

FROM CULT TO CULTURE, A CASE OF DISSEMINATED FUSOBACTERIUM NUCLEATUM

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Abstract

Fusobacterium nucleatum is an anaerobic Gram-negative rod commonly found in the oral cavity. We report a woman recently living in a Puerto Rican cult, presenting with abdominal pain and weight loss, found to have a liver abscess growing *F. nucleatum* extending to the pericardium, as well as a tubo-ovarian abscess.

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CONFLICT OF INTEREST

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CONSENT

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Cardiovascular disorders, Dentistry, Gastroenterology and hepatology, Infectious diseases, Obstetrics and gynecology

Key Clinical Message :

Fusobacterium spp. should be on the differential for any organ abscess, especially when there are multiple sites of infection, including but not limited to, the liver, brain, or lungs. When patients have concomitant periodontal disease, *Fusobacterium* spp. should be higher on the differential since they are typically oral flora.

Summary:

Fusobacterium nucleatum is an anaerobic Gram-negative rod commonly found in the oral cavity. We report a woman recently living in a Puerto Rican cult, presenting with abdominal pain and weight loss, found to have a liver abscess growing *F. nucleatum* extending to the pericardium, as well as a tubo-ovarian abscess.

Background :

Fusobacterium species are anaerobic Gram-negative rods that are considered normal flora in the human oral cavity but are also rarely seen as opportunistic infections in oral and extraoral diseases such as the case presented below (1). Despite their ubiquitous presence in the general population, most clinicians are not familiar with this organism as a pathogen due to its typically innocuous nature. *F. nucleatum* has rarely been associated with a number of conditions including periodontitis (2), peri-implant disease (3), chorioamnionitis (4), pre-term births (5-7), pericarditis (8), and organ abscesses- typically in the brain, liver, or lungs (6, 9, 10). *Fusobacteria* are not commonly encountered in clinical practice; in one retrospective analysis *Fusobacterium* spp. bacteremia is seen in 5.5 out of one million cases of bacteremia per year (11). We present a case of disseminated *F. nucleatum* resulting in a pyogenic liver abscess with pericardial involvement as well as a tubo-ovarian abscess.

Case Presentation:

A previously healthy woman in her 20s presented with three weeks of fatigue, abdominal pain and unintentional weight loss. She had recently returned from living in the Puerto Rican jungle with a known cult that emphasized living off the land with unusual beliefs that precluded regular body hygiene. On examination, she was febrile to 103.9° F, tachycardic to 130 bpm with no murmurs, rubs, or gallops, but otherwise hemodynamically stable and with an unremarkable physical exam outside of poor hygiene.

Investigations:

Admission labs were pertinent for a hemoglobin of 5.6 g/dL, a WBC of 12.4 K/microL, and a lactic acid of 2.5 mmol/L. Negative labs included HIV, hepatitis panel, *Neisseria gonorrhoeae* , RPR, EBV IgM, IgG and antigen, *Plasmodium falciparum* antigen and thin and thick blood smear. Chest CT demonstrated a hepatic abscess to pericardial communication (Figure 1). Triple phase abdominal CT scan showed multiple liver abscesses with communication into the right cardiophrenic space (Figure 2). Hepatic abscess aspirate cultures grew *Fusobacterium nucleatum* . A transthoracic echocardiogram (TTE) revealed a large pericardial effusion, and serial TTEs demonstrated expansion of this effusion leading to tamponade physiology with diastolic right ventricular collapse and tricuspid valve E inflow respiratory variation >60% (Figures 3, 4). Pericardiocentesis was performed with 300 mL of fluid removed out of which no organisms were isolated. Repeat CT abdomen and pelvis showed persistent multiloculated fluid collections (Figure 5). MRI pelvis

confirmed a right adnexal multiloculated mass concerning for tubo-ovarian abscess (Figure 6), ultimately requiring percutaneous nephrostomy due to mass effect and subsequent hydronephrosis.

Treatment:

The patient underwent pericardiocentesis then laparoscopic drainage of her perihepatic abscesses and drain placement with extensive hepatic necrosis noted intraoperatively. She improved clinically and was discharged with ampicillin-sulbactam and doxycycline for a total of eight weeks of antibiotic therapy.

Outcomes and Follow-Up:

She was seen once more in the Infectious Disease clinic and was asymptomatic. She was then lost to follow up before being seen by OB-GYN for evaluation of the tubo-ovarian abscess.

Discussion:

Fusobacteria are an obligate anaerobic, non-spore forming, Gram-negative bacilli that are considered normal flora in the oral cavity. This organism accounts for less than 1% of bacteremia and less than 1% of clinically significant infections (1). *Fusobacterium nucleatum* is at times a difficult organism to isolate in clinical practice where the bacterium is not easily grown in blood or abscess cultures, but only on PCR or other modalities (12). As in the case above with only the liver aspirate culture with positive growth, patients may present with disseminated infections and have abscesses in multiple organs despite most of the cultures remaining negative. One contributing factor to this culture negativity would be ample pre-culture antibiotics. Although there was no confirmed source for this case's infection, we assume it was from poor dental hygiene and social history.

Pyogenic liver abscesses (PLA) are the most common form of liver abscess in the United States and are most frequently caused by *E. coli* in adults. *Fusobacterium nucleatum* has rarely been reported as a cause of PLA, and to our knowledge, there is only one other reported case of *Fusobacterium* PLA associated with pericardial effusion (12).

Cardiac tamponade (CT) is defined as compression of the cardiac chambers due to an increase in intrapericardial pressure. This may be due to accumulation of fluid, pus, blood, clots, or gas within the pericardial space as a result of an effusion, trauma, or rupture of the myocardium (13). While the pericardium does have some degree of elasticity, a rapid accumulation of fluid will lead to a marked increase in intrapericardial pressure that may impede normal cardiac filling and result in cardiovascular collapse. Beck's triad of hypotension, elevated jugular venous pressure, and muffled heart sounds are the classic presentation of acute CT. However, these features are not always present, especially in subacute tamponade as in our patient. Additional clinical diagnostic factors include tachycardia and pulsus paradoxus. Prompt diagnosis and assessment of acute or subacute CT should be aided by TTE.

There are many echocardiographic signs of CT in addition to the presence of a pericardial effusion. The most sensitive findings include collapse of the right atrium (RA) or right ventricle (RV) and inferior vena cava plethora. Left atrial collapse is also highly specific, but only seen in approximately 25% of hemodynamically compromised patients (14). Additionally, there may be changes in right and left-sided inflow velocities with respiration. Tricuspid E wave velocity variation >60% and mitral E wave velocity variation of >25% by pulsed-wave doppler is highly suggestive of CT (14).

In regards to etiology, infection is a less common cause of tamponade. Multiple studies have demonstrated a rate of 15-24%, however these infections are predominately viral, with bacteria accounting for approximately 3.7% of total cases (15). Common bacteria to cause tamponade include *Staphylococcus*, *Streptococcus*, *Escherichia coli*, *Salmonella*, and *Neisseria meningitidis* (16). However, despite extensive literature review, we were unable to find a case of a *Fusobacterium* infection causing tamponade, nor any bacterial liver abscess invading into the pericardium causing tamponade physiology.

Furthermore, this may be the first documented case of a tubo-ovarian abscess (TOA) caused by *F. nucleatum*. While there are two case reports of TOA caused by *F. necrophorum* (14,15) there are no published cases of

TOA caused by this species of *Fusobacterium*.

In conclusion, maintaining a broad differential diagnosis during unique clinical presentations is prudent. *Fusobacterium nucleatum* is considered normal flora in the oral cavity, but when it rarely causes clinically symptomatic infection, its presentation varies widely. In this case, rapid identification of an exceedingly rare and possibly novel case of *Fusobacterium nucleatum* infection prevented grave hemodynamic collapse in the setting of sub-acute cardiac tamponade and yielded a favorable outcome.

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Learning Points:

- To appreciate that *Fusobacterium* spp. should be on the differential for any organ abscess in an immunocompromised patient, especially when there are multiple sites of infection, including but not limited to, the liver, brain, or lungs.
- To understand that for any case of *Fusobacterium* spp. infection, the most common source is oral/periodontal flora, especially in patients with poor dental hygiene.
- To understand that *Fusobacterium* spp. is difficult to grow in culture.
- To understand the etiologies, clinical presentation, and imaging findings associated with cardiac tamponade.
- To consider repeat imaging following completion of treatment regimen to ensure improvement or resolution of infection given the microbe's tendency to seed various organ systems.







