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Case Report

Microbiology Section

Brevundimonas diminuta Infection in a Congenital Atrial Septal Defect Patient: A Case Report

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ABSTRACT

Brevundimonas species are aerobic, non fermenting Gram negative bacilli. *Brevundimonas diminuta (B. diminuta)* is not believed to be a significant pathogen, and its virulence is generally low, being rarely isolated from clinical samples. Only a few clinical cases of serious opportunistic infections, particularly in patients with compromised immunity, have been reported for *B. diminuta*. All known species of *Brevundimonas* spp. show strong resistance to most antibiotics, according to the Centers for Disease Control and Prevention (CDC). Here, a case of *B. diminuta* infection in an eight-year-old female child is described. The patient also had a minor Patent Ductus Arteriosus (PDA) and a known congenital Atrial Septal Defect (ASD). Following isolation from the blood sample, the VITEK 2 compact system identified *B. diminuta*.

Keywords: Gram negative, Non fermentor, VITEK-2 compact

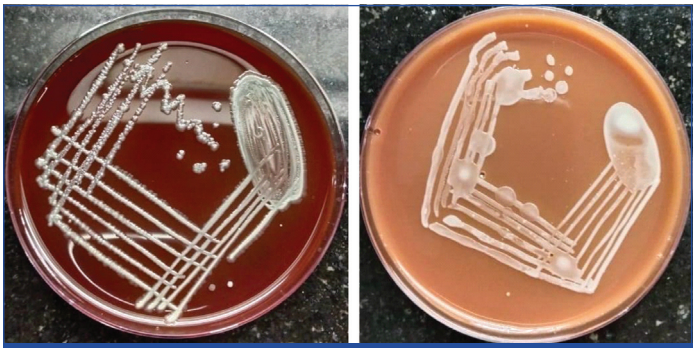
CASE REPORT

An eight-year-old girl presented to the casualty department at night with complaints of fever, cough, and cold for six days. The fever was not associated with any rashes, vomiting, loose stools, or burning micturition. The child had a past history of a similar illness six years before, for which she was admitted and treated. The birth history indicated a normal vaginal delivery, with a weight of 2 kg, immediate crying after birth, and no Neonate Intensive Care Unit (NICU) admission. The child also had a past history of ASD. Significant points in the antenatal history included the mother being a known case of Gestational Diabetes Mellitus (GDM) and receiving treatment. The child attained the milestones for her age and had completed all vaccinations to date.

During the general examination, the child was febrile (100.5°C), alert, and active, with a pulse rate of 108/minute, Oxygen Saturation (SpO_2) of 98%, and a respiratory rate of 20/min. Systemic examination revealed a murmur in the Cardiovascular System (CVS), no focal neurological deficits in the Central Nervous System (CNS), bilateral air entry in the Respiratory System (RS), and a soft, non tender abdomen. The diagnosis of acute febrile illness with suspected enteric fever was made, and all routine investigations [Table/Fig-1] were sent along with a blood culture before starting antibiotics. These tests were conducted only before the administration of cefotaxime. The child was then treated with Inj. ceftriaxone i.v. BD, paracetamol 650 mg SOS, i.v. fluids at 30 mL/hr, and Inj. pantaprazole 40 mg i.v. OD for five days. On the fifth day of admission, the blood culture report showed *B. diminuta*. Hence, the antibiotic treatment was changed to tablet cefotaxime, which resulted in an improvement in the child's clinical status. Subsequently, the child was discharged after seven days of admission.

Investigation	Results	Reference range
Haemoglobin (g/dL)	12.8	Male 13-18 Female 12-16
WBC (cells/mm^3)	8470	4000-11000
Platelets (/µL)	294000	1,50,000-4,50,000
CRP (mg/dL)	Positive 27.7	Normal: <6
Blood culture	*Brevundimonas diminuta*	
SGOT (units/L)	Normal 20	8-45
SGPT (units/L)	Normal 24	7-56
Urine analysis	No organisms few pus cells many epithelial cells Sugars- nil	
Dengue IgG, IgM, and NS-1	Negative	
Peripheral smears	No haemoparasites	

[Table/Fig-1]: Routine investigations.
WBC: White blood cells; CRP: C reactive protein; SGOT: Serum glutamic oxaloacetic transaminase; SGPT: Serum glutamic pyruvic transaminase



[Table/Fig-2]: Blood agar.
[Table/Fig-3]: Chocolate agar. (Images from left to right)

Microbiological profile: Non-haemolytic grey colonies were observed on blood agar [Table/Fig-2], grey colonies were seen on chocolate agar [Table/Fig-3], and no growth was detected on the MacConkey agar plate. The microbe was identified as a motile, non lactose fermenting, gram negative, indole-negative, oxidase- and catalase-positive bacillus. The identification of *B. diminuta* was done with 97% probability and an analysis time of eight hours using the Vitek 2 compact system, based on the examined biochemical traits. The organism was found to be susceptible to other medications tested using the Kirby Bauer disk diffusion method, including amoxicillin-clavulanate, piperacillin-tazobactam, imipenem, meropenem, amikacin, and gentamicin, ceftazidime-clavulanate, ceftazidime, cefepime, and cotrimoxazole, but resistant to cefazolin and colistin. After five days of admission, the medication was changed to cefotaxime BD based on antibiotic susceptibility testing [Table/Fig-4]. The patient's hospital stay was uneventful, and she was subsequently discharged in stable condition after seven days. No further follow-up was conducted after discharge.

Antimicrobial	DD (Zone diameter)	Interpretation
Ceftazidime	33	S
Ceftazidime clavulanate	34	S
Piperacillin tazobactum	30	S
Cefazolin	6	R
Cefotaxime	32	S
Amoxicillin clavulanate	28	S
Cefepime	32	S
Ceftriaxone	33	S
Ertapenem	30	S
Imipenem	33	S
Meropenem	32	S
Amikacin	26	S
Gentamicin	27	S
Ciprofloxacin	33	S
Levofloxacin	28	S
Tetracycline	32	S
Tigecycline	27	S
Colistin	12	R
Trimethoprim-sulfamethoxazole	16	S

[Table/Fig-4]: Antimicrobial susceptibility profile of *Brevundimonas diminuta* isolated from automated blood culture obtained from the patient with congenital ASD patient.
S: Sensitive; R: Resistant; DD: Disk diffusion

DISCUSSION

Brevundimonas is an aerobic, non sporulating, glucose non fermenting, oxidase-positive Gram negative Bacillus [1]. It forms orange-pigmented colonies on blood and chocolate agar within 48 hours. Most strains fail to grow on MacConkey agar, as observed in this case. These bacteria are ubiquitous in the environment and have also been isolated in clinical settings. The factors predisposing patients to this infection remain unknown. In this case, it grew in the blood culture and is possibly the first reported case in a patient with congenital ASD/small PDA. There is no relation between *Brevundimonas* infection and Congenital ASD/small PDA; it is just an incidental finding.

This organism is intrinsically resistant to colistin. Another noticeable feature of this organism is its frequent resistance to fluoroquinolones, and other study data suggest that treatment of future *B. diminuta* infections with a quinolone should be avoided. Poor choices for treatment include ampicillin, trimethoprim/sulfamethoxazole, and third- and fourth-generation cephalosporins, to which *B. diminuta* is frequently resistant [2]. However, this case differs in the fact that it was found to be sensitive to fluoroquinolones. Susceptibility to other antibiotics, such as aminoglycosides, carbapenems (mostly imipenem), and piperacillin/tazobactam, is more uniform. Piperacillin-tazobactam and amikacin show good susceptibility profiles, and doripenem and tigecycline appear to be promising agents for the treatment of bacteraemia [3]. Adequate antimicrobial agents are still warranted in most patients with infections due to *Brevundimonas* species. *Brevundimonas* human infections are generally caused by *B. diminuta*, with only a few cases of severe opportunistic infections reported, particularly in immunocompromised patients, mainly in cases of cancer, cystic fibrosis, and those with indwelling vascular catheters [Table/Fig-5] [4-8]. Reviewing the case reports of *B. diminuta*, its virulence appears to be low. However, active treatment is necessary [9].

S. No.	Authors	Place of isolation/ Type of infections caused	Underlying diseases	Age (years)/ sex	Causative organisms
1.	Gupta PK et al., [5]	Chandigarh, India UTI	Nil	24/Male	*B. vesicularis*
2.	Bhatawadekar SM and Sharma J [6]	Pune, India Bacteraemia	Viral hepatitis	1/Female	*B. vesicularis*
3.	Viswanathan R et al., [7]	Kolkata, India Bacteraemia	Nil	Neonate/ Male child	*B. vesicularis*
4.	Nandy S et al., [8]	New Delhi, India Bacteraemia	Aspiration of meconium while birth	Neonate /Female	*B. vesicularis*
5.	Chandra A et al., [9]	Lucknow, India Bacteraemia	Nephrotic syndrome	18/Male	*B. diminuta*
6.	Present study	Chennai, India Bacteraemia	Congenital ASD/small PDA	8/Female	*B. diminuta*

[Table/Fig-5]: *Brevundimonas* infection reported in India [5-9].
B.diminuta: Brevundimonas diminuta; B. vesicularis: Brevundimonas vesicularis; UTI: Urinary tract infection

CONCLUSION(S)

This case report concludes that *B. diminuta* grew in the blood culture and is possibly the first reported case in a patient with congenital ASD/small PDA. It is also noted that this organism is usually resistant to fluoroquinolones, but in the present case, it was sensitive. Although *Brevundimonas* spp. are not currently considered major pathogens, it is important that they be re-evaluated. These species have the ability to pass through sterilising filters, allowing them to potentially cause harmful infections with a risk of mortality in some cases. This organism has a low virulence rate and does not pose as big a risk as other non fermenting Gram negative bacteria, such as *Burkholderia*, etc. However, it is important to consider it as a possible cause of nosocomial infections and to include it in hospital screening and prevention programs. These programs should investigate possible *Brevundimonas* species outbreaks if these bacteria are clinically isolated in more than one patient.

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