Community-Acquired *Acinetobacter* Meningitis in Adults

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Summary

Community-acquired *Acinetobacter* meningitis in adults is an extremely rare infection of the central nervous system (CNS). Here we report one adult case of this rare CNS infection and review the clinical data of another seven cases reported in the English language literature. In total, eight patients (six men and two women) aged between 19 and 63 years were studied. The causative pathogen in our patient was *Acinetobacter baumannii*; in the other reported cases they were most likely *Acinetobacter lwoffii*, *Acinetobacter johnsonii*, *Acinetobacter junii*, a genomic species 3 or 6. No underlying disease was found in seven of the eight cases and six of the eight patients acquired the infections before the age of 30 years. Fever and consciousness disturbance were the most common clinical manifestations. Waterhouse-Friderichsen syndrome (WFS) was found in two cases. Unlike the *Acinetobacter* strains found in nosocomial infections, the strain of *Acinetobacter* meningitis in the community-acquired case did not show multiple antibiotic resistance. Most adult patients with community-acquired *Acinetobacter* meningitis can be saved by timely therapy with appropriate antibiotics before deterioration of the systemic condition and impairment of consciousness.

Key Words

Acinetobacter baumannii · Adult meningitis · Community-acquired

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Introduction

Acinetobacter spp. are nonfermentative aerobic gram-negative coccobacilli that are widely distributed in nature and in the hospital environment [1, 2]. They can survive on moist and dry surfaces and are isolated as commensals from the skin and respiratory tract of healthy individuals [1, 2]. Although *Acinetobacter* spp. have generally been considered to be of low virulence and nonpathogenic, they have recently become important causative pathogens of bacterial meningitis, especially among debilitated patients [3, 4]. Because community-acquired *Acinetobacter* meningitis in adults has rarely been reported [5], we report on one adult patient with this infection and review the English language literature.

Case Report

On November 11, 1999, a 51-year-old man was sent to our emergency room where he complained of fever, headache and progressive consciousness disturbance which had begun the previous day. He had a history of diabetic mellitus, hypertension, chronic renal insufficiency and urolithiasis. Physical examination showed him to be confused and agitated. His blood pressure was 62/42 mmHg and body temperature 38.6 °C. There was evidence of meningeal irritation including nuchal stiffness and positive Kernig and Brudzinski signs. A chest X-ray showed lobar pneumonia of the left upper lobe. Laboratory examinations showed a WBC count of 13.8×10^9/l with 90% neutrophils, blood urea nitrogen 34 mg%, Cr 2.2 mg%, glucose 20.4 mmol/l and normal liver enzyme and electrolyte levels. CSF analysis revealed WBC count of 3.501×10^9/l (neutrophils 86%), glucose 9.36 mmol/l, total protein 1.6 g/l and a negative Gram stain result. After the examination, therapy with intravenous aqueous penicillin (24×10^5 U/day) and ceftazidime (8 g/day) was started.

CSF, blood and sputum cultures were also performed and they all grew *Acinetobacter baumannii*, with additional *Pseudomonas* spp. in the sputum culture. In our hospital the following methods were used to make an identification of *A. baumannii*: conventional biochemical tests (triple sugar iron agar, Christensen's urea agar, Simmon's citrate agar, sulfide-idole-motility medium, Voges-Proskauer medium, ornithine decarboxylase), oxidase reaction, api 20 NE system (bioMerieux Vitex, Inc, USA) and growth at different temperatures (37 °C, 41 °C, 44 °C). Antibiotic susceptibility was tested by the Kirby-Bauer disc diffusion method (Becton Dickinson, BBL, Mueller-Hinton II agars). The GNS methodology of the Vitek System (VITEK®, bioMerieux Vitek, Inc. USA), an established automated method of obtaining MIC data, was also used to further determine the antimicrobial susceptibility. The MIC breakpoints are based on NCCLS guidelines. The antibiogram of this *A. baumannii* strain is shown in table 1.

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Table 1
Antibiogram of the isolated *Acinetobacter baumanii* strain.

Antibiotics	MIC (µg/ml)	MBC (µg/ml)
Amikacin	≥ 64 R	(-)
Ampicillin	≥ 32 R	(-)
Ampicillin/sulbactam	≥ 32 R	(-)
Aztreonam	≥ 32 R	(-)
Cefazolin	≥ 32 R	(-)
Cefotaxime	8 S	32
Ceftazidime	≤ 8 S	8
Ceftizoxime	≤ 8 S	128
Ceftriaxone	≤ 8 S	64
Cefuroxime-axetil	≥ 32 R	(-)
Cefuroxime-sodium	≥ 32 R	(-)
Cephalothin	≥ 32 R	(-)
Ciprofloxacin	2 I	(-)
Gentamicin	≥ 16 R	(-)
Imipenem	≤ 4 S	4
Mezlocillin	≤ 16 S	(-)
Mitrofurantoin	≥ 128 R	(-)
Piperacillin	≤ 8 S	(-)
Ticarcillin	≥ 256 R	(-)
Ticarcillin/Clavulanate	≤ 16 S	(-)
Tobramycin	≥ 16 R	(-)
Trimethoprin/sulfa	≤ 10 S	(-)

S: sensitive, R: resistant, I: intermediate, (-): not done, MIC: minimum inhibitory concentration, MBC: minimum bactericidal concentration, MBC was determined by broth dilution method

On the 3rd day of hospitalization, convulsive type status epilepticus developed for which intravenous anticonvulsant therapy, including phenytoin (300 mg/day) and phenobarbital (200 mg/day), was started. The seizures were controlled. However, despite aggressive medical management, the patient's general condition deteriorated and he remained in a deep coma. The patient died after 26 days of hospitalization.

Discussion

Adult bacterial meningitis caused by gram-negative pathogens, including *Acinetobacter* spp., is usually seen in postneurosurgical patients with nosocomial infection [6]. Although the prevalence of pathogens varies over time, in different geographic areas, in patients with different ages, with underlying medical and/or surgical conditions and means of contraction, *Acinetobacter* spp. are uncommon pathogens of adult bacterial meningitis [7–9]. Therefore, community-acquired *Acinetobacter* meningitis in adults is an extremely rare condition with only seven cases reported in the English language literature to date [10–15]. The *Acinetobacter* spp. reported in these seven cases were *Mima polymorpha* [10–13] and *Acinetobacter calcoaceticus var lwoffii* [14, 15]. According to current nomenclature [2], the implicated pathogens of these seven cases were most likely *Acinetobacter lwoffii*, *Acinetobacter johnsonii*, *Acinetobacter junii*, a genomic species 3 or 6. Unlike the other *Acinetobacter* spp., *A. baumannii* is rarely recovered from the skin of patients and healthy humans [16, 17]. Until now, *A. baumannii* had not been reported as a causative pathogen of adult community-acquired bacterial meningitis.

The basic clinical data of the seven adult cases with *Acinetobacter* meningitis are listed in table 2 as Patients 1–7, and our case as Patient 8. In total there were six men

Table 2
Review of reported adult cases with *Acinetobacter* meningitis.

Pt	[Ref.] year	Age (yr)/sex	Underlying diseases	Clinical manifestations	Antimicrobial therapy	Outcome
1[a]	[10] 1954	19/M	No	Fever, consciousness disturbance, WFS	No	Died
2	[10] 1954	23/M	No	Fever, WFS	Sulfadiazine, penicillin G	Survived
3	[11] 1958	19/M	No	Fever, consciousness disturbance	Penicillin G	Survived
4	[12] 1958	63/M	No	Fever, consciousness disturbance	Sulfadiazine,	Survived
5	[13] 1972	21/F	No	Fever, consciousness disturbance hemiparesis, seizure	Chloramphenicol, penicillin G, ampicillin	Survived
6	[14] 1993	19/F	No	Fever, consciousness disturbance	Amoxycillin, cefotaxime	Survived
7[b]	[15] 1995	29/M	No	Fever, consciousness disturbance	Chloramphenicol, penicillin G	Survived
8	Present study	51/M	Yes[c]	Fever, consciousness disturbance septic shock	Ceftazidime, penicillin G	Died

[a] diagnosis made by postmortem examination, [b] mixed pathogens including *Acinetobacter calcoaceticus var lwoffi* and *Streptococcus faecium*, [c] diabetes mellitus, chronic renal insufficiency, urolithiasis; Pt: patient number; WFS: Waterhouse-Friderichsen syndrome

and two women aged between 19 and 63 years. Mixed pathogens were found only in Patient 7. Underlying disease was found only in Patient 8. Six of the eight patients contracted *Acinetobacter* meningitis before the age of 30 years. This is not consistent with previous studies which found that community-acquired adult gram-negative bacterial meningitis is usually seen in older, debilitated patients [7, 8]. In this study, fever and consciousness disturbance were the most common clinical manifestations of adult patients with community-acquired *Acinetobacter* meningitis, though these findings are hardly unique. In fact, these manifestations are commonly seen in patients with adult bacterial meningitis caused by other pathogens. Waterhouse-Friderichsen syndrome (WFS) is most often seen in pediatric patients with meningococcal infection [18]. In this study, WFS was the initial clinical presentation of two cases (Patients 1 and 2), though again, this clinical syndrome is not specific to infection with one particular pathogen.

In recent years, the *Acinetobacter* strains found in nosocomially acquired meningitis were usually associated with multiple-resistant pathogens including those resistant to third-generation cephalosporins [19, 20]. However, no such multiple-resistant *Acinetobacter* strain was found in this study. The *A. baumannii* strain isloated from Patient 8 retained susceptibility to third-generation cephalosporins including cefotaxime, ceftazidime, ceftizoxime and ceftriaxone. Use of antibiotics priot to the development of meningitis is not uncommon in community-acquired meningitis, and use of broad-spectrum antibiotics before the development of meningitis is an important factor for the emergence of multi-antibiotic resistant strains [21]. None of the cases in this study had these predisposing conditions. In this study, six patients (Patients 2–7) fully recovered. Patient 1 died of septicemia, multi-organ involvement and a delay in medical treatment, and Patient 8 died of multi-organ failure. Initial consciousness disturbance and septic shock were the clinical manifestations of Patient 8 and they are known as important poor prognostic factors in adult patients with gram-negative bacillary meningitis [9].

In conclusion, *A. lwoffii* has been known as the implicated pathogen of adult community-acquired bacterial meningitis in several reports, but it is extremely rare to find *A. baumannii* as a causative pathogen of this specific group of diseases. The infectious strains found in community-acquired adult *Acinetobacter* meningitis are currently susceptible to most of the antibiotics used in the treatment of acute bacterial meningitis, and a multiple-resistant strain has not yet been found. Although the case number is too small to make a definite conclusion, most adult patients with community-acquired *Acinetobacter* meningitis can survive and fully recover when appropriate antibiotic therapy is started before deterioration of the systemic condition and impairment of consciousness.

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