CASE REPORT

Unraveling the mosaic of emerging nosocomial infections: Revealing insights from two cases of *Ochrobactrum anthropi* bacteremia

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ABSTRACT

Ochrobactrum anthropi with its strong survival ability and subtle clinical presentation, has been associated with hospital-acquired infections in immunocompromised patients. Lack of knowledge regarding its clinical importance is the prime reason for underreporting of cases. We present here two cases of *Ochrobactrum anthropi* bacteremia in nephrology and oncology patients, suggesting that these infections may be fairly common in immunocompromised individuals. No antimicrobial resistance was observed in our first case and the patient responded to monotherapy with meropenem whereas, the second case involved infection with a multidrug resistant strain of *Ochrobactrum anthropi* and improved with combination therapy comprising of levofloxacin and trimethoprim-sulfamethoxazole. To ensure that such pathogens are not missed, more thorough and accurate diagnostic procedures must be employed. A favorable outcome in such cases can be possible with prompt identification and optimal antibiotic therapy.

Keywords: *Ochrobactrum anthropi*, Nephrology, Oncology, Immunocompromised, Bacteremia

BACKGROUND

Ochrobactrum anthropi, a gram-negative bacterium, is an emerging opportunistic and nosocomial pathogen. It is known to frequently colonize invasive medical devices and antiseptic solutions, forming biofilms and hence, leading to hospital-acquired infections[1]. In addition to this, it is primarily associated with opportunistic infections in immunocompromised individuals due to its low virulence. Even more concerning is the fact that it is resistant to the routinely used β-lactam antibiotics, including cephalosporins and penicillins.[1] The main reason for the underreporting of cases is the lack of awareness among physicians regarding its clinical significance.

Here, we document two cases of *Ochrobactrum anthropi* bacteremia in oncology and nephrology patients who were admitted in the Indus Hospital & Health Network, Karachi, Pakistan. We would like to emphasize that since it is an emerging pathogen, more diligence and efficient diagnostics must be employed to ensure that these pathogens are not missed.

CASE 1: A 40-year-old female with known end-stage renal disease (ESRD) secondary to hypertension, undergoing dialysis in the last 1 month, presented with fever since 15 days. Clinical examination revealed a middle-aged female with average built lying comfortably in bed. She was afebrile without any lymphadenopathy, organomegaly or swelling, erythema and discharge at the site of dialysis catheter insertion. She was admitted for further investigations and in-patient monitoring.

Two sets of blood cultures collected from the peripheral vein were sent to the microbiology laboratory for evaluation of bacteremia, which came out positive within 48 hours of incubation. Gram stain from the blood culture broth showed uniformly stained thin and long gram-negative bacilli with tapering ends. Subculture on chocolate, sheep blood and MacConkey agars grew grey, convex, glistening, non-hemolytic and non-lactose fermenting colonies which were positive for motility, oxidase, catalase and urease tests while indole test was negative. For confirmation of identification and antimicrobial susceptibility testing (AST) of the isolate, VITEK-2 automated system (BioMérieux) was used. *Ochrobactrum anthropi* was identified with AST shown in Table-I. The minimum inhibitory concentration (MIC) of antibiotics was interpreted in accordance with the Clinical and Laboratory Standards Institute (CLSI) M100 guidelines.[2]

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A diagnosis of catheter-related bloodstream infection (CRBSI) was made after ruling out other causes of bacteremia. Subsequently, the infected catheter was removed and antibiotic therapy with meropenem was initiated along with supportive management. The patient remained afebrile after treatment and was discharged in stable condition on ciprofloxacin. A follow up blood culture was reported as negative after 5 days of incubation.

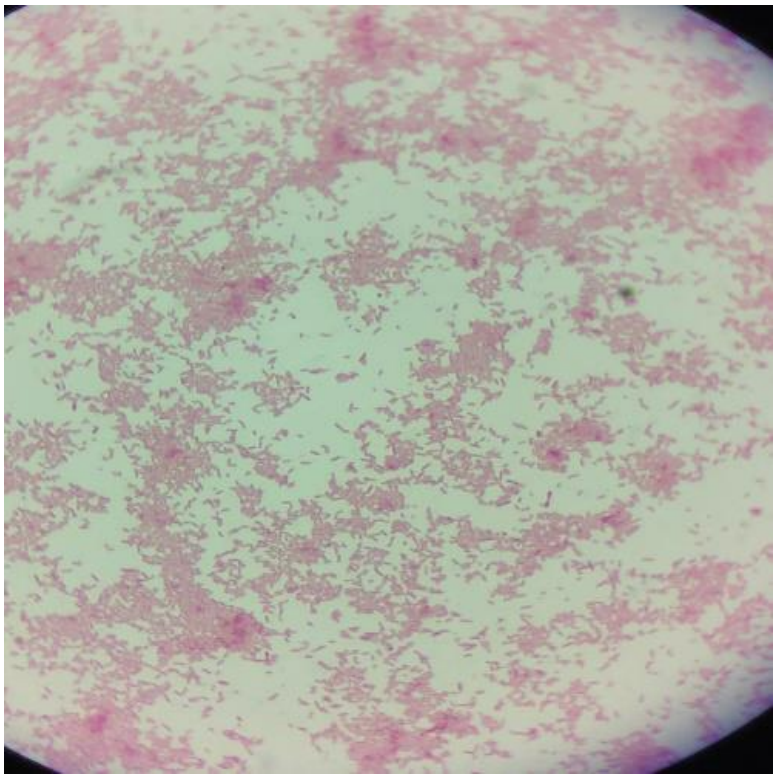

Figure-I: Gram stain from colonies of *Ochrobactrum anthropi*.

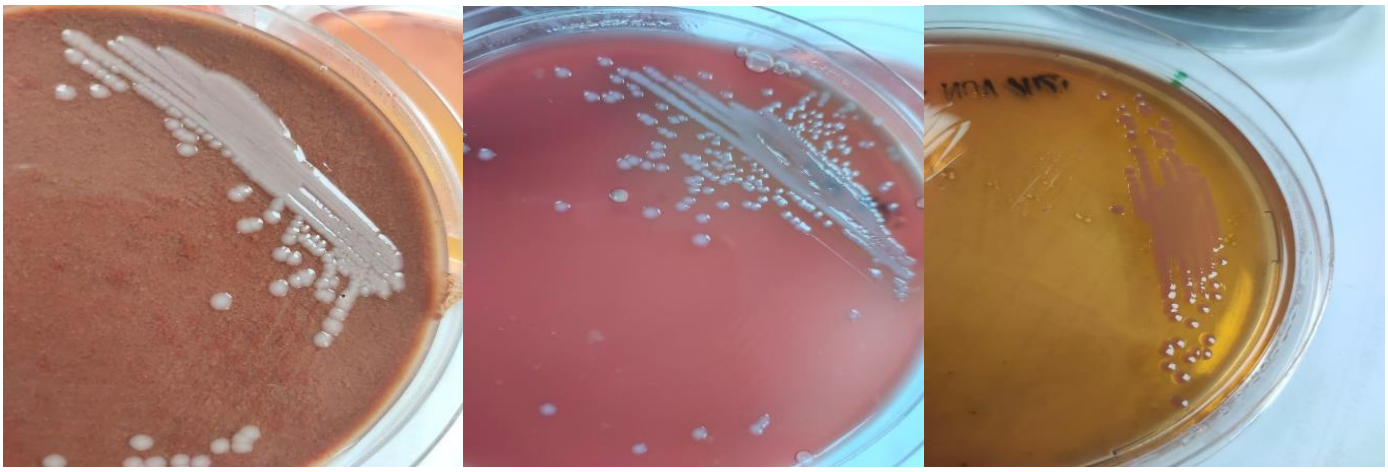

Figure-II: Colony morphology of *Ochrobactrum anthropi* on chocolate, 5% sheep blood and MacConkey agars

CASE 2: A 4-year-old male came with abdominal pain and distension since 1 month. He was found to have an abdominal mass involving the cecum and part of ascending colon on CT scan. Burkitt lymphoma was diagnosed with subsequent biopsy and histopathology workup. The patient was started on chemotherapy during which he developed fever.

Two sets of blood cultures, one each from peripheral vein and central line, were sent for workup of bacteremia which came positive within 48 hours of incubation. As in the previous case, the pathogen was identified as *Ochrobactrum anthropi* with AST shown in Table-I.

A diagnosis of central line-associated bloodstream infection (CLABSI) was made after ruling out other causes of bacteremia. Combination antibiotic therapy with levofloxacin and trimethoprim-sulfamethoxazole was initiated and the patient was discharged in stable condition after response to therapy was observed.

Table-I: Antimicrobial susceptibility pattern of the *Ochrobactrum anthropi* isolates.

Antibiotic	MIC (µ/ml) / Interpretation	
	Case 1	Case 2
Amikacin	<=2 (S)	<=16 (S)
Gentamicin	<=4 (S)	<=4 (S)
Ceftazidime	<=1 (S)	>=64 (R)
Ciprofloxacin	<=0.25 (S)	<=0.25 (S)
Trimethoprim/ sulfamethoxazole	<=20 (S)	>=320 (R)
Piperacillin-tazobactam	<=2 (S)	>=128 (R)
Imipenem	<=0.25 (S)	<=1 (S)
Meropenem	<=0.25 (S)	<=1 (S)

DISCUSSION

Ochrobactrum species infections are uncommon and typically observed in immunocompromised patients, consisting of necrotizing fasciitis, osteomyelitis, endophthalmitis, sepsis, pelvic abscess, etc. The environmental niche of *Ochrobactrum* species, which includes soil, water, and polluted environments, allows them to thrive in various conditions, making them opportunistic pathogens capable of causing bacteremia or invasive infections in vulnerable populations, particularly those who are immunocompromised or have indwelling medical devices.[3-5] Their ability to adhere to synthetic materials and contaminate medical devices further facilitates their role as agents of nosocomial infections, especially in hospital settings where they can spread through contaminated fluids or devices.[6] Since, both our patients were immunocompromised and had invasive vascular devices in place, they were particularly susceptible to opportunistic infections caused by organisms such as *Ochrobactrum anthropi*.

Regarding laboratory diagnosis, the main diagnostic challenge is reliably identifying and differentiating these organisms from *brucellae* using standard biochemical test systems due to their high phenotypic similarity. In this regard, automation is essential for the quick and accurate identification of such unusual pathogens that traditional methods are likely to miss. Furthermore, the production of AmpC β-lactamase poses a therapeutic challenge as it is frequently refractory to standard empirical antimicrobial therapy. In a study conducted on 103 isolates, Thoma *et al*. found that 97.1% of the *Ochrobactrum* strains were susceptible to trimethoprim/sulfamethoxazole and ciprofloxacin whereas, highly resistant to β-lactam antibiotics.[7] Furthermore, Zhu *et al*. suggested using monotherapy with either carbapenems or quinolones, or both, in cases where patients had serious medical conditions during their seven-year investigation on *Ochrobactrum anthropi* bloodstream infections. They came to the conclusion that there was no universal need to remove the intravascular catheter.[8]

Reports from the World Bank's 'South Asia' region are scarce, with only few cases reported over the past two decades. From Pakistan, Mahmood *et al*. described a case of infective endocarditis with *Ochrobactrum anthropi* complicated by septic embolization.[9] Furthermore, two cases of *Ochrobactrum anthropi* were reported in oncology patients by Anjana *et al*. from India, which showed higher MICs for aminoglycoside group of antibiotics and fluoroquinolones were resistant in one of the cases.[10] According to our findings, no antimicrobial resistance was observed in the first case and the patient responded to monotherapy with meropenem whereas, the second case involved infection with a multi-drug resistant strain of *Ochrobactrum anthropi* and improved with combination therapy comprising of levofloxacin and trimethoprim-sulfamethoxazole (Table-I).

In order to prevent these infections in hospital setting, rigorous adherence to infection control practices, including proper hand hygiene, use of personal protective equipment, and thorough environmental cleaning are essential. Ensuring the sterile handling and reprocessing of medical equipment is crucial, as *Ochrobactrum* species can survive in antiseptic solutions and on invasive devices. Implementing surveillance programs to detect unusual pathogens early and maintaining strict asepsis during procedures can also help mitigate the risk of these infections.

Additionally, antibiotic stewardship and appropriate treatment based on susceptibility testing are necessary for managing infections when they occur.

CONCLUSION

This report suggests that *Ochrobactrum anthropi* infections may be fairly prevalent among immunocompromised individuals and due to inadequate diagnostic methods and a lack of knowledge about their clinical significance, are often overlooked in routine microbiological reporting. Subsequently, this is the main reason why there are scarce reports of *Ochrobactrum anthropi* infection in the literature. A positive outcome in such infections is linked to early identification and administration of appropriate antibiotics.

CONFLICT OF INTEREST

None

GRANT SUPPORT & FINANCIAL DISCLOSURE

Declared none

AUTHOR CONTRIBUTION

Moiz Ahmed Khan: Formal analysis, Investigation, Visualization and Writing - original draft

Nazia Khursheed, Fareeha Adnan: Resources, Supervision and Writing – review and editing

Qurat-ul-Ain Zahid: Data Curation and Writing – review and editing

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