



***Haemophilus aphrophilus* brain abscess: a case report**

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Haemophilus aphrophilus infection is rare, and the organism is infrequently implicated in serious infection. We report a case of a 61-year-old patient who experienced left hemiparesis with dizziness. Computed tomography of the brain demonstrated a lesion with ring enhancement in the right frontotemporal region. Craniotomy was performed, abscess was drained, and *H. aphrophilus* was isolated. Following the surgical procedure and further antibiotic treatment, the patient recovered completely.

Key words: Brain abscess, *Haemophilus aphrophilus*

Haemophilus aphrophilus infrequently causes human diseases; it has been reported in patients with sinusitis, otitis media, dental abscess, pneumonia, empyema, bacteremia, endocarditis, soft tissue abscesses, wound infections, necrotizing fasciitis, septic arthritis, osteomyelitis, spinal epidural abscess, meningitis, and brain abscess [1,2]. Most reported cases of endocarditis have been in association with rheumatic heart disease [3]. Brain abscess due to *H. aphrophilus* is rare. The organism can be isolated from gingival scrapings and interdental material with selective media, and therefore seems to be a normal component of the oral flora [4]. Dental procedures such as flossing, cleaning, and extraction may cause bacteremia and subsequent hematogenous dissemination to brain [5]. In one report, *H. aphrophilus* has been isolated from the mouth of a pet dog, which belongs to a patient who experienced brain abscess. The dog habitually licked the face and neck of the patient, and these close contacts presumably predispose the patient to the infection [6]. Nevertheless, the source and natural habitat of *H. aphrophilus* are still under debate. We report a case of brain abscess caused by *H. aphrophilus* and discuss the potential sources of infection.

Case Report

A 61-year-old man was admitted to the Mackay Memorial Hospital in Taiwan. He was previously healthy, but complained of progressive left-sided weakness which started 3 days before admission. The

patient had a habit of cleaning his teeth with a bamboo stick. He also had frequent close contacts with his pet dog. One month prior to admission, he underwent tooth extraction and there were no complications after this procedure. On admission, his body temperature was 37.2°C and he was slightly drowsy. Apart from some missing teeth and poor dental hygiene, there was no evidence of periodontitis. Chest examination was normal, and there was no murmur on cardiac examination. The liver and spleen were not palpable. Strength in the left upper and lower extremities was decreased. The white cell count was 12 620/mm³ with 1% bands and 93% neutrophils. Examinations revealed hemoglobin of 11.3 g/L, blood urea nitrogen 10 mg/dL (normal range, 5-22 mg/dL), creatinine 0.9 mg/dL (normal range, 0.6-1.2 mg/dL), sodium 135 mEq/L (normal range, 135-147 mEq/L), K 4.5 mEq/L (normal range, 3.5-5.3 mEq/L), and glucose 102 mg/dL (normal range, 70-120 mg/dL). Computed tomography of the brain revealed a ring-enhancing lesion in the right frontotemporal region (Fig. 1). Craniotomy was performed and the abscess was drained. Gram-negative coccobacilli were grown on chocolate agar from the abscess fluid. The organism was not X- or V-factor dependent and had a positive oxidase test but a negative result in motility, catalase, urease and indole tests. It fermented lactose, sucrose, and maltose but not xylose or mannitol. These findings indicate the presence of *H. aphrophilus*. Using the disk diffusion method, the organism was found to be susceptible to ampicillin, chloramphenicol, ceftazidime, ceftriaxone, cefotaxime, and cefuroxime. The patient received ceftriaxone 2 g intravenously, every 12 h for 6 weeks. His neurologic symptoms gradually improved, with eventual complete recovery.

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Discussion

H. aphrophilus is a small, pleomorphic, nonmotile, facultatively anaerobic, gram-negative coccobacillus that may cause serious infection [1,2,7]. Growth is optimal when cultures are incubated in a humid environment containing 5% to 7% CO₂ at 33°C to 37°C. Most *Haemophilus* species exhibit fastidious nutritional requirements and grow only in nutrient-rich media. All species, with the exception of *H. aphrophilus*, require either exogenous hemin (X factor) or nicotinamide adenine dinucleotide (NAD, V factor), or both [2]. Most grow well on conventional chocolate agar but do not grow at all on standard 5% sheep blood agar. A commercially available quadrant plate contains Muller-Hinton agar supplemented with either X factor, V factor, X + V factor, or X + V factor and horse erythrocytes. After overnight incubation, the plate is examined to determine the isolate's X- and V-factor requirements as well as its ability to hemolyze horse erythrocytes. *Haemophilus* species which require X factor do not excrete porphobilinogen or porphyrins during growth because of enzymatic deficiencies in the hemin biosynthetic pathway [2]. *H. aphrophilus* is non-X and -V factor dependent, oxidase positive, and urea, indole, and catalase negative with fermentation of glucose, sucrose, lactose, and maltose [2,8]. *Actinobacillus actinomycetemcomitans* and *H. aphrophilus* are closely related and frequently confused. *H. aphrophilus* does not produce catalase and ferments both lactose and sucrose. *A. actinomycetemcomitans* ferments mannitol or xylose or both whereas *H. aphrophilus* does not [3].

H. aphrophilus was first described and reported by Khairat [9] in 1940 in a fatal case of endocarditis. Congenital heart diseases, any dental procedures, and canine contact are considered potential predisposing

factors of brain abscess caused by *H. aphrophilus*. Page and King [3] reported 9 patients with brain abscess caused by *H. aphrophilus* infection in 1966, most of whom had congenital heart disease. All patients in that study recovered after treatment with surgical evacuation and antibiotics. In cerebral abscess associated with cyanotic congenital heart disease, *H. aphrophilus* is the second most frequent infecting agent [10]. The patient in this case report had no evidence of a cardiac anomaly.

Clapper and Smith [5] reported a case of *H. aphrophilus* brain abscess in a patient who had had a tooth extracted 10 days earlier. It has been suggested that blood stream infection following tooth extraction is significant in the pathogenesis of brain abscess. In 1972, Kraut et al [4] reported that *H. aphrophilus* is a component of the normal oral flora in adults. Using selective medium consisting of trypticase soy agar, 5 µg/mL of hemin, and 5 units/mL of bacitracin, they isolated *H. aphrophilus* from gingival scrapings and interdental material in 16 of 45 healthy adult volunteers whose dental health was unknown. Therefore, the mouth is a likely source of the organism in cases of infection with *H. aphrophilus*. This report showed that *H. aphrophilus* can also be isolated without the presence of hemin (X factor). Dental cleaning, flossing, or any other dental procedure may cause bacteremia [11]. This patient had a daily habit of cleaning his teeth with a bamboo stick, and he had had a tooth extraction one month before admission.

In 1978, Bieger et al [12] reviewed a total of 90 cases of *H. aphrophilus* infection, of which 19 were cases of brain abscess. Associated conditions were congenital heart disease in 8 cases, dental procedure or disease, upper respiratory infection, and otitis media each in one case. No obvious source of infection was found in the remaining 8 cases and 6 patients died.

Contact with canines has been implicated as an infection source of *H. aphrophilus* since Isom et al [6] isolated the organism from the mouth of a patient's pet dog. Although Abla et al [13] noted that the source and natural habitat of *H. aphrophilus* is still debatable, he also reported the third case of brain abscess due to *H. aphrophilus* in which the bacterium was isolated from the mouth of the patient's pet dog. Therefore, canine transmission should be considered in such circumstances. The patient in this report had intimate contacts with his dog, but the organism was not isolated from its mouth.

Hung et al [11] reported a case in 1997 of *H. aphrophilus* bacteremia with vertebral osteomyelitis and spinal epidural abscess in a patient with liver cirrhosis. He reviewed 9 cases of vertebral osteomyelitis due to

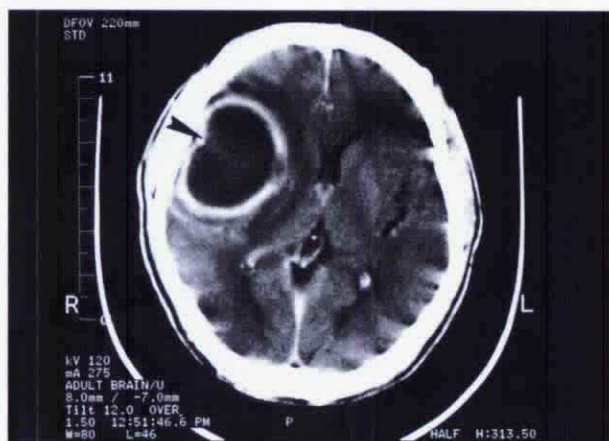


Fig. 1. Computed tomography of the brain revealed a ring-enhancing lesion (arrow) in the right frontotemporal region.

H. aphrophilus. Underlying diseases—polyarthritis, cirrhosis, diabetes mellitus, and sciatica—were described in 5 patients. Predisposing factors include lip laceration, trivial skin breaks, dental procedures, and penetrating injuries such as epidural catheterization, lumbar puncture, and myelography.

The National Committee of Clinical Laboratory Standards has developed standard disk diffusion and minimum inhibitory concentration methods for testing antimicrobial sensitivity of *Haemophilus* species. Some *Haemophilus* species are resistant to ampicillin by the production of a plasmid-mediated β -lactamase and structural alterations of penicillin-binding proteins [2]. However, clinical isolates of *H. aphrophilus* have been demonstrated to be susceptible to penicillin, ampicillin, and cephalosporins by disk diffusion method. Using microdilution sensitivity testing, the *in vitro* activities of penicillin, ampicillin, third-generation cephalosporins, and ciprofloxacin against clinical isolates of *H. aphrophilus* are excellent, while those of oxacillin, erythromycin, and aminoglycosides are poor [11].

In summary, the patient in this case report experienced brain abscess due to *H. aphrophilus* with potential predisposing factors of daily dental manipulation, tooth extraction, and close contact with a dog. Surgical drainage and antibiotic treatment are necessary to achieve a favorable clinical outcome.

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