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CASE REPORT

Delftia acidovorans pneumonia with lung cavities formation

Neumonia por Delftia acidovorans con formación de cavidades pulmonares

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Abstract

Case Description:

A 52-year-old female patient was admitted to our clinic with complaints of cough, sputum, fever and fatigue. The patient has been receiving immunosuppressive therapy for thrombocytopenic purpura for 5 years.

Clinical Finding:

Inspiratory crackles were heard on both hemithorax. Oxygen saturation measured with the pulse oximeter was 97%. Chest X-ray showed diffuse reticular opacities that were more prominent in the upper zones of both lungs. WBC counts were 17,600 mm3 and Platelet counts were 29,000 mm3. Thorax CT showed that there were many thin-walled cavities and millimetric nodules accompanied by ground-glass infiltrates in the upper and middle lobes. Gram staining of bronchial fluid, taken by bronchoscopy, revealed Gram-negative bacilli and intense polymorphonuclear leukocytes. The bacteria were defined as Delftia acidovorans by BD Phoenix automated system.

Treatment and outcomes:

The patient was hospitalized with suspicion of opportunistic pulmonary infections and cavitary lung disease. After the empirical treatment of intravenous piperacillin-tazobactam and oral clarithromycin, her clinical and radiological findings significantly regressed, and she was discharged with outpatient follow-up.

Clinical Relevance:

This is the first example of cavitary pneumonia due to Delftia acidovorans in an immunocompromised patient. We would like to emphasize that Delftia pneumonia should be considered in the differential diagnosis of pulmonary cavitary involvement in such patients.

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Palabras clave:
Delftia acidovorans, bacterias aerobicas gram-negativas, huesped immunocomprometido, pneumonia por bacterias, infecciones del tracto respiratorio,sonidos respiratorios, tos, Piperacilina, combinación Piperacilina Tazobactam, nodulos pulmonares multiples, enfermedad pulmonar interstitial

Conflicts of interest:
The authors declare that there were no conflicts of interest for the writing of this article

Resumen

Descripción del caso:

Una mujer de 52 años llegó a la clínica con tos, esputo, fiebre y fatiga. El paciente estuvo recibiendo terapia inmunosupresora durante 5 años para el tratamiento de la púrpura trombocitopénica.

Hallazgo clínico

Se escucharon crepitaciones inspiratorias en ambos hemitórax. La saturación de oxígeno fue del 97%. La radiografía de tórax mostró opacidades reticulares difusas que eran más prominentes en las zonas superiores de ambos pulmones. Los recuentos de leucocitos fueron de 17,600 mm3 y los recuentos de plaquetas fueron de 29,000 mm3. La TC de tórax mostró muchas cavidades de pared delgada y nódulos milimétricos acompañados de infiltrados vitrales en los lóbulos superior y medio. La tinción de Gram del líquido bronquial reveló bacilos gramnegativos y leucocitos polimorfonucleares. Las bacterias fueron identificadas como Delftia acidovorans.

Tratamiento y resultados

La paciente fue hospitalizado con una sospecha de infección oportunista pulmonar y enfermedad pulmonar cavitaria. Después del tratamiento empírico de piperacilina-tazobactam intravenosa y claritromicina oral, los síntomas y signos retrocedieron significativamente, y fue dada de alta con seguimiento ambulatorio.

Relevancia clínica

Este es el primer registro de neumonía cavitaria causado por Delftia acidovorans en una paciente inmunocomprometida. Enfatizamos que la neumonía por Delftia debe considerarse en el diagnóstico diferencial de la afectación de la cavidad pulmonar en tales pacientes.

Introduction

Although ITP was formerly used for idiopathic thrombocytopenic purpura, it is now used for pathologies that develop due to an immunological cause. But the autoantibodies are only diagnosed in 50-60% of patients[1]. The clinical process is usually longer in adults[1]. Treatment of ITP involves corticosteroids, intravenous immunoglobulins, anti-D, and rituximab (anti-CD20) that are used differentially during the acute and persistent/chronic phase of the disease. Splenectomy is predominantly considered for refractory adult patients in the chronic phase[1]. Our patient also had a history of splenectomy due to refractory thrombocytopenia.

Delftia acidovorans is an anaerobic, oxidase positive and Gram-negative generally non-pathogenic bacillus that can be cultured in MacConkey agar[2-5]. There are few case reports in the literature that have been reported to cause infection in humans[2,3]. In accordance with some case reports *Delftia acidovorans* can cause infective endocarditis, ocular infections, otitis media, peritonitis, urinary tract infections, empyema, and nosocomial bacteremia, including central venous catheter-related bacteremia in immunocompromised individuals[6]. According to our investigation, here we present the first example of cavitary and interstitial pneumonia caused by *Delftia acidovorans* in a patient who received immunosuppressive treatment due to ITP.

Case description

A 52-year-old female patient was admitted to our outpatient clinic with complaints of chest pain, cough, sputum dyspnea, and weight loss, which was started three weeks ago. The patient with diabetes mellitus was under immunosuppressive therapy for five years due to drug-resistant ITP. Our patient also had a history of splenectomy due to refractory thrombocytopenia. In the last year, the patient's treatment was daily 50 mg azathioprine and 4 mg methylprednisolone. On examination, the patient's temperature was 38° C. The respiratory rate was 25 min and the pulse rate was 95 beats/min. In auscultation, the inspiratory crackles were heard on both hemithorax. WBC counts were 17,600 mm^3 and platelet counts were 29,000 mm^3. Oxygen saturation measured by the pulse oximeter was 97%. Chest X-ray showed diffuse reticular opacities that were more prominent in the upper zones of both lungs (Fig. 1).

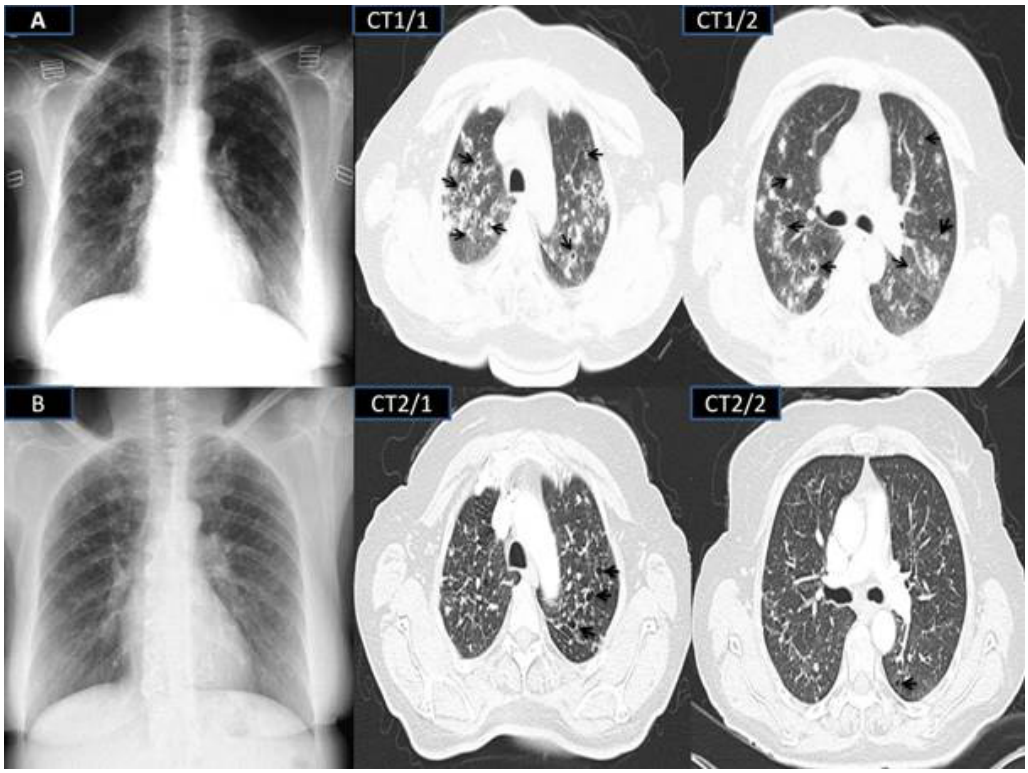

Figure 1. Radiography and thoracic CT images, taken at the time of admission and at 12th months of follow-up. A is showing the chest radiographic image, taken at admission, B is showing the radiographic image, taken at the 12th months of follow-up, CT1/1 and CT1/2 show the computed thoracic images, taken at the admission, and CT2/1 and CT2/2 are showing the computed thoracic images, taken at the 12th months of follow-up. Black arrows are indicating cavitary infiltrates.

The patient was hospitalized with suspicions of opportunistic pulmonary infection and cavitary lung disease. Empirically, intravenous piperacillin-tazobactam (3x4.5 g/day) and oral clarithromycin (2x500 mg/day) were started. Thorax CT revealed many thin-walled cavities and millimetric nodules accompanied by ground-glass infiltrates in the upper and middle lobes of both lungs (Fig. 1). Most of the nodules, which one of the largest has 17x12 mm in diameter, predominantly were located in the peripheral areas (Fig. 1). The disease which could develop cavities in the lung, such as tuberculosis, rheumatic lung diseases, vasculitis syndromes, and fungal infections were excluded by using acid-fast bacilli staining and Gram staining, serum and blood galactomannan levels, and vasculitis markers.

Gram staining of bronchial fluid, taken by bronchoscopy, revealed Gram-negative bacilli and intense polymorphonuclear leukocytes. The bronchial fluid sample obtained by bronchoscopy was inoculated in 5% sheep blood and Eosin Methylene Blue (EMB) agar and then was cultured by semiquantitative culture method in the microbiology laboratory. The cultured sample was incubated for 48 hours at 37° C under aerobic conditions. After the incubation, the colonies, $>10^5$ CFU/mL, which have the white central areas with gray edges and irregular borders, were observed in the blood agar. EMB agar revealed colonies that did not ferment lactose and had a clear appearance. In TSI medium, citrate and oxidase positive, mobile and Gram-negative bacilli, which couldn't ferment glucose, lactose, and sucrose, were detected. *Delftia acidovorans* were defined as by using the BD Phoenix automated microbiology system (BD Diagnostic Systems, Sparks, MD). Before the patient sample was inoculated into the automated system, there was no growth in the culture taken from the sample of the automated system to eliminate device-related contamination. Antibiotic susceptibility testing was also performed with the same system as previously performed[7-9]. The Phoenix ID broth was inoculated with bacterial colonies from a pure culture adjusted to a 0.5 to 0.6 McFarland standard using a nephelometer. After having transferred 25 µL of the ID suspension to the Phoenix AST broth, the suspension was poured into the ID side of the Phoenix panel. Once inoculated the panel was logged and loaded into the instrument, where kinetic measurements of colorimetric and fluorescent signals were collected every 20 min[9]. EUCAST 2017 criteria were used to evaluate the thresholds for antibiotic susceptibility, as in the study by Ranc *et al*[10]. Results were classified as sensitivity (S), moderate sensitivity (MS), and resistance (R) (Table 1).

Empirical treatment was continued for 21 days because the sensitivity was detected. After the treatment, the patient's clinical and radiological findings regressed significantly, and he was discharged with outpatient follow-up. At the 12th months of follow-up, thoracic CT taken for transient dyspnea revealed that pulmonary infiltrates were significantly reduced and only sequelae cavitary lesions could be observed (Fig. 1).

According to our investigation, this case is the first example of cavitary, and interstitial pneumonia caused by *Delftia acidovorans* in a patient with immunosuppression.

Informed consent

The written informed consent was obtained from the patient for the publication of this case report.

Table 1. Antibiotic susceptibility test result.

Antibiotics	Sensitivity result	(MIC, µg/mL)
Amikacin	Resistant	>16
Aztreonam	Moderate-sensitive	16
Cefepime	Resistant	>8
Ceftazidime	Sensitive	1
Ciprofloxacin	Resistant	>2
Colistin	Resistant	>4
Gentamicin	Resistant	>4
Imipenem	Sensitive	1
Netilmicin	Resistant	>4
Piperacillin	Sensitive	≤4
Piperacillin/Tazobactam	Sensitive	≤4/4

MIC: Minimum inhibitory concentration

Discussion

A pulmonary cavity is defined as a gas-filled space in the lung and occurs by the accumulation of air into a nodule, mass or a region of consolidation[11]. A pulmonary cavity is the common finding of a wide variety of the pathological process which is affecting the lung. Since some diseases are more associated with the development of the pulmonary cavity the evaluation of the cavity helps to clinicians in the differential diagnosis[12]. According to the developmental periods, it is recommended to divide the cavities into two groups. Some cavities develop within the 12 weeks, while others require more than 12 weeks[13]. A rapidly developing cavity (<12 weeks) strongly suggests an infectious or acute cause. However, the cavities those had a more chronic or silent development (>12 weeks) support the presence of chronic infections, autoimmune conditions, or malignancy. Nevertheless, there may be a significant change in the temporal development of cavitary disease processes, depending on both the patient's immune status and comorbidities[13]. We suspected that the patient has an infection because the patient's complaints had started three weeks ago and she had been receiving immunosuppressive treatment for a long time. Moreover, the radiological findings also suggested the possibility of cavitary lung disease in addition to the suspicion about infectious diseases.

There are some reports of *Delftia acidovorans* that cause infection in humans[2-5]. However, in the literature, we could not find a study reported that *Delftia acidovorans* causes pulmonary cavitary disease. The vasculitis syndromes were not considered among the preliminary diagnoses since the markers of cavitary pulmonary vasculitis syndromes were negative.

The cavity development is more common in some disease such as tuberculosis and Klebsiella pneumoniae infections[12]. Additionally, some fungal infections may also cause cavity development in the lung[12]. However, in our patient's serial sputum microscopy the acid-fast bacilli were not detected. Bronchoscopic fluid analysis has been reported to be useful when a specific infectious agent, such as fungal and tuberculosis infection, is suspected in immunocompromised patients[14,15]. Therefore, we also performed bronchoscopy for further analysis. The galactomannan antigen was found negative in serum and bronchoscopic fluid.

In a large-sample study using PCR for validity and comparing Biotyper (MALDI-TOF MS; matrix-assisted laser desorption ionization-time of flight mass spectrometry) and Phoenix methods, the urine-isolated bacteria was accurately identified 99.9% and 99.5% at the genus level, 99.1% and 98.5% at the species level[7]. Additionally, it has been demonstrated that the Phoenix automated microbiology systems can be used for in the majority of strains encountered in a university-based laboratory to evaluate the identification (ID) and antimicrobial susceptibility testing (AST) performances[8]. For this reason, we used this system to evaluate the identification (ID) and antimicrobial susceptibility test. By bronchial lavage fluid culture and automatized bacteria validation test *Delftia acidovorans* was detected.

Bilgin *et al.*[2], reported a case of *Delfia acidovorence* pneumonia in a patient with neutropenia. However, in their case, there was no pulmonary cavitary involvement[2]. Taş *et al.*[5], reported that they detect *Delftia acidovorans* in deep tracheal aspiration culture of a patient with chronic obstructive pulmonary disease. This patient with symptoms of lower respiratory tract infection died despite treatment[5]. The reported cases of *Delfia* infection consist mostly of patients with immunodeficiency[2,16,17] However, there are also cases reported in immunocompetent patients[3,5,18]. Khan *et al.*[3], reported a case of *Delftia acidovorans* bacteremia, in a four-year-old immunocompetent patient with pulmonary abscess. Patel *et al.*[14], reported a case of catheter-related septic pulmonary embolism, caused by *Delftia acidovorans* in a 49-year-old woman with vertebral osteomyelitis. However, there was no cavitary pulmonary infiltrates in this patient CT images, and the CT scan revealed bilateral pulmonary nodules and pleural effusion. For an accurate diagnosis and treatment, the elimination of the contaminations is very important. Before examining the patient sample, we took a swab sample from the automated system in order to eliminate contamination. There was not a bacterial growth in the culture of this swab sample. Additionally, this organism couldn't be isolated from the culture of other patients. Moreover, the patient's clinical features, laboratory, and radiological findings indicated the presence of a pulmonary infection. These points supported the fact that this organism wasn't an environmental contaminant for our patient.

In Latin America, Galles *et al.*[19], examined a total of 176 unusual, non-facultative gram-negative bacteria, including four *Delftia acidovorans* isolates. In this multicenter study, there was poor in vitro efficacy with aminoglycosides. Although the information on *Delftia acidovorans* sensitivity is limited, *Delftia acidovorans* is generally known to be susceptible to broad-spectrum cephalosporins, piperacillin, aztreonam, carbapenems, quinolones, and trimethoprim-sulfamethoxazole[19]. Similarly, in our case, an effective response was obtained with piperacillin/tazobactam treatment (MIC ≤4/4/g/mL). Since *Delftia acidovorans* isolates are resistant to aminoglycosides, type determination is important for appropriate treatment[20]. Similarly, in our case, the bacterium was found to be resistant to aminoglycosides (MIC <16 µg/dL for amikacin).

According to our literature research, the case presented here will be the first example of pulmonary cavitary infiltrates due to *Delftia acidovorans*.

Conclusion

Delftia acidovorans pneumonia which can respond well to treatment should be considered, in immunocompromised patients with interstitial nodules and cavitary infiltrates.

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