Acinetobacter baumannii Isolation in Cerebrospinal Fluid in a Febrile Neonate

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SUMMARY: Jeong HL, Yeom JS, Park JS, Seo JH, Park ES, Lim JY, Park C-H, Woo HO, Youn H-S. *Acinetobacter baumannii* isolation in cerebrospinal fluid in a febrile neonate. Turk J Pediatr 2011; 53: 445-447.

We report the isolation of multidrug-resistant *Acinetobacter baumannii* from the cerebrospinal fluid (CSF) of a neonate suffering from fever and irritability who was initially regarded as aseptic meningitis [CSF analysis: white blood cell (WBC), 14/mm3 (neutrophil 78%); glucose, 41 mg/dl; protein, 52 mg/dl]. The normal range of WBC counts in the CSF is fairly wide, and the symptoms of meningitis are nonspecific in this age group. This patient had several risk factors for Acinetobacter infection, including exposure to antibiotics and previous admission to a neonatal care unit; therefore, it was difficult to judge the import of the isolation of *A. baumannii* from the CSF in this case. With the increasing prevalence of Acinetobacter species in hospital environments, clinicians may thus be confronted with uncertainty regarding whether isolated *A. baumannii* is a true pathogen or a contaminant. Thus, clinicians should be familiar with the risk factors for Acinetobacter infection and clinical/laboratory findings of clinically significant CSF Acinetobacter isolates.

Key words:* *Acinetobacter baumannii, pseudomeningitis, meningitis, infant, newborn.

Acinetobacter baumannii (*A. baumannii*) is a non-fermentative, gram-negative bacillus that exists widely in the natural environment, especially in soil and water. Recently, the prevalence of isolation of Acinetobacter species in nosocomial environments has increased, and infections caused by these organisms have emerged in importance. Acinetobacter species are part of the normal flora of the skin and mucous membranes[1] and may colonize the skin in as many as 75% of hospitalized patients[2]. Consequently, the chance of isolating these organisms from specimens is high. This may lead to clinical confusion regarding whether the isolated organism is a pathogen or a contaminant, especially in the absence of typical clinical presentation. For meningitis, even if Acinetobacter is isolated from cerebrospinal fluid (CSF), a confirmed diagnosis may not be possible in cases of ambiguous laboratory results and atypical clinical presentation. Pseudomeningitis in adults[1,3] caused by *A. baumannii* and clinically insignificant isolation of Acinetobacter species in various age groups have been described already[4]. However, there are no reports concerning pseudomeningitis or clinically insignificant isolation of *A. baumannii* in neonates. Here, we report the isolation of multidrug-resistant *A. baumannii* from the CSF of a neonate suffering from fever and irritability. In this age group, the normal range of white blood cell (WBC) counts in CSF is fairly wide and the symptoms of meningitis are nonspecific; therefore, it was difficult to judge the import of the isolation of *A. baumannii* from the CSF in this case.

Case Report

A two-week-old male neonate was admitted to the emergency room with fever, vomiting and irritability for one day, after previous hospitalization in the neonatal care unit from birth to 10 days of age for poor oral feeding and vomiting. Previously, in the neonatal care unit, the patient was treated with antibiotics (ampicillin/sulbactam, gentamicin) after organic disorders were excluded. No organism was

isolated in blood or urine samples, and no lumbar puncture was performed previously.

At the time of presentation to the emergency room, the following vital signs were recorded: heart rate, 150/min; respiration rate, 48/min; and body temperature, 38°C. The patient appeared ill but there were no specific findings on physical examination. Blood, urine and CSF samples were obtained to investigate the cause of fever. The following results were obtained from immediate laboratory tests: (1) blood: hemoglobin, 10.2 g/dl; WBC count, 6,230/mm^3; platelets, 484,000/mm^3; C-reactive protein, 1.7 mg/L; and glucose, 76 mg/dl; (2) urine: no pyuria; and (3) CSF analysis: WBC count, 14/mm^3 (78% polymorphonuclear leukocyte (PMN), 17% lymphocytes, 5% monocytes); protein, 52 mg/dl; and glucose, 41 mg/dl. Elevated WBC counts in the initial CSF analysis were in the normal range of WBC counts for neonates (11 ± 10/mm^3); however, normal healthy neonates usually have under 10 leukocytes/mm^3, and the PMN proportion of total WBC counts of the patient were higher than normal (2.2 ± 3.8%)[5]. Moreover, parameters of CSF analysis may be normal in the early stages of bacterial meningitis[6]. Therefore, we could not exclude bacterial meningitis even though aseptic meningitis was strongly suspected. The patient was treated using empirical antibiotic therapy (ampicillin/sulbactam, cefotaxime) until the CSF culture was proven.

On the next hospitalization day, the fever subsided with improvement in the general condition. No specific organism was found in the blood or urine culture. Analysis of the CSF with polymerase chain reaction including herpes simplex type 1 and 2, Epstein-Barr virus, enterovirus, cytomegalovirus, varicella-zoster virus and human herpes virus 6 were all negative. However, multidrug-resistant *A. baumannii* was recovered in CSF on day 7 of hospitalization, which was resistant to ampicillin/sulbactam, and only sensitive to colistin and minocycline. We performed a 2nd lumbar puncture on day 7 with the following CSF findings: WBC, 13/mm^3 (3% PMN, 88% lymphocytes); glucose, 46 mg/dl; and protein, 76 mg/dl. Antibiotic therapy was continued until the results of the 2nd CSF culture were obtained. On day 10 of hospitalization, the 2nd CSF culture was reported to be sterile, and the patient was discharged in good health.

Discussion

Although Acinetobacter species are regarded to have low virulence, they are now recognized as important pathogens in nosocomial infections associated with high mortality rate and long hospital stay[7]. Acinetobacter species can survive on human skin and in dry conditions for several weeks[8,9], a characteristic that easily propagates transmission through fomite contamination in hospitals[10]. For these reasons, Acinetobacter species are commonly found on the skin and mucous membranes of hospitalized patients[2], which is an important factor for the occurrence of nosocomial infections and pseudoinfections by extrinsic contamination of sample specimens[4].

Pseudomeningitis is the second-most common form of pseudoinfection[1]. Pseudomeningitis may be defined as the demonstration of a pathogen by stain/culture of the CSF in a patient with neurological signs/symptoms of meningitis but no evidence of meningitis on CSF analysis[1,3]. The causes of pseudomeningitis include contaminated specimen tubes, pipettes, transport containers, and media[11–13]. However, extrinsic contamination during lumbar puncture by organisms colonizing the skin appears to be the main mechanism underlying pseudomeningitis caused by Acinetobacter[1,3]. *A. baumannii* is a common organism on hospitalized patients' skin; therefore, extrinsic contamination during CSF collection may also be common. Pseudomeningitis in adults[1,3] caused by *A. baumannii* and clinically insignificant isolation of Acinetobacter species in various age groups have been described[4]. According to Chen et al.[4], clinically significant isolates comprised only 37% of Acinetobacter-positive CSF cultures. In other words, most Acinetobacter CSF isolates were caused by extrinsic contamination. They reported that clinically significant Acinetobacter species in CSF were obtained more frequently from patients in intensive care units, with previous CNS infection or prior antibiotic exposure, or from those who had undergone neurosurgical procedures; further, such patients showed typical CSF characteristics of bacterial meningitis (neutrophilic pleocytosis, elevated protein level, and a low CSF-to-serum

glucose ratio). The authors mentioned that multiple Acinetobacter-positive CSF cultures were a highly suggestive finding for active Acinetobacter CNS infection.

In our patient, although the parameters of CSF analysis were inconsistent with bacterial meningitis, the interpretation of the isolation of *A. baumannii* in CSF was difficult because of the following: first, the patient had several risk factors for Acinetobacter infection, including exposure to antibiotics and previous admission to a neonatal care unit over 7 days[14,15]. Second, the absence of CSF pleocytosis has been noted in the early phase of active Acinetobacter central nervous system infections[4]. Moreover, the normal range of WBC counts in CSF in the neonatal period varies widely, and the symptoms and signs of meningitis in neonates are nonspecific[5,6]. Third, the 2nd CSF analysis showed mildly elevated protein levels. Further, several studies have reported the effective treatment of multidrug-resistant *A. baumannii* with ampicillin/sulbactam *in vivo*[17,18]. Nevertheless, we considered the possibility of multidrug-resistant *A. baumannii* meningitis to be remarkably low because inflammatory markers were in normal range and clinical improvement was too rapid for gram-negative meningitis[18]. Thus, we did not change the antibiotic, and the patient was discharged in good general health and did not show any complications.

Our experience demonstrated that discriminating between *A. baumannii* as a pathogen and a contaminant, particularly in the face of the increasing prevalence of Acinetobacter species in hospital environments, can be quite challenging, especially in neonates. Therefore, the clinician's familiarity with the risk factors and clinical presentation of pathogenic Acinetobacter infections would be invaluable for accurate diagnosis, along with follow-up CSF analysis. Since significant data for colistin use in neonates and children are not available, pediatricians and neonatologists should be cautious and avoid the unnecessary use of this antibiotic in cases showing clinically insignificant Acinetobacter isolates.

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