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Opportunistic Pathogen Francisella philomiragia Pneumonia Associated with Near-drowning

Boğulayazma ile İlişkili Fırsatçı Patojen Francisella philomiragia Pnömonisi

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Abstract

Francisella philomiragia is a rare opportunistic pathogen that causes pneumonia and systemic infections in humans. There have been a few reports of *F. philomiragia* causing disease in humans, mainly in people with the chronic granulomatous disease, severe immunosuppression, or near drowning. We describe a 70-year-old diabetic man who almost drowned and got pneumonia from *F. philomiragia*. We also looked at other cases of *F. philomiragia* infections.

Keywords: *Francisella philomiragia, near-drowning, francisella pneumonia.*

Öz

Francisella philomiragia, insanlarda pnömoni ve sistemik enfeksiyonlar gibi çeşitli hastalıklara neden olan çok nadir görülen fırsatçı bir patojendir. Literatürde insanlarda hastalığa yol açan *F. philomiragia* olguları çok az sayıdadır ve çoğunlukla kronik granülomatöz hastalığı olan, ağır immünsupresif veya boğulmak üzere olan kişilerde bildirilmiştir. Bu makalede, 70 yaşında diyabeti olan bir erkek hastada suda boğulma sonrası gelişen *F. philomiragia* pnömonisini sunuyoruz ve *F. philomiragia* enfeksiyonlarına ilişkin çeşitli raporları gözden geçiriyoruz.

Anahtar Kelimeler: *Francisella philomiragia, boğulayazma, francisella pnömonisi.*

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Francisella philomiragia is an aerobic, gram-negative coccobacillus of the genus *Francisella. F. philomiragia* is a rare pathogen that causes pneumonia and other systemic infections in immunocompromised and near-drowning patients, unlike its more virulent sibling *Francisella tularensis* (1). Because of the low incidence of this bacterium in society and a lack of information about it, patient care can suffer from delayed diagnosis and treatment failure. It is potentially lethal, especially in patients with diabetes and renal failure who have treatment failure (2).

CASE

A 70-year-old male patient with a history of diabetes mellitus and hypertension was referred to our hospital from an external center. The patient had more than 60 years of smoking history and was taking amlodipine for hypertension and metformin, sitagliptin, and insulin glargine for diabetes. The patient was intubated, put in the intensive care unit for 15 days, and then referred to our hospital due to a general deterioration following his near drowning. In the arterial blood gas analysis during the first admission to the ICU, pH was 7.13 mmHg, PCo_2 was 32 mmHg, PO_2 was 54.6 mmHg, and HCO_3 was 23.6 mmol/L; the hemogram revealed leukocytosis (17,400 cells/mm^3), 93.2% neutrophils, hyponatremia (Na: 121 mmol/L), CRP, and procalcitonin were negative. In the follow-up in the ICU, the patient who developed acute renal failure (creatinine: 3.15 mg/dl, urea: 42 mg/dl) had bilateral opacities and blunted sinuses on a chest X-ray. When the patient's oxygen requirement decreased after receiving ampicillin-sulbactam treatment for 12 days, he was extubated and transferred to our hospital. In the first physical examination of the patient, a pale appearance was found on examination. The patient was afebrile, normotensive, and had no tachypnea (16 breaths/min). SpO_2 was 95% with nasal oxygen support at 5 L/min. On auscultation, respiratory sounds decreased, and bibasilar crepitation was heard. As the patient's hypoxia worsened and he began experiencing tachycardia attacks during the follow-ups, pulmonary embolism was suspected, and a CT pulmonary angiography was planned as a result of the desired tests (D-dimer: 2345 ng/mL, proBNP: 4407 pg/mL). A CT pulmonary angiography showed no embolism in the main pulmonary artery or subsegment arteries.

In the mediastinal window, lymph nodes with a fusiform configuration were seen, the largest of which was over one cm in short diameter (Figure 1a). In the parenchyma window, consolidation was observed in the left lung's upper lobe, inferior lingula segment, and lower lobe, consistent with pneumonia, in which air bronchograms were also observed. (Figure 1 b–f). Subpleural fine reticulation and band atelectasis were observed in the left lung. A bilateral pleural effusion was detected, which was more prominent on the left side. Following a recurrent fever (38.3°C) during service follow-up, two sets of aerobic and anaerobic blood cultures were obtained. The patient with a tendency to have an increased CRP value (CRP: 129 mg/L) was started on cefepime 3x2 g intravenous and trimethoprim/sulfamethoxazole 2x800/160 mg tablet treatment. Total parenteral nutrition was started due to the patient's loss of appetite and increased sleepiness. Cardiac and neurological evaluations were normal. The patient, who had been immobilized for a long time following ICU admission and had muscle atrophy, was scheduled for respiratory and extremities physiotherapy.

Trimethoprim/sulfamethoxazole and furosemide treatments were stopped after the patient experienced profound hyponatremia (114 mmol/L) on the sixth day of his therapy. Instead, 3% hypertonic fluid support was started. As a result of the 5-day incubation period, *Francisella philomiragia* growth was observed in the patient's blood culture (Figure 2). The patient's drug sensitivity could not be studied, so the decision was made to begin ciprofloxacin 3x400 mg intravenous therapy. The ciprofloxacin treatment lasted for ten days in the patient whose oxygen requirement decreased after treatment, whose fever did not recur, and whose infection markers regressed. Following the treatment for pneumonia, he was transferred to the physical therapy department for effective mobilization and exercise programs.

DISCUSSION

According to the literature, the taxonomy of *F. philomiragia* and *Francisella*, in general, is debatable. This microorganism was first reported in 1969 as *Yersinia philomiragia*, a new member of the Pasteurella bacterial group and a muskrat pathogen (3). However, because this microorganism has the same phenotype, fatty acids, and marked DNA structure as *Francisella tularensis*, it was later classified as a Francisella species and given the name *Francisella philomiragia* (4).

F. philomiragia differs from *F. tularensis* by some biochemical characteristics and DNA hybridization patterns, but both appear as small, nonmobile, aerobic gram-negative coccobacillus. Despite genetic similarities, *F. philomiragia* infection and *F. tularensis*-related diseases have different epidemiologies. Tularemia is usually spread through contact with infected animals and insects or by consuming contaminated freshwater or meat. Although no animal or arthropod vectors are involved in *F. philomiragia* infections, the infection is frequently associated with saltwater exposure. While most *F. tularensis* infections cause disease in healthy humans, *F. philomiragia* is an opportunistic pathogen (5,6).

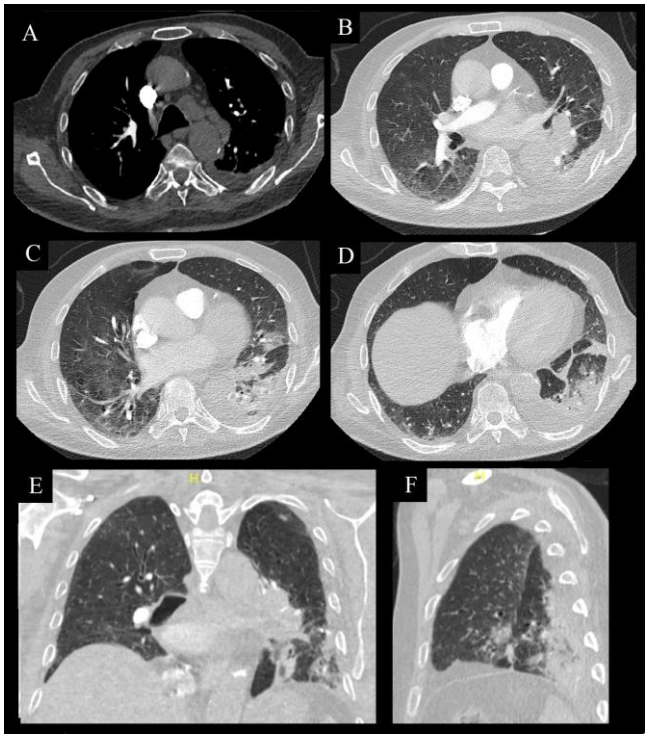

Figure 1: *CT pulmonary angiography mediastinal window reveals a fusiform left lower paratracheal lymph node and a subcarinal lymph node with a short diameter of over 1 cm* ***(a)****. In the axial section parenchyma window, there is pneumonic infiltration in the upper lobe lingular segment of the left lung and in the lower lobe, where air bronchograms are also monitored. There is parapneumonic effusion in the left lung as well as band atelectasis in the lower lobe basal* ***(b-d)****. In the coronal section parenchyma window, pneumonic infiltrations are seen in the left lung* ***(e)****. In the sagittal parenchyma window, nodular infiltration of the upper lingular segment of the left lung and pneumonic consolidation with an airbronchogram in the basal and posterior segments of the lower lobe of the left lung are observed in the neighborhood of an oblique fissure* ***(f)***

This microorganism's natural habitat is the aquatic environment (notably brackish and saltwater). Because *F. philomiragia*-caused human diseases are not nationally reportable, there are no reports on their incidence and prevalence (1).

Previous studies have revealed that chronic granulomatous disease, hematogenous malignancies (typically myeloproliferative neoplasms), kidney transplantation, and near drowning in saltwater are identified risk factors for *F. philomiragia* infection (6–8). Because it is most commonly isolated from people who have recently been exposed to water, it is assumed that contact with, ingestion, or inhaling contaminated water may expose individuals to the risk of infection. In our case, the patient had a history of near drowning, a risk factor for *F. philomiragia* bacteremia, and a history of uncontrolled diabetes mellitus, which can cause immunosuppression. In the few reported human cases, *F. philomiragia* infection mainly manifests as pneumonia, as in our case. The literature has also reported peritonitis, meningitis, abscess, and sepsis cases. The microorganism is typically isolated from blood cultures but has also been isolated from pleural fluid, lymph nodes, and lung samples. Patients typically experience recurrent, resistant fevers. In the early stages of *F. philomiragia* pneumonia, the thorax CT findings may show ground-glass nodules in the parenchyma. Nodular infiltration, consolidations, and parapneumonic effusion may be observed in the following days. Peribronchial lymphadenomegaly may be observed due to infection in the mediastinum (1,6,8).

There is no standard treatment for *F. philomiragia* infection, but beta-lactam-group antibiotics should be avoided because this microorganism produces beta-lactamase. *F. philomiragia* is generally sensitive to fluoroquinolones, aminoglycosides, and tetracyclines. One case of fever and pleuritis was reported to have resolved without antibiotic therapy; however, in most other cases, combined antibiotic therapy is commonly used (4,6,9).

When we look at the *F. philomiragia* cases reported in humans worldwide, we see that most cases come from the United States and Canada. One patient has been diagnosed with *F. philomiragia*, which originated in Turkey. A 24-year-old tourist with chronic granulomatous disease who was on a summer vacation in Turkey and was reported to have swum in the sea and taken a mud bath died of progressive pneumonia in the center, where he was hospitalized after returning from vacation with complaints of recurrent fever, cough, and sputum (10).

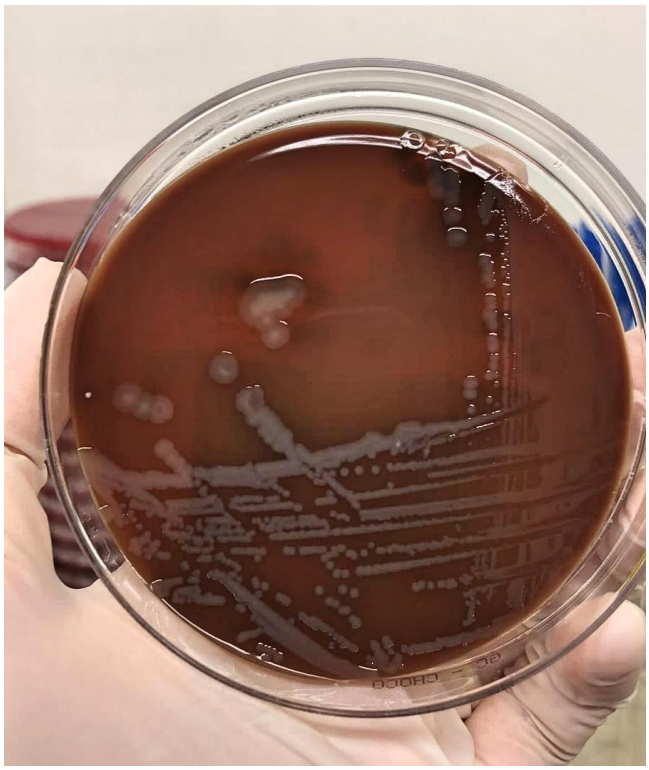

Figure 2: *White and shiny Francisella philomiragia colonization on chocolate agar*

In this case, we wanted to present a rare case of the opportunistic pathogen *Francisella philomiragia*, which was detected and successfully managed in a patient with uncontrolled diabetes with a history of near drowning. Finally, it should be noted that infection with the opportunistic pathogen *F. philomiragia* can result in recurrent fever and resistant pneumonia in individuals with established risk factors such as near-drowning, chronic granulomatous disease, or immunosuppression.

CONFLICTS OF INTEREST

None declared.

AUTHOR CONTRIBUTIONS

Concept - A.E., K.K., Ş.E.D., A.K., N.M.; Planning and Design - A.E., K.K., Ş.E.D., A.K., N.M.; Supervision - A.E., K.K., Ş.E.D., A.K., N.M.; Funding - A.K.; Materials - A.E., K.K.; Data Collection and/or Processing - Ş.E.D., K.K.; Analysis and/or Interpretation - A.K., Ş.E.D.; Literature Review - N.M.; Writing - K.K., Ş.E.D.; Critical Review - A.E., Ş.E.D., A.K.

REFERENCES

1. Relich RF, Humphries RM, Mattison HR, Miles JE, Simpson ER, Corbett IJ, et al. Francisella philomiragia bacteremia in a patient with acute respiratory insufficiency and acute-on-chronic kidney disease. J Clin Microbiol 2015; 53:3947-50. [CrossRef]
2. Shen Y, Cai R, Sun J, Dong X, Huang R, Tian S, et al. Diabetes mellitus as a risk factor for incident chronic kidney disease and end-stage renal disease in women compared with men: a systematic review and meta-analysis. Endocrine 2017; 55:66-76. [CrossRef]
3. Jensen WI, Owen CR, Jellison WL. Yersinia philomiragia sp. n., a new member of the Pasteurella group of bacteria, naturally pathogenic for the muskrat (Ondatra zibethica). J Bacteriol 1969;100(3):1237-41. [CrossRef]
4. Wenger JD, Hollis DG, Weaver RE, Baker CN, Brown GR, Brenner DJ, et al. Infection caused by Francisella philomiragia (formerly Yersinia philomiragia). a newly recognized human pathogen. Ann Intern Med 1989; 110:888-92. [CrossRef]
5. Hollis D, Weaver R, Steigerwalt A, Wenger J, Moss C, Brenner D. Francisella philomiragia comb. nov.(formerly Yersinia philomiragia) and Francisella tularensis biogroup novicida (formerly Francisella novicida) associated with human disease. J Clin Microbiol 1989; 27:1601-8. [CrossRef]
6. Mailman TL, Schmidt MH. Francisella philomiragia adenitis and pulmonary nodules in a child with chronic granulomatous disease. Can J Infect Dis Med Microbiol 2005; 16:245-8. [CrossRef]
7. Sicherer SH, Asturias EJ, Winkelstein JA, Dick JD, Willoughby RE. Francisella philomiragia sepsis in chronic granulomatous disease. Pediatr Infect Dis J 1997; 16:420-2. [CrossRef]
8. Kreitmann L, Terriou L, Launay D, Caspar Y, Courcol R, Maurin M, et al. Disseminated infection caused by Francisella philomiragia, France, 2014. Emerg Infect Dis 2015; 21:2260-1. [CrossRef]
9. Ender PT, Dolan MJ. Pneumonia associated with near-drowning. Clin Infect Dis 1997; 25:896-907. [CrossRef]
10. Friis-Møller A, Lemming LE, Valerius NH, Bruun B. Problems in identification of Francisella philomiragia associated with fatal bacteremia in a patient with chronic granulomatous disease. J Clin Microbiol 2004; 42:1840-2. [CrossRef]