

Case Report

RHIZOBIUM RADIOBACTER BACTEREMIA IN A TWO-YEAR-OLD PATIENT WITH AN ACUTE LYMPHOBLASTIC LEUKEMIA: A CASE REPORT

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Abstract

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Key words: *Rhizobium radiobacter*, malignancy, central venous catheter, immunocompromised, cephalosporins

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Rhizobium radiobacter is a Gram-negative rod-shaped bacterium usually associated with diseases in plants. Infections due to *R. radiobacter* in humans are strongly related to the presence of foreign plastic materials, immunocompromised and chronically debilitated hosts with underlying conditions such as malignancies, human immunodeficiency virus as well as bone marrow transplant recipients. The aim of this paper was to present a rare blood infection with *Rhizobium radiobacter* in North Macedonia in a pediatric patient with underlying conditions. The treatment was successful with appropriate cephalosporin and aminoglycoside therapy without removing the central venous catheter

Студија на случај

БАКТЕРИЕМИЈА ПРЕДИЗВИКАНА ОД RHIZOBIUM RADIOBACTER КАЈ ДВЕГОДИШЕН ПАЦИЕНТ СО АКУТНА ЛИМФОБЛАСТНА ЛЕУКЕМИЈА: ПРИКАЗ НА СЛУЧАЈ

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Цитирање: Какараскоска-Боцеска Б, Османи Д, Петровска-Басовска Б, Какараскоска-Петреска В, Мартинова К, Антевска-Трајкова З, Јовановска А, Кочева С. Бактериемија предизвикана од *Rhizobium radiobacter* кај двегодишен пациент со акутна лимфобластна леукемија: приказ на случај. Арх Ј Здравје 2020;12(3) doi.org/10.3889/aph.2020.5612

Клучни зборови: *Rhizobium radiobacter*, малигнитет, централен венски катетер, имунокомпромитиран, цефалоспорино

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Печатарски права: ©2020 Билјана Какараскоска-Боцеска. Оваа статија е со отворен пристап дистрибуирана под условите на нелокализирана лиценца, која овозможува неограничена употреба, дистрибуција и репродукција на било кој медиум, доколку се цитираат оригиналниот(ите) автор(и) и изворот.

Конкурентски интереси: Авторот изјавува дека нема конкурентски интереси.

Rhizobium radiobacter е Грам-негативна стапчеста бактерија најчесто поврзана со болести кај растенијата. Кај луѓето, инфекциите предизвикани од *R. radiobacter* се строго поврзани со присуство на материјали од пластика, имунокомпромитирачки и хронични состојби кај пациенти со основни заболувања како малигнитети, СИДА (или присуство на вирус на хумана имунодефициенција), како и кај пациенти со трансплантирана коскена срцевина. Целта на овој труд беше да се прикаже редок случај на инфекција на крвта предизвикана од *Rhizobium radiobacter* кај педијатриски пациент со акутна лимфобластна леукемија како основно заболување. Терапијата беше успешно спроведена со соодветна цефалоспориноска и аминогликозидна терапија, без отстранување на централниот венски катетер.

Introduction

Bacteria from genus *Rhizobium* (formerly *Agrobacterium*) are plant pathogens and usually associated with tumorigenic disease in plants^{1,2}. In 2001, *Agrobacterium species* and *Allorhizobium undicola* have been reclassified in the genus *Rhizobium*, based on comparative 16S rRNA gene analyses and proposed to contain five species (*R. radiobacter*, *R. rhizogenes*, *R. rubi*, *R. undicola* and *R. vitis*)³. *R. radiobacter* is the only species of the genus known to cause human diseases and recognized as an opportunistic pathogen^{4,5}. Infections due to *R. radiobacter* are strongly related to the presence of foreign plastic materials, and effective treatment often requires removal of the device^{5,6,7}. Catheter-related bacteremia, continuous ambulatory peritoneal dialysis peritonitis, urinary tract infections and rarely endophthalmitis, endocarditis, brain abscess and pneumonia are the most common clinical conditions caused by these bacteria^{8,9}. Identification of clinical isolates by molecular methods, such as rRNA gene analysis, has been described only in few studies^{10,11}.

The **aim of the study** was to present a rare blood infection with *Rhizobium radiobacter* in a pediatric patient with acute lymphoblastic leukemia.

Case report: On 27.12.2019, a 2-year-old boy was hospitalized at the University Clinic for Pediatric Diseases in Skopje, R. North Macedonia, with diagnosis acute lymphoblastic leukemia (pre B-ALL).

On 31.12.2019 therapy (ALL-IC 2002; BFM protocol) was started. On the 33rd day of the treatment, morphological and molecular remission of the primary illness was accomplished. The therapy was conducted through central venous catheter (CVK), allocated on 23.01.2020. Protocol therapy

was completed on 30.03.2020.

During the recovery period, after long term myelosuppression, on 24.03.2020 the child became febrile – 38.6°C. Blood sample was collected from CVK, with complete aseptic precaution, into pediatric blood culture bottle for aerobic and anaerobic bacteria (PediBact/BactAlert, Biomérieux, France). Blood sample beeped positive after few hours of incubation. Aliquot of broth was sub-cultured on 10% sheep blood agar and Mueller Hinton-F agar [culture medium with 5% horse blood plus β -NAD (β -Nicotinamide Adenine Dinucleotide (MHF))]. After 18h of incubation, non-hemolytic, grey colonies, 1-2 mm size, circular, smooth, glistening, with entire edges were grown on blood agar, as well as on MHF agar (Picture 1). Using Gram negative identification card (Biomérieux, France), the isolate was identified as *Rhizobium radiobacter* with 99% probability on VITEK2 (fully automated identification system).



Picture 1. Non-hemolytic, grey colonies of *Rhizobium radiobacter* on Columbia blood agar

The isolate was found to be sensi-

tive to ampicillin, amoxicillin with clavulanic acid, ceftriaxone, carbapenems, gentamicin, quinolones, amikacin, cephalosporins, except ceftazidime, which was resistant. I.v. cefotaxime was instituted as the fever started in 7 days and according to the culture results, solution of aminoglycoside was injected directly in the CVK. The same causative microorganism was confirmed in the second specimen, too. Other laboratory investigations made on 24.03.2020 revealed the following: total leukocyte count – $1.56 \times 10^9/l$, neutrophil – $0.07 \times 10^9/l$, hemoglobin 79 g/l, erythrocyte $2.82 \times 10^{12}/l$, thrombocyte – $25 \times 10^9/l$. C-reactive protein (CRP) was 3.4 mg/l.

Control blood sample was taken on 07.04.2020, one week after antibiotic application into CVK, and *Rhizobium radiobacter* was not detected.

Discussion: Before 1977, the growth of *Rhizobium* species has been mostly considered as laboratory contaminant or colonization rather than true infection¹¹. Now it is recognized as an emerging opportunistic pathogen affecting mostly immunocompromised and chronically debilitated host with underlying conditions such as malignancies, chronic renal failure, human immunodeficiency virus as well as bone marrow transplant recipients. Corticosteroid therapy and diabetes have also been identified as predisposing factors^{6,8,11,12}. In our case, severe neutropenia with ANC $70/\mu l$ was probably the cause of the infection.

We made a thorough review of the medical literature and found few cases of *R. radiobacter* infection reported in children, but not a single one from North Macedonia^{8,13,14,15,16}. Also, there are no reported cases infected with these pathogens in other

age groups from N. Macedonia. In our case, bacteremia was associated with two underlying conditions: firstly, malignant disease, secondly, implicated central venous catheter and finally as the result of the immunosuppressive therapy, severe neutropenia appeared, as another risk factor for generating this bacteremia.

In most of the cases removal of foreign devices was required to treat bacteremia, but in many cases, as in ours, only antibiotic therapy without the removal of devices has also been successful^{1,6,11}. Although there is no uniform opinion about the catheter removal, its use is recommended in cases of clinical deterioration, or when the culture remains positive 48 hours after initiated treatment¹⁵.

There are no clinical trials on the optimal therapy for *Rhizobium radiobacter* infection due to its low virulence and incidence. In our investigation, antimicrobial susceptibility pattern for *Rhizobium radiobacter* was sensitive to third generation cephalosporins, aminoglycosides, fluoroquinolones and carbapenems, consistent with the previous reports we found in the literature^{1,10,17,18,19}. Our patient did not demonstrate any long-term consequences of this infection.

Conclusion: *Rhizobium radiobacter* is an opportunistic pathogen mainly affecting immunocompromised children. It has shown a high susceptibility pattern to many antibiotics which makes treatment much easier and successful. Usually, appropriate antibiotic therapy with foreign device removal is necessary to control infection, but in our case, only therapy with third generation cephalosporin and aminoglycoside directly applied into CVK was enough.

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