Short Communication

Hickman Catheter-Related Bacteremia with Kluyvera cryocrescens: a Case Report

Demet Toprak, Ahmet Soysal, Ozden Turel, Tuba Dal\(^1\), Özlem Özkan\(^1\),
Guner Soyler\(^2\) and Mustafa Bakir\(^*\)

Department of Pediatrics, Section of Pediatric Infectious Diseases and \(^1\)Department of Microbiology,
Marmara University School of Medicine, Istanbul, Turkey

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SUMMARY: This report describes a 2-year-old child with neuroectodermal tumor presenting with febrile neutropenia. Blood cultures drawn from the peripheral vein and Hickman catheter revealed *Kluyvera cryocrescens* growth. The Hickman catheter was removed and the patient was successfully treated with cefepime and amikacin. Isolation of *Kluyvera* spp. from clinical specimens is rare. This saprophyte microorganism may cause serious central venous catheter infections, especially in immunosuppressed patients. Clinicians should be aware of its virulence and resistance to many antibiotics.

Central venous catheters (CVCs) are frequently used in patients with hematologic and oncologic disorders. Along with their increased use, short- and long-term complications of CVCs are more often being reported. The incidence of CVC infections correlates with duration of catheter usage, immunologic status of the patient, type of catheter utilized and maintenance techniques employed. A definition of CVC infection has been difficult to establish because of problems differentiating contaminant from pathogen microorganisms. The most common isolated pathogens associated with CVC infections include Gram-positive and Gram-negative bacteria and fungi. Isolation of *Kluyvera* spp. from clinical specimens and especially from CVCs is rare (2). This report describes a child who presented with CVC infection caused by the uncommon pathogen *Kluyvera cryocrescens*.

A 2-year-old boy previously diagnosed with primary neuroectodermal tumor (PNET) was admitted to the hospital with fever. He had a Hickman catheter which was placed for intravenous access 4 months before admission. His axillary temperature was 38.5°C and his arterial blood pressure was normal. Other vital signs, such as breath frequency, pulse and oximetry, were normal. The capillary refill of the patient was <1 s. The patient was not irritable after fever showed defervescence. His physical examination revealed no focus for fever. For this reason, we did not suspect catheter-related bacteremia at presentation. His complete blood count (CBC) revealed an absolute neutrophil count (ANC) of 100/\(\text{mm}^3\). He was diagnosed with febrile neutropenia, and empiric focus for fever. For this reason, we did not suspect catheter-related bacteremia at presentation. His complete blood count (CBC) revealed an absolute neutrophil count (ANC) of 100/\(\text{mm}^3\). He was diagnosed with febrile neutropenia, and empiric cefepime (3 \(\times\) 50 mg/kg/dose) and amikacin (1 \(\times\) 15 mg/kg/dose) was initiated. On the second day, a Gram stain of the blood culture bottles disclosed Gram-negative bacilli in both samples obtained from the CVC and peripheric vein. Subcultures inoculated on 5% sheep blood agar, MacConkey agar and chocolate agar plates and aerobically incubated at 37°C for 24 h revealed growth of *K. cryocrescens* in both samples. The organism was identified by using biochemical tests and confirmed by VITEK AMS (VITEK Systems, Hazelwood, Mo., USA) and by API (Analytab Inc., Plainview, N.Y., USA). Antimicrobial susceptibility was assessed by the disc diffusion method. *K. cryocrescens* was sensitive for cefotaxime, cefepime, carbapenems, gentamycin, amikacin and ciprofloxacin. Intravenous cefepime and amikacin were continued and the CVC was removed. His echocardiogram was normal and a repeat peripheral blood culture was sterile 48 h after the removal of the CVC. He became afebrile on the third day of antibiotic therapy. The patient ultimately received a 14-day-course of intravenous cefepime and amikacin and was discharged from the hospital without sequelae.

This is a case of CVC-related bacteremia caused by *K. cryocrescens*, a Gram-negative bacillus initially defined as a benign saprophyte. It is considered that this genus predominantly colonizes the respiratory, gastrointestinal and urinary tracts. Isolation of *Kluyvera* spp. was previously reported by Farmer et al. (3) from human sources, including sputum, urine, stool and blood specimens. Environmental sources noted were sewage, soil, kitchen food, water and hospital sinks. These findings suggest that *Kluyvera* spp. are widely distributed. The species *Kluyvera* is a small, motile Gram-negative bacillus with peritrichous flagella. Its biochemical profile is similar to that of other *Enterobacteriaceae*. Bacteria of the *Kluyvera* genus are mainly grouped into four known species, *Kluyvera ascorbata*, *Kluyvera cryocrescens*, *Kluyvera cochleae* and *Kluyvera georgiana* (4,5). In addition, Pavan et al. (4) have also proposed that *Enterobacter intermedium* is phenotypically and genotypically a member of the *Kluyvera* genus. West et al. (6) stated that *K. cryocrescens* is as often isolated as *K. ascorbata*. These two species are differentiated by the ability of *K. ascorbata* to utilize ascorbate and *K. cryocrescens* to grow and ferment D-glucose at 5°C. They are also differentiated by differences in the zone of inhibition around carbenicillin (100-\(\mu\)g disk) and cephalothin (30-\(\mu\)g disk).

It has recently been shown that, even if *Kluyvera* infections are initially benign, serious infections can develop in immunosuppressed hosts. Cases of urinary tract infections, mediastinitis, sepsis, enteritis, biliary tract infections, peritonitis, intraabdominal abscesses and CVC-related bacteremia have been reported (6-11). In a case series described by Carter

\(^*\)Corresponding author: Mailing address: Section of Pediatric Infectious Diseases, Department of Pediatrics, Marmara University School of Medicine, Topkämciliolu caddesi, Altunizade, Istanbul, Turkey. Tel: +90-216-3273757, Fax: +90-216-3267667, E-mail: mbakir@marmara.edu.tr
and Evans (12), 7 clinically significant Kluyvera isolates were identified in a 5-year-period: 3 patients had urinary tract infections; 2 patients had bacteremia; 1 had a soft tissue infection of the finger; and 1 had acute appendicitis with a subsequent intraabdominal abscess. All isolates were identified as K. ascorbata. The entire spectrum of disease related to Kluyvera spp. remains unknown because of the limited number of cases reported. Analysis of the reported cases indicates that the most common manifestation of infection with Kluyvera spp. is urinary tract infection. Kluyvera infections related solely to bacteremia have been documented in 10 cases previously: 5 cases were reported as K. cryocrescens, 4 as K. ascorbata and 1 as Kluyvera with no species identified. Our case is the third child to present with bacteremia due to Kluyvera spp. in the literature.

A nosocomial outbreak of K. cryocrescens bacteremia isolated in 4 cases has been reported (13). These 4 cases all had coronary artery disease and peripheral intravenous line. All patients had two consecutive sets of blood cultures positive for K. cryocrescens and all of the patients were discharged from the hospital after appropriate antibiotic therapy. There have been only a few cases of CVC infections and bacteremia due to Kluyvera spp. in the literature. In this case, the isolation of K. cryocrescens from blood drawn from the central catheter and the clinical response to antibiotic therapy suggested a CVC infection. No other focus for Kluyvera infection was found and possible environmental sources for K. cryocrescens were not investigated. Our patient was also not colonized with Kluyvera before bacteremia. Two blood cultures drawn from the peripheral vein and central catheter of our patient both grew K. cryocrescens, making Kluyvera spp. a pathogen responsible for bloodstream infection in the patient.

Antimicrobial susceptibility studies of Kluyvera spp. have shown general trends of resistance to ampicillin and first- and second-generation cephalosporins. Usually this resistance is mediated by the production of beta-lactamase. The addition of clavulanate reverses this resistance. Based on susceptibility testing and results and clinical outcomes in reported cases, effective treatment options remain the third-generation cephalosporins, aminoglycosides, imipenem, aztreonam, tetracycline and fluoroquinolones. Our K. cryocrescens isolate was also resistant to ampicillin and first- and second-generation cephalosporins, aminoglycosides, imipenem, aztreonam, tetracycline and fluoroquinolones. Our K. cryocrescens isolate was also resistant to ampicillin and first- and second-generation cephalosporins. It was sensitive to amoxicillin-clavulanate, third- and fourth-generation cephalosporins, ciprofloxacin, carbapenems and aminoglycosides. However, while Thornsberry (14) demonstrated susceptibility to ciprofloxacin in all 5 of their Kluyvera isolates, a nonclinically significant isolate identified by Carter and Evans (12) showed resistance to ciprofloxacin.

Despite their initial description as a benign saprophyte, Kluyvera organisms are potentially life-threatening and should not be discounted when isolated in the clinical setting. Clinicians should be aware of this potential and provide appropriate antimicrobial therapy. This case emphasizes that this potential saprophyte microorganism can cause serious CVC infections, especially in immunosuppressed children. Kluyvera spp. are similar to other enteric bacteria in terms of their biochemical identification patterns. This may be a reason for potential underestimation of Kluyvera infections. In conclusion, clinicians should be aware of their virulence and must be careful about their potential resistance to many antibiotics.

REFERENCES