

Rare Encounter: *Rhizobium radiobacter* Bacteraemia Coupled with Antimicrobial Resistance in an Acute Lymphoblastic Leukaemia Patient

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ABSTRACT

Rhizobium radiobacter, a gram-negative bacterium, typically causes infections in immunocompromised individuals with indwelling devices. In these cases, it is important to promptly remove affected devices and administer parenteral antimicrobials, along with antimicrobial lock. Although infections caused by this organism are rarely life-threatening, they require careful management.

In this specific case, a patient diagnosed with early T precursor cell acute lymphoblastic leukaemia (ETP ALL) was admitted to the Hematology ward for consolidation chemotherapy. A baseline blood culture from the Peripherally Inserted Central Catheter (PICC) revealed the presence of *Rhizobium radiobacter*. The patient was successfully managed with parenteral antimicrobials and PICC line antibiotics lock, and was discharged after completion of chemotherapy.

KEYWORDS: Anti-Microbial Resistance (AMR), CRBSI (Catheter Related Blood Stream Infection), Early T Precursor Cell Acute Lymphoblastic Leukemia (near ETP ALL), PICC (Peripherally Inserted Central Catheter), *Rhizobium radiobacter*

INTRODUCTION

Rhizobium radiobacter, previously known as *Agrobacterium radiobacter*, is an aerobic, motile, oxidase-positive, and non-spore forming gram negative bacilli [1–3]. It is a rare but significant threat to immunocompromised individuals, particularly those with haematological malignancies and indwelling catheters such as PICC i.e. PICC line: peripherally inserted central venous catheter [4–8] lines. While these devices provide crucial vascular access, they also present a potential entry point for pathogens, significantly increasing the risk of bloodstream infections. The incidence of *Rhizobium radiobacter* infections in such contexts, although rare, represents a serious clinical challenge due to the bacterium's ability to form biofilms on medical devices, complicating eradication efforts.

In such cases, prompt removal of the source of infection, coupled with targeted parenteral antibiotics based on antimicrobial susceptibility, is crucial. In resource-limited settings, antimicrobial lock therapy for

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indwelling devices can be a valuable alternative when device removal is not feasible. [4]. This case report aims to delineate the clinical course of the infection, the diagnostic challenges, and the therapeutic strategies employed, highlighting the importance of a multidisciplinary approach in managing such complex infections.

CASE SUMMARY

A 17 – year old male follow-up case of early T precursor cell acute lymphoblastic leukemia (ETP ALL) was admitted for consolidation chemotherapy (i.e. 1st high dose methotrexate). The patient had a PICC line inserted during the induction chemotherapy and received regular dressing for the PICC line in the haematology ward. On the next day after admission, the patient experienced a single episode of fever (101.0 F) with chills but remained hemodynamically stable.

Following admission, routine blood investigations, including blood cultures from the PICC line and peripheral vein, were conducted. The patient's baseline hemogram revealed significant values, and renal/liver function tests were within the normal range.

The patient developed a febrile illness the next day, prompting immediate initiation of appropriate treatment, including anti-microbial lock therapy for the PICC line. The PICC line blood culture grew *Rhizobium radiobacter*, while the peripheral blood culture was sterile. Subsequent antimicrobial therapy was tailored based on susceptibility patterns, and following the completion of the required course of antibiotics, the patient successfully received a complete course of chemotherapy via the PICC line without further fever episodes. After being discharged, the patient remained asymptomatic and planned to undergo the 2nd high dose methotrexate chemotherapy.

Patient had PICC line in situ which was inserted during the induction chemotherapy 5 months ago and was undergoing regular PICC line dressing with strict aseptic precautions in hematology ward by trained health care person. Next day of admission patient had single episode of fever (101 F) with chills with hemodynamic stability. General and systemic examination were unremarkable.

Table 1. Anti-Microbial Susceptibility Pattern of *Rhizobium*

ANTIBIOTIC	SUSCEPTIBILITY
TIER 1	
CEFTAZIDIME	INTERMEDIATE
CEFEPIME	RESISTANT
GENTAMICIN	SUSCEPTIBLE
CIPROFLOXACIN	SUSCEPTIBLE
LEVOFLOXACIN	SUSCEPTIBLE
TIER 2	
PIPERACILLIN- TAZOBACTAM	RESISTANT
TRIMETHOPRIM-SULPHAMETHOXAZOLE	SUSCEPTIBLE
IMIPENEM	SUSCEPTIBLE
MEROPENEM	SUSCEPTIBLE
AMIKACIN	SUSCEPTIBLE
MINOCYCLINE	SUSCEPTIBLE

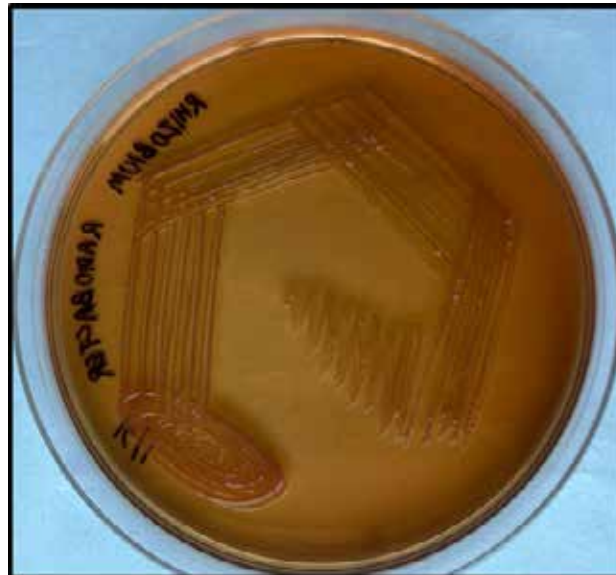


Figure 1. MacConkey agar *Rhizobium radiobacter*: non lactose fermenting, translucent colonies seen after 48hrs of aerobic incubation at 37 degrees Celsius.

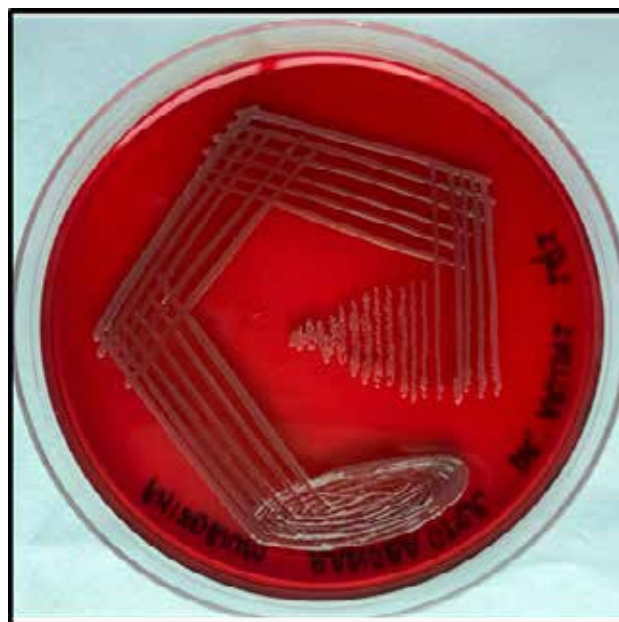


Figure 2. Blood agar: *Rhizobium radiobacter* non hemolytic grey colonies seen after 48hrs of aerobic incubation at 37 degrees Celsius.

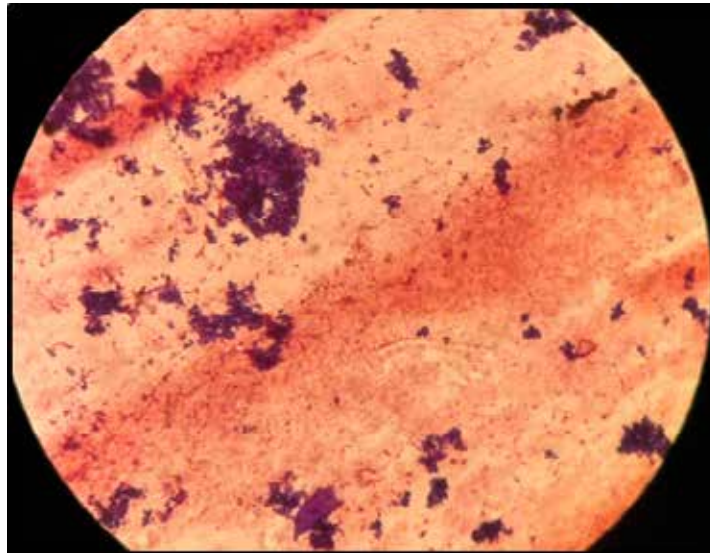


Figure 3. Gram negative rods seen in 100x oil immersion field.

DISCUSSION

Rhizobium radiobacter is the most prevalent species of the genus *Rhizobium* responsible for opportunistic infections in humans [2]. These infections are frequently observed in immunocompromised individuals, particularly those with haemato-lymphoid malignancies, transplant recipients, and paediatric patients, particularly neonates with immature immune systems [9,10]. There are documented cases of infections in immunocompetent individuals as well [2,3,11,12].

The primary sources of infection are often indwelling catheters, especially central venous catheters (as in our case), peritoneal catheters, post-contact lenses, and prostheses, among others [13-16]. Due to its relatively low incidence and prevalence, there is limited data available to guide the selection of antimicrobial therapy for this organism. However, in clinical practice, initial antimicrobial options commonly include fluoroquinolones, third-generation cephalosporins, aminoglycosides, and carbapenems [2,17].

In the case of our patient with a PICC in place, we initiated parenteral antibiotics consistent with institutional policy, administering Piperacillin-tazobactam, Amikacin, and Teicoplanin. Subsequently, the organism was found to be resistant to Piperacillin-tazobactam but sensitive to Amikacin. There are no specific guidelines for the optimal duration of therapy. In this instance, we administered parenteral antibiotics for 7 days, along with antimicrobial lock therapy of the PICC line using Gentamicin and Vancomycin. Following afebrile status, the patient was discharged without complications, and there were no further febrile episodes up to the last follow-up.

CONCLUSION

Rhizobium radiobacter, while uncommon, is often associated with indwelling devices. Due to its low prevalence, there is limited data on the best treatment approach. Consequently, standardized treatment protocols are not well established. In practice, successful management of *Rhizobium radiobacter* infections typically involves a two-pronged approach. First, it is often necessary to remove the infected or colonized device, as this can be the primary source of the bacterial growth and biofilm formation. Second, an appropriate course of antimicrobial therapy is administered to eradicate the infection. The choice of antibiotics may vary based on susceptibility patterns and clinical judgment, but commonly used agents include those effective against Gram-negative bacteria. It is crucial to promptly address this infection, as it can pose a life-threatening risk, especially to immunocompromised and individuals with multiple comorbidities. Overall, while *Rhizobium radiobacter* infections are uncommon, awareness and prompt management are vital to effectively treat affected patients and mitigate potential risks. Further research and accumulation of clinical data will be important to develop more definitive treatment guidelines in the future.

STANDARD OF REPORTING

CARE guidelines and methodology were followed to conduct the study.

CONSENT FOR PUBLICATION

Written informed consent has been taken from the patient.

FUNDING

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COMPETING INTEREST

The authors declare no conflicts of interest, financial or otherwise.

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Declared none.

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