

# *Morganella morganii*, subspecies *morganii*, biogroup A: An unusual causative pathogen of brain abscess

Asha B Patil, Shobha D Nadagir, Lakshminarayana SA<sup>1</sup>, Syeda Fasiha M

Department of Microbiology, Karnataka Institute of Medical Sciences, Hubli, Karnataka, <sup>1</sup>Sree Gokulam Medical College, Kerala, India

### ABSTRACT

*Morganella morganii* is a gram negative aerobe, found often as intestinal commensal. It is commonly implicated in Urinary tract infections and pyogenic infections, but rarely causes CNS infections especially brain abscess. There are very few published reports of *Morganella morganii* as a causative pathogen in brain abscess. High index of suspicion of this pathogen is important in cases of brain abscess secondary to otogenic infections. This paper reports an unusual case of *Morganella morganii*, subspecies *morganii*, biogroup A Brain abscess. The paper also reviews other infections caused by *Morganella morganii*.

**Key words:** Brain abscess, Chronic Suppurative Otitis Media, *Morganella morganii*

### Introduction

The hospital incidence of brain abscess is reported to be 8.4% cases per year. Congenital heart disease and Chronic Suppurative Otitis Media (CSOM) are the most common predisposing factors accounting for 72% of the cases.<sup>[1]</sup> *Morganella morganii* is a gram-negative aerobe, belonging to the Enterobacteriaceae family, normally found in soil, water, and fecal flora. Central Nervous System (CNS) infections due to *Morganella Morganii* are extremely rare.<sup>[2]</sup> We report a case of brain abscess caused by the *Morganella morganii* subspecies, *morganii* biogroup A, following CSOM.

### Case Report

A 12-year-old male patient presented with fever, headache, and ear discharge for 20 days. There was one episode of vomiting. There was no history of convulsions. On CNS examination, he was conscious, but disoriented, left-sided seventh nerve palsy was present, and tone

and power had decreased on the left side. Meningeal signs were present. There was a past history of ear discharge intermittently since the last six years, and he was probably on antibiotic treatment, details of which could not be obtained. Based on the clinical findings and a CT scan report he was provisionally diagnosed with brain abscess and meningitis. The abscess was situated in the right temporoparietal region.

Right parietotemporal burr hole evacuation was performed. The pus sample from the abscess was collected intraoperatively and sent to the microbiology laboratory. The sample was purulent, and was processed as follows:

#### Gram stain

The gram stain revealed a few pus cells and Gram-negative coccobacilli; a preliminary report was given. The sample was cultured on to Chocolate agar and MacConkeys agar, inoculated in thioglycolate broth and incubated overnight at 37°C aerobically. Based on the routine biochemical tests the isolate was identified as Tribe proteae Genus Proteus, Providencia, and Morganella. Decarboxylase tests and Trehalose fermentation were done for speciation and the isolate was identified as *Morganella morganii*, subspecies *morganii*. It was further identified as biogroup A, as it was resistant to tetracycline.<sup>[3]</sup>

Antibiotic susceptibility was performed by using the disk diffusion method and interpreted as per Clinical

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#### Address for correspondence:

Dr. Asha Patil, c/o Dr Ravindra Eligar, S-1, 2<sup>nd</sup> floor, D Block, Revankar Complex, Court Circle, Hubli, Karnataka, India.  
E-mail: drashapatil@rediffmail.com

Laboratory Standard Institute (CLSI) guidelines. The isolate was susceptible to Chloramphenicol, Ceftriaxone, Cefotaxime, Cefepime, Ceftazidime, Cefoperazone, Gentamicin, Amikacin, Ticarcillin, and Levofloxacin, and resistant to Ampicillin, and Ofloxacin.

Extended Spectrum Beta Lactamase (ESBL) and Amp C-beta lactamase detection was done as per CLSI guidelines, by phenotypic confirmatory disk diffusion and cefoxitin disk diffusion test methods, respectively. The isolate was negative for both. Apart from surgical evacuation, the patient was treated with amikacin, ceftriaxone, and metronidazole and recovered at discharge. Ear discharge was not present at the time of admission as the patient was partially treated elsewhere. Hence, the ear swab was not sent for microbiological investigations.

## Discussion

Despite the advent of modern neurosurgical techniques, antibiotics, and new powerful imaging techniques, brain abscess remains a potentially fatal central nervous system infection. Brain abscess is almost always secondary to a focus of suppuration elsewhere in the body and may develop either by a contiguous focus of infection, head trauma, or hematological spread from a distant focus.<sup>[4]</sup> Orogenic infections remain the important foci of infection, especially among children, where they occur at a greater frequency. Furthermore, the similarity of the causative pathogens in CSOM and brain abscess point toward the contiguous extension of infection to the CNS. In CSOM, the most common location of the brain abscess is reported to be the cerebellum and temporal lobe (37.1% and 22.9%), respectively.<sup>[1]</sup> In the present case the abscess was situated in the temporoparietal lobe. The causative pathogen of bacterial brain abscess vary with the time period, geographic distribution, age, underlying medical and / or surgical condition, and mode of infection.<sup>[4]</sup> The polymicrobial nature of the infection and lack of anaerobic culture facilities could also influence pathogen prevalence in different hospitals. Apart from the anaerobic bacteria, the aerobic bacteria reported to cause brain abscess are *Staphylococcus aureus*, *Streptococcus pneumoniae*, *Streptococcus pyogenes*, *Streptococcus viridians*, *Escherichia coli* (*E. coli*), *Proteus*, *Klebsiella*, *Citrobacter*, *Salmonella*, *Enterobacter*, *Pseudomonas*, *Morganella*, *Haemophilus*, *Corynebacterium*, and the *Enterococcus* species.<sup>[1,4,5]</sup> CNS infections due to *M. morganii* are extremely rare, with few published reports in the literature.<sup>[1,2,5-7]</sup> Nine cases of CNS infections caused by *M. morganii* were reported before 1997, of which four had otogenic meningitis.<sup>[2]</sup>

A Taiwanese study reported one case of *M. morganii* brain abscess between 1992 and December 2002.<sup>[5]</sup> In a review of 107 cases between 1985 and December 2005 in Thailand, *Proteus* and *Pseudomonas* were reportedly more common isolates among the gram-negative bacilli (GNB) accounting for 38.1 and 19.1%; there was only one case of *M. morganii* brain abscess in this review.<sup>[1]</sup> A case of frontal brain abscess caused by *Morganella morganii* was reported in 2006.<sup>[6]</sup> A rare case of multiple brain abscesses after mastoiditis due to *Morganella morganii*, secondary to otitis media, was reported in 2007.<sup>[7]</sup>

*M. morganii* was earlier designated as *Proteus morganii*, now it is included as a separate genus in the Enterobacteriaceae with one species *morganii*. The most recent, extensive, DNA-DNA hybridization studies have shown the existence of two subspecies: *M. morganii* subspecies *morganii*, with four biogroups and subspecies *sibonii* with three biogroups.<sup>[3]</sup>

It has been a well-known cause of urinary tract infection, wound infection, sepsis, and other extraintestinal infections. It is commonly a part of polymicrobial infection and can rarely cause fatalities in debilitated patients.<sup>[2]</sup>

The organism is usually susceptible to quinolones such as nalidixic acid, ciprofloxacin, aminoglycosides, such as, Gentamicin, Amikacin, Tobramycin, Chloramphenicol, Cotrimoxazole, Aztreonam, and other Carbapenems.<sup>[3]</sup> In a brain abscess, the third generation Cephalosporins like Cefotaxime and Ceftriaxone are generally adequate therapy. Aminoglycosides and anti-pseudomonal Penicillin are not good choices in the management of brain abscess because of their limited penetration into the cerebrospinal fluid (CSF) and the abscess. They are also less active in acidic and anaerobic conditions.<sup>[2]</sup>

*Morganella morganii* are resistant to Penicillins and many Cephalosporins through the formation of ESBL and Amp C-beta lactamase production. Although it is common to find drug-resistant *Morganella*, there is no evidence that strains of different biogroups differ in their susceptibility patterns.<sup>[3]</sup> However, with an increase in beta lactamase-mediated resistance around the world it may be quite possible that selection pressures may lead to the dominance of the resistant subspecies and biogroups in future. Furthermore, spread of these clones in the community poses a problem in the treatment of common community-acquired infections like CSOM. In the present case the isolate was susceptible to most of the antibiotics tested and was not an ESBL or Amp C-beta lactamase producer.

## Conclusion

*Morganella morganii* is considered to be an opportunist pathogen, and has been known to occur in both community and nosocomial infections. Although *Morganella morganii* is a rare causative pathogen in CNS infections, it is especially relevant in a brain abscess of otogenic origin, where it occurs more commonly. This microbe must be suspected when a patient with brain abscess secondary to otogenic infection is being treated. In developing countries with a low socioeconomic status, it is important to create awareness about the complication of otitis media, which is otherwise easily treated.

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