

# Pyogenic Hepatic Abscess in an Immunocompetent Patient With Poor Oral Health and COVID-19 Infection

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**Background:** Pyogenic hepatic abscess (PHA) is a collection of pus in the liver caused by bacterial infection of the liver parenchyma. PHA is more common in immunosuppressed individuals and those with diabetes mellitus, cancer, and liver transplant.

**Case Presentation:** We present a rare case of PHA with *Fusobacterium nucleatum* in an immunocompetent patient with poor oral health, history of diverticulitis, and recent COVID-19 infection whose only symptoms were chest pain and a 4-week

history of fever and malaise. The source of infection in this patient was likely dental caries and periodontal disease, with COVID-19 infection playing a role as a red herring in this patient's disease progression, delaying diagnosis.

**Conclusions:** Diagnosis and treatment of PHA must be prompt with drainage and empiric anaerobic coverage followed by a more tailored antibiotic regimen if indicated by culture and further drainage if indicated by computed tomography.

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Pyogenic hepatic abscess (PHA) is a collection of pus in the liver caused by bacterial infection of the liver parenchyma. This potentially life-threatening condition has a mortality rate reported to be as high as 47%.<sup>1</sup> The incidence of PHA is reported to be 2.3 per 100,000 individuals and is more common in immunosuppressed individuals and those with diabetes mellitus, cancer, and liver transplant.<sup>2,3</sup> PHA infections are usually polymicrobial and most commonly include enteric organisms like *Escherichia coli* and *Klebsiella pneumoniae*.<sup>4</sup>

We present a rare cause of PHA with *Fusobacterium nucleatum* (*F nucleatum*) in an immunocompetent patient with poor oral health, history of diverticulitis, and recent COVID-19 infection whose only symptoms were chest pain and a 4-week history of fever and malaise.

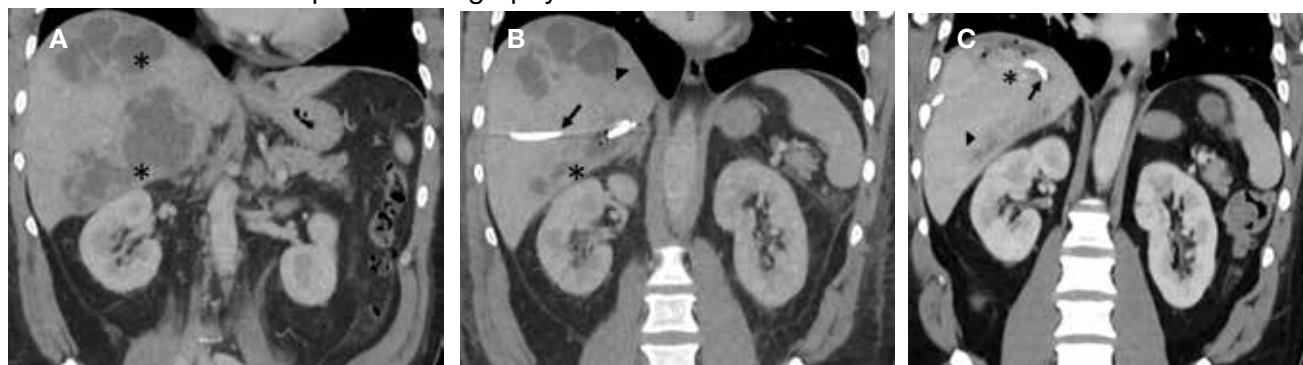
**CASE PRESENTATION**

A 52-year-old man initially presented to the C.W. Bill Young Veterans Affairs Medical Center (CWBYVAMC) emergency department in Bay Pines, Florida, for fever, malaise, and right-sided chest pain on inspiration. The fever and malaise began while he was on vacation 4 weeks prior. He originally presented to an outside hospital where he tested positive for COVID-19 and was recommended ibuprofen and rest. His symptoms did not improve, and he returned a second time to the outside hospi-

tal 2 weeks later and was diagnosed with pneumonia and placed on outpatient antibiotics. The patient subsequently returned to CWBYVAMC 2 weeks after starting antibiotics when he began to develop right-sided inspiratory chest pain. He reported no other recent travel and no abdominal pain. The patient's history was significant for diverticulitis 2 years before. A colonoscopy was performed during that time and showed no masses.

On presentation, the patient was febrile with a temperature of 100.8 °F; otherwise, his vital signs were stable. Physical examinations, including abdominal, respiratory, and cardiovascular, were unremarkable. The initial laboratory workup revealed a white blood cell (WBC) count of 18.7 K/μL (reference range, 5-10 K/μL) and microcytic anemia with a hemoglobin level of 8.8 g/dL. The comprehensive metabolic panel revealed normal aspartate transaminase, alanine transaminase, and total bilirubin levels and elevated alkaline phosphatase of 215 U/L (reference range, 44-147 U/L), revealing possible mild intrahepatic cholestasis. Urinalysis showed trace proteinuria and urobilinogen. Coagulation studies showed elevated D-dimer and procalcitonin levels at 1.9 ng/mL (reference range, < 0.1 ng/mL) and 1.21 ng/mL (reference range, < 0.5 ng/mL), respectively, with normal prothrombin and partial thromboplastin times. The patient had a normal troponin, fecal, and blood culture; entamoeba serology was negative.

**FIGURE 1** Coronal Computed Tomography of the Abdomen and Pelvis With IV Contrast



A, Large multiloculated hepatic fluid collection can be seen in the dome and base of the liver (\*). B, Interval decrease in fluid collection (arrow) after placement of first drainage catheter (arrowhead), persistent loculation near the dome of the liver. C, Marked overall improvement of the superior hepatic fluid collection (\*) after placement of second drainage catheter (arrow). Near complete resolution of the abscess in the dome of the liver can be seen (arrowhead).

A computed tomograph (CT) angiography of the chest was performed to rule out pulmonary embolism, revealing liver lesions suspicious for abscess or metastatic disease. Minimal pleural effusion was detected bilaterally. A subsequent CT confirmed the presence of hepatic lesions consistent with an abscess (Figure 1). Empiric antibiotics with anaerobic coverage, including piperacillin-tazobactam and metronidazole, were started. Drainage and culture of the abscess by interventional radiology were performed on hospital day 2, which included placement of a pigtail catheter.

Following the procedure, the patient developed shaking chills, hypertension, fever, and acute hypoxic respiratory failure. He improved with oxygen and was transferred to the intensive care unit (ICU) where he had an increase in temperature and became septic without shock. A repeat blood culture was negative. An echocardiogram revealed no vegetation. Vancomycin was added for empiric coverage of potentially resistant organisms. The patient clinically improved and was able to leave the ICU 2 days later on hospital day 4.

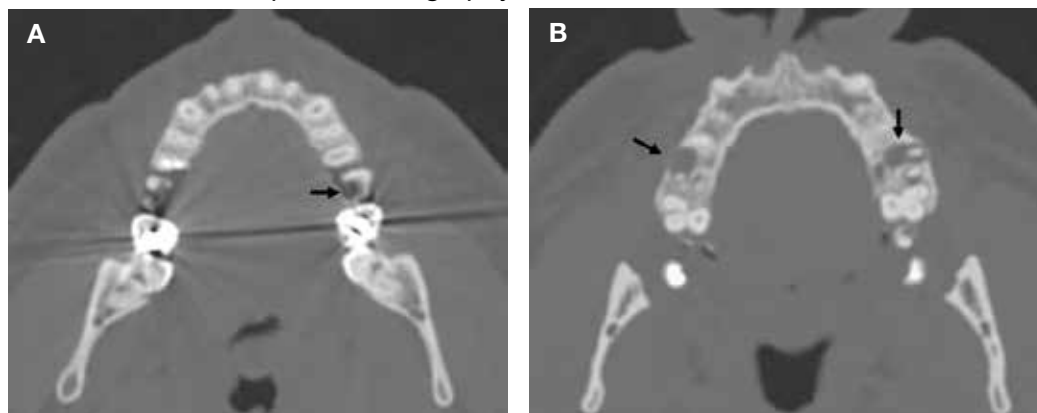
The patient's renal function worsened on day 5, and piperacillin-tazobactam and vancomycin were discontinued due to possible acute interstitial nephritis and renal toxicity. He started cefepime and continued metronidazole, and his renal function returned to normal 2 days later. Vancomycin was then re-administered. The results of the culture taken from the abscess came back positive for monomicrobial growth of *F nucleatum* on hospi-

tal day 9. The patient's mouth revealed dental caries. A maxillofacial CT confirmed signs of dental caries and periodontitis (Figure 2). The patient had not reported any oral cavity symptoms.

Due to the patient's persisting fever and WBC count, a repeat CT of the abdomen on hospital day 10 revealed a partial decrease in the abscess with a persistent collection superior to the location of the initial pigtail catheter placement. A second pigtail catheter was then placed near the dome of the liver 1 day later on hospital day 11. Following the procedure, the patient improved significantly. The repeat CT after 1 week showed marked overall resolution of the abscess, and the repeat culture of the abscess did not reveal any organism growth. Vancomycin was discontinued on day 19, and the drains were removed on hospital day 20. He was discharged home in stable condition on metronidazole and cefdinir for 21 days with follow-up appointments for CT of the abdomen and with primary care, infectious disease, and a dental specialist.

## DISCUSSION

*F nucleatum* is a gram-negative, nonmotile, spindle-shaped rod found in dental plaques.<sup>5</sup> The incidence of *F nucleatum* bacteremia is 0.34 per 100,000 people and increases with age, with the median age being 53.5 years.<sup>6</sup> Although our patient did not present with *F nucleatum* bacteremia, it is possible that bacteremia was present before hospitalization but resolved by the time the sample was drawn for culture. *F nucleatum* bacteremia

**FIGURE 2** Axial Computed Tomography of the Face With IV Contrast

A, Focal lucency within the left maxillary first molar demonstrating signs of caries (arrow). B, Lucency around the maxillary molar roots showing periodontal disease (arrows).

can lead to a variety of presentations. The most common primary diagnoses are intra-abdominal infections (eg, PHA, respiratory tract infections, and hematological disorders).<sup>1,6</sup>

#### PHA Presentation

The most common presenting symptoms of PHA are fever (88%), abdominal pain (79%), and vomiting (50%).<sup>4</sup> The patient's presentation of inspiratory right-sided chest pain is likely due to irritation of the diaphragmatic pleura of the right lung secondary to the abscess formation. The patient did not experience abdominal pain throughout the course of this disease or on palpation of his right upper quadrant. To our knowledge, this is the only case of PHA in the literature of a patient with inspiratory chest pain without respiratory infection, abdominal pain, and cardiac abnormalities. There was no radiologic evidence or signs of hypoxia on admission to CWBYVAMC, which makes respiratory infection an unlikely cause of the chest pain. Moreover, the patient presented with new-onset chest pain 2 weeks after the diagnosis of pneumonia.

Common laboratory findings of PHA include transaminitis, leukocytosis, and bilirubinemia.<sup>4</sup> Of note, increased procalcitonin has also been associated with PHA and extreme elevation (> 200 µg/L) may be a useful biomarker to identify *F nucleatum* infections before the presence of leukocytosis.<sup>3</sup> CT of PHA usually reveals right lobe involvement, and *F nucleatum* infection usually demonstrates multiple abscesses.<sup>4,7</sup>

#### Contributing Factors in *F nucleatum* PHA

*F nucleatum* is associated with several oral diseases, such as periodontitis and gingivitis.<sup>8</sup> It is important to do an oral inspection on patients with *F nucleatum* infections because it can spread from oral cavities to different body parts.

*F nucleatum* is also found in the gut.<sup>9</sup> Any disease that can cause a break in the gastrointestinal mucosa may result in *F nucleatum* bacteremia and PHA. This may be why *F nucleatum* has been associated with a variety of different diseases, such as diverticulitis, inflammatory bowel disease, appendicitis, and colorectal cancer.<sup>10,11</sup> Our patient had a history of diverticulosis with diverticulitis. Bawa and colleagues described a patient with recurrent diverticulitis who developed *F nucleatum* bacteremia and PHA.<sup>11</sup> Our patient did not have any signs of diverticulitis.

Our patient's COVID-19 infection also had a role in delaying the appropriate treatment of PHA. Without any symptoms of PHA, a diagnosis is difficult in a patient with a positive COVID-19 test, and treatment was delayed 1 month. Moreover, COVID-19 has been reported to delay the diagnosis of PHA even in the absence of a positive COVID-19 test. Collins and Diamond presented a patient during the COVID-19 pandemic who developed a periodontal abscess, which resulted in *F nucleatum* bacteremia and PHA due to delayed hospital presentation after the patient's practitioners recommended self-isolation, despite a negative COVID-19 test.<sup>12</sup> This

highlights the impact that COVID-19 may have on the timely diagnosis and treatment of patients with PHA.

Malignancy has been associated with *F nucleatum* bacteremia.<sup>1,13</sup> Possibly the association is due to gastrointestinal mucosa malignancy's ability to cause micro-abrasions, resulting in *F nucleatum* bacteremia.<sup>10</sup> Additionally, *F nucleatum* may promote the development of colorectal neoplasms.<sup>8</sup> Due to this association, screening for colorectal cancer in patients with *F nucleatum* infection is important. In our patient, a colonoscopy was performed during the patient's hospitalization for diverticulitis 2 years prior. No signs of colorectal neoplasm were noted.

## CONCLUSIONS

PHA due to *F nucleatum* is a rare but potentially life-threatening condition that must be diagnosed and treated promptly. It usually presents with fever, abdominal pain, and vomiting but can present with chest pain in the absence of a respiratory infection, cardiac abnormalities, and abdominal pain, as in our patient. A wide spectrum of infections can occur with *F nucleatum*, including PHA.

Suspicion for infection with this organism should be kept high in middle-aged and older individuals who present with an indolent disease course and have risk factors, such as poor oral health and comorbidities. Suspicion should be kept high even in the event of COVID-19 infection, especially in individuals with prolonged fever without other signs indicating respiratory infection. We believe that the most likely causes of this patient's infection were his dental caries and periodontal disease. The timing of his symptoms is not consistent with his previous episode of diverticulitis. Due to the mortality of PHA, diagnosis and treatment must be prompt. Initial treatment with drainage and empiric anaerobic coverage is recommended, followed by a tailored antibiotic regimen if indicated by culture, and further drainage if suggested by imaging.

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## Ethics and consent

Written informed consent was obtained from the patient.

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