Molecular Identification of *Leuconostoc mesenteroides* as a Cause of Brain Abscess in an Immunocompromised Patient

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Received 20 March 2006/Accepted 26 April 2006

*Leuconostoc* species are emerging pathogens that can cause severe infections, particularly in immunocompromised patients. Using molecular methods, we identified *Leuconostoc mesenteroides* as the cause of a brain abscess which was successfully treated by surgery and antimicrobial treatment. This is the first report of brain abscess caused by this species.

CASE REPORT

A 61-year-old woman was hospitalized for a seizure with loss of consciousness. On admission, she was fully alert with right hemiparesis, an intense headache, normal vital signs, including temperature, and no other symptoms. The patient was receiving long-term low-dose prednisolone (5 mg once daily) for previous sarcoidosis. Magnetic resonance imaging (MRI) revealed two masses, located in the left occipital and temporal lobes of the brain (Fig. 1). Lab work revealed microcytic hypochromic anemia (3 × 10⁶ erythrocytes/mm³), 9,000 white cells/µl (55% polymorphonuclear cells), 200,000 platelets/µl, a C-reactive protein concentration of 0.19 mg/liter, and a 1-hour erythrocyte sedimentation rate of 10 mm. Other laboratory findings were unremarkable. An initial diagnosis of brain tumor was made, and supportive care, including administration of mannitol and dexamethasone for control of cerebral edema, was started. The day after admission, however, the patient abruptly lost consciousness and was promptly taken to the operating room. During surgery, both lesions identified on MRI were found to contain purulent material, which was completely drained and submitted for histopathology and microbiological analyses. The cytologic findings were consistent with necrotic abscesses, and direct Gram staining revealed a few gram-positive organisms with irregular coccoid morphology. In light of these findings, empirical intravenous treatment with cefotaxime (2 g every 6 h intravenously) was started. Both pus samples grew pure cultures of alpha-hemolytic gram-positive cocci. The isolates were presumptively identified as *Leuconostoc* species by the API 20 Strep system (bioMérieux), and additional manual tests (7) indicated that both were *Leuconostoc mesenteroides*. Bacterial DNA was extracted from pus specimens as well as from culture isolates by use of a QIAmp DNA Mini kit (QIAGEN, Hilden, Germany). Sequence analysis of the 16S rRNA genes revealed 99% homology with the prototype strain sequence (AY675249.1) of *L. mesenteroides* strain LM2 (http://www.ncbi.nlm.nih.gov/BLAST/).

Susceptibility testing by the microdilution method (6) yielded the following MICs: vancomycin, >128 mg/liter; penicillin, 0.5 mg/liter; ampicillin, 1 mg/liter; cefotaxime, 8 mg/liter; ceftazidime, 64 mg/liter; ciprofloxacin, 2 mg/liter; erythromycin, 0.03 mg/liter; clindamycin, 0.03 mg/liter; imipenem, 2 mg/liter; quinupristin-dalfopristin, 0.5 mg/liter; rifampin, 1 mg/liter; and linezolid, 4 mg/liter. Cefotaxime was discontinued, and continuous-infusion penicillin G (24 million U/day) plus ampicillin (2 g every 4 h intravenously) was given for 6 weeks. The postoperative course was uneventful, and no other foci of infection were identified. The patient was discharged with mild right hemiparesis. She remained on oral amoxicillin (2 g every 12 h) for another 6 weeks. At 1-year follow-up, she was in good condition.

The *Leuconostoc* genus includes facultatively anaerobic catalase-negative gram-positive cocci arranged in pairs and in chains (7). Their distinguishing characteristics include vancomycin resistance, pyrrolidonyl arylamidase and leucine aminopeptidase negativity, and failure to produce gas from glucose. Until recently, these environmental organisms, which are usually found on vegetables and food products, were widely considered nonpathogenic and therefore of limited clinical importance (7).

In 1985, however, Buu-Hoi et al. (3) reported the first cases of *Leuconostoc* infection in humans. Since then, *Leuconostoc* species have been implicated in a variety of infections (7, 8, 10–12, 14, 17), particularly in patients being treated with vancomycin (1). Little is known about the epidemiology of *Leuconostoc* infections. They occur naturally on various foods, and gastrointestinal colonization has been demonstrated for patients with previous gastrointestinal disease, surgery, and antibiotic therapy, suggesting that the gastrointestinal tract can be a potential reservoir for infection (1, 7). The outbreak potential of these opportunistic pathogens and their risk for nosocomial transmission have also been determined (4, 18). The frequency of *Leuconostoc* infections may be underestimated. *Leuconostoc* species are difficult to detect with routine methods (7) and can easily be misidentified as *Lactobacillus*, alpha-hemolytic streptococci, *Pediococcus*, *Enterococcus*, or *Lactococcus* (7).
To our knowledge, this is the first report of brain abscesses caused by *Leuconostoc*, although other types of central nervous system infection (5, 6, 9) and abscesses at other sites (2, 15, 20) have been reported. *Leuconostoc* infections are generally described for patients with underlying disease and impaired immunity of some type (7, 8, 14). This pattern is consistent with the characteristics of our patient, who had advanced age, sarcoidosis, and possible immunosuppression caused by steroid therapy. Her infection seems to have been community acquired, but the source of the isolate is unknown. Only five species of *Leuconostoc* (*L. mesenteroides*, *L. lactis*, *L. citreum*, *L. pseudomesenteroides*, and *L. paramesenteroides*) are currently considered human pathogens (7). Species-level discrimination is unreliable with the automated systems routinely used in many microbiology laboratories, and additional manual tests are labor-intensive and time-consuming (7). In our case, the phenotypic identification was confirmed by sequence analysis of the 16S rRNA gene, which can provide reliable identification of uncommon bacterial pathogens (16).

Improvements in the diagnosis and treatment of brain abscesses over the past 2 decades have progressively reduced the mortality associated with these lesions (13, 21), but their incidence is on the rise, especially among immunocompromised patients. As our case illustrates, the initial presentation can be fairly nonspecific, and precious time can be lost ruling out the more common causes of headache (13). As soon as brain lesions are identified by imaging modalities, every attempt should be made to obtain material for pathological and microbiological analysis. Effective treatment requires antibiotics that are not only active against the infecting pathogen but also capable of penetrating the abscess cavity (13). In our case, the presence of gram-positive coccoid organisms in the pus specimen justified empirical therapy with cefotaxime (13). Subsequent studies, however, revealed that the bacterium was resistant to cephalosporins and only marginally susceptible to penicillin and ampicillin, as previously described (19). In our opinion, the in vitro susceptibility profile played a decisive role in the successful outcome of our case. Although the patient’s condition was significantly improved after surgical drainage of the abscesses (which is obviously a cornerstone of effective treatment), it is unlikely that this improvement would have persisted if cefotaxime therapy had been continued. The switch to a dual-drug regimen (high-dose intravenous penicillin G plus ampicillin for 6 weeks), followed by 6 weeks of oral amoxicillin, resulted in complete cure of the infection.

Our report adds brain abscess to the list of infections caused by *Leuconostoc* spp. and highlights the usefulness of molecular biology techniques for supplementing routine phenotypic identification methods for rare isolates. Failure to identify *Leuconostoc* infections and to verify the appropriateness of empirical treatment carries a high risk of therapeutic failure.

This work was partially supported by grants from the Italian Ministry for University and Scientific Research (ex MURST 2005). We thank Marian Kent for editorial assistance.

REFERENCES