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Case Report / Olgu Sunumu

A Case of Legionellosis Detected with Molecular Syndromic Panel and Review of the Literature

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Abstract

Legionella pneumophila is an obligate aerobic intracellular bacterium. It stains poorly with Gram staining and appears as a thin, pleomorphic Gram-negative bacillus. The organism grows poorly on routine culture media. It is distributed worldwide and causes both epidemic and sporadic infections. Transmission usually occurs through inhalation of aerosolized water droplets containing the bacteria.

Legionella pneumonia is more frequently observed in elderly and immunosuppressed patients and may present as community-acquired or hospital-acquired pneumonia with a severe clinical course. In this report, we present a case of legionellosis diagnosed using a molecular syndromic panel after the lack of response to β-lactam therapy and the presence of extrapulmonary findings raised suspicion of atypical pneumonia. A brief review of the recent literature was also conducted.

Keywords: *Legionella pneumophila*; pneumonia; polymerase chain reaction

Moleküler Sendromik Panel ile Tespit Edilen Bir Lejyonelloz Olgusu ve Literatür Taraması

Öz

L. pneumophila zorunlu aerob, hücre içi bir bakteridir. Gram boyası ile zayıf boyanır ve ince, pleomorfik Gram-negatif basil şeklinde görülür. Etken, rutin kültür besiyerlerinde zayıf ürer. Dünya genelinde yaygın olarak bulunur ve hem salgın hem de sporadik enfeksiyonlara neden olabilir. Bulaş genellikle bakteriyi içeren aerosolize su damlacıklarının inhalasyonu yoluyla gerçekleşir.

Legionella pnömonisi daha sık yaşlı ve immünsüprese hastalarda görülür ve ağır klinik seyirli toplum kökenli veya hastane kökenli pnömoni şeklinde ortaya çıkabilir. Bu çalışmada, β-laktam tedavisine yanıt alınmaması ve ekstrapulmoner bulguların atipik pnömoni şüphesini artırması üzerine moleküler sendromik panel ile tanı konulan bir lejyonelloz olgusu sunulmaktadır. Ayrıca güncel literatür kısaca gözden geçirilmiştir.

Anahtar kelimeler: *Legionella pneumophila*; pnömoni; polimeraz zincir reaksiyonu

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INTRODUCTION

L. pneumophila is a Gram-negative, aerobic intracellular bacillus. It is responsible for causing Legionnaires' disease and Pontiac fever. Legionnaires' disease is an atypical form of pneumonia, typically acquired in the community, although healthcare-associated infections can also occur. The bacteria are transmitted by inhaling or aspirating aerosolized water droplets contaminated with Legionella[1,2]. This organism is contracted from environmental reservoirs such as water sources or soil. L. pneumophila flourishes in warm aquatic conditions, optimally between 20°C and 42°C, promoting its proliferation and dissemination.

In this study, we present a patient who initially exhibited atypical clinical features and whose causative organism was not identified by conventional culture methods but was diagnosed with L. pneumophila through a syndromic panel test and urine antigen assay.

The patient's clinical status improved following appropriate treatment.

CASE REPORT

A 73-year-old male patient was admitted to the emergency department with complaints of gait disturbance, weakness, chills, frequent urination, and foul odor in the urine. His medical history included diabetes mellitus, hypertension, hemorrhagic cerebrovascular accident, benign prostatic hyperplasia, and chronic hepatitis B carrier status, for which he was receiving regular medical treatment. The patient had no fever or respiratory complaints in recent days. On physical examination, his general condition was moderate; he was conscious, oriented, and cooperative. Vital signs included blood pressure of 135/85 mmHg, pulse of 92 beats/min, body temperature of 36.7°C, and oxygen saturation of 97% on room air.

No acute pathology was detected in the cranial computed tomography (CT) performed in the emergency service. Laboratory tests revealed white blood cell count of 18,000/mm^3, CRP: 218 mg/L, BUN: 25 mg/dL, creatinine: 0.66 mg/dL, and sodium: 132 mmol/L (hyponatremia). Urinalysis performed at admission revealed 99 leukocytes per high-power field and leukocyte esterase positivity (+3). A urine culture was obtained simultaneously prior to the initiation of empirical antibiotic therapy; however, no bacterial growth was detected. Empirical intravenous ceftriaxone (2 g/day) therapy was initiated with a preliminary diagnosis of urinary tract infection. On the second day of hospitalization, the patient developed a fever (38.5°C) and deterioration in his clinical condition, and therefore, antibiotic treatment was changed to meropenem. On the fifth day, a productive cough developed, and a sputum sample was sent to the microbiology laboratory, suggesting a lower respiratory tract infection. The sputum sample was cultured on sheep blood agar, Eosin Methylene Blue (EMB) agar, and chocolate agar (bioMérieux, France) and incubated at 37°C in a CO_2 incubator for 72 hours; however, there was no growth other than Candida colonization. There was no growth in the blood and urine cultures.

The patient's sample was first tested using the BioFire FilmArray Pneumonia Panel (BioFire Diagnostics, bioMérieux), which was positive for L. pneumophila. Subsequently, the urinary Legionella antigen test was performed and was also positive.

After microbiological diagnosis, antibiotic treatment was changed to intravenous levofloxacin. Due to the development of

respiratory symptoms, thoracic CT was performed and demonstrated consolidation in the left upper lobe and nodular areas with ground-glass density in the right upper lobe. (Figure 1). Hyponatremia continued to be detected in biochemical tests. After eight days of intravenous levofloxacin (750 mg/day), the patient showed significant clinical and laboratory improvement and was discharged on oral levofloxacin to complete a 14-day course. He was referred to the infectious diseases clinic for follow-up and control.

Figure 1. Axial chest CT images demonstrating pulmonary findings. (A) Diffuse ground-glass opacities and consolidation in the left lung. (B) Patchy opacities with bronchovascular distribution in the left lung at a different level.

Written informed consent was obtained from the patient for the publication of the clinical information and accompanying images included in this case report.

DISCUSSION

Legionellosis accounts for approximately 2-15% of community-acquired pneumonias, and the mortality rate can be as high as 10-30% if undiagnosed[3]. This case is important in terms of atypical initial symptoms, rapid clinical deterioration, and the role of early molecular diagnostic methods.

The incubation period for L. pneumophila infection often spans from 2 to 10 days following contact with polluted water sources. Typical manifestations of legionellosis encompass weariness, fever, cough, myalgia, dyspnea and headache. Certain symptoms, including nausea, vomiting, diarrhea, and confusion, heighten clinical suspicion for legionellosis. Radiographic findings are variable but frequently demonstrate patchy, fluffy, or unilobar infiltrates with a tendency toward consolidation.

Compared to other bacterial pneumonias, sputum production, chest pain, and pleural effusions are less commonly observed[4,5].

Diagnosis of Legionella infection can be validated using immunohistochemical staining or molecular methods in respiratory samples, including sputum, bronchoalveolar lavage (BAL) and tracheal aspirate. Bronchoalveolar lavage is the most recommended sample for polymerase chain reaction (PCR). Over 15 serogroups of L. pneumophila have been found, with serogroups 1, 4, and 6 responsible for human disease; serogroup 1 is the predominant pathogenic agent, accounting for at least 80% of recorded cases of L. pneumophila pneumonia. Urine antigen testing utilizing immunochromatography is a readily accessible, rapid diagnostic assay for L. pneumophila. Nonetheless, the existing assay exclusively evaluates L. pneumophila serogroup1.

Sputum culture is regarded as the gold standard for diagnosing legionellosis. Culturing the fastidious L. pneumophila necessitates the use of buffered charcoal yeast extract agar (BCYE). The sensitivity of sputum culture is markedly diminished in patients on antibiotic treatment; thus, PCR has high specificity and sensitivity and provides rapid diagnostic results. Serological analysis of serum identifies acute and convalescent anti-Legionella antibodies. The microagglutination assay is often employed to support retrospective identification of infection or to confirm an acute episode by evaluating convalescent-phase serum samples.

The diagnosis of Legionella pneumonia may be difficult to establish. According to Cunha et al., six laboratory abnormalities serve as valuable indicators and predictors of legionellosis. These

include an erythrocyte sedimentation rate (ESR) exceeding 90 mm/h or a C-reactive protein (CRP) level above 180 mg/L, serum ferritin concentrations reaching twice the upper normal limit, creatine phosphokinase (CPK) elevations to at least double normal values, as well as the presence of microscopic hematuria, hypophosphatemia, and hyponatremia[6]. In the presented case, CRP, sodium levels, ESR, and radiographic findings were consistent with the literature. Routine sputum cultures showed no growth, but L. pneumophila was detected by syndromic molecular testing, and the urinary antigen test for L. pneumophila serogroup 1 was positive. This study highlights that rapid molecular diagnostic tests are effective tools for identifying L. pneumophila and distinguishing it from other atypical pneumonia-causing pathogens. Multiplex molecular panels, such as the BioFire FilmArray Pneumonia Panel, enable rapid (approximately 1 hour) and highly sensitive detection[7]. According to the literature, the incidence of Legionella pneumonia in hematology and oncology patients may reach up to 10%[8]. The clinical findings and laboratory results of our patient are consistent with previously reported L. pneumophila cases in the current literature, and these findings are summarized in Table 1.

Table I: Reported cases of Legionella pneumophila in the literature

Case	Characteristics	Diagnosis method	Year
1	A 64-year-old woman was admitted with dysarthria, syncope, and a hyperintense lesion in the splenium of the corpus callosum.	-Legionella urine antigen test	2025[9]
2	66-year-old woman with a history of smoking who was admitted with increasing dyspnea and fatigue.	-PCR* in sputum	2024[10]
3	A 48-year-old man presented with a dry cough and shortness of breath. Chest computed tomography demonstrated bilateral ground-glass opacities, while COVID-19 PCR testing was negative. The patient also exhibited marked rhabdomyolysis accompanied by acute renal failure.	- Legionella urine antigen test -PCR* (Ezplex® Respiratory Pathogen Real-time PCR Kit, Republic of Korea) in deep tracheal aspirate	2022[11]
4	A 73-year-old patient experienced persistent fatigue for five consecutive days. He was undergoing treatment with docetaxel and prednisolone as part of his chemotherapy regimen for prostate cancer.	-Legionella urine antigen test -SARS-CoV-2 test (+) in BAL**	2021[12]
5	70-year-old male patient, hypertensive and ex-smoker, hospitalized for dyspnea, malaise, fever, and abdominal pain.	-The **BioFire® FilmArray® Pneumonia Molecular Panel** in BAL	2023[13]

PCR Polymerase chain reaction*

*BAL** Bronchoalveolar Lavage*

β-lactam antibiotics are ineffective in Legionella infections because the bacteria can produce β-lactamase and are protected from the effects of these agents due to their intracellular localization[14]. Macrolides and fluoroquinolones are effective agents against Legionella. In clinical guidelines, levofloxacin or azithromycin are among the first-line treatment agents[14,15]. In our patient, based on the positive result of the syndromic panel test, we switched from extended-spectrum β-lactam antibiotics to levofloxacin, and clinical improvement was achieved.

The use of sterile water in nebulizers and routine maintenance of cooling towers are important measures to reduce bacterial proliferation. Hospitals commonly monitor water supplies and perform decontamination when needed. Effective disinfection methods include heating water to 70–80°C, copper-silver ionization, and UV light. Hyperchlorination is ineffective due to Legionella's chlorine resistance and chlorine breakdown at high temperatures.

In conclusion, L. pneumophila is a significant cause of atypical pneumonia that often presents

with nonspecific clinical features and can result in serious morbidity and mortality if diagnosis is delayed. Given the limitations of conventional culture methods, rapid and sensitive diagnostic tools such as syndromic panel tests offer substantial advantages. As demonstrated in this case, early diagnosis combined with appropriate antibiotic therapy can lead to clinical improvement. Timely diagnosis requires close collaboration among clinicians, microbiologists, and radiologists. Antimicrobial therapy, directed by infectious disease experts, must be commenced without delay, considering individual patient risks and regional resistance trends. Furthermore, identifying infection sources and risk factors enables health authorities to implement effective prevention and control strategies. These measures include proper maintenance and disinfection of water systems, routine environmental sampling and testing for Legionella, timely reporting and investigation of suspected cases or outbreaks, and ensuring the administration of appropriate antimicrobial therapy. Implementing such strategies can markedly decrease the morbidity and mortality linked to Legionnaires' disease.

Informed Consent: Written informed consent was obtained from the patient for the purpose of this case report.

Conflict of Interest: The authors declared no conflicts of interest.

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