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Ralstonia Mannitolilytica Induced Septicemia in a Patient with Pulmonary Edema-A Rare Case Report

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Abstract

Ralstonia mannitolilytica is an emerging human pathogen, which is an environmental bacterium. Hospital outbreaks are limited; however, the organism has been reported from tumour patients, bloodstream infections, recurrent meningitis patients, etc. In this report, we discuss a case of septicemia caused by R. mannitolilytica and its antibiotic susceptibility in a patient with pulmonary oedema. A 96-year-old female patient presented to the hospital with breathlessness, palpitations and chest pain. Ralstonia mannitolilytica has been isolated from blood culture using conventional techniques and the diagnosis was confirmed with automated VITEK 2 compact. To the best of our knowledge, this is the first case of Ralstonia mannitolilytica reported in a cardiac patient with septicaemia in Chennai. Rapid identification of this bacteria and appropriate use of antibiotics would help in minimising the emergence of drug resistance.

Keywords: *Antibiotic Resistance, Pulmonary Edema, Ralstonia mannitolilytica, Septicaemia.*

Introduction

Ralstonia is a Gram-negative bacteria, commonly found in the environment. Among the various species of the genus Ralstonia, three species namely *Ralstonia pickettii, Ralstonia insidiosa and Ralstonia mannitolilytica* are of human importance [1]. These bacteria are of higher significance because of their ability to survive in disinfectant solutions and their ability to pass through microbiological filters used for sterilisation of solutions [2]. *Ralstonia mannitolilytica* is an emerging opportunistic pathogen among the nonfermenting Gram-negative bacteria, which was previously called *Pseudomonas thomasii* [3, 4, 5].

The prevalence of human infections by Ralstonia is less, however, if occurs the disease progression and severity of the disease is higher. *R.mannitolilytica* can cause clinical infections such as sepsis, bone infections, meningitis, etc [6]. Ralstonia species are one of the emerging nosocomial pathogens, especially in immunocompromised patients. Lucarelli C, et al had reported infections due to *R.mannitolilytica* in 12 oncology patients attending their hospital [7]. This microorganism can overcome disinfectants and grow in various water resources and moist environments [8]. There are reports of outbreaks of *R.mannitolilytica* infections due to contamination of oxygen transport equipment, contamination of intravenous solutions and instruments, etc. [4, 9-11].

R. mannitolilytica causing septicemia is relatively a rare condition. The development of drug resistance in such cases is alarming. There are no unique clinical characteristics or manifestations of *R.mannitolilytica* infections and hence, without knowledge about the pathogen, the diagnosis and management of *R.mannitolilytica* infections is a real challenge for the treating doctors. The outbreak of

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infections due to *R.mannitolilytica* is a great concern because such bacteria may not have a great role only as human pathogens, but also may present as potential reservoirs of resistant genes especially in hospital settings.

R.pickettii is one of the Ralstonia species frequently reported in the literature, with only a few clinical cases reported by other species, especially *R.mannitolilytica*. The biofilm production by Ralstonia species is associated with localized and systemic infections with frequent antibiotic resistance [12]. Reports on Surveillance and monitoring of antibiotic resistance in *R.mannitolilytica* are limited. We describe here a case of *Ralstonia mannitolilytica* infection in a cardiac patient diagnosed with Acute pulmonary oedema who was successfully treated with antibiotics.

Case Report

A 96-year-old female, resident of Chennai was brought to the hospital with complaints of breathlessness, palpitations and non-radiating chest pain since morning on the day of admission. The patient had a fever and dry cough for the previous 3 days. She was an old case of myocardial infarction and a known hypertensive on anti-hypertensive drugs.

On examination, the patient was pale, conscious, confused, agitated, and febrile with adequate hydration. Her pulse rate was 110/mt, SpO2 – 99% with nasal oxygen. She had bilateral scripts more pronounced in the basal area of the lungs with normal vesicular breath sounds. Initial blood pressure was 130/90mmHg followed by a drop in her BP to 100/60mmHg. ECG revealed a left bundle branch block and had 48% left ventricle ejection fraction. The patient was diagnosed with Acute Pulmonary oedema with moderate to severe Left ventricle dysfunction. The patient was promptly shifted to the cardiac intensive care unit. The patient was put on diuretics, heparin and intravenous antibiotics. She was started on intravenous ceftriaxone 1g once a day. A blood sample was sent for culture and sensitivity. Routine laboratory tests were performed. She had 3+ urine ketones and troponin T positive.

The patient's urine culture was negative for any bacteria. Blood was drawn from the patient under aseptic conditions and cultured with an automated blood culture instrument (BacT/ALERT® 3D 120, BioMerieux Inc., Marcy L'Etoile, France). Blood culture yielded a Gram-negative non-fermenter, which was oxidase-positive. The bacterium was processed in an automated VITEK2 compact (BioMérieux, France) using Vitek 2 cards for identification of Gram-Negative bacteria, which revealed the bacterium to be *Ralstonia mannitolilytica*. (Bio number: 4243611103500001. Excellent identification with 99% probability). Antimicrobial susceptibility testing of the isolate was performed by Kirby - Bauer disc diffusion method according to Clinical and Laboratory Standards Institute (CLSI) guidelines. The bacterial suspension was inoculated on the Mueller-Hinton agar plate as a smooth lawn, and antibiotic discs were placed on it, and incubated at 37^{o}C overnight. The antibiotic susceptibility testing showed that the bacteria was resistant to Cephalosporins, Colistin and Meropenem and were sensitive to Ciprofloxacin, Amikacin, Amoxycillin clavulanic acid, and Imipenem. Gentamycin and Piperacillin tazobactam (Figure 1). After the sensitivity report, IV ceftriaxone was immediately ceased, and she was started on amoxicillin clavulanic acid. The patient improved clinically and was discharged from the hospital with an uneventful stay. On discharge, she was advised to restrict fluid intake, diuretics and antihypertensives.

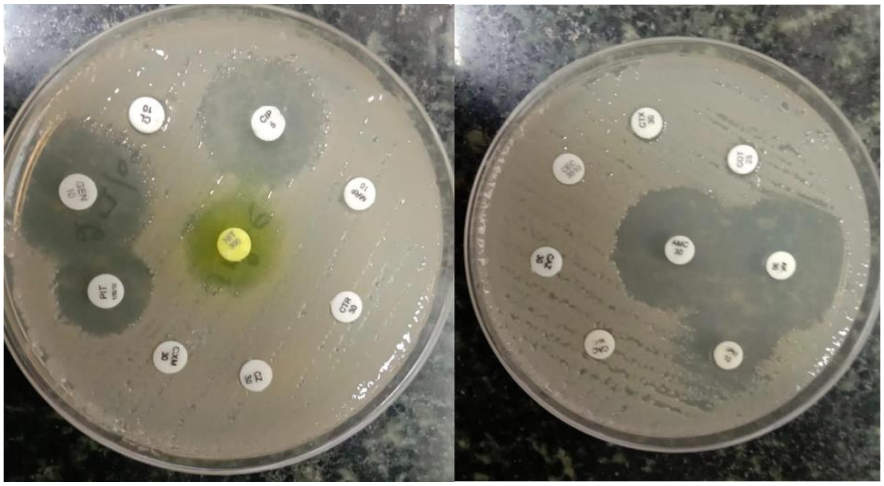

Figure 1. Kirby Bauer disc Diffusion Antibiotic Susceptibility of Ralstonia Mannitolilytica Isolate on Muller Hinton Agar

Discussion

Ralstonia is an aerobic, Gram-negative bacillus, usually an environmental microbe, which is unique in exhibiting different metabolic pathways. Clinical infection primarily due to this organism is rare [6]. However, abuse of broad-spectrum antibiotics, prolonged use of immunosuppressive drugs, etc. lead to the rise in infections due to these organisms. Many hospital outbreaks of this microorganism have been reported recently, including Ralstonia contamination of parenteral fluids and saline solutions prepared in hospital pharmacies [4,11].

The genus Ralstonia includes four main species, viz. *R. picketii*, *R. solanacearum*, *R. insidosa* and *R. mannitolilytica*. There are only fewer cases of clinical infections due to *R. mannitolilytica* reported in the literature. The contamination by this organism would even lead to hospital outbreaks including severe hospital-acquired infections such as sepsis, respiratory diseases, meningitis, renal transplant infections, hemoperitoneum, etc. [1, 3, 13, 14].

R. mannitolilytica outbreak was reported in 22 states of the USA in 2005 due to contaminated oxygen delivery devices [10]. Another study in 2007, reported Catheter-related bacteremia due to *R.mannitolilytica* infections in leukaemia patients probably due to contaminated intravenous solutions and indwelling intravenous devices [15].

In this case, the patient was an elderly female, with a weaker immunity. She had an old case of myocardial infection, presenting with pulmonary oedema. Therefore, the patient had predisposing risk factors for acquiring this bacterium. Further, the patient had breathlessness, palpitations, increased pulse rate, decreased blood pressure, etc. These symptoms were consistent with the previous reports in the literature [2, 16]. *R. mannitolilytica* has been reported to show resistance to routinely used antibiotics such as ampicillin, penems and aminoglycosides. In the present case also, the bacteria were resistant to cephalosporins and meropenem. Stekzmueller in his report mentioned that Ralstonia lacks virulence factors and can be successfully treated using broad-spectrum antibiotics [17]. It has been reported that *R.mannitolilytica* can form a biofilm on plastic catheters [18].

The use of ventilators, oxygen delivery systems, venous catheters, contaminated intravenous solutions, etc. are a few of the risk factors for the possibility of occurrence of infections with *Ralstonia mannitolilytica*. Ralstonia possesses the capability of passing through 0.2-micrometer filters used in sterilizing medical instruments [1]. The ability

of the bacterium to grow on the abiotic surfaces forming a biofilm plays a major role in the colonization of Ralstonia species on hospital equipment and indwelling devices. Biofilm formations might be a cause of adherence and dissemination of the pathogen in the human host.

Although the source of infection could not be identified in most of the cases, investigations suggest that preventive measures can be strengthened by improving hospital infection control practices and maintaining proper antibiotic policies in the hospitals. Currently, there are no proper management guidelines or CLSI breakpoints for appropriate identification of *R.mannitolilytica* infections. The clinical importance of *R.mannitolilytica* is often underestimated because of the difficulty in identifying the species with conventional culture-based microbiological tests. It has been reported that due to the similarity in the biochemical pattern-based techniques, Ralstonia identification is quite challenging [19]. Molecular diagnostic tests would help in the appropriate identification of the bacterial strains. Microbiological, epidemiological and molecular typing would help in the detection of the source of outbreaks due to *R.mannitolilytica*.

Even though *R.mannitolilytica* infections often do not cause life-threatening infections, the emergence of multidrug-resistant isolates is a reason for concern, especially in vulnerable patients with extremes of ages, chronic illnesses, immunodeficient diseases and patients on immunosuppressive drugs, who may require appropriate antimicrobial therapy. Management of severe Ralstonia infections is reported to be challenging due to their intrinsic resistance to inducible β-lactamases [20]. Active surveillance is the best way to understand the prevalence, pathophysiology and public health impact of Ralstonia infections.

Conclusion

We report a rare case of *Ralstonia mannitolilytica* causing septicemia in a patient with pulmonary oedema. Presently, no proper guidelines are available for the diagnosis and management of Ralstonia infections. Though the virulence factor may be low in *R.mannitolilytica* infections, it may potentially cause harmful effects in immunodeficient individuals. High clinical suspicion with accurate laboratory diagnosis is very important in assisting prompt identification of the organism. We recommend routine antibiotic susceptibility testing to adjust the use of antimicrobials in the treatment of cases. The problems due to Ralstonia can occur rapidly with a fast progression of the disease. Therefore, knowledge about the organism among the treating physicians as well as the bacteriology workers is essential in tackling the severe consequences if occurs. Further, active surveillance is recommended for a better understanding of the epidemiology, source of infection and public impact of the clinical infections caused by this organism.

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Conflict of Interest

All the authors declare that there is no conflict of interest.

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