Catheter associated bloodstream infection caused by *R. radiobacter*

Rhizobium radiobacter is a gram negative bacillus that is infrequently recognized in clinical specimens but is emerging as an opportunistic human pathogen. Infections due to *Rhizobium radiobacter* are strongly related to the presence of foreign plastic material and effective treatment often requires removal of the device. We report a case of *R. radiobacter* bloodstream infection associated with a central venous catheter which was easily controlled by antimicrobial treatment and did not require removal of intravascular device. To the best of our knowledge, this is the first case report from India implicating *R. radiobacter* as a cause of human infection.

Key words: *Bloodstream infection, central venous catheter, Rhizobium radiobacter*

Introduction

The *Rhizobium* genus is most widely recognized as a plant pathogen. They are typically oxidase positive, aerobic, non spore forming gram negative rods that resemble CDC group Vd-3.[1] Their biochemical profile is notable for rapid hydrolysis of urea, O- nitrophenyl- β-D-galactopyranoside and aesculin.[2] The genus has been formed by reclassifying the *Agro bacterium* genus and *Allorhizobium undicola* together, based on comparative 16SrRNA gene analyses. Five species include *Rhizobium radiobacter*, *Rhizobium rhizogenes*, *Rhizobium vitis*, *Rhizobium rubi* and *Rhizobium undicola*.[2,3] Although not without controversy, *R. radiobacter* is now commonly accepted as the new nomenclature for *A. radiobacter*, *A. tumefaciens* and CDC group Vd-3.[4] Of all the species, *R. radiobacter* is most commonly associated with human disease[5] and has been recognized as an opportunistic pathogen. The current case report describes a case of central venous catheter associated bloodstream infection caused by *R. radiobacter*.

Case Report

A 51-year-old male was admitted to the coronary care unit of a tertiary care hospital in Jaipur in October, 2008, with a diagnosis of acute inferior wall myocardial infarction with triple vessel disease. The patient was a known case of diabetes (on oral hypoglycaemic drugs) and hypertension since two years. There was no other significant past history of disease or surgery. The patient also complained of recurring melena since 10 days. Hence, thrombolytic therapy with primary angioplasty was cancelled and the patient was advised coronary artery bypass grafting after evaluation for melena. Injection amikacin 500 mg BD and injection cefoperazone/sulbactam1 gm IV BD were started as per the protocol for prophylaxis for emergency intestinal surgery. A central venous catheter was inserted in the internal jugular vein. After a successful laparotomy, the patient developed fever (101.5°F) after 48 hours of CVC insertion. Physical examination showed no evidence of any localised surgical site infection or inflammation. Complete blood count showed a WBC count of 9.3 thousands/micro litres and a haemoglobin level of 9.7 g/dl. Urine culture was found to be negative Blood was then collected simultaneously from 2 separate sites, the central line and peripheral arterial line and inoculated into separate commercial BACTEC vials for automated culture on the BACTEC 9050 system (Sparks, Maryland, U.S.A). The antibiotic regimen was changed to tigecycline 100 mg stat followed by 50 mg OD and Injection imipenem 500 mg

six-hourly empirically. Propped up position, high flow oxygen mask, cold sponging and IV fluids were also added. The patient responded well and became afebrile within next 48 hours.

During the processing of samples in the microbiology lab, the BACTEC vial containing blood from the central line blood beeped positive two hours 15 minutes earlier than the vial with peripheral blood. Identical oxidase positive, urease positive, non lactose fermenting colonies were isolated from both the blood culture vials the next day. Both the isolates were sent to our reference laboratory in Mumbai (Super Religare Laboratories [Formerly, SRL Ranbaxy Limited], Andheri East, Mumbai) for identification and sensitivity testing. Both the isolates did not ferment carbohydrates except adonitol and oxidised glucose. Both were indole negative, voges proskauer negative, β-galactosidase negative and tryptophan deaminase negative. They hydrolysed aesculin, but did not utilize citrate, tartrate, malonate or acetate. They also did not decarboxylate ornithine, lysine and arginine. Using the Microscan® Walkaway Sl automated identification and susceptibility system (Siemens, West Sacramento, California, USA)), both were separately identified as *Rhizobium radiobacter*. The identities were reconfirmed using the mini API system (Biomerieux, Marcy-l'Etoile, France) using the API GN ID® strips. The isolates were found to be sensitive to amikacin, cefepime, cefotaxime, ceftriaxone, ciprofloxacin, gatifloxacin, gentamicin, imipenem, levofloxacin, meropenem, piperacillin-tazobactum, tetracycline, ticarcillin-clavullanate and cotrimoxazole and demonstrated resistance to aztreonam.

Isolation of the same organism with similar susceptibilities from two blood cultures thus implicated *R. radiobacter* as the definitive cause of bacteraemia. Since it is validated that a definite diagnosis of catheter associated infection can be made if a positive catheter hub-blood culture is detected at least two hours earlier than peripheral-blood culture,[6] it was concluded that the patient was suffering from a central venous catheter associated bloodstream infection by *R. radiobacter*.

Though removal of the catheter is usually required to control catheter associated bloodstream infections, it was decided to not remove the device as the patient has already responded to the antibiotic treatment and become afebrile. Repeat blood cultures were also found sterile.

Discussion

Human disease caused by members of the *Rhizobium* genus is uncommon. Two initial reports published in 1967 and 1977 found no evidence implicating them in human infectionsl despite isolation from clinical specimens.[5,7] Agents were thought to represent colonisers or laboratory contaminants. It was not until 1980 that its pathogenic potential was recognized when it was identified as a causative agent of prosthetic valve endocarditis.[2] The organism is now recognised as an emerging opportunistic pathogen affecting mostly immunocompromised and chronically debilitated hosts. Underlying conditions contributing to disease include malignancies, bone marrow transplants, chronic renal failure and HIV infection.[8] Corticosteroid therapy and diabetes have also been identified as predisposing factors.[3]

Catheter related bacteraemia, continuous ambulatory peritoneal dialysis associated peritonitis, urinary tract infections and pneumonia are the common clinical conditions caused by *R. radiobacter*.[3] Other clinical conditions include endocarditis, cellulitis, myositis, endopthalmitis and foetal death due to maternal and foetal bacteraemia.[8] Infection with *R. radiobacter* is often associated with the presence of a foreign plastic body such as central venous catheter, nephrostomy tubes, intraperitoneal catheters and prosthetic cardiac valves. The frequent correlation between these organisms and plastic indwelling devices can be attributed to the capacity of this organism to adhere to silicone tubes, comparable to that exhibited by *Staphylococcus aureus* and *Staphylococcus epidermidis*.[2]

Catheter-related blood stream infection is the most frequent route of *R. radiobacter* infection and the usual presentation reported in literature, just as in our patient, is fever without localizing signs. Though there is one documented case report of *R. radiobacter* bacteraemia due to probable central venous catheter colonization from exposure to soil,[2] the mode of transmission remains largely unclear as most of the infections reported in literature give no history of unusual plant or soil exposure.

R. radiobacter infections are most commonly community acquired.[3] However, our case should be considered as nosocomial since the episode of blood stream infection identified by positive cultures occurred later than 48 hours of hospital admission. This implies the ubiquitous nature of *R. radiobacter* and its presence even in the hospital environment. The organism should thus be considered as a possible nosocomial pathogen and surveillance studies should be conducted to determine its reservoirs in hospital settings. Lai *et al*., have however reported the absence of nosocomial spread of the organism as pulse field gel electrophoresis profiles differed among the isolates recovered from different patients.[4]

There is no consensus regarding the need for removal of indwelling foreign devices to facilitate treatment of *R. radiobacter* infections. In our case, the central venous catheter was not removed due to clinical improvement in the patient and negative follow-up blood cultures. However, removal of catheter is recommended when there is clinical deterioration or the culture continues to yield *R. radiobacter* isolates longer than 48 hours of initiation of appropriate antibiotic therapy.[9]

The outcome of *R. radiobacter* bacteraemia has been universally favourable with only a single documented case of mortality with foetal demise in surviving mother.[2]

Being natural soil inhabitants, *R radiobacter* strains may very well be inherently resistant to many antibacterial agents due to the presence of other antibiotic producing organisms in their habitat. Production of antibiotic inactivating enzymes including inducible cephalosporinase, an aminoglycoside acetyltransferase and chloramphenicol acetyl transferase has been previously described in a clinical isolate of *R. radiobacter*.[9]

Antibiotic regimens should not be based on results of disc diffusion susceptibility testing as reference breakpoints have not been standardized for *R. radiobacter* by the CLSI. The therapy might thus be best guided by Minimal inhibitory Concentration (MIC) testing results.[10] Third generation cephalosporins, fluroquinolones, extended spectrum beta lactams and carbapenems are the most frequently chosen antibiotics to treat *R. radiobacter* infections.[2]

Conclusion

We thus report a case of central venous catheter associated *R. radiobacter* bloodstream infection that was easily controlled by antimicrobial treatment. This report emphasises the need for including *R. radiobacter* in the list of pathogens causing bacteraemia in immunocompetent patients, especially in the presence of an intravenous catheter.

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