Achromobacter Xylosoxidans Bloodstream Infection in Elderly Patient with Hepatocellular Carcinoma: Case Report and Review of Literature

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ABSTRACT

Achromobacter xylosoxidans is a nonfermentative Gram-negative organism, known to cause opportunistic infection in humans. We report a case of septicemia in a 76-year-old male patient with underlying hepatocellular carcinoma due to A. xylosoxidans, which showed a different antimicrobial susceptibility pattern from what is usually reported. From aerobic blood culture of the patient, A. xylosoxidans was isolated which was found to be sensitive to amoxicillin-clavulanic acid, piperacillin-tazobactam, ceftazidime, cefoperazone-sulbactam, meropenem, minocycline, tigecycline, and trimethoprim/sulfamethoxazole. The patient recovered with amoxicillin-clavulanic acid treatment, which was given empirically to the patient. The present case highlights the possible role of amoxicillin-clavulanic acid for treatment of bloodstream infection with A. xylosoxidans.

Key words: Achromobacter xylosoxidans, amoxicillin-clavulanic acid, bloodstream infection

INTRODUCTION

Members of genus Achromobacter (formerly Alcaligenes) are nonfermentative Gram-negative bacilli usually found in the aquatic environment. It is considered an opportunistic pathogen, known to cause infections such as bacteremia, pneumonia, meningitis, urinary tract infection, abscesses, osteomyelitis, corneal ulcers, prosthetic valve endocarditis, and peritonitis.

Bloodstream infection with Achromobacter has been reported among patients with malignancy, IgM immunodeficiency, post valve replacement patients, and in neonates. Literature search has shown case fatality rates varying from 3% for primary or catheter-associated bacteremia to 80% for neonatal infection.

Previous studies have shown that Achromobacter strains are frequently resistant to aminoglycosides, ampicillin, first and second generation cephalosporins, chloramphenicol, fluoroquinolones, tetracycline and rifampin, and are usually susceptible to antipseudomonal third generation cephalosporins, carbapenem and cotrimoxazole.

We are reporting a case of Achromobacter xylosoxidans as a causative agent of septicemia, which showed a different susceptibility pattern from what is usually reported. The case report reinforces the need to identify this organism, especially among febrile patients with malignancy.
CASE REPORT

A 76-year-old male presented with complaints of fever, lump in the right upper abdomen, and weight loss for duration of 2 months. His examination revealed findings of firm nodular hepatomegaly. Computed tomography showed evidence of hepatocellular carcinoma with deposits in the lesser sac. He was started on chemotherapy with cisplatin, leucovorin, etoposide, and 5 fluorouracil. His chemotherapy was upgraded to oxaliplatin and gemcitabine.

After 3 weeks of starting the upgraded chemotherapy, he developed high-grade fever without chills and rigors that lasted for next 2 days. He presented to the outpatient unit on the 3rd day of fever where aseptically his blood sample was collected, and he was started empirically on amoxicillin-clavulanic acid 625 mg twice daily. The blood sample was processed as per standard microbiological procedure. Positive signal was detected after 48 h of incubation in Bae T/Alert 3D (BioMérieux, Durham, North Carolina/USA). The broth was subcultured on Mac Conkey agar and blood agar. After overnight incubation at 37°C MacConkey agar showed small nonlactose fermenting colonies and blood agar showed 1–2 mm, round, moist, grey, smooth, entire edge, nonhemolytic colonies. Gram-stained smear showed Gram-negative bacilli, which were oxidase and catalase positive. The growth was subjected to identification by automated VITEK®2 Compact (C) system version: 06.01 (BioMérieux, North Carolina/USA) using GNID 21 341 and antibiotic susceptibility was done using AST-N 280 and AST-N 281 cards. The organism was identified as A. xylosoxidans. Antibiotic sensitivity was expressed as sensitive, intermediate, and resistant according to CLSI M 100 S 24 (2014).[6]

The isolated organism was sensitive to amoxicillin-clavulanic acid, pipercillin-tazobactam, ceftazidime, cefoperazone-sulbactam, meropenem, minocycline, tigecycline, and trimethoprim/sulfamethoxazole. However, it was intermittently sensitive to imipenem, ciprofloxacin, and levofloxacin and resistant to ampicillin, cefuroxime, ceftriaxone, nalidixic acid, aztreonam, amikacin, and gentamicin. On the follow-up visit after 9 days of starting the treatment, the patient informed us that he was afebrile after 2 days of treatment. Repeat blood culture was sterile. Patient had responded to the treatment with amoxicillin-clavulanate.

DISCUSSION AND REVIEW OF LITERATURE

Achromobacter initially characterized by Holmes, was later studied and isolated by Yabuuchi and Ohyama in 1971 from seven patients with chronic otitis media.[7] There are 2 subspecies of A. xylosoxidans namely Denitrificans and Xylosoxidans according to a recent reclassification.[8]

Achromobacter species are oxidase, catalase, and nitrate positive. They are ornithine and lysine negative.[2]

Gómez-Cerezo et al. in his study found neutropenia and age more than 65 years to be a predisposing factor for bacteremia with A. xylosoxidans.[8] In our case, the predisposing factors present were the age of the patient and underlying malignancy.

Achromobacter infection is often associated with multiple episodes. Multiple episodes is indicated by the finding of A. xylosoxidans isolated in blood culture samples obtained more than 4 weeks apart, or more than 2 weeks apart if blood culture became sterile or there was evidence of clinical resolution of the infection; hence regular follow-up of the patients is required. In our case, the patient was found to be afebrile after 2 weeks of completion of treatment and also after 4 weeks of completion of treatment.

Table 1 briefly outlines studies with Achromobacter isolates from blood across various parts of the world.

The antibiotic regimen for this organism has not been described. Turel et al., and Aisenberg et al., in their respective studies showed that combination of carbapenem with ciprofloxacin, ceftazidime or pipercillin-tazobactam to be an effective treatment for bloodstream infection in neonates and cancer patients.[1,4] Trimethoprim-sulfamethoxazole was found to be treatment option according to studies done by Legrand and Anaissie, Shie et al., Duggan et al., and Padmaja et al.[5-11] Gómez-Cerezo et al., had shown that antibiotic therapy with antipseudomonal penicillin or carbapenems would be an effective treatment for Achromobacter species.[8] Till date, the maximum number of blood culture isolates (92) have been reported by Kaur et al.[12] They have reported 88% of the isolates to be resistant to cefuroxime and 70% of the isolates to be resistant to aminoglycosides, first and second generation cephalosporins. They have also done a comparative analysis of various typing methods on all 92 isolates. The antibiogram typing in their study had a discriminatory power of 96.9% compared to 98.9% of pulse field gel electrophoresis. They found that whole cell protein profiling with a discriminatory power of 94% was a faster,
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Table 1: Various studies showing bloodstream infection caused by Achromobacter species

| Reference | Species isolated | Underlying medical condition | Number of isolates | Year and place of isolation | Treatment given and response to treatment |
|-----------|------------------|-------------------------------|--------------------|----------------------------|------------------------------------------|
| Aisenberg et al.
[4] | A. xylosoxidans | Cancer | 47 | 1989-2003 Texas | Meropenem with piperacillin-tazobactam; 7 patients expired, rest recovered |
| Legrand and Anaissie
[11] | A. xylosoxidans | Cancer, pneumonia | 26 | 1992 Houston | Trimethoprim-sulfamethoxazole, antipseudomonal penicillin, ceftazidime, cefoperazone, imipenem; all patients recovered |
| Duggan et al.
[24] | A. xylosoxidans | Cancer, renal failure | 4 | 1996 Michigan | 1. Trimethoprim-sulfamethoxazole with tobramycin-patient expired 2. and 3. Ticarcillin-clavulanic acid-patients recovered |
| Weitkamp et al.
[30] | A. xylosoxidans | IgM syndrome | 1 | 2000 Tennessee | Amikacin, imipenem, tobramycin; recurrent episodes of bacteremia on follow-up |
| Gómez-Cerezo et al.
[40] | A. xylosoxidans | Cancer | 54 | 2003 Spain | Antipseudomonal penicillins and carbapenem; 8 patients expired, rest recovered |
| Shie et al.
[44] | A. xylosoxidans | Cancer, intravascular catheters, neutropenia | 40 | 2005 Taiwan | Piperacillin, imipenem, ceftazidime, and trimethoprim-sulfamethoxazole; 19 patients expired, rest recovered |
| Al-Jasser and Al-Anazi
[50] | A. xylosoxidans | Cancer | 1 | 2007 Saudi Arabia | Colistin - patient expired |
| Kaur et al.
[54] | A. xylosoxidans | - | 92 | 2009 India | Comparison of different typing methods in clinical isolates is done |
| Padmaja et al.
[60] | A. xylosoxidans subsp. denitrificans | Post valve replacement | 1 | 2013 India | Meropenem with trimethoprim-sulfamethoxazole; patient recovered |
| Krause et al.
[64] | A. piechaudii | Immunocompetent individual | 1 | 2012 USA | Levofloxacin and patient recovered |
| Turel et al.
[68] | A. xylosoxidans | Neonates | 22 | 2013 Turkey | Meropenem in combination with ciprofloxacin(ceftazidime)/ piperacillin tazobactam; 3 patients expired, rest recovered |
| Peterson et al.
[72] | A. xylosoxidans | Neonate | 1 | 2014 India | Meropenem; patient expired |
| Otto et al.
[76] | A. xylosoxidans | Hypertensive, alcoholic, acute pancreatitis | 1 | 2014 India | Amikacin with piperacillin-tazobactam; patient recovered |

A. xylosoxidans: Achromobacter xylosoxidans, A. denitrificans: Achromobacter denitrificans, A. piechaudii: Achromobacter piechaudii

Achromobacter: easier, and technically less demanding typing method. In our case, the patient recovered with amoxicillin-clavulanic acid treatment, which was given empirically to the patient and on doing antibiotic susceptibility testing it was found that the strain was susceptible to it.

Our patient was diagnosed to have A. xylosoxidans and had responded to treatment with amoxicillin-clavulanic acid. Similar findings of Achromobacter sensitivity to amoxicillin-clavulanate have been reported by Ng et al.[15] More light on this aspect may generate enough evidence to show that amoxicillin-clavulanic acid is a proper drug for curing Achromobacter septicemia, which is definitely a safer and well-tolerated drug.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. Turel O, Kavuncuoglu S, Hosaf E, Ozbek S, Aldemir E, Uyygur T, et al. Bacteremia due to Achromobacter xylosoxidans in neonates: Clinical features and outcome. Braz J Infect Dis 2013;17:450-4.
2. Peterson RR, Anandan S, Ebenezer K, Agarwal I. Achromobacter xylosoxidans bacteremia in a neonate. Paediatr Infect Dis J 2014;33:99-101.
3. Weitkamp JH, Tang YW, Haas DW, Midha NK, Crowe JE Jr. Recurrent Achromobacter xylosoxidans bacteremia associated with persistent lymph node infection in a patient with hyper-immunoglobulin M syndrome. Clin Infect Dis 2000;31:1183-7.
4. Aisenberg G, Rolston KV, Safdar A. Bacteremia caused by Achromobacter and Alcaligenes species in 46 patients with cancer (1989-2003). Cancer 2004;101:2134-40.
5. Padmaja K, Lakshmi V, Rao MA, Mishra RC, Rosy C, Sridharan V. Prosthetic valve endocarditis with aortic root abscess due to Achromobacter xylosoxidans subsp. denitrificans – A rare case report. Int J Infect Control (Serial Online) 2013;9:1-5. Available from: http://www.ijic.info. [Last accessed on 2014 Dec 14].
6. Clinical and Laboratory standards Institute, Performance standards for Antimicrobial Susceptibility testing; Twenty fourth informational supplement CLSI document M 100-S 24. Vol. 34. Wayne, PA: Clinical and Laboratory Standards Institute; 2014. p. 1.
7. Al-Jasser AM, Al-Anazi KA. Complicated septic shock caused by Achromobacter and Alcaligenes species in 46 patients with cancer (1989-2003). Cancer 2004;101:2134-40.
8. Gómez-Cerezo J, Suárez I, Ríos JJ, Peña P, García de Miguel MJ, de José M, et al. Achromobacter xylosoxidans bacteremia: A 10-year analysis of 54 cases. Eur J Clin Microbiol Infect Dis 2003;22:360-3.
9. Legrand C, Anaissie E. Bacteremia due to Achromobacter xylosoxidans in patients with cancer. Clin Infect Dis 1992;14:479-84.
10. Duggan JM, Goldstein SJ, Chenoweth CE, Kauffman CA, Bradley SF. Achromobacter xylosoxidans bacteremia: Report of four cases and review of the literature. Clin Infect Dis 1996;23:569-76.
11. Shie SS, Huang CT, Leu HS. Characteristics of Achromobacter xylosoxidans bacteremia in northern Taiwan. J Microbiol Immunol Infect 2005;38:277-82.
12. Kaur M, Ray P, Bhatty M, Sharma M. Epidemiological typing of clinical
isolates of *Achromobacter xylosoxidans*. Comparison of phenotypic and genotypic methods. Eur J Clin Microbiol Infect Dis 2009;28:1023-32.

13. Krause ML, Sohail MR, Patel R, Wittich CM. *Achromobacter piechaudii* bloodstream infection in an immunocompetent host. Am J Case Rep 2012;13:265-7.

14. Otta S, Swain B, Panigrahy R, Panda K, Debata NK. Achromobacter xylosoxidans: A rare pathogen for community acquired acute pancreatitis. JMM case reports (serial online) 2014;1:1-3. Available from http://jmmcr.sgmjournals.org. [Last accessed on Dec 15 2014].

15. Ng ZY, Fang G, Leo KW. Resolution of concomitant *Achromobacter xylosoxidans* burn wound infection without adjustment of antimicrobial therapy. Indian J Plast Surg 2014;47:137-40.