

Rhizobium radiobacter – A rare organism causing central line-associated bloodstream infection in a preterm neonate

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ABSTRACT

Rhizobium radiobacter is an opportunistic human pathogen. Infections due to *R. radiobacter* are strongly related to the presence of foreign plastic materials 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 removal of the catheter. To the best of our knowledge, this is the first case report of *R. radiobacter* as a cause of central line-associated bloodstream infection in a preterm neonate.

Key words: Central line, Central line-associated bloodstream infection, Neonate, *Rhizobium radiobacter*, Sepsis

Nosocomial sepsis in the neonatal intensive care unit (NICU), often by drug-resistant strains, is a major cause of mortality, prolonged hospitalization, and increased hospitalization costs [1]. A central line-associated bloodstream infection (CLABSI) contributes considerably to nosocomial sepsis in neonatal units. Over the past decade, CLABSI incidence in India has been varying from 0.2% to 27%, with the rate of 0.5–47 per 1000 catheter days in various studies [2]. Of all the organisms reported in literature, *Rhizobium radiobacter* appears to be the rare cause of CLABSI in pediatric population. However, CLABSI due to *R. radiobacter* has not yet been described. Hereby, we report the first case report of CLABSI in a preterm neonate caused by *R. radiobacter*.

CASE REPORT

A male baby, born at 34 weeks of gestation to a primigravida mother by cesarean section (meconium stained liquor) with antenatal sonography suggestive of jejunal obstruction, was referred to NICU for further management. On admission, the baby was stable with no obvious dysmorphic features. Abdominal radiograph at 6 h of life was suggestive of midgut obstruction. Exploratory laparotomy was performed on day 2 of life. Intraoperative findings were suggestive of jejunal atresia.


Jejunoplasty was performed. Immediate post-operative course was uneventful. A peripherally inserted central catheter (PICC) was secured on the day of operation and total parenteral nutrition (TPN) was started. The baby was kept nil per oral for 20 days and was supported with TPN as per the unit protocol.

On day 21, the baby appeared off colored, lethargic, and had an apnea episode requiring stimulation. The baby was put on continuous positive airway pressure support. Septic screen was sent and third line intravenous (IV) antibiotics (meropenem and colistin) were started. Two sets of blood culture (using BACTEC-automated blood culture system) were obtained before starting antibiotics. The first one was collected from the peripheral vein through a separate venipuncture site, whereas the second one was collected from the PICC through the new connector after discarding the old connector. Septic screen results were positive (hemoglobin –10.1 g/dL, total leukocyte counts 17,340/uL, neutrophils 55.8%, lymphocytes 31.7%, platelets 197,000/mm³, C-reactive protein was 75 mg/dL, serum sodium 129 meq/L, and potassium 3.8 meq/L). Lumbar puncture done on the same day was normal.

Blood for aerobic culture was inoculated into blood culture pediatric bottle (Becton Dickinson) and was loaded into the BACTEC machine which flagged positive in 2 days showing thin Gram-negative, non-fermenting bacilli. The isolate was identified as *R. radiobacter* with 99% confidence (Fig. 1a-c). Further, manual biochemical tests were carried out to confirm the identification. The isolate was oxidase positive, motile, strongly urease positive,

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Access this article online	
Received - 05 August 2020 Initial Review - 29 August 2020 Accepted - 30 October 2020	Quick Response code 
DOI: 10.32677/IJCH.2020.v07.i10.006	

and was able to hydrolyze esculin. The isolate was susceptible to carbapenems, resistant to aminoglycosides and fluoroquinolones, however, exhibited variable susceptibility to cephalosporins. After obtaining the sensitivity report, antibiotics were stepped down. Appropriate IV antibiotics were given for total 14 days. The baby showed clinical improvement within 24 h of starting antibiotics and was symptom free in 48 h. Neurosonography was normal. Feeds were initiated on day 25 of life. The baby tolerated feeds well and was discharged home on day 44 of life. Baby weighed 2200 g at discharge. At present, the baby is 3 months of age and has developmental milestones appropriate for the age.

DISCUSSION

Hospital-acquired infections (HAIs) are among the most common complications of hospital care, leading to high morbidity and mortality [1]. Insertion of central line, a common procedure in critical care settings, is one of the common causes of HAI [1]. The common organisms associated with CLABSI are *Staphylococcus aureus* and coagulase-negative staphylococci, *Klebsiella* spp., *Acinetobacter baumannii*, *Escherichia coli*, and *Pseudomonas aeruginosa*. Rare organisms such as *Enterobacter* spp., *Serratia*

marcescens, *Malassezia furfur*, or *Candida parapsilosis* have also been reported in literature [3].

Strains of *Rhizobium* species (formerly *Agrobacterium*) are aerobic, motile, oxidase-positive, and non-spore-forming Gram-negative bacilli [4]. Among the species of *Rhizobium*, *R. radiobacter* is most commonly causing disease in humans. It has been recognized as an opportunistic human pathogen and has been associated with systemic diseases such as – peritonitis, urinary tract infection, myositis, and infection of indwelling intravascular devices in immunocompromised patients. *R. radiobacter* as a cause of neonatal sepsis has been reported in the literature [5-8]. The summary of the reports is depicted in Table 1. To the best of our knowledge, ours is the first case report of *R. radiobacter* causing CLABSI.

The day of the presentation varied in all cases. Fever followed by lethargy was observed to be a common presentation [5-7]. In our case, the baby was lethargic and off-colored at the time of presentation. Prematurity was a common risk factor emphasizing the preference of this bacteria for immunocompromised [9,10,11,12]. In the index case, the PICC was seen as an additional and important risk factor. The PICC as the cause for *R. radiobacter* sepsis was established by the documentation of its growth in the blood culture

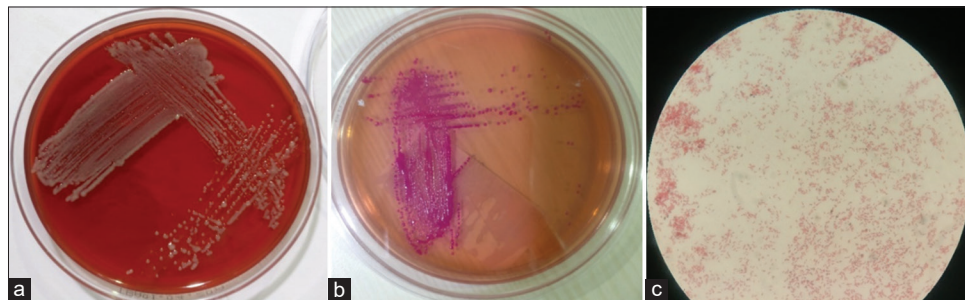


Figure 1: (a) Tenacious colonies of *Rhizobium radiobacter* in isolates from blood specimens from our patient. Colonies with growth of 1 mm in diameter, which were convex, smooth, and shining, grew on blood agar. (b) On MacConkey agar non-lactose fermenting colonies which on extended incubation (after completion of 48 h) turned wet looking mucoid pink. (c) A colony smear prepared on Gram stain from the plates showed thin Gram-negative bacilli with stubby ends

Table 1: Summary of case reports on *Rhizobium radiobacter* sepsis in neonates

Cases No.	Case report	Clinical features	Day of presentation after birth	Risk factors	Sensitivity report Sensitive (S) Resistant (R)	Outcome
1.	Kaselitz <i>et al.</i> [7]	Apnea, Cyanosis, bradycardia	Day 1	Home delivery, herbal supplements	Aminoglycosides (S) Carbapenems (S) Fluroquinolones (S)	Discharged at 14 days of life.
2.	Khan <i>et al.</i> [6]	Fever, abdomen distension	Day 115	Preterm, repeated sepsis	Aminoglycosides (S) Carbapenem (S) Fluroquinolones (S)	Died due to prematurity-related complication.
3.	Tiwari and Beriha [4]	Fever, lethargy, refusal to feed, tachypnea	Day 4	No risk factor	Aminoglycosides (S) Cephalosporin (S) Carbapenems (S) Fluroquinolones (S)	Discharged at 14 days of life
4.	Surpam <i>et al.</i> [5]	Fever, lethargy, refusal to feed, tachypnoea	Day 2	Preterm, PPROM>24 h, foul-smelling liquor	Aminoglycosides (R) Carbapenems (S) Fluroquinolones (S)	Discharged at 20 days of life
5.	Our case	Off colored, lethargy, apnea	Day 21	Preterm, peripherally inserted central catheter, total parenteral nutrition	Aminoglycosides (R) Carbapenems (S) Fluroquinolones (R)	Discharged at 44 days of life

sent in pair (blood collected from PICC and the peripheral vein). This was a proven case of *R. radiobacter* CLABSI. Although all previous case reports showed uniform sensitivity of the bacteria to the carbapenems, the sensitivity pattern for aminoglycosides and fluoroquinolones varied between centers. However, the overall prognosis remains excellent.

A strong clinical suspicion of CLABSI should be kept in sick preterm neonates with central venous catheters *in situ* [13]. Paired blood cultures (from the central line and peripheral vein) should be sent to confirm the diagnosis of CLABSI. Prognosis of *R. radiobacter* CLABSI if diagnosed early and treated promptly is excellent.

CONCLUSION

We report a case of invasive *R. radiobacter* infection in a newborn infant with a history of central venous catheterization. Although having a low virulence, it is highly susceptible to many antibiotics. Usually, appropriate antimicrobial therapy and removal of foreign devices are necessary to control infection.

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Funding: None; Conflicts of Interest: None Stated.

How to cite this article: Bhansali VD, Kalane SU, Mandke H, Joe G. *Rhizobium radiobacter* – A rare organism causing central line-associated bloodstream infection in a preterm neonate. *Indian J Child Health*. 2020; 7(10):418-420.