



Case Report

A case of *Legionella* pneumonia after robot-assisted radical prostatectomy

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Abbreviations & Acronyms

CK = creatine kinase
CRP = C-reactive protein
CT = computed tomography
LDH = lactate dehydrogenase
LVFX = levofloxacin
Na = sodium
PIPC/TAZ = piperacillin/tazobactam
POD = postoperative day
WUH = Winthrop University Hospital

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Introduction: Postoperative *Legionella* pneumonia is very rare.

Case presentation: A 71-year-old male patient with prostate cancer (cT2bN0M0) underwent a robotic-assisted radical prostatectomy. On the 5th postoperative day, the patient developed chills and a fever of 39.2°C. Chest radiography revealed decreased permeability in the right middle lung field, leading to the diagnosis of postoperative pneumonia. Antimicrobial therapy was initiated immediately. Blood tests on postoperative day 10 revealed mild liver function abnormalities, electrolyte abnormalities, and a markedly elevated inflammatory response. *Legionella* pneumonia was suspected based on blood sample results and systemic symptoms, such as diarrhea and nausea. Furthermore, *Legionella* antigens were detected in the patient's urine, prompting further administration of levofloxacin. The patient's subsequent clinical course was favorable.

Conclusion: When bacterial pneumonia fails to respond to antimicrobial therapy and systemic symptoms develop, atypical pneumonia, caused by pathogens such as *Legionella pneumophila*, should be considered even in cases of postoperative pneumonia.

Key words: bacterial pneumonia, case report, *Legionella* pneumonia, postoperative infection, robot-assisted radical prostatectomy.

Keynote message

Legionella pneumonia is often difficult to diagnose and can be life-threatening if not treated promptly and appropriately. Atypical pneumonia should be considered when postoperative pneumonia fails to respond to antimicrobial therapy for bacterial pneumonia.

Introduction

Although the members of the *Legionella* genus are naturally soil dwellers, more than 20 species have been shown to be pathogenic in humans, with *Legionella pneumophila* being the most isolated clinically. The incidence of *L. pneumophila* infection in Japan is increasing yearly, tending to be higher from August to November. The bacterium predominantly affecting males in their 50s and those over 70, and its demographic distribution is bimodal. *Legionella* bacteria are not transmitted from person to person; however, they multiply in wet environments, such as bathtubs, hot water supply facilities, and humidifiers, with inhalation serving as the primary mode of infection establishment in individuals. Clinically, reports indicate the efficacy of quinolones or macrolides as more suitable therapeutic options for *Legionella* infections.

Case presentation

Robot-assisted radical prostatectomy was performed on a 71-year-old man with prostate cancer. The patient's medical history included hypertension, hepatitis C, stroke, depression, and smoking 30 cigarettes daily for 50 years. On the 5th POD, the patient developed chills and a fever of 39.2°C. A catheter-associated urinary tract infection was suspected due to indwelling urinary catheter, and cefmetazole treatment was initiated, including the coverage of (extended-spectrum β -lactamase) EBSL-producing bacteria. Subsequently, oxygen saturation decreased to 88%, and chest radiography revealed decreased permeability in the right middle

lung field, leading to the diagnosis of postoperative pneumonia. As his general condition was good, antimicrobial therapy was changed to ceftriaxone; however, the fever persisted, and diarrhea and nausea appeared on the 7th POD. Considering the possibility of ileus and intra-abdominal abscess formation, thoracoabdominal CT was performed, which revealed mixed reticular and infiltrating shadows in the right middle lung field. A hematoma was suspected at the prostatectomy site; however, no abscess formation was observed (Fig. 1). The fever persisted for 9 days postoperatively, and the treatment was switched to PIPC/TAZ due to the involvement of *Pseudomonas aeruginosa* and bacterial resistance. However, blood tests on POD 10 revealed a spike in the inflammatory response (white blood cell (WBC) 11 000/ μ L; CRP 25.9 mg/dL), liver dysfunction (aspartate aminotransferase (AST) 87 U/L; alanine aminotransferase (ALT) 68 U/L), electrolyte abnormalities (Na 137 mmol/L; K 3.4 mmol/L; Cl 97 mmol/L), and elevated LDH levels (316 U/L). Based on the characteristic blood sample results (CRP 25.9 mg/dL; AST 87 U/L, ALT 68 U/L; Na 137 mmol/L; LDH 316 U/L), persistent systemic symptoms, such as nausea and diarrhea, which appeared on POD 7, and the inefficacy of β -lactam antimicrobials, *Legionella* pneumonia was strongly suspected. Consequently, a *Legionella* urinary antigen test was performed. A *Legionella* nucleic acid test was also conducted on the patient's sputum to rule out a preexisting infection, and a confirmed diagnosis of *Legionella* pneumonia was made the following day, prompting the addition of LVFX to the patient's antimicrobial regimen. The fever resolved on POD 12, and oxygen was no longer required on POD 14 (Fig. 2). PIPC/TAZ was discontinued on POD 14, and only LVFX was administered. Intravenous LVFX followed by oral LVFX

were administered for 14 days to complete the treatment. The patient was discharged on POD 24.

Discussion

Reports of postoperative *Legionella* pneumonia are rare. In this case, it was diagnosed 10 days postoperatively. *Legionella pneumophila* was likely an isolated case, as it was not reported from this hospital in the month before or after this case. However, the route of transmission is still unknown. Patient factors for the development of *L. pneumophila* infection include the following: male sex, over 50 years of age, smoking, surgery, intubation, nasogastric tube, ventilator management, immunocompromised status (post organ transplant, cancer carrier, on steroid treatment).^{1,2} Considering that the incubation period is 2–10 days, it was inferred that the patient was infected before admission and that the infection developed postoperatively.

Most *Legionella* pneumonia cases are caused by *L. pneumophila* serotype 1, with a mortality rate of approximately 27% if not adequately treated.³ Chills, myalgia, malaise, and upper respiratory tract symptoms characterize the clinical presentation of *Legionella*. Systemic symptoms include chest pain, diarrhea, and impaired consciousness. Laboratory findings include hyponatremia, elevated liver enzymes and LDH levels, and an increased inflammatory response. A definitive diagnosis of *Legionella* pneumonia is made by detecting *Legionella* antigens in urine, sputum culture, and sputum polymerase chain reaction. Urinary *Legionella* antigen testing is the most commonly used method because it provides rapid results. Formerly limited to detecting *L. pneumophila* serotype 1, new rapid urinary antigen tests could detect all *L. pneumophila* serotypes, from 1 to 15.

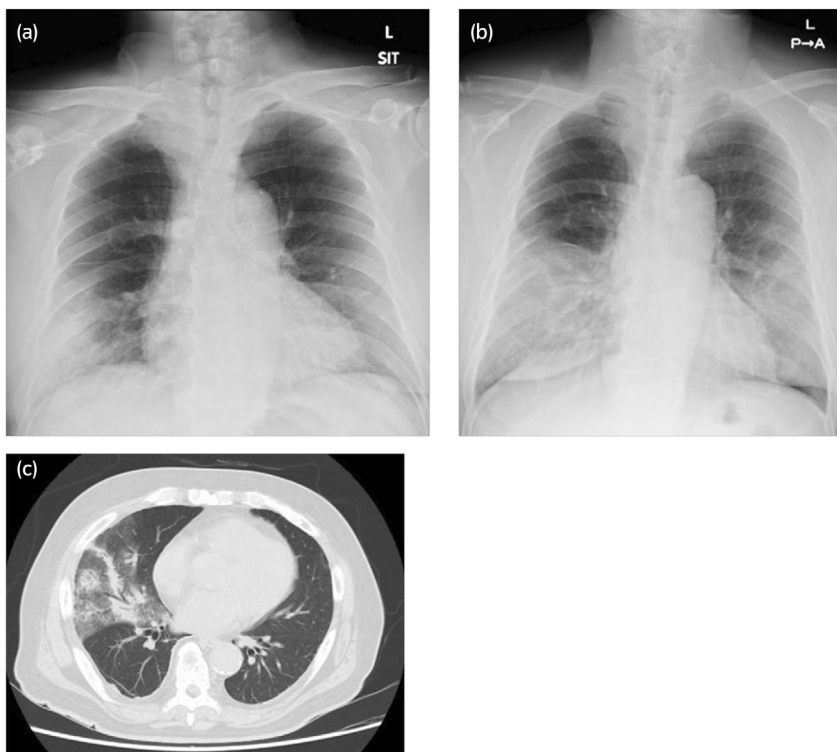


Fig. 1 The patient's chest radiographs (x-rays) and CT images on POD 6 and 9. (a) Chest x-ray on POD 6 reveals reduced right lower lung field permeability. (b) Chest x-ray on POD 9 reveals that the decreased permeability in the right lower lung field had worsened over the last 3 days. (c) Chest CT on POD 9 reveals a mixture of reticular and infiltrating shadows demarcated from the surrounding area.

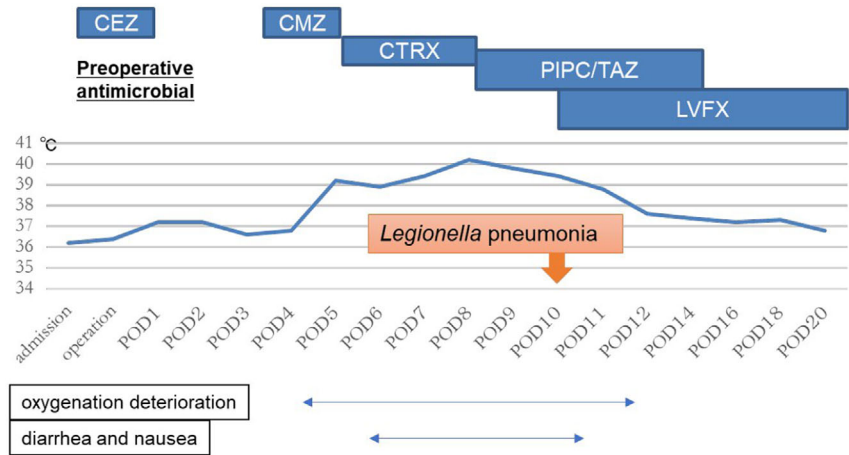


Fig. 2 The clinical course of the patient.

Diagnosis of *Legionella pneumonia* is often difficult, and numerous diagnostic methods have been proposed. The WUH scoring system⁴ was developed in 1998. Subsequently, diagnostic scores have been proposed by the WUH Weighted Point Modified System,⁵ Fiumefreddo *et al.*⁶ and Cunha *et al.*^{7,8} However, these are all foreign reports and diagnostic scores incorporating Japanese characteristics have only recently been reported. Saraya *et al.*⁹ reported a sensitivity of 36.3% and a specificity of 99% for three or more of the following: (i) relative bradycardia, (ii) Na ion <137 mmol/L, (iii) LDH >292 U/L, and (iv) CRP >21.0 mg/dL. Miyashita *et al.*¹⁰ reported a sensitivity of 93% and a specificity of 75% for three or more of the following criteria: (i) male sex, (ii) no cough, (iii) dyspnea, (iv) Na <134 mmol/L, (v) LDH >260 U/L, and (vi) CRP >18 mg/dL (Table 1). In the present case, *L. pneumophila* was strongly suspected, as it corresponded to 4/6 characteristics in the reports by Saraya *et al.* and Miyasita *et al.* Although postoperative *Legionella pneumonia* is extremely rare, the above diagnostic scoring system seems useful for

early diagnosing and treating postoperative pneumonia with poor response to antimicrobial agents.

Conclusion

We encountered a case of *Legionella pneumonia* that developed after robot-assisted radical prostatectomy. It is paramount to consider atypical pneumonia when postoperative pneumonia exhibits resistance to standard antibiotics, particularly when the symptoms and blood test results are atypical for normal pneumonia.

Author contributions

Takuhisa Nukaya: Conceptualization; data curation; formal analysis; investigation; methodology; project administration. Kiyohito Ishikawa: Formal analysis; project administration; writing – review and editing. Kiyoshi Takahara: Formal analysis; project administration; supervision; writing – review and editing. Masashi Takenaka: Writing – review and editing. Kenji Zennami: Writing – review and editing. Manabu Ichino: Writing – review and editing. Hitomi Sasaki: Writing – review and editing. Makoto Sumitomo: Writing – review and editing. Ryoichi Shiroki: Project administration; writing – review and editing.

Conflict of interest

The authors declare no conflict of interest.

Approval of the research protocol by an institutional reviewer board

Not applicable.

Informed consent

Not applicable.

Registry and the Registration No. of the study/trial

Not applicable.

Table 1 Scoring system for *Legionella pneumonia*

	Fiumefreddo <i>et al.</i> ⁴	Saraya <i>et al.</i> ⁷	Miyashita <i>et al.</i> ⁸
Temperature	>39.4°C	–	–
Male	–	–	Yes
Cough	–	–	No
Sputum	No	–	–
Dyspnea	–	–	Yes
Relative bradycardia [†]	–	Yes	–
Na (mmol/L)	<133	<137	<134
Phosphorus (mg/dL)	–	–	–
LDH (U/L)	>225	>292	>260
CK (IU/L)	–	–	–
CRP (mg/dL)	>18.7	>21	>18
Platelet (μ/L)	<17.1 × 103	–	–

[†]Relative bradycardia: In a febrile state, the heart rate increases by 8–10 beats/min for each degree above 38.3°C (101°F) body temperature. The heart rate must be lower than expected despite the increase in body temperature. Fiumefreddo *et al.*: less than two items, negative predictive value of 99.6%. Saraya *et al.*: three or more items, sensitivity, 36.3%, specificity, 99%. Miyashita *et al.*: more than three items, sensitivity 93%, specificity 75%.

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