**RESUMO**

Entre as bactérias Gram-negativas, o Acinetobacter sp tornou-se um importante patógeno hospitalar, devido ao aumento do número de cepas multi-resistentes. Esta espécie é responsável por um número crescente de infecções pós-operatórias caracterizadas pela alta mortalidade. A ocorrência de bactérias Gram-negativas multi-resistentes levou a um aumento no número de infecções do sistema nervoso central. Em particular, a ocorrência de bactérias resistentes à cefalosporinas de quarta geração e carbapenênicos resultou em uma redução significativa de opções terapêuticas para o tratamento destas infecções. Acinetobacter baumannii é um importante agente hospitalar e sua resistência antibiótica moderna aumenta a cada dia, o que é uma ameaça aos pacientes infectados. Descrevemos um caso de um paciente submetido a neurocirurgia e colocação de derivação ventricular externa evoluindo com ventriculite por Acinetobacter baumannii resistente a cefalosporinas de quarta geração e meropenem.

**Palavras-chave:** Acinetobacter baumannii, Acinetobacter sp, Infecciones por Acinetobacter

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**ABSTRACT**

Among Gram-negative bacteria, Acinetobacter sp. has become an important nosocomial pathogen due to the increase in the number of multiresistant strains, and this species is responsible for a growing number of postoperative infections with a high mortality rate. The occurrence of multiresistant Gram-negative bacteria has led to an increase in the number of central nervous system infections and the occurrence of bacteria resistant to fourth-generation cephalosporins and carbapenems resulted in a significant reduction of therapeutic options for the treatment of these infections. Acinetobacter baumannii is an important nosocomial agent and its resistance to antibiotic has improved over the time and the occurrence of carbapenems and fourth generation cephalosporins resistant strains is a serious threaten to infected patients. We describe a case of a multi-resistant Acinetobacter baumannii resistant to fourth-generation cephalosporins and meropenem, after a neurological procedure.

**Key words:** Acinetobacter baumannii, Acinetobacter sp, Acinetobacter infections Ventriculite causada por Acinetobacter baumannii multiresistente
ABREVIATIONS

EVD - External ventricular drainage  
CCT – Cranial computed tomography  
CSF – cerebrospinal fluid  
CNS - central nervous system

INTRODUCTION

Neurosurgical patients have a high risk of developing nosocomial meningitis, with potentially lethal consequences. The widespread use of antibiotics may have altered the epidemiology of postneurosurgical meningitis in recent years. The incidence of these infections varies and mainly depends on the type of surgery, use of prophylactic antibiotics, general health of the patient, and use of drains. The incidence of bacterial meningitis in clean surgeries is 0.6% in the presence of antibiotic prophylaxis, with this rate reaching 1.9% in the absence of antibiotic prophylaxis.\(^1,6\)

External ventricular drainage (EVD) is one of the procedures most widely performed in neurosurgery, presenting a high infection rate of 2 to 33%.\(^1,6\) Risk factors for this type of infection include the duration of EVD, inadequate asepsis during manipulation of drain components, increased intracranial pressure, and intraventricular hemorrhage.\(^6\)

Gram-positive bacteria are the most frequent cause of EVD infection, followed by Gram-negative bacteria.\(^6,8,13\) Among Gram-negative bacteria, *Acinetobacter* sp. has become an important nosocomial pathogen due to the increase in the number of multiresistant strains: this species is responsible for a growing number of postoperative infections with a high mortality rate.\(^3,7,9\)

During the past three decades, multi-drug-resistant organisms are a growing concern in intensive care units. *Acinetobacter baumannii* is an ubiquitous, gram negative bacteria that can survive for prolonged periods on environmental surfaces, and has emerged as an important infectious agent in hospitals worldwide, due to its ability to tolerate desiccation and to accumulate diverse mechanisms of resistance to most antimicrobials, including aminoglycosides and carbapenems.\(^10\)

We describe a case of multi-resistant *Acinetobacter baumannii* ventriculitis, an important pathogen in infections of intensive care patients.

CASE REPORT

A 62-year-old female patient with no previous comorbidities presented with a sudden reduction in consciousness level and signals of increased intracranial pressure: Glasgow Coma Scale was nine. Cranial computed tomography (CT) showed a fusiform aneurysmal dilatation involving the right vertebral artery throughout its extension and involving the beginning of the basilar artery, associated to acute hydrocephalus due to compression of the fourth ventricle and ischemia in the cerebellar hemisphere (Fig. 1).

![Figure 1. CT without contrast, obtained on admission, showing a basilar artery aneurysm compressing the brainstem.](image_url)

The patient was submitted to decompressive craniectomy of the posterior fossa and placement of an external ventricular drainage (EVD). Intensive care unit was needed, with continuous ventilatory support, analgesia and sedation. Three days later, the patient developed fever, but CSF was unremarkable. Chest x-ray diagnosed pneumonia and antibiotic therapy with vancomycin and cefepime was instituted. Culture of pulmonary secretion collected from the orotracheal tube revealed the presence of *Proteus* sp. sensitive to cefepime and meropenem.

The patient remained afebrile for 4 days, when persistent fever returned. The patient presented an allergic reaction to vancomycin, which was replaced by targcid and cefepime was replaced by meropenem. Fever continued despite antibiotic therapy, leading us to a new CSF study that was suggestive of bacterial infection, with pleocytosis (neutrophilic predominance), elevated protein level, low glucose and elevated lactic acid levels.

A new CT showed ependymal impregnation, characteristic of ventriculitis. CSF culture revealed infection due to *Acinetobacter baumannii*, resistant to penicillin, methicillin, tetracycline, erythromycin, levofloxacin, ciprofloxacin, trimethoprim-sulfamethoxazole, ampicillin-subbactan aminoglycosides, vancomycin, first, second, third and fourth-generation cephalosporins, meropenem and imipenem and sensitive only to tigecycline. Before the adjustment of the new antibiotic therapy, the patient presented rapid progressive worsening and developed severe sepsis, dying few hours later.
DISCUSSION

The main pathogens involved in ventriculitis after EVD insertion are *Staphylococcus epidermidis* (46%), *Staphylococcus aureus* (20.4%) and Gram-negative bacteria. The most widely used routine treatment for these patients is a combination of fourth-generation cephalosporins or carbapenems combined with vancomycin. Aminoglycosides and quinolones may also be used depending on the hospital flora and sensitivity of the bacteria. Third-generation cephalosporins are still widely employed despite the growing number of resistant strains.

The spread of multiresistant Gram-negative bacteria has led to an increase in the number of CNS infections caused by these bacteria. In this respect, the occurrence of bacteria resistant to fourth-generation cephalosporins and carbapenems results in a significant reduction of therapeutic options for the treatment of these infections.

Acinetobacter spp. are non-fermentative, aerobic, gram-negative coccobacilli widely distributed in soil and water. *Acinetobacter baumannii*, main representative bacteria of the group, can cause various types of nosocomial infections. Recently published data from the National Nosocomial Infections Surveillance System regarding ICU patients across the USA show that in 2003 *A. baumannii* was responsible for 6.9% of pneumonia, 2.4% of bloodstream infections, 2.1% of surgical site infections and 1.6% of urinary tract infections.

CNS infections due to *A. baumannii* after neurosurgical procedures are rare but with a high mortality rate (20-27%), normally progressing to sepsis. Risk factors for nosocomial *A. baumannii* meningitis are associated with emergency neurosurgical procedures and more than 5 days of EVD, both present in our patient.

*A. baumannii* are highly resistant to quinolones and third-generation cephalosporins, but respond well to antibiotic therapy with fourth-generation cephalosporins and carbapenems. Recent studies have shown that the occurrence of *Acinetobacter* strains resistant to these antibiotics is becoming a great therapeutic challenge. A multicenter study (MYSTIC Program) conducted between 1997 and 2000 and involving 37 European hospitals has shown a sensitivity of *Acinetobacter baumannii* to imipenem ranging from 93 to 100% at most hospitals studied compared to a rate of 62-66% reported for Turkish hospitals. Two other studies evaluating patients with meningitis caused by *Acinetobacter* found no resistance to carbapenems, with the sensitivity to these drugs ranging from 92 to 100%, but showed a high resistance to other antibiotics, including cephalosporins.

Another series involving 35 patients evaluated after neurosurgery reported a sensitivity to imipenem, meropenem and cefepime of 55.2%, 55.2% and 37.9%, respectively. The presence of multiresistance and the poor penetration of many drugs through the blood–brain barrier have forced the use of topical therapies, initially with aminoglycosides and more recently the use of intraventricular and intrathecal colistin. Colistin is a polymyxin used successfully against Gram-negative bacteria in the past and abandoned because of reported toxicity, mainly nephrotoxicity. They have shown good results in selected cases.

Colonization of the EVS with *Acinetobacter sp.* was considered as the source of the infection in the patient. The organism’s ability to tolerate desiccation and to accumulate diverse mechanisms of resistance favors its long-term persistence in ICUs, where skin carriage may persist for weeks/months and the Acinetobacter-colonized hands of the staff may be responsible for patient-to-patient spread. Environmental contamination and contamination of medical equipment may also play an important role in the transmission of *A. baumannii* in healthcare institutions.

One of the major treatment difficulties is the late identification of the pathogen which normally takes about 72 hours to be identified by culture, as was the case of the present patient, in which the delay in the bacterial identification led to late proper treatment, with a consequent unfavorable prognosis. Empirical treatment with carbapenems and vancomycin, normally used in most hospitals, is usually ineffective and compromises the treatment of patients infected with a highly virulent bacterium. Although Gram staining is a useful tool, suggestive of the germ type, only culture permits the exact identification of the microorganism and the eligible antibiotic. In addition to therapeutic improvement, advances in diagnostic work-up are important since only early identification of the involved pathogen permits planning and application of an effective treatment, which can be either intravenous, intrathecal or intraventricular.

CONCLUSION

Gram-negative bacteria are important pathogens of postoperative infections in patients submitted to neurosurgical procedures. The occurrence of bacteria resistant to fourth-generation cephalosporins and carbapenems, including *Acinetobacter* spp., impairs the prognosis of these patients. In addition to the need for new antibiotics and therapeutic modalities, new tools for the early identification of these pathogens are necessary in order to quickly initiate treatment and thus improve the final prognosis of the patient.
REFERENCES


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