

Emerging Pathogens in Immunocompromised Hosts in ICU Settings: *Ralstonia pickettii*

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ABSTRACT

Ralstonia pickettii, an oligotrophic betaproteobacteria is found in rivers, soils, lakes, and in biofilms in plastic water pipes. The objective of this case report was to describe a case of *R. pickettii* causing ventilator-associated pneumonia in an intensive care unit (ICU) setting, focusing on risk factors, antibiotic sensitivity patterns, clinical characteristics, management, and outcomes.

A 45-year-old male patient presented to the Emergency Department with a complaint of neurotrauma after a road traffic accident. Decompressive craniectomy was done and the patient was shifted to ICU for postoperative care and mechanical ventilation, later patient was tracheostomized in view of prolonged mechanical ventilation, poor GCS, and for better tracheal toilet. Later patient developed pneumonia, and antimicrobial susceptibility testing showed the isolate *R. pickettii*, sensitive to levofloxacin and piperacillin/tazobactam. After five days of treatment, the patient was weaned from the ventilator.

Keywords: Case report, Critical care, Intensive care units, Opportunistic Infections, *Ralstonia pickettii*, Respiratory distress syndrome.

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INTRODUCTION

Ralstonia pickettii an oligotrophic Betaproteobacteria is found in rivers, soils, lakes, and in bio-films in plastic water pipes. It can survive with low concentration of nutrients and some survives in highly contaminated metals environments. The ability to tolerate these resistant circumstances makes *R. pickettii* suitable for bioremediation.¹ *Ralstonia pickettii* and *R. insidiosa* are new strains in intensive care unit (ICU) settings.

CASE DESCRIPTION

A 45-year-old male patient presented to the Emergency Department with alleged history of road traffic accidents. NCCT head revealed a right parietal bone fracture with right temporoparietal contusion with CSF rhinorrhea. The patient underwent right frontotemporal parietal decompressive craniectomy with the evacuation of underlying subdural hematoma with right temporal contusionectomy with augmented duroplasty using a pericranial patch with bone flap in the anterior abdominal wall. Patient was not extubated in view of low preoperative GCS and was later tracheostomized in view of prolonged ventilatory support. The patient was weaned off gradually and was maintained well on room air in the further postoperative course. On the 4th postoperative day (POD) he developed a high-grade fever (102°F). Cultures were sent and tracheal aspirate showed growth of *Klebsiella pneumoniae*. On POD-7 he went into respiratory distress and ventilatory support was required so the patient was shifted to the critical care unit. Repeat cultures were sent. Gradually TLC count started decreasing following which the patient was taken on prophylactic antifungals (Caspofungin). TLC went down upto 320 with n-12, l-85. Tracheal aspirate showed heavy growth *Ralstonia pickettii* - (10⁵ CFU/mL) k, (direct gram stain few pus cells, few gram-negative rods were seen) sensitive only to levofloxacin and piperacillin-tazobactam. Antibiotic sensitivity tests (ASTs) based antibiotics were given to the patient and a repeat tracheal aspirate sample was sent for AST after

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5 days of treatment. Gradually patient was weaned from ventilatory support and repeat cultures were sterile.

DISCUSSION

Ralstonia pickettii is a low virulence nonfermenting gram-negative oxidase-positive. It is a Betaproteobacteria species found in soils, rivers, lakes, and in biofilms in plastic water pipes, mainly in immunosuppressed patients.² *Ralstonia* species is a new subtype that includes older members of *Burkholderia* species, (*B. pickettii* and *B. solanacearum*). These bacteria are now called as *R. pickettii* and *R. solanacearum*. *Ralstonia* manufactures acid from glucose and other carbohydrates and is motile due to one or more polar flagella. Identification is difficult as *R. pickettii*, *R. mannitolilytica*, and *R. insidiosa* grow on media which is used

for the isolation of *Burkholderia cepacia*. *R. pickettii* has reduced susceptibility to aztreonam, narrow-spectrum cephalosporins, and aminopenicillins because it manufactures a chromosomally transcribed enzyme inhibitor, class D β -lactamase, OXA-22, unlike other *Ralstonia* or *Cupriavidus* species.³ Some species of *R. pickettii* are reported to be susceptible to trimethoprim-sulfamethoxazole, ciprofloxacin, and ureidopenicillins with varied susceptibility to aminoglycosides.⁴ *Ralstonia pickettii* infection is linked to contamination of the medication ampules, dialysis water, intravenous fluid administration, and use of extracorporeal oxygenation membranes, among other factors. In the ICU broad-spectrum antibiotics, steroids, prolonged mechanical ventilation, poor intake, and nutritional deficiency make them more prone to be victims of such an opportunistic infection.

Disease Response

Ralstonia pickettii has a difficult pathology, though it does not affect healthy individuals. The bacteria target immunocompromised hosts. Outbreaks have been reported, particularly in patients with Crohn's and cystic fibrosis disease. Among 55 reported cases, most were due to contaminated solutions like saline, drugs, and water.² The sterilized medical product gets easily contaminated by *R. pickettii* as 0.2 and 0.45 μ m filters that are used in the sterilization of medicinal products are easily penetrated by the bacteria. The majority strains of *R. pickettii* and *R. insidiosa* were sensitive to most of the antibiotics with quinolones and sulfamethoxazole/trimethoprim being the most effective.

CONCLUSION

Ralstonia pickettii and *R. insidiosa* are entering the picture as new pathogens in hospital settings. *Ralstonia pickettii* has a difficult pathology, though it does not affect healthy individuals. The bacteria target immunocompromised hosts. In healthy individuals, infections with *Ralstonia* spp. are extremely rare. However, in immunocompromised patients, *R. pickettii* may cause infections, mainly of the respiratory tract, our case study is an example of the same. Hospital outbreaks of infections with *R. pickettii* have been documented with the use of contaminated fluids used for patient care, central venous lines, and other medical products.

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