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A Rare Case of Aortic Valve Endocarditis and Acute Meningitis Due to *Haemophilus influenzae*

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Abstract

HACEK organisms represent a rare but important group of causative pathogens in endocarditis. These bacteria have historically been associated with culture-negative endocarditis; however, modern laboratory techniques have made this less common. In this case, we present a 74-year-old man who presented with acute onset altered mentation, fever, and sepsis. He was ultimately found to have *Haemophilus influenzae* meningitis, cerebral empyema, aortic valve endocarditis, psoas myositis, and L2 - L3 diskitis with osteomyelitis. Although HACEK organisms are commonly found in the oropharynx and upper respiratory tract in humans, our patient did not report recent preceding dental or ENT procedures. *H. influenzae* is responsible for approximately 0.16% of all cases of bacterial endocarditis, representing a very limited subset. Although generally considered low virulent pathogens, this case demonstrates the unusual extent of infection from a HACEK organism, *H. influenzae*, causing aortic valve endocarditis as well as atypical non-cardiac sequelae, including acute meningitis.

Keywords

HACEK, *Haemophilus influenzae*, Aortic Valve Endocarditis, Bacterial Meningitis, Cerebral Empyema

1. Introduction

Infective endocarditis (IE) is a condition due to infection of the inner lining of the heart, known as the endocardium. These infections most frequently affect the cardiac valves [1]. The disease is rare with an approximate annual incidence of 3 to 10 in 100,000 and a mortality rate of nearly 30% at 30 days [2]. Strepto-

cocci, staphylococci, and enterococci species are implicated in nearly 90% of all cases [1]. Another group of pathogens, known as the HACEK organisms, are implicated in approximately 1% - 3% of cases [3]. Members of the HACEK group, *Haemophilus* species, *Aggregatibactor* species, *Cardiobacterium hominis*, *Eikenella corodens*, and *Kingella* species, are considered low virulence organisms and contribute to the normal oropharyngeal and upper respiratory tract flora in humans. However, they are known causes of bacteremia, endocarditis, periodontal infections, otitis, and abscess development [4]. *Haemophilus* species comprise approximately 40% of all HACEK endocarditis. However, nearly all these cases are due to *H. parainfluenzae*; only 4% of all HACEK cases are due to *H. influenzae [5]*. IE presents another challenge to clinicians, especially when HACEK organisms are the culprit. Historically, these pathogens have been associated with blood culture-negative IE and may result in delayed diagnosis, although contemporary lab techniques have made this less common [6]. In this case, we present a 74-year-old man who presented with acute onset altered mentation. He was ultimately found to have bacterial meningitis and aortic valve endocarditis in the setting of *H. influenzae* bacteremia.

2. Case Report

A 74-year-old man with a history of atrial flutter and hypertension presented with acute onset altered mentation after waking from an afternoon nap. His family stated that he had been feeling poorly with upper respiratory tract symptoms for several days prior. He also complained of left-sided hearing loss and low back pain. The day before admission, he was seen in the emergency department and diagnosed with viral bronchitis. His vitals were significant for a temperature 101.0˚F, blood pressure of 175/105 mm Hg, pulse rate of 97 beats-per-minute. He was tachypneic with a respiratory rate of 40 respirations per minute and oxygen saturation was 93% on 10 L via high-flow mask. Initial labs revealed leukocytosis of 16,100 cells/mm^3 (reference: 4000 - 11,000 cells/mm^3), acute kidney injury, and lactate of 5.4 mmol/L (reference: <2 mmol/L). Respiratory pathogen testing was positive for *Parainfluenza virus 1*. Physical exam findings included agitation and inability to follow commands, bilateral conjunctivitis, mucopurulent discharge from the left eye, and dry mucous membranes. While he was not following commands, his neurological exam was non-focal and he was moving all extremities. There was no appreciable neck stiffness. He was intubated for airway protection and admitted to the intensive care unit.

A lumbar puncture the next morning demonstrated a significantly elevated opening pressure with yellow hazy cerebrospinal fluid (CSF), white blood cell count of 3,216 cells/mm^3 with 49% polymorphonuclear neutrophils. *H. influenzae* was detected on nucleic acid amplification testing of the CSF. Two of two blood cultures were also positive for *H. influenzae.* Subsequent brain magnetic resonance imaging (MRI) demonstrated multiple scattered intracranial abscesses with leptomeningeal enhancement (**Figure 1**). MRI of the lumbar spine revealed L2 - L3 diskitis with osteomyelitis and psoas myositis. Transthoracic

echocardiogram revealed a moderate sized vegetation of the aortic valve (Figure 2). Because the patient did not have significant clinical or echocardiographic evidence of aortic valve insufficiency, transesophageal echocardiography was not thought to change management and therefore was deferred given his clinical status.

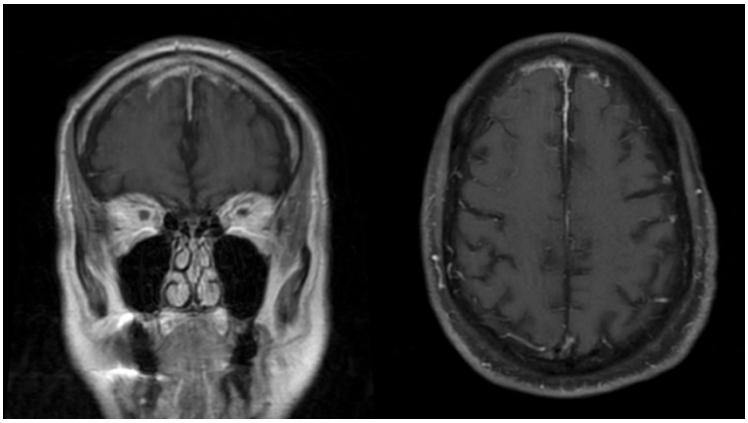

Figure 1. MRI brain with coronaland axial T1 demonstrating leptomeningeal enhancement from bacterial meningitis.

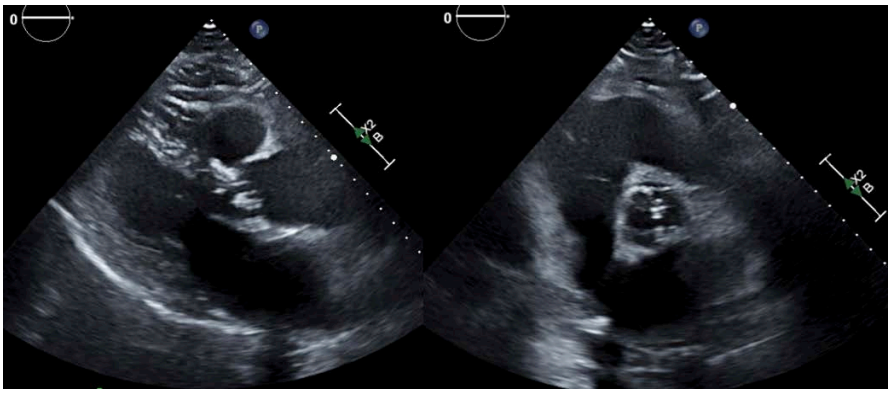

Figure 2. Transthoracic echocardiogram demonstrating vegetation of the aortic valve

The patient improved clinically and was extubated. At the time of discharge, he was ambulating, following commands, and eating without assistance. He remained on ceftriaxone therapy twice daily for six weeks. His progress post ICU discharge was hindered by the onset of visual hallucinations. He reported seeing small creatures initially, and eventually larger figures and people. He returned to the hospital with these complaints and underwent repeat MRI and lumbar puncture, which did not reveal any evidence of recurrent meningitis. Autoimmune and paraneoplastic encephalitis were felt to be unlikely given the isolated hallucinations. Epileptic hallucinations were also ruled out, as the hallucinations did not occur in a stereotyped manner. The patient had endorsed a decline in memory over the past year, raising the question of underlying Lewy body dementia. Because the hallucinations were purely visual and remained aware they were not real, there is consideration for Charles Bonnet Syndrome, a condition

that produces visual hallucinations due to vision loss. The patient is currently undergoing additional workup with neurology, ophthalmology, and infectious disease to elucidate the etiology of his hallucinations.

3. Discussion

H. influenzae is a facultatively anaerobic gram-negative coccobacillus and is a common cause of otitis media, sinusitis, and pneumonia [7]. IE due to *H. influenzae* is exceedingly rare and has primarily been limited to case reports and clinical vignettes [8] [9] [10]. A review study from 2001 reported only 13 cases of *H. influenzae* [11]. Because of their low virulence, HACEK organisms primarily infect patients with preexisting valvular disease or recent dental surgery, neither of which applied to our patient [12]. IE from HACEK organisms is thought to be due to local invasion of the vascular space from the oropharynx [4]. In our patient's case, this was also the likely mechanism for CSF infiltration. He did not have any recent preceding dental procedures. The brain abscesses were felt less likely due to septic embolization from the aortic valve, but rather an extension of the meningeal infection. Additionally, our patient did not have an elevated high sensitivity troponin I, which has been associated with favorable prognosis. Central nervous system involvement is associated with poorer outcomes irrespective of septic embolization [13]. Because of widespread vaccination against *H. influenzae* type B (HIB) for the past three decades, invasive infections almost exclusively occur in elderly patients. HACEK endocarditis is associated with younger patient age, risk of stroke, and favorable outcomes compared to other bacterial IE [12].

For our patient, the preceding *Parainfluenza virus 1* most likely led to a secondary bacterial infection with *H. influenzae*. What makes this case particularly noteworthy is the simultaneous occurrence of non-cardiac manifestations associated with H. Influenza, such as meningitis, lumbar diskitis with osteomyelitis, and psoas myositis. Furthermore, the rapid positivity of our patient's blood cultures within just 30 hours, as apposed to 3.4 days for HACEK organisms suggests and exceptional infectious burden. To our knowledge, this is the first described case of *H. influenzae* IE in combination with meningitis, lumbar diskitis with osteomyelitis, and psoas myositis. Such a multifaceted presentation underscores the singular nature of this case and emphasizes the importance of thorough investigations in conjunction with the involvement of multiple disciplines in the management of similarly complex clinical scenarios.

4. Conclusion

IE due to HACEK organisms, particularly *H. influenzae*, presents as unique challenge to providers due to delay in diagnosis and indolent onset. Our patient had aortic valve *H. influenzae* endocarditis, meningitis, lumbar diskitis with osteomyelitis, and psoas myositis, all likely from a primary oropharyngeal bacterial source superimposed on a preexisting viral infection. Although our patient's

blood cultures were positive after only 30 hours, this case is a reminder to consider HACEK organisms as potential etiology for patients with recurrent culture-negative IE when clinical suspicion is high.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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