

Short Communication

# Drug-resistant post-neurosurgical nosocomial *Acinetobacter baumannii* meningitis in two Iranian hospitals

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*Acinetobacter baumannii* may cause meningitis and ventriculitis, particularly after head trauma and/or neurosurgery. The rate of multidrug-resistant *Acinetobacter* meningitis has increased over the past years. This study was conducted to determine prevalence of drug-resistant post-neurosurgical nosocomial *A. baumannii* meningitis. During the period of study between 2007 and 2009, a total of 39 patients with positive culture of *A. baumannii* in their cerebrospinal fluid were evaluated. Standard bacteriological methods were used for identification of *A. baumannii*. The method which has been recommended by Clinical Laboratory and Standards Institute (CLSI) was applied to determine susceptibility and resistant pattern. All patients had a history of neurosurgical intervention and more than half of them stayed in the intensive care units (ICU) at the time of isolation. The highest rate of resistant pattern accounted for the third generation cephalosporins, followed by ciprofloxacin, amikacin, gentamicin and co-trimoxazole. Of all the isolates, 39% were resistant to imipenem and 15.5% to meropenem. The majority of carbapenem-resistant isolates were resistant to at least three other antibiotic classes. The emergence of postsurgical multi-drug resistant *Acinetobacter* meningitis highlights the importance of implementing preventative strategies towards nosocomial infections.

**Key words:** *Acinetobacter baumannii*, resistance, meningitis, neurosurgery.

## INTRODUCTION

*Acinetobacter baumannii* is present in soil, and inhabits the skin and mucous membranes of human. The organism can survive for a long period on dry and moist surfaces (Bayuga et al., 2002). *A. baumannii* can cause meningitis and ventriculitis, particularly after neurosurgical procedures or head trauma (Gulati et al., 2001; Rodriguez Guardado et al., 2001; Wang et al., 2005; Krol et al., 2009). The cerebrospinal fluid (CSF) changes in *Acinetobacter* meningitis are indistinguishable from other causes of bacterial meningitis (Wang et al., 2005). Moreover, so-called pseudomeningitis may be present when an organism that is not compatible with the clinical

and other laboratory findings is identified in the CSF by stain or culture (Krol et al., 2009), for example if skin bacteria like *A. baumannii* are found in the CSF. However, carbapenem-resistant *Acinetobacter* meningitis and multidrug-resistant *Acinetobacter* meningitis have previously been reported (Metan et al., 2007; Baek-Kim et al., 2009; Cascio et al., 2010; Ozdemir et al., 2010). In the present study, we sought to determine the prevalence of drug-resistant post-neurosurgical nosocomial *A. baumannii* meningitis.

## MATERIALS AND METHODS

Between 2006 and 2009, all the patients with pleocytosis in their cerebrospinal fluid together with a positive culture of *A. baumannii* were enrolled in this study. Totally, 39 positive culture of *A. baumannii* were evaluated in two teaching hospitals in Tehran, Iran.

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Cases of pseudo-meningitis with *Acinetobacter* (CSF culture positive for *Acinetobacter* in the absence of clinical and laboratory features of meningitis) were excluded from the study. Eosin methylene blue agar (EMB) medium was used to isolate gram negative organisms for all CSF specimens. All the suspected colonies were assessed by Gram-staining, colonial morphology, negative oxidize, triple sugar iron (TSI) agar and other biochemical reactions (Forbes et al., 1998). Disk diffusion method recommended by the Clinical Laboratory and Standards Institute (2004) was chosen to determine antimicrobial susceptibility of the isolated *Acinetobacter*. A suspension of each isolate was prepared; so that the turbidity was equal to 0.5 McFarland standards and then plated onto Mueller-Hinton agar. After incubation at 35°C for 18 to 24 h, diameter of inhibition zones was measured and data were reported as susceptible, intermediate and resistant.

## RESULTS AND DISCUSSION

All patients, of which 24 (62%) were males and 15 (38%) were females, had a history of neurosurgical intervention, and 22 (54%) of them stayed in the intensive care units (ICU) at the time of isolation. The rate of resistance was 49% to co-trimoxazole, 59% to gentamicin, 67% to amikacin, 75% to ceftizoxime, 77% to ceftaxime, 90% to ceftazidime, 70% to ciprofloxacin, 49% to norfloxacin, 39% to imipenem and 15.5% to meropenem. Resistant pattern of isolated *Acinetobacter* is shown in Figure 1. 70% of meropenem resistant isolates were also resistant to imipenem, ciprofloxacin, gentamicin, amikacin and all these isolates were resistant to ceftazidime, ceftaxime and ceftizoxime. Of the imipenem resistant isolates, 86% of them were amikacin resistant, and 60% of them were gentamicin resistant. Ciprofloxacin and norfloxacin resistant isolates were found in 80 and 60% of isolates. In the present study, we found a remarkably high prevalence of multi-resistant *Acinetobacter* isolates in CSF from neurosurgical patients. This suggests that multi-resistant *Acinetobacter* meningitis is increasing, and agrees with previous findings that indicate that *Acinetobacter* is more likely to be multidrug-resistant when isolated in intensive care or neurosurgical units (Baek-Kim et al., 2009). Moreover, the apparent emergence of carbapenem-resistant *Acinetobacter* meningitis is very important in terms of treatment (Metan et al., 2007; Baek-Kim et al., 2009; Cascio et al., 2010); both imipenem and meropenem have been used to treat *Acinetobacter* meningitis. However, imipenem usage may be problematic because of a high risk of seizures (Fulnecky et al., 2005), which may be lower if meropenem is used instead (Linden, 2007).

## Conclusion

We found a high rate of *A. baumannii* isolates from CSF of patients that had undergone neurosurgical interventions and were resistant to third-generation cephalosporins, fluoroquinolones, amikacin, gentamicin,

cotrimoxazole and carbapenems. The apparent emergence of multidrug-resistant *A. baumannii* meningitis after neurosurgical interventions highlights the importance of preventive measures against nosocomial infection.

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