggestive of negativity, and finally no pathogenic bacteria were detected. With the consent of the patient and family, we perfected the bronchoscopy, and microscopically a large amount of yellow mucous sputum was seen in the right lower lobe, anterior basal segment and dorsal segment, and TB-DNA and external NGS were performed by lavage three times in this area. TB-DNA test indicated negative and no Mycobacterium tuberculosis infection, and external NGS examination indicated the presence of Legionella pneumophila with a relative abundance of 92.59%. Therefore, we adjusted the antibiotic regimen: Oral intake doxycycline with a dose of 0.1 g twice a day combined with intravenous (IV) moxifloxacin with a dose of 0.4 g once daily. After 10 days of anti-infection treatment, the patient's infec-

tion index was reviewed: CRP 1.68 mg/L (reference value 0 mg/L - 8 mg/L), PCT 0.14 ng/mL (reference value 0 ng/mL - 0.05 ng/mL), but the review of chest CT indicated scattered multiple inflammatory lesions in both lungs, mainly in the lower lobe of the right lung, and some local solid lung tissue did not show significant changes compared with before (Figure 3, 4). In order to further clarify the nature of the lesions, we performed CT-guided percutaneous lung aspiration, and the pathology of the lower lobe of the right lung after the aspiration biopsy suggested chronic inflammation of a few lung tissues, with lymphocyte and plasma cell infiltration and foamy histiocytes, considering the presence of mechanized pneumonia, which we finally diagnosed as mechanized pneumonia secondary to Legionella infection (Figure 5, 6). Therefore, the treatment regimen was adjusted to doxycycline tablets 0.1 g orally 2/day combined with clarithromycin tablets 0.25 g orally 2/day, during which methylprednisolone tablets 12 mg orally 2/day were also given. Three weeks later, the patient's repeat chest CT scan showed that the inflammatory lesion in the right lower lung was absorbed more than before, and the patient was discharged after subsequent improvement and adhered to the glucocorticoid maintenance therapy.

DISCUSSION

Legionella was identified during an investigation of a major pneumonia outbreak in 1976 by members of the American Legion attending an annual meeting in Philadelphia [1]. Legionella pneumonia is an important cause of hospital-acquired infections and respiratory disease outbreaks [2] and usually presents as a rapidly progressive and severe form of pneumonia. In addition, the mortality rate of Legionella infection is approximately 10% and up to 27% in patients who do not receive adequate antibiotic therapy at the time of admission [3]. Recent studies have identified Legionella as one of the four most common microbial causes of CAP leading to hospitalization [4], accounting for 2% to 15% of patients with severe community-acquired pneumonia requiring hospitalization [5,6]. Among these, Legionella pneumophila was the most common species isolated, followed by Legionella bovis, Legionella dubliniensis, Legionella miltiorrhiza, and Legionella Long Beach [7]. NGS testing in this patient suggested the presence of Legionella pneumophila.

The incubation period of Legionella infection is approximately 2 - 14 days and the prodromal symptoms are nonspecific; patients may present with headache, muscle pain, malaise, and anorexia. Except in some immunocompromised patients, fever is usually present and is usually accompanied by relative bradycardia, hypophosphatemia or elevated serum ferritin levels [8]. High risk factors for Legionella infection are advanced age, smoking, immunocompromised, diabetes mellitus, and chronic lung disease [9]. Although, in this case, the patient

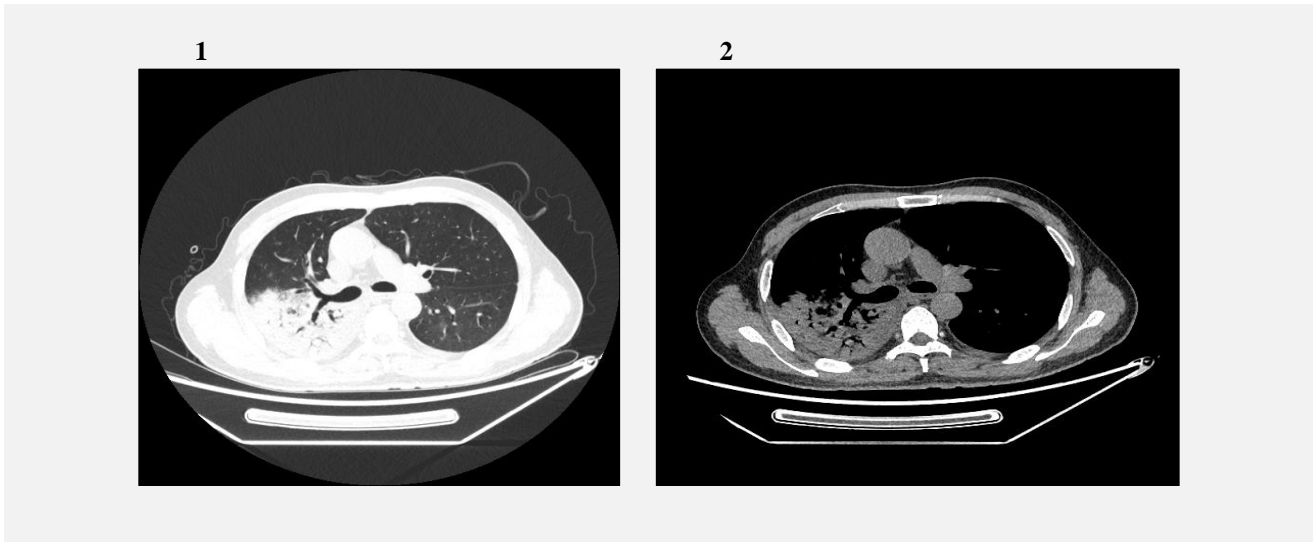


Figure 1 - 2. Scattered multiple patchy flocculent shadows in both lungs, mainly in the lower lobe of the right lung, with some localized solid lung tissue, considering inflammatory lesions.

Genus	Species	RPTM *	Relative abundance
Legionella spp.	Legionella pneumophila	2,748	92.59%

* - RPTM: The number of positive sequences contained in every 10 million detected sequences.

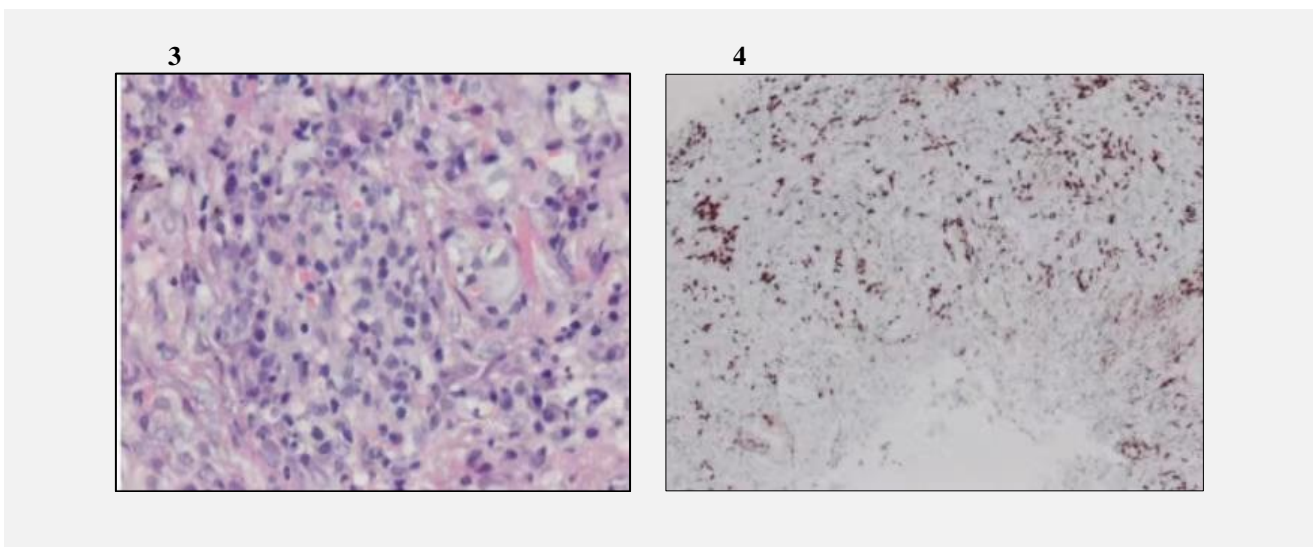


Figure 3 - 4. A puncture biopsy of the lower lobe of the right lung showed a little lung tissue with chronic inflammation, lymphocyte and plasma cell infiltration, and foamy histiocytes were seen, considering the presence of mechanized pneumonia.

initially presented with gastrointestinal symptoms as the first manifestation, we did not pay attention to it because he did not have high risk factors for Legionella infection and diarrhea symptoms improved after self-application of drugs, and at the same time, we did not see any abnormalities in the tests such as urine antigen test,

sputum culture, and respiratory pathogens after admission.

In most patients with Legionella infection, the most common CT presentation of Legionella pneumonia is multilobar or multisegmental consolidation and GGO [10]. Its poor chest imaging specificity often leads to

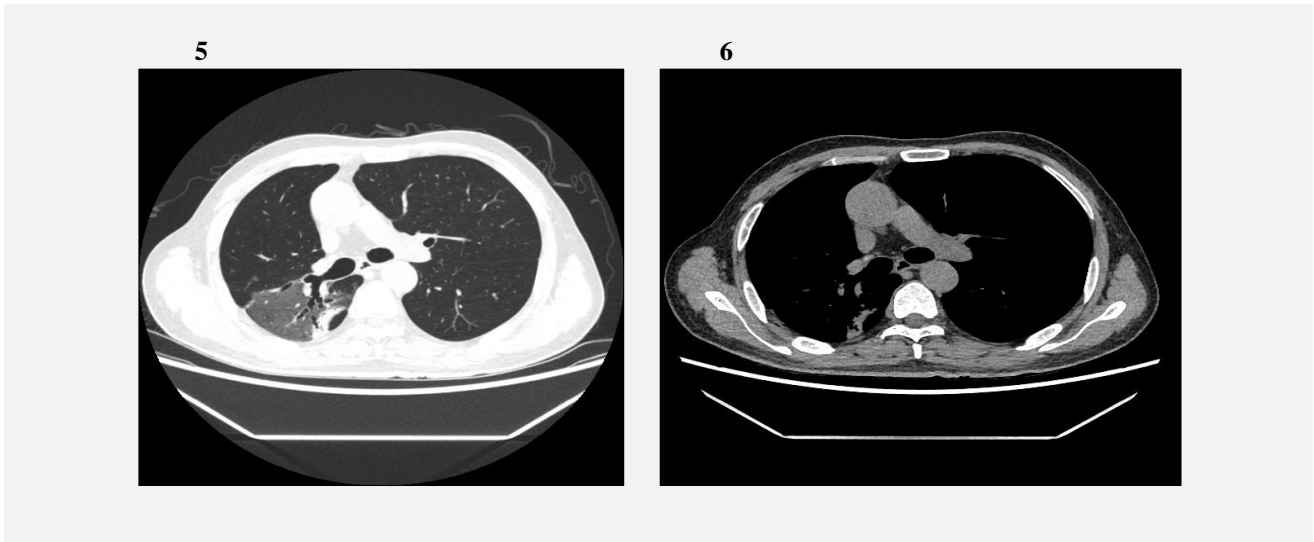


Figure 5 - 6. After three weeks of doxycycline tablets combined with clarithromycin, during which glucocorticoids were given, the inflammatory lesion in the right lower lung was absorbed more than before.

difficulties in differentiating it from bacterial pneumonia such as *Streptococcus pneumoniae*, so any diagnosis of *Legionella* relies on the use of specific laboratory tests [11,12]. For *Legionella* infections, sample culture of the lower respiratory tract remains the gold standard, but the sensitivity of cultured respiratory samples is 20 - 80% and varies with sample type, as well as being time-consuming [13]. In addition, urine antigen testing is now widely used as a first-line screening method due to its simplicity and low cost and the rapid availability of results, but it does not allow for definitive *Legionella* typing [14]. In this case, the patient was critically ill on admission with atypical symptoms, and we diagnosed *Legionella pneumophila* infection using electronic bronchoscopy and NGS testing of alveolar lavage fluid. The treatment of Legionnaires' disease is antibiotic treatment of infection and management of complications and any comorbidities. If appropriate antibiotics are given early, recovery is possible in the short term and rarely secondary to mechanized pneumonia [15,16]. However, in this case, due to the critical condition, the inflammatory lesions in the lungs were poorly absorbed by staged anti-infective therapy. Ultimately, we suggested the presence of mechanized pneumonia by percutaneous lung puncture biopsy pathology.

CONCLUSION

For severe pneumonia with non-respiratory symptoms as the first manifestation, we need to clarify the infecting pathogen as early as possible, and we also need to evaluate the anti-infective efficacy in a timely manner. For patients with poorly absorbed lung lesions, bronchoscopy or percutaneous lung biopsy should be per-

formed in a timely manner to obtain pathological tissue to further clarify the disease.

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Ethical Approval:

This study was approved by the ethics committee of The First People's Hospital of Zigong City. All procedures performed in studies were in accordance with the ethical standards. Informed consent was obtained.

Declaration of Interest:

No conflicts of interest.

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