ABNORMAL MORPHOLOGY OF BACTERIA IN THE CEREBROSPINAL FLUID OF A PATIENT ON ANTIBIOTICS

Dear editor,

A five-month-old male child was referred to our hospital with a diagnosis of sacral meningocoele with meningitis and hydrocephalus from a private hospital. He had been treated with cefotaxime and amikacin for a week prior to admission to our hospital. The exact dosage of the drugs received by the patient was not known. A ventric tap performed at our hospital yielded a turbid cerebrospinal fluid (CSF) with a cell count of 700 cells/mm³, predominantly polymorphs, glucose of 10 mg/dL and protein of 165 mg/dL. Gram stain of the CSF showed the presence of gram negative bacilli ranging from 5 to 60 μm in length, surrounded by an unstained zone, suggestive of a capsule. Long, filamentous forms (Fig. 1A), a few of them with central enlargement (Fig. 1B) were also seen. Culture of the CSF on 5% sheep blood agar and MacConkey’s agar yielded a pure growth of *Klebsiella oxytoca*, sensitive to cefotaxime and amikacin by Kirby and Bauer’s disc diffusion method. The gram stain morphology of the organisms recovered on culture was not unusual.

Cephalosporins and other beta lactam antibiotics which inhibit cell wall synthesis are known to produce morphological changes in susceptible organisms, both *in vivo* and *in vitro*. Bacteria usually divide by forming a central septum across the middle of the cell.[1] Penicillin binding protein 3 (PBP-3) is a transpeptidase that plays a crucial role in cell septation of gram negative bacilli. Beta lactam antibiotics can inhibit PBP-3 and thereby prevent the formation of the dividing septum resulting in abnormal elongation and filamentation of rod shaped bacteria.[2,3]

The patient was started on intravenous cefotaxime 400 mg, thrice a day (200 mg/kg/day) and amikacin 50 mg twice daily (15 mg/kg/day). Two subsequent ventric taps performed after 3 and 4 weeks of therapy respectively, yielded a clear CSF, which was bacteriologically sterile. Hence a ventriculo-peritoneal shunt was performed and the patient was discharged with an advice to follow-up.

Abnormal forms of bacteria have been observed in various clinical specimens including blood, sputum and cerebrospinal fluid of patients on antibiotic therapy.[3-5] The presence of such abnormal bacterial forms in the specimen of the patient, rather than in the culture of the specimen has clinical significance. Their presence may indicate a sub lethal antibiotic concentration at the site of infection resulting from a low dose of antibiotic or intermittent, possibly unsuspected antibiotic therapy.[4]

These bacteria are ‘atypical’ in morphology but usually can be recovered on routine culture media unlike L-forms,

![Figure 1: Gram stain of the CSF showing filamentous gram negative bacilli (A) ×400, with central enlargement (B) ×1000](www.ijmm.org)
protoplasts or spheroplasts which may require specialized media for growth. Such filamentous forms of bacteria in clinical specimens can be confused for anaerobes like *Fusobacterium* or *Bacteroides* species, filamentous actinomycetes or fungal hyphae. Hence it is important for microbiologists to be aware of antibiotic induced morphologic variations in bacteria which may pose a diagnostic dilemma.

**References**


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