Pyogenic Liver Abscess with *Prevotella* Species and *Fusobacterium necrophorum* as Causative Pathogens in an Immunocompetent Patient

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Pyogenic liver abscess of odontogenic origin in an immunocompetent patient is extremely rare. We report an immunocompetent 25-year-old male hepatitis B carrier with severe dental disease that led to the development of liver abscess. A periapical abscess in the upper left molar area was seen on his dental X-ray. Two sets of blood cultures grew *Prevotella* species, bacteria that are commonly found inside the oral cavity. Bacterial culture of the liver abscess drainage sample grew both *Prevotella* and *Fusobacterium necrophorum*. This led to our diagnosis of pyogenic liver abscess of dental origin, since we found no other source of infection in our patient except for his dental disease. After antibiotic therapy with drainage, abdominal sonography showed resolution of the abscess. The diseased teeth were also extracted. During 1 year of follow-up, there was no sign of abscess recurrence. A diagnosis of pyogenic liver abscess necessitates a complete evaluation to rule out possible biliary, colonic or other associated diseases. However, when a liver abscess is thought to be cryptogenic, we also recommend a careful dental examination to help identify the source of infection. [J Formos Med Assoc 2009;108(3):253–257]

Key Words: *Fusobacterium necrophorum*, hepatitis B, immunocompetence, liver abscess, odontogenic origin, *Prevotella*

Case Report

A 25-year-old male hepatitis B carrier was referred to our hospital with a 3-week history of fever, chills and headache. He had previously been healthy until he started to have toothache 1 month before. He visited a dental clinic, and was diagnosed as having endodontic infection and periodontitis. The pain subsided after medical management. During 3 weeks before hospital admission, he started experiencing episodes of fever with shaking chills, productive cough, anorexia, and malaise. He visited a private medical clinic initially. When...
episodic fever persisted, he was referred to our hospital.

At the time of admission, physical examination revealed hypotension (86/41 mmHg) and fever (39.4°C). Initial laboratory examination disclosed an inflammatory reaction, an elevated C-reactive protein level of 24.3 mg/dL (normal, <0.8 mg/dL) and white blood cell count of 18.2 × 10^9/L with 90% neutrophils. Liver function tests showed a slight increase in alanine aminotransferase (32 U/L; normal, 5–30 U/L), alkaline phosphatase (138 U/L; normal, 40–120 U/L), and γ-glutamyl transpeptidase (78 U/L; normal, 9–50 U/L). Chest X-ray showed increased bronchovascular markings in bilateral lower lung fields. Abdominal ultrasonography and computed tomography (CT) revealed a 5.0 × 7.0-cm low-attenuation lesion, with multiple septa and peripheral enhancement in the posterior segment of the right lobe of the liver (Figure 1). CT-guided percutaneous drainage yielded purulent material, and cultures were positive for *F. necrophorum* and *Prevotella* species. *Prevotella* grew on two sets of blood cultures. Amebic hemagglutination test titer was undetectable. Human immunodeficiency virus ELISA was negative. Ultrasonography of the biliary tree was normal, but further investigation with gastroduodenoscopy, colonoscopy or colon X-ray examination was declined by the patient.

Since peripapical abscesses of the upper left molar area were seen on dental panoramic radiography (Figure 2), a dental surgeon was consulted. The diseased teeth were then extracted.

Empirical antibiotics were administered since admission, and then replaced by amoxicillin-clavulanate after bacteria culture. After 3 weeks of antibiotic therapy and abscess drainage, our patient showed marked clinical and biological improvement, and clearance of fever. Abdominal sonography also showed resolution of the abscess. During 1 year of follow-up, there was no sign of abscess recurrence or immune dysfunction.

**Discussion**

Pyogenic liver abscess is a relatively uncommon but important disease, which can be fatal without prompt diagnosis and early treatment. Although earlier cases were most often secondary to acute appendicitis, biliary tract disease is now the most common cause, and accounts for 40–60% of cases. In Taiwan, *K. pneumonia* is the leading cause of liver abscess, especially in patients with diabetes. However, a large proportion of affected patients have no underlying causes. Recent reports have described an increased frequency of patients with cryptogenic liver abscess, in spite of the use of a number of imaging techniques and microbiology methods.

Dental disease has rarely been reported as the cause of pyogenic liver abscess, especially in immunocompetent patients. Of the documented cases, Tweeny and White described a 27-year-old...
man who developed multiple liver abscesses that contained *Fusobacterium nucleatum* several days after dental manipulation. Crippin and Wang reported two patients who had severe dental disease when diagnosed with pyogenic liver abscess, and culture of the abscess yielded oral flora. None of these patients showed any evidence of immune dysfunction.

*Prevotella* species are Gram-negative anaerobic rods commonly found in the human oral cavity. They are frequently involved in the etiology of periodontitis, and can also cause diseases such as oral and peritonsillar abscesses, pulmonary infection, and bacteraemia. Previous studies have shown that some species of *Prevotella* are able to inhibit lymphocyte proliferation, which suggests its ability to evade the immune system. These findings, coupled with the organism’s ability to cause disease in concert with other bacteria, add to its pathogenic potential.

*F. necrophorum* is another common constituent of oral flora. It usually causes more serious infection than *Prevotella* species. It has been isolated from dental plaque and gingival sulci, sinuses, lung, and the gastrointestinal and urogenital tracts. The most commonly reported infection sources are the respiratory and gastrointestinal tracts. *F. necrophorum* can also cause Lemierre’s syndrome, endocarditis and other fatal sepsis. However, it rarely causes liver abscess. In a series of 40 cases of *Fusobacterium* bacteremia, there was only one case of liver abscess caused by *F. nucleatum*.

The pathway of infection of pyogenic liver abscess secondary to dental disease is different from that caused by biliary and colonic disease. The bacteria from the oral cavity enter the venous system first, and then spread systemically through the arterial circulation to reach the hepatic arterial tree. In contrast, colonic bacteria spread through the portal system. From experience, we know that hematogenously seeded abscesses are more likely to be multiple and caused by a single microorganism. In an earlier study by Crippin and Wang, 10 patients with diverticulitis all had a single liver abscess, whereas multiple liver abscesses were seen in two patients with dental disease.

In our case, we found only infectious foci of dental origin to be the possible source of liver abscess. Sonography of the biliary tract was normal. Although the patient did not undergo colonic examination, there was no clinical evidence of colon diverticulitis or colitis. The respiratory tract infection in our patient cleared several weeks prior to his hospital admission, and we consider it unlikely that it was the cause of his liver abscess. The apparent source of *Prevotella* and *F. necrophorum* infection was the dental abscesses. This led to our diagnosis of pyogenic liver abscess of dental origin. However, the liver abscess in our patient was solitary, and caused by two types of microorganism, in contrast to previous reports. We do not have an explanation of this different infection pattern.

Invasion of *Prevotella* beyond the natural barrier resulted in bacteremia, which may have occurred simultaneously with or following previous dental manipulations for endodontic and periodontal infections. The routes of spread, extent and clinical manifestation of odontogenic infection depend on the local anatomical barriers of bone, muscle and fascia. In our case, pus from the periapical infection of the upper molars penetrated through the maxillary buccal plate. The infection spread beyond the attachment of the buccinator muscle into the buccal space, and manifested clinically as an extraoral infection.

Unchecked odontogenic infection can lead to systemic infection, including fever, and bacteraemic seeding of native or prosthetic heart valves, artificial joints, or other prosthetic devices. Although bacteremia can occur following almost all types of dental manipulations, such as scaling, drilling and endodontic treatment, such episodes are usually transient and inconsequential in healthy individuals. In contrast, bacteremia in patients with severe endodontic infection and periodontal disease is more sustained, and poses the particular threat of infective endocarditis in elderly patients.

Patients with diabetes mellitus, sickle cell anemia, liver transplant, and malignant cancer are at an even greater risk for developing liver abscess.
because of their relatively immunocompromised state. The concurrence between hepatitis B and liver abscess can be seen in medical practice. Although there does not seem to be any connection between these two disorders, they yield poorer prognosis when they occur together, which often leads to a requirement for intensive care. The causative pathogens are similar to those in general patients with abscesses, according to a study by Wiwanitkit et al.

Although rare, there have been reports of pyogenic liver abscess in immunocompetent patients caused by anaerobes such as *Leptotrichia buccalis*, *Actinomyces meyeri*, and *Fusobacterium* species. In one of these studies, Memain et al described an immunocompetent woman with a tonsil infection who developed septic shock and liver abscess formation from *Fusobacterium nucleatum*, which is usually correlated with higher mortality. In our case, the young male hepatitis B carrier with *Prevotella* bacteremia also developed septic shock initially, but he showed no evidence of immunosuppression during or after hospitalization. As far as we know, our patient is the first reported case of hepatic abscess caused by *Prevotella* species and *F. necrophorum* in an immunocompetent patient with hepatitis B.

Therapy for pyogenic liver abscess usually requires percutaneous drainage combined with intravenous administration of antibiotics. The management of patients with dental disease does not differ from those with pyogenic liver abscess with other etiology. To summarize, we recommend that a detailed dental examination, including radiology, should be performed in all patients with pyogenic liver abscess, especially when clinically apparent dental disease is present within weeks of symptomatic onset of the hepatic abscess.

In conclusion, pyogenic liver abscess caused by dental disease in immunocompetent patients is rare. A diagnosis of pyogenic liver abscess necessitates a complete evaluation to rule out possible biliary, colonic or other associated diseases. If a liver abscess is thought to be cryptogenic, a careful dental examination is recommended.

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References