

CASE REPORT

Aggregatibacter aphrophilus and Eikenella corrodens: a case of brain abscess

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SUMMARY

We report a case of a 26-year-old female who developed a brain abscess that was strongly suspected to be caused by *Staphylococcus epidermidis*, *A. aphrophilus*, and *E. corrodens* species. In general, *A. aphrophilus* and *E. corrodens*, members of the HACEK group (*Haemophilus* spp., *Aggregatibacter* spp., *C. hominis*, *E. corrodens*, and *K. kingae*), have been associated with the development of endocarditis, meningitis, sinusitis, otitis media, pneumonia, osteomyelitis, peritonitis, and wound infections. Cerebral abscesses are a rare manifestation of these bacteria; only a few cases are described in the literature, generally related to the diffusion of these organisms through the bloodstream after a dental procedure or a heart disease. Our case is unique because the rarity of the infection site appeared apparently in absence of risk factors. The patient underwent surgery to drain the abscess and was subsequently put on intravenous antibiotic treatment with ceftriaxone, vancomycin, and metronidazole. After 6 months, brain imaging revealed that the lesion had disappeared. The patient achieved excellent results with this approach.

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INTRODUCTION

Brain abscess is a serious emergency that can result in permanent neurological deficits (Yakut N. *et al.*, 2015).

It is an infection localized to the central nervous system (CNS) parenchyma and consists of a hollow formation delimited by a more or less vascularized wall, containing purulent material mixed with tissue debris (Sonneville *et al.*, 2017). It constitutes a complication of neighboring infections (e.g., otitis media, sinusitis, periodontal diseases, dental abscesses) from which the microorganisms originate through contiguity, or of systemic infections (among which the most frequent is endocarditis (Morris *et al.*, 2014)) determined by the spread of microorganisms through blood, or by a trauma to the craniofacial region (and therefore also neurosurgical interventions), access door for the microorganisms. These pathogenetic

mechanisms explain the microbial potential responsible for the injury.

Among the microorganisms responsible for this complication, the HACEK (*Haemophilus* species, *A. actinomycetemcomitans*, *A. aphrophilus*, *A. segnis*, *Cardiobacterium* spp., *E. corrodens*, and *Kingella* spp.) group includes pleomorphic coccobacillus, Gram-negative, aerobic and facultative anaerobic, fastidious, commensals of the oropharynx; opportunists that can cause endocarditis, periodontal infections, pneumonia, and soft tissue abscesses (Daoud *et al.*, 2019). These bacteria were originally grouped in HACEK because they were thought to be a significant cause of infective endocarditis, and are now considered responsible for 5-10% of cases of infective endocarditis involving native valves. Here we refer to a case of brain abscess with the suspected implication of *S. epidermidis*, *E. corrodens*, and *A. aphrophilus* species.

CASE REPORT

A 26-year-old woman was admitted to the hospital for a 7-day history of deviation of the left buccal rim and an ipsilateral upper limb monoparesis, associated with fever lasting 48 hours. Computed tomography (CT) of the brain was performed, revealing a hypodense lesion in the left frontal lobe associated with voluminous perilesional edema, also confirmed by

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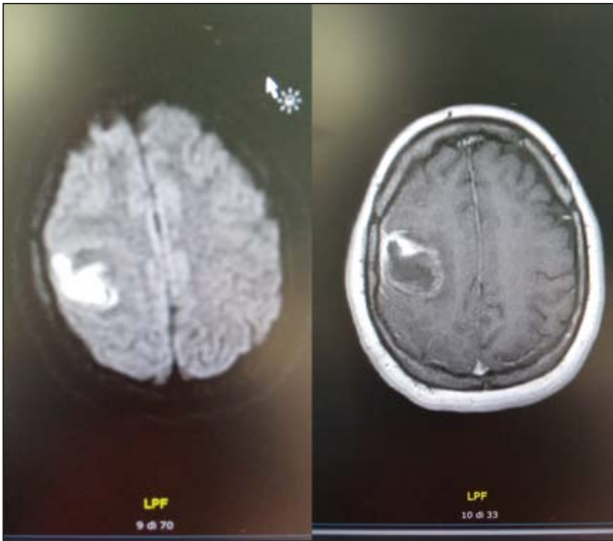


Figure 1 - Hypodense lesion left frontal lobe associated with voluminous perilesional edema compatible with abscess by MRI.

magnetic resonance imaging (MRI), and compatible with abscess (Figure 1).

Antimicrobial therapy with meropenem and vancomycin was started at admission until surgery, decided following worsening symptoms. The material collected during surgery was sent to the microbiology and pathology laboratories for investigation. Pathology laboratory examinations showed neutrophilic leukocytosis (white blood count 17000/ μ l with 83% of neutrophils) and increased C-reactive protein (2.81 mg/l; reference value <0.50); procalcitonin was within normal levels. The patient received surgery to drain the abscess.

The collected material was sent to the Microbiology and Virology laboratory, inoculated on Columbia agar with 5% sheep blood, Chocolate agar, MacConkey agar, Sabouraud agar, and incubated at 37°C for 48h in aerobiosis; Schaedler agar with 5% sheep blood was used for anaerobiosis condition (also incubated 48h). Moreover, it was enriched through inoculation in blood culture bottles (BACT/ALERT FA PLUS), aerobic and anaerobic, and incubated in Bact/Alert 3D for 5 days. When the aerobic blood culture was flagged as positive, it was seeded in Chocolate agar and MacConkey agar; after 24h of incubation at 37°C the colonies grown in chocolate agar were dissociated and incubated for another 24h at 37°C. Identification was then performed via mass spectrometry (VITEK MS BioMerieux).

As suggested by the infectiologist, an empiric intravenous antibiotic treatment was started with ceftriaxone, vancomycin, and metronidazole. Imaging investigations, performed 10 days after surgery and 4 days after antibiotic therapy, showed persistence of an oval-shaped collection. The patient started rehabilita-

tion and continued the antibiotic treatment; 6 months after surgery, a brain CT and MRI showed disappearance of the lesion (Figure 1). The patient recovered completely.

DISCUSSION

In 1940, Khairat described *A. aphrophilus* as a Gram-negative disease-causing bacterium with fermentative metabolism, nonmotile, and capnophilic; originally known as *H. aphrophilus* and *H. paraphrophilus*, it belongs to the indigenous flora of biofilms on tooth surfaces (Khairat *et al.*, 1971). *E. corrodens*, however, was first described by Eiken in 1958 as a facultative anaerobic Gram-negative bacillus that inhabits both the mouth and upper respiratory tracts and is involved in meningitis and abscess formation with necrosis of the infected tissue (Emmerson and Mills, 1978).

They have been isolated from various body sites, such as the mouth (dental plaque and gingival pockets), pleura, peritoneum, and bone. Endocarditis, empyema, meningitis, sinusitis, otitis media, bacteremia, pneumonia, osteomyelitis, peritonitis, and wound infections are all cases in which they were found (Murphy, 2005; Maraki *et al.*, 2016; Noeskov-Lauritsen *et al.*, 2006).

In the last few years, a study by Maraki and colleagues described a case of brain abscess caused by *A. aphrophilus*, probably associated with some dental procedures (Maraki *et al.*, 2016).

Moreover, cases of brain abscesses caused by this microorganism in patients who live in close contact with dogs were attested in the literature (Clapper *et al.*, 1971). Specifically, *A. aphrophilus* has leukotoxic activity, but can exist in the oral cavity without causing disease; for example, it has been isolated from a population of Masai adolescents who use certain medicinal plants for oral hygiene procedures that reduce toxic activity (Lindholm *et al.*, 2021).

Our patient seemingly had no history of heart diseases or dental extractions, but two of the isolated bacteria are HACEK members: *A. aphrophilus*, and *E. corrodens*.

Prompt diagnosis and adequate treatment reduce brain abscess mortality in patients without predisposing factors such as underlying congenital heart diseases, pulmonary hypertension, and multiple brain abscesses. The treatment of cerebral abscesses generally consists of surgery associated with antibiotic therapy (Emmerson and Mills, 1978).

There is a high susceptibility of *Aggregatibacter* species towards third-generation cephalosporins, ampicillin, rifampin, fluoroquinolones, trimethoprim-sulfamethoxazole, aminoglycosides, and chloramphenicol. Metronidazole has shown a high synergistic effect if combined with amoxicillin (Steinberg and Burd, 2009).

In our case, empirical treatment of the patient consisted of ceftriaxone, metronidazole, and vancomycin; the organisms most implicated in brain abscesses are streptococci, Gram-negative aerobes, and strict anaerobes. The excellent central nervous system penetration of third-generation cephalosporins has made them the drug of choice. Despite that, the wide variety of antibiotics commonly used for this complication and the low number of cases observed do not allow a uniform therapeutic regime to be established; this is also dependent on the difficulty of susceptibility testing due to their fastidious growth and the potential production of β -lactamases (Rahamat-Langendoen *et al.*, 2011).

CONCLUSION

A. aphrophilus and *E. corrodens*, members of the HACEK organisms, associated with the formation of cerebral abscesses, appeared with a clinical picture compatible with an intracerebral mass, probably caused by their diffusion through the blood system. Our case report, unusually, was manifested in the absence of risk factors. Luckily, the combined action of surgical excision, microbiological investigation, and well-orientated therapy allowed a speedy recovery. In fact, after removal of the abscess, timely identification and antibiotic therapy initiation brought the resolution of the clinical and anatomic symptoms.

Author contributions

Conceptualization, C. L.B. and A.B.; methodology, A.B.; S.T., A.S., and T.F.; formal analysis, A.G.; and O.D., investigation, A.B.; S.T., A.S., and T.F.; data curation, A.G., O.D., and S.T.; writing-original draft preparation, C. L.B. and A.B.; writing-review and editing, C. L.B., T.F., A.G., O.D., and A.B.; visualization, A.G., O.D., T.F., and S.T.; supervision, A.G., O.D., and S.T.; All authors have read and agreed to the published version of the manuscript.

Informed consent statement

Informed consent was obtained from all subjects involved in the study.

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