



Case report



A CASE OF LEGIONNAIRES' DISEASE IN 70-YEAR-OLD PATIENT: DELAYED DIAGNOSIS AFTER EXPOSURE TO CONTAMINATED HOTEL SHOWER

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ABSTRACT:

Legionellosis, an acute infectious disease, often manifests as Legionnaires' disease with severe pneumonia. Transmission occurs via inhalation of *Legionella*-contaminated aerosols generated by contaminated water systems, with increased susceptibility in older adults, immunocompromised individuals, and those with comorbidities. Standard antibiotics for community-acquired pneumonia, such as β -lactams and aminoglycosides, are ineffective against *Legionella* due to its intracellular nature, highlighting the need for prompt and accurate diagnosis.

In this study, we report a case of a 70-year-old woman presenting to the Emergency Department with weakness, cough, fever, palpitations, and nausea. Initially admitted to the Cardiology department for heart rhythm disorders, subsequent chest X-ray revealed bilateral pneumonia. Empiric antibiotic therapy with cephalosporins and monobactams was initiated but yielded no clinical improvement. As her condition deteriorated with signs of multi-organ involvement, she was transferred to the intensive care unit. PCR testing confirmed *Legionella pneumophila*, and targeted antibiotic therapy was initiated, resulting in the progressive improvement of the patient's condition.

This case underscores the importance of considering *Legionella* in patients with epidemiological data of exposure to a potential contaminated environment, particularly patients with unspecific and various symptoms but present clinical data indicative of lung involvement. Early diagnosis and appropriate treatment are essential to prevent short-term and long-term complications and improve outcomes.

Keywords: legionnaires' disease, exposure, contaminated environment, legionella pneumonia, antibiotic therapy,

BACKGROUND:

Legionellosis was first described in 1976 in Philadelphia, Pennsylvania, USA and is an acute infectious disease that can occur in two clinical forms: Legionnaires' disease is a respiratory infection, with the main clinical manifestation being severe pneumonia, which incubation period varies from 2 to 10 days, with an average of 7 days. It often presents with very high fever, muscle pain, shortness of breath, dry cough, hemoptysis, chest pain, sleep disturbance, disorientation, and others. Among the extrapulmonary symptoms, gastrointestinal (diarrhea and abdominal pain) and neurological (headache, disorientation, emotional lability) are also relatively common [1, 2, 3, 4]. The second clinical form is Pontiac fever, with flu-like symptoms - muscle aches, fever, fatigue, headache, a short incubation period of 1-2 days and a duration of about a week. It ends with full recovery [4].

Any water system that operates in the temperature range between 25-45°C and is able to generate water aerosols has the potential to cause disease. The presence of sediment, sludge, scale, etc., together with the biofilm in water supply systems, provides favorable conditions for the growth of *Legionella*. The mechanism of transmission is through inhalation of *Legionella* bacteria in aerosols generated by contaminated water systems. Of primary importance are facilities generating water aerosols in large public buildings (administrative buildings, hotels, hospitals, holiday resorts and sanatoriums), hot and cold water supply systems (showers, taps, pipes, tanks, etc.), air conditioning systems, respiratory therapy equipment, decorative fountains, waterfalls, swimming pools and air humidification facilities in parks [4]. The susceptibility to *Legionella* pneumonia is about 10%, with the risk group being older people and patients with various concomitant

diseases or those on immunosuppressive therapy. Risk factors include long-term smoking, chronic respiratory diseases, leukemia, neoplasia, diabetes, and chronic diseases [4]. *Legionella* grows within phagocytic cells such as alveolar macrophages. Since β -lactams and aminoglycosides possess low intracellular activity, the Infectious Diseases Society of America recommends fluoroquinolones or macrolides as first-line treatment for *Legionella pneumophila* [5, 6].

CASE DESCRIPTION:

A 70-year-old woman developed a headache and general weakness at the beginning of July 2024. On 11. 07. 2024 manifests with elevated body temperature and cough.

Two days later, due to increased asthenia, heart palpitations, nausea, followed by weakness in the left arm, she visited the Emergency Department of the University Hospital "Plovdiv", Plovdiv. There, a new-onset atrial fibrillation with tachycardia was registered, which required hospitalization in the cardiology department. The patient has the following comorbidities - arterial hypertension, congestive heart failure, mild tricuspid and mitral valve insufficiency, hyperuricemia.

During her stay in the Cardiology Department, the bronchopulmonary and toxicoinfectious syndrome persisted. In order to clarify the diagnosis, an X-ray was performed, which revealed bilateral pneumonia. Antibacterial treatment with Cefoperazone (2 g/d) and Imipenem (4x500 mg) was initiated but without significant impact on the patient's condition. During the stay, elevated serum glucose values were also recorded and she was diagnosed with diabetes mellitus. Due to worsening condition and signs of multi-organ involvement, the patient was transferred to the Department of Anesthesiology, Resuscitation and Intensive Care of the Plovdiv University Hospital. There, a nasopharyngeal probe was taken and tested using a respiratory panel for PCR diagnostics by the hospital laboratory, which tested positive for *Legionella pneumophila*. Treatment with intravenous Levofloxacin 500 mg and oral Azithromycin 500 mg was initiated on the 16th of July. A consultation with an infectious disease specialist was conducted, and on the 17th, she was transferred to the University Hospital "St. George", Clinic of Infectious Diseases.

Upon admission to the clinic, the epidemiologically focused anamnesis reports that from June 22nd to June 23rd, 2024, she resided in a spa hotel in a winter resort complex and visited the SPA area. Due to insufficient accommodation in the hotel, the patient and her colleague were accommodated in an attic room, which is not con-

stantly used. Upon arrival, the patient used the bathroom and shower first.

From the physical examination, the patient was found to be in an impaired general condition, alert and in clear consciousness. Chest examination concluded an auscultatory finding of fine crackles bilaterally in the lung bases. The patient also presented signs of respiratory failure - oxygen saturation was measured at 90% during oxygen delivery with a flow rate of 6 L/min through nasal cannulas and a respiratory rate of 22 breaths/minute. From the cardiovascular status, arrhythmic heart activity with a frequency of 100 beats/min was detected, the arterial blood pressure was measured at 100/60 mmHg. The neurological status was without abnormalities, with a negative meningeal irritation syndrome.

Initial laboratory tests revealed elevated liver enzymes, CRP, urea (serum), serum glucose, LDH, as well as leukocytosis, hypoproteinemia, hypoalbuminemia (Table 1). Blood gas analysis showed hypoxemia. A chest X-ray showed left-sided pneumonia. PCR for COVID-19 was negative. A urine sample was taken and sent to the National Center for Disease Control and Prevention for etiological clarification. On the 18th of July 2024, a rapid notification was received from the National Center for Disease Control and Prevention for a confirmed case of Legionnaires' disease.

In the Clinic of Infectious Diseases, the initiated antibacterial treatment with Levofloxacin and Azithromycin was continued, pathogenetic therapy with intravenous infusions of crystalloid solutions was also carried out, anticoagulant therapy with Clexane (6000 IU), mucolytic with Bromhexine (3x8 mg), also vitamin C, vitamin B1, vitamin B6, Human Albumin 20%. After receiving a positive result from a microbiological examination of a throat swab for *C. albicans*, antifungal treatment with Fluconazol (100 mg) was also initiated.

For the duration of hospitalization, the described symptoms and syndromes gradually reversed, and the patient's condition improved. During the first days of the hospital stay, the patient needed oxygen supplementation with high oxygen requirements of up to 12 L/min, but by the fourth day of treatment, the respiratory failure was under control. The patient was discharged on the 25th of July 2024 after a 10-day course of antibacterial treatment.

Despite the improvement in the leading symptomatology, there is data of a prolonged convalescent period post-dehospitalization. A month and a half after the onset of the disease (early October), the patient reports a protracted asthenodynamic and consumptive syndrome - she has lost 12-13 kg since the onset of the disease, with persistent general weakness and reduced functional capacity.

She also reports maintaining high serum glucose levels during this period, as well as the occurrence of complications from the underlying diseases – worsening of mitral insufficiency and a period of prolonged arrhythmia. As of the 14th of Oct.2024, the patient reports improved general

condition regarding the cardiovascular system, as well as a return to normal daily activities and attendance at work. The patient no longer experiences shortness of breath, even with physical exertion. She is currently being actively monitored by a pulmonologist and cardiologist.

Table 1. Initial laboratory data.

Laboratory parameter	Level	Measurement unit	Reference ranges
Hemoglobin (HGB)	168	g/L	120-160
Red blood cell (RBC)	5.73	10 ¹² /l	3.9-5.3
Hematocrit (HCT)	0.52	L/L	0.36-0.47
White blood cell(WBC)	19.45	10 ⁹ /l	3.5-10.5
Platelet (PLT)	277	10 ⁹ /l	140-400
C-reactive protein (CRP)	190	mg/L	
Aspartate aminotransferase (AST)	43	U/L	0-36
Alanin aminotransferase (ALT)	43	U/L	0-35
Bilirubin (total)	9.1	µmol/L	3.4-20.21
Conjugated bilirubin	2.3	µmol/L	0.8-8.5
Gamma-glutamyl transpeptidase (GGT)	36	U/L	0-38
Lactate dehydrogenase (LDH)	942	U/L	230-460
Total protein	54	g/L	60-83
Albumin	27	g/L	35-52
Creatinine	75	µmol/L	44-96
Urea	12.7	mmol/L	2.6-7.2
Serum Sodium	140	mmol/L	136-151
Serum Potassium	4.2	mmol/L	3.5-5.6
Serum Chlorine	99	mmol/L	96-110

DISCUSSION:

Legionella infection is associated with two main factors: a history of exposure to potentially contaminated aerosols (it is important to ask whether the patient has used public baths, spa treatments, etc.) and the patient’s immune status (factors that compromise the patient’s immune defenses include age, smoking, chronic lung disease, cardiovascular disease, and kidney disease) [7, 8].

Legionella pneumophila can have a wide variety of clinical manifestations, and this should be considered when making the diagnosis. Symptoms (frequency) of Legionella pneumophila reported in previous studies in the United States include cough (67%), purulent sputum (27%), pleurisy (21%), myalgia (51%), headache (43%), digestive symptoms (19%), chills (59%), and confusion (25%) [9, 10]. Legionella pneumonia is also characterized by a lower frequency of purulent sputum (Legionella, 27%; pneumococcal pneumonia, 64%). Legionella pneumonia is asso-

ciated with bradycardia, hypoxemia, and elevated liver enzymes [9].

Researchers present a very interesting case of Legionella pneumonia in a 72-year-old man with no history of exposure to sewage from public baths or other sources. The patient presented with fever and chills. A urine antigen test for Legionella was negative, and a chest X-ray was suggestive of pneumonia. The patient was treated with intravenous ceftriaxone (2 g/day) for right-sided pneumonia and was intubated on day 1 because of poor oxygenation and a tendency to exacerbate to acute respiratory distress syndrome. The fever resolved after day 3 (36.4–36.9°C), and the patient was extubated on day 6. A positive sputum PCR test for Legionella (type 1) deoxyribonucleic acid (DNA) was performed on day 6, and therapy with levofloxacin and dexamethasone was initiated. After completing a 10-day course of levofloxacin, the patient’s symptoms were cured.

It is important to reevaluate the diagnosis and intervention in the treatment of cases in which β -lactam antimicrobials are ineffective or extrapulmonary symptoms are present, as in the present case, to administer new quinolone antimicrobials. [8]

The treatment was carried out in the clinical case we presented according to a similar model. Initially, treatment was started with Cefoperazone and Imipenem. Against this background, the patient's condition deteriorated, which necessitated her transfer to the intensive care unit. On day 4 of her admission to the hospital, *Legionella pneumophila* was confirmed and targeted antibacterial therapy with Levofloxacin and Azithromycin was started, which led to a gradual improvement in clinical indicators, symptom control and healing of the patient.

Timely diagnosis of atypical pneumonia, and in particular, caused by *L. pneumophila*, often poses a difficulty in clinical practice. The variety of clinical symptoms characteristic of the disease are not sufficiently indicative for the correct diagnosis - as are laboratory markers such as elevated inflammatory markers, presence of bacterial constellation, dyselectrolyteemia with hyponatremia [9, 11]. The described cases indicate that empirical antibacterial therapy of pneumonia acquired in the community is not successful in the presence of Legionnaires' disease. In community-acquired pneumonia, an improvement in the clinical course of the disease is expected 48-72 hours from the start of antibiotic treatment. In the absence of such, infection with *L. pneumophila* should be excluded, and the therapy should be adjusted if necessary.

The main anti-epidemic measures for legionellosis are aimed at identifying the reservoir of infection, the

routes and factors for the formation of water aerosol and carrying out disinfection. Measures for the prevention of legionellosis are aimed at securing water as the main reservoir and factor for the transmission of infection. For systematic water decontamination, chemical and/or physical methods are applied in combination with mechanical cleaning for the periodic removal of the formed rust and sediment. Periodic sanitation of water supply systems (showers, taps, pipes, tanks) and cooling facilities is carried out mandatory in hospital facilities, industrial enterprises and hotels. Systematic water control and periodic sanitation of water facilities, waterways of medical/dental equipment, as well as the water supply network of public buildings, hotels, etc. are important. [4, 10, 12, 13]

CONCLUSION:

In the presence of pronounced systemic symptoms dominating the clinical picture even before the symptoms of the bronchopulmonary system, poor physical findings and the presence of radiographic findings, especially in elderly patients and those with polymorbid conditions, Legionnaires' disease should be considered. Reassess the diagnosis and treatment of cases in which β -lactam antimicrobials are ineffective as therapy or extrapulmonary symptoms of the infection are present. To refine the treatment, it is recommended to support the diagnosis with a PCR panel and/or a urine antigen test to refine the treatment. It is extremely important to conduct an epidemiological study of each case and, in case of risk exposure, to test for the presence of *Legionella* in the water/waterways from showers, spa treatments, as well as any equipment that works with water and has the potential to form an aerosol.

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