

Catheter-Related Bloodstream Infection Caused by *Kingella Denitrificans*: A Case Report

Kingella Denitrificans'ın Neden Olduğu Kateterle İlişkili Kan Dolaşımı Enfeksiyonu: Bir Vaka Raporu

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Abstract

Kingella denitrificans is a gram-negative coccobacillus that, although rare, can be a human pathogen. Infections such as endocarditis and peritonitis have been reported in the literature. Here, we report a previously undocumented catheter-related bloodstream infection caused by *Kingella denitrificans*. Although an antibiogram was not performed for the microorganism, clinical and laboratory findings improved with intravenous meropenem treatment and the removal of the infected permanent tunneled subclavian catheter.

Keywords: *Kingella denitrificans*, Meropenem, Catheter-related infection, Fever, Bacteria

Öz

Kingella denitrificans, nadir görülmesine rağmen insanlarda patojen olabilen gram-negatif bir kokobasildir. Literatürde endokardit ve peritonit gibi enfeksiyonlara dair vakalar bildirilmiştir. Bu çalışmada, daha önce belgelenmemiş *Kingella denitrificans* kaynaklı kateterle ilişkili bir kan dolaşımı enfeksiyonunu sunuyoruz. Mikroorganizma için bir antibiyogram testi yapılmamış olmasına rağmen, intravenöz meropenem tedavisi ve enfekte olmuş kalıcı tünelli subklavyen kateterin çıkarılmasıyla klinik ve laboratuvar bulgularında iyileşme sağlanmıştır.

Anahtar Kelimeler: *Kingella denitrificans*, meropenem, catheter-related infection, fever, bacteria

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Introduction

Kingella denitrificans is a species within the *Kingella* genus, classified under the *Neisseriaceae* family in the current taxonomic system. This Gram-negative microorganism is a coccobacillus and an aerobic bacterium. *K. denitrificans* is a non-motile microorganism that grows on blood agar, is oxidase-positive, and nitrate-positive (1). *K. denitrificans* can cause various infections such as endocarditis, osteomyelitis, bacteremia, and peritonitis (2). To the best of our knowledge, we present the first documented case of catheter-related bloodstream infection (CRBSI) caused by *Kingella denitrificans* and aim to review the literature on this bacterium.

Case

A 55-year-old male patient from Sivas, Turkey, presented to the infectious diseases and clinical microbiology outpatient clinic with complaints of fever occurring after dialysis sessions over the past week. The patient reported experiencing chills preceding the fever episodes, along with fatigue and loss of appetite. On physical examination, his general condition was good. Vital signs were as follows: body temperature, 37.2°C; pulse rate, 95 beats per minute; respiratory rate, 18 breaths per minute; and arterial blood pressure, 130/90 mmHg. A permanent tunneled hemodialysis catheter was present in the left subclavian region, with a small amount of purulent discharge noted around the catheter insertion site. His medical history included diabetes mellitus, primary hypertension, venous thromboembolism, and chronic renal failure requiring regular hemodialysis.

Routine laboratory investigations revealed a white blood cell count of 11,320 cells/mm³ (78% granulocytes), serum C-reactive protein (CRP) level of 73 mg/L, procalcitonin level of 3.78 ng/mL, and serum creatinine level of 3.57 mg/dL. The patient was admitted to the infectious diseases and clinical microbiology ward with a preliminary diagnosis of catheter-related bloodstream infection (CRBSI). Blood cultures were obtained simultaneously from both peripheral veins and the central venous catheter. Empirical antibiotic therapy was initiated with renal-adjusted doses of meropenem and vancomycin.

On the second day of treatment, the patient developed a fever of 38.3°C, prompting repeat blood cultures from both the peripheral vein and the catheter lumen. Following the manufacturer's instructions, the blood samples were inoculated into BD BACTEC Plus Aerobic/F (Becton Dickinson, Sparks, USA) culture bottles and incubated in the BD BACTEC FX top system (Becton Dickinson, Sparks, USA). After two days of incubation, the system indicated bacterial growth. Subcultures were then performed on 5% sheep blood agar, eosin methylene blue (EMB) agar, and chocolate agar, and the plates were incubated for 24–48 hours. Growth was detected only in the blood culture obtained from the catheter lumen prior to treatment. The causative organism was identified as *Kingella denitrificans* using the

BD Phoenix™ automated identification system (Becton Dickinson, USA). Following this identification, vancomycin therapy was discontinued. Transthoracic echocardiography revealed no evidence of vegetations or abscesses.

The permanent tunneled hemodialysis catheter was removed under sterile conditions. The distal 5 cm segment of the catheter was cut and sent to the microbiology laboratory in a dry, sterile tube. Both semi-quantitative (Maki method) and quantitative culture methods were applied. For the Maki method, the catheter tip was rolled four times back and forth on 5% sheep blood agar and EMB agar. After 24–48 hours of incubation at 37°C, cultures were evaluated. For quantitative culture, the catheter tip was vortexed in 1 mL of sterile saline for one minute, and 0.1 mL of the suspension was plated on 5% sheep blood agar and EMB agar, followed by incubation at 37°C for 24–48 hours.

No microbial growth was observed in the blood cultures obtained from the peripheral veins before treatment, nor in the blood cultures from the peripheral vein and catheter lumen taken on the second day of treatment. Similarly, no growth was observed in the catheter tip cultures.

Meropenem therapy was continued for 10 days. Follow-up laboratory tests revealed a white blood cell count of 6,950 cells/mm³ (52% granulocytes), serum CRP level of 1.8 mg/L, procalcitonin level of 0.43 ng/mL, and serum creatinine level of 3.44 mg/dL.

Discussion

K. denitrificans is a slow-growing microorganism found in the upper respiratory tract flora, and it rarely causes infections (3). Both *K. denitrificans* and *K. kingae* possess type IV pili, which play a critical role in their pathogenicity in humans (4). These bacteria can lead to severe clinical conditions such as endocarditis, peritonitis (5–7).

In a 1986 study involving two cases of prosthetic valve endocarditis, *K. denitrificans* demonstrated susceptibility to beta-lactam antibiotics, including cefotaxime, ampicillin, and penicillin G (6). However, a 1988 study demonstrated the presence of the TetM gene, which confers tetracycline resistance in *K. denitrificans* (8). Due to the limited number of cases and studies, the antibiotic susceptibility of this microorganism remains unclear. Nevertheless, susceptibility studies of *K. kingae*, a related species, have shown that it is susceptible to cephalosporins, carbapenems, and fluoroquinolones (9).

In our case, since growth was detected only in the blood culture taken from the catheter lumen, it did not meet the definitive criteria for catheter-related bloodstream infection (CRBSI). However, given the patient's fever at the beginning of treatment and during follow-up, along with the absence of any other apparent focus (10), it was evaluated as a possible CRBSI. Although antibiotic susceptibility testing for *K. denitrificans* could not be performed, a favorable response was observed to 10 days of meropenem treat-

ment. A review of the literature revealed no previous studies on meropenem susceptibility for *K. denitrificans*. This case is clinically significant as it represents the first documented catheter-related bloodstream infection caused by *K. denitrificans* in the literature. Although such infections are rare, the increasing use of invasive procedures highlights the need to consider opportunistic pathogens as potential causative agents. Our aim in presenting this case is to raise awareness among clinicians that *K. denitrificans* can act as a human pathogen and should be included in the differential diagnosis when encountering similar clinical scenarios. Despite its rarity, such organisms can lead to serious clinical outcomes, underscoring the importance of accurate diagnosis and timely, appropriate treatment.

Ethical Approval: The patient was clearly and comprehensibly informed about which information would be used in the case report and how this information would be published. Written consent was obtained from the patient.

Author Contributions:

Concept: M.Ö.

Literature Review: M.Ö., Ö.A.

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Data acquisition: M.Ö., Ö.A.

Analysis and interpretation: M.Ö., Ö.A.

Writing manuscript: M.Ö., Ö.A.

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Conflict of Interest: The authors have no conflicts of interest to declare.

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