**Brevibacterium casei** as a Cause of Brain Abscess in an Immunocompetent Patient

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Coryneform bacteria belonging to the genus *Brevibacterium* have emerged as opportunistic pathogens. Of the nine known species of *Brevibacterium* isolated from human clinical samples, *Brevibacterium casei* is the most frequently reported species from clinical specimens. We report the first case of *B. casei* brain abscess in an immunocompetent patient successfully treated by surgery and antimicrobial therapy.

**CASE REPORT**

A 31-year-old man was hospitalized for recurrent right-sided focal seizures with loss of consciousness for the last 3 months. The seizures were preceded by auras in the form of vomiting and paresthesia of the right upper and lower limbs. On admission, he complained of a bifrontal headache but was fully alert with normal vital signs, including temperature. Motor system examination revealed normal tone and bulk with power grade V in all groups. Deep tendon reflex was brisk bilateral with bilateral flexor plantar and numbness present in the right lower limb. The patient had received antituberculous chemotherapy (isoniazid, 300 mg; rifampin, 450 mg; ethambutol, 800 mg; and pyrazinamide, 1,500 mg) for the last 3 months as the brain lesion was misdiagnosed as tuberculoma at a local hospital. The isolate was misdiagnosed as tuberculoma at a local hospital. The seizures were preceded by auras in the form of vomiting and paresthesia of the right upper and lower limbs. On admission, he complained of a bifrontal headache but was fully alert with normal vital signs, including temperature. Motor system examination revealed normal tone and bulk with power grade V in all groups. Deep tendon reflex was brisk bilateral with bilateral flexor plantar and numbness present in the right lower limb. The patient had received antituberculous chemotherapy (isoniazid, 300 mg; rifampin, 450 mg; ethambutol, 800 mg; and pyrazinamide, 1,500 mg) for the last 3 months as the brain lesion was misdiagnosed as tuberculoma at a local hospital.

Magnetic resonance imaging (MRI) revealed a dark ring enhancing lesion measuring 1.2 by 0.7 cm in the left post-central gyrus with a central mural nodule (Fig. 1). Magnetic resonance spectroscopy revealed elevated lipids/lactic acid suggestive of infective etiology. Lab workup revealed microcytic hypochromic anemia (4.8 l/l, 106 erythrocytes/mm3), 5,500 white cells/μl, 106 platelets/μl, and a 1-h erythrocyte sedimentation rate of 22 mm. Other laboratory findings were unremarkable. An initial diagnosis of brain abscess of infective etiology was made, and supportive care, including administration of mannitol and dexamethasone for control of cerebral edema, was started. He underwent left parasaggital craniotomy and excision of the abscess. During surgery, lesions identified on MRI were found to contain purulent material, which was completely drained and submitted for histopathology and microbiological analysis. The cytologic findings were consistent with necrotic abscesses, and direct Gram staining revealed a few Gram-positive bacilli.

Smear and culture (MB/BacT ALERT 3D system) for acid-fast bacilli were negative. In light of these findings, empirical intravenous treatment with cefotaxime (2 g every 6 h intravenously) was started, which was continued for 7 days, followed by oral amoxicillin for 4 weeks. Pus samples on blood agar plates grew grayish-white opaque colonies of Gram-positive bacilli which were beta-hemolytic after 72 h of incubation (6). The isolate was positive for catalase, citrate, gelatin, and casein hydrolysis, while negative for nitrate reduction, acetamide, urease, mannitol (oxidation and fermentation), and oxidase. The isolate was presumptively identified as *Brevibacterium* based on these biochemical tests (11).

The 16S rRNA gene sequence of the strain was studied using bacterial universal primers 27F (positions 8 to 27, forward, 5′-AGAGTTTGATCCTGGCTCAG-3′) and 1492 R (positions 1492 to 1510, reverse, 5′-GGTACCCTTGTAGACT T-3′) (7). A single colony of the bacterial isolate was grown in LB medium for 16 h at 30°C, and genomic DNA was extracted using the acridinium thiocyanate-phenol-chloroform extraction method. Analysis of the full sequence was performed with an automatic DNA sequencer using the ABI Prism BigDye terminator cycle sequencing ready reaction kit (Perkin Elmer, Applied Biosystems, Foster City, CA). The nucleotide sequence (1,389 bp) was compared to sequence data available in the GenBank database using the BLAST program at http://www.ncbi.nlm.nih.gov/BLAST, which revealed 99% similarity to the sequence (accession no. AJ251418.1) of *Brevibacterium casei* type strain DSM 20657.

There is no standardized treatment for *B. casei* brain abscess, and Clinical and Laboratory Standards Institute (CLSI) 2011 criteria for interpreting susceptibility results are based on the recommendations that apply to *Corynebacterium* spp. (4). Susceptibility of the strain was tested using the Kirby-Bauer disk diffusion method on cation-adjusted Mueller-Hinton agar plates incubated at 37°C for 24 h. Our isolate produced large clear zones around discs for penicillin, ampicillin, ciprofloxacin, doxycycline, ceftriaxone, amikacin, chloramphenicol, gentamicin, rifampin, imipenem, meropenem, and linezolid. MICs were measured by Etest on
cation-adjusted Mueller-Hinton agar plates for gentamicin (1.5 μg/ml), ciprofloxacin (1 μg/ml), cefotaxime (2 μg/ml), daptomycin (0.19 μg/ml), and vancomycin (0.25 μg/ml). Through extrapolation of the CLSI criteria for MIC breakpoints for *Corynebacterium* spp., our isolate was deemed susceptible to all antibiotics tested (4). The patient’s symptoms resolved after treatment. A repeat MRI scan (Fig. 2) done 6 weeks later showed no residual lesion. He remained symptom free on review 6 months later.

The genus *Brevibacterium* is characterized by non-spore-forming, nonmotile, catalase-positive Gram-positive rods and was established in 1953 by Breed (3). In nature, *Brevibacterium* contributes notably to the aroma and color (orange pigment) of surface-ripened cheese. The organism can also be found in raw milk, human skin, and animal sources. Presently, the genus *Brevibacterium* consists of 45 different species, of which only nine, namely, *B. linens*, *B. casei*, *B. epidermidis*, *B. iodinum*, *B. mcbrellneri*, *B. otitidis*, *B. paucivorans*, *B. sanguinis*, and the recently described *B. massiliense*, have been isolated from clinical samples. It is now accepted that *B. casei* is by far the most frequently isolated *Brevibacterium* species from otherwise sterile human sites (5, 6, 11). Pyogenic brain abscess is defined as a focal collection within the brain parenchyma arising as a complication of a variety of infection, trauma or surgery. Bacteria gain access to the brain either by direct spread, accounting for 20 to 60% of cases, or through hematogenous seeding (2). While direct spread from contagious sites usually causes a single brain abscess, bacteremic spread typically causes multiple lesions (9). Primary infections that can directly spread to the cerebral cortex include subacute and chronic otitis media, mastoiditis, frontal or ethmoid sinusitis, and dental infections. In 20 to 40% of patients with brain abscess, no primary site or underlying condition can be identified (12).

Opportunistic infections by *Brevibacterium* spp., mostly in nosocomial settings, are on the rise, and the vast majority of them are caused by *B. casei* (1, 5, 6). Reports of *B. casei* causing a variety of infections like sepsis, meningitis, cholangitis, salpingitis, and peritonitis, have been documented (1, 5, 6, 11).
Wauters et al. have recently described a new species of Brevibacterium, B. sanguinis, which is phenotypically similar to B. casei, and they proposed thallium acetate susceptibility testing to differentiate between them (11). Brain abscess due to B. casei or any other species of Brevibacterium has never been reported before. Brain abscess is likely a late manifestation of bacteremia or infections at contiguous sites, but we were unable to document any such evidence in our patient. Previous bacteremia or infections at contiguous sites, but we were unreported before. Brain abscess is likely a late manifestation of B. casei or any other species of Brevibacterium (B. casei, B. sanguinis). Wauters et al. have recently described a new species of Brevibacterium (B. casei). The organisms isolated from brain abscess frequently provide a clue to the primary site of infection and any potential underlying condition in the host. Brevibacterium infections are generally described for patients with underlying disease and impaired immunity of some type (10). This pattern is not consistent with the characteristics of our patient, who was young and had no history of head injury or infection of the sinuses or middle ear cavity or any comorbid condition which may possibly cause immunosuppression. His infection seems to have been community acquired, but the source of the isolate could not be determined. Improvements in the diagnosis and treatment of brain abscesses over the past 2 decades have progressively reduced the mortality associated with these lesions, but their incidence is on the rise, especially among immunocompromised patients. As our case illustrates, the initial presentation can be fairly nonspecific and was confused with tuberculosis. Precious time was lost by treating the patient conservatively with antituberculous chemotherapy. As soon as brain lesions are identified by imaging modalities, every attempt should be made to obtain material for pathological and microbiological analyses. Successful treatment of a brain abscess requires a high index of suspicion of infection, which can have subtle presentations, and frequently requires a combination of drainage and antibiotics that are not only active against the infecting pathogen but also capable of penetrating the abscess cavity (8). In our case, the presence of Gram-positive bacilli in the pus specimen justified empirical therapy with cefotaxime followed by 6 weeks of oral amoxicillin, resulting in complete cure of the infection.

**Conclusion.** Our case indicates the increasing relevance of B. casei as a pathogen and the need to consider it when faced with serious infections like brain abscess, even in immunocompetent patients. This is the first reported case of brain abscess due to any species of Brevibacterium. Our report adds brain abscess to the list of infections caused by B. casei and highlights the usefulness of molecular biology techniques for supplementing routine phenotypic identification methods for rare isolates.

**Nucleotide sequence accession number.** The nucleotide sequence of the strain found in this study has been submitted to the GenBank database under accession no. JF951998.

We thank Novartis Pharmaceuticals for providing the Etest strips. We declare that we have no conflicts of interest.

**REFERENCES**

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