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Achromobacter xylosoxidans: The Unexpected Guest of the İntensive Care Unit

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Abstract: Achromobacter xylosoxidans is recognized as a significant nosocomial pathogen. This waterborne microorganism is resistant to most antibiotics and liquid solutions, allowing it to thrive in hospital water sources. Although A. xylosoxidans is a rare causative agent, it is a significant pathogen that can pose challenges in treatment. This study emphasizes the clinical importance of this bacterium, particularly in the presence of underlying risk factors.

Keywords: Achromobacter Xylosoxidans, Nosocomial İnfection, İntensive Care Unit, Antibiotic Resistance, Pneumonia.

Case Report

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INTRODUCTION

Although intensive care units (ICUs) comprise less than 10% of total hospital beds, they account for more than 20% of nosocomial infections [1]. This case report discusses the isolation of Achromobacter xylosoxidans from a sputum culture after prolonged hospitalization in an ICU, where this pathogen is rarely encountered.

Achromobacter xylosoxidans was first isolated in 1971 by Yabuchi and Ohyama from patients diagnosed with chronic otitis media. This pathogen can commonly colonize medical care products such as saline solutions, dialysis fluids, intravenous fluids, and contact lens solutions. It can also be isolated from mechanical ventilator sets, neonatal incubators, and vascular catheters [2].

The treatment protocol for Achromobacter xylosoxidans is typically determined based on the patient's clinical course and antibiogram results. It has been identified as a pathogen in cystic fibrosis patients and is often confused with Burkholderia cepacia complex. Although its virulence is considered low, its mortality rate varies depending on the host.

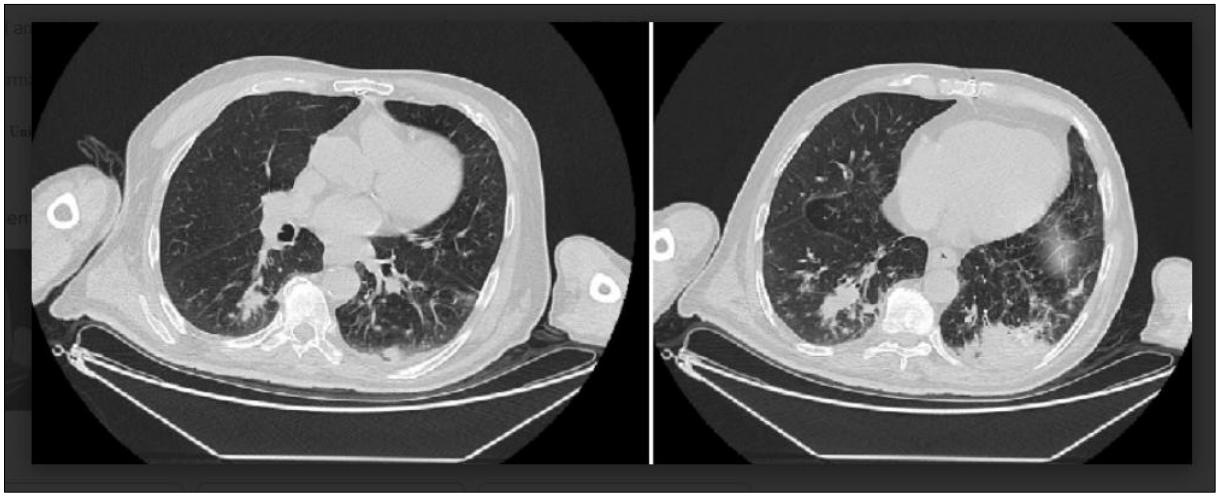
CASE PRESENTATION

An 81-year-old male patient with a known diagnosis of chronic obstructive pulmonary disease (COPD) presented to the emergency department with complaints of shortness of breath. The patient reported fatigue and general deterioration. Due to high oxygen demand, he was admitted to the pulmonary diseases step down intensive care unit(ICU). On examination, bilateral rhonchi were heard, and no significant abnormalities were detected in other systems. His medical history included hypertension, diabetes mellitus, congestive heart failure, and dementia, along with a 100 pack-year smoking history. The patient's initial laboratory test results revealed an elevated white blood cell (WBC) count of 17,800/mm³ (normal range: 4,000-10,000/mm³) with a neutrophilic predominance. C-reactive protein (CRP) was significantly elevated at 285 mg/L (normal <5 mg/L), indicating an inflammatory response. Procalcitonin was measured at 4.1 ng/mL (normal <0.05 mcg/mL), suggesting a bacterial infection. Blood gas analysis showed respiratory acidosis with a pH of 7.32, $PaCO_2$ of 56 mmHg, and PaO_2 of 67 mmHg on supplemental oxygen. Renal and liver function tests showed no abnormalities.

A thoracic computed tomography (CT) scan revealed peribronchial infiltrative densities and consolidation in the lower lobes, centrilobular emphysema predominantly in the upper lobes, and bronchial wall thickening. No significant pleural effusion was detected. Mild fibrotic changes were observed in the lower lobes, consistent with the patient's history of COPD. No radiologic signs of cavitary lesions

were present. Upon admission, the patient was started on a comprehensive treatment addressing both COPD and bacterial infection with short-acting bronchodilators administered via nebulization every six hours. Systemic corticosteroids, (Methylprednisolone at 40 mg IV daily) were initiated. Supplemental oxygen therapy, and non-invasive ventilation was started. Empirical antibiotic therapy was initiated with ceftriaxone. Physiotherapy and pulmonary rehabilitation were incorporated. The sputum culture on admission revealed normal flora.

On the second day of follow-up, due to increased oxygen demand and inadequate response to noninvasive mechanical ventilation, the patient was transferred to the ICU. A sputum culture collected at the ICU isolated Achromobacter xylosoxidans. The patient was started on Piperacillin-Tazobactam treatment based on antibiogram results. After seven days of treatment, his clinical condition improved, and he was discharged in a stable condition.



DISCUSSION

Achromobacter xylosoxidans is classified as a non-lactose-fermenting, Gram-negative bacillus that can thrive in moist environments. This pathogen can cause nosocomial infections, particularly in patient populations with cystic fibrosis, hematological malignancies, renal failure, and immunodeficiency [3, 4]. Various clinical syndromes, including pneumonia, bacteremia, urinary tract infections, and gastrointestinal infections, have been reported in the literature [5, 6].

Nosocomial infections caused by Achromobacter xylosoxidans are more likely to occur in patients with prolonged hospital stays and invasive procedures. A 2013 study by Amoureux *et al*., demonstrated widespread colonization of this pathogen in hospital water sources, highlighting the need for meticulous hygiene protocols and equipment sterilization [7].

In terms of treatment, Achromobacter species are known to be resistant to first- and second-generation cephalosporins, aminoglycosides, and narrow-spectrum penicillins. However, third-generation cephalosporins, carbapenems, and fluoroquinolones are generally effective [8]. The increasing emergence of multidrug-resistant strains in recent years underscores the importance of careful antibiotic selection based on antibiogram results.

Although community-acquired cases of Achromobacter xylosoxidans are rarely reported in the literature, they are usually associated with multiple risk factors. A 2018 case report by Habib *et al*., highlighted a fatal case of bacteremia caused by this pathogen, followed by pleural empyema due to Escherichia coli and Streptococcus anginosus [9].

The present case demonstrates that prolonged hospitalization and invasive procedures are the primary risk factors for Achromobacter xylosoxidans infection. This underscores the critical role of effective hygiene practices in healthcare settings to prevent nosocomial infections.

In conclusion, more detailed data on the pathogenesis of this infection and antibiotic resistance mechanisms could play a crucial role in reducing morbidity and mortality associated with Achromobacter xylosoxidans infections.

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