Lyme Disease: A Rare Cause of Infective Endocarditis

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Central Message (200/200): We present a case of acute endocarditis secondary to *Borrelia burgdorferi* and define clinical characteristics that should trigger tissue PCR to diagnose this pathogen in culture-negative endocarditis.

**Introduction:**

Lyme disease is a tick-borne illness caused by *Borrelia* species commonly found throughout North America and certain regions of Europe and Asia. Infection by this spirochete manifests itself with various clinical presentations, including heart involvement, most commonly as atrioventricular conduction disturbances.¹ Serologic testing is used to diagnose the infection (Figure 1) and valvular involvement is exceedingly rare and was first reported in 1993.² Isolated valvular endocarditis associated with Lyme disease confirmed by polymerase chain reaction (PCR) testing is very rare.³⁻⁵ We present a new case of culture-negative Lyme endocarditis highlighting clinical characteristics that should trigger tissue PCR to diagnose this pathogen in cases of culture-negative endocarditis. Informed consent was obtained from patient for publication of this case report (Protocol #1709755537, Approved 9/23/23).

**Case Description:**

A 40-year-old male with a medical history of hypertension presented to the emergency department in complaining of a 5-day headache and intermittent left arm numbness. At time of evaluation, his neurodeficits had fully resolved and denied any other symptoms besides a headache. Physical exam was significant for an elevated blood pressure but otherwise unremarkable. CT brain and MRI revealed findings of acute subarachnoid hemorrhage. He was admitted to the neurology service for continued medical management of acute stroke. During his admission, a transthoracic echocardiogram (TTE) was obtained, revealing 3+ mitral regurgitation with a fixed density on the A2 and A3 segments of the anterior leaflet of the mitral valve, suggesting a possible vegetation. This prompted obtaining blood cultures and a transesophageal echocardiogram (TEE) that redemonstrated the previously seen density on the mitral valve in addition to perforation of the valve leaflet with 4+ mitral regurgitation (Video 1). He was also
found to have a calcified bicuspid aortic valve with 3+ aortic insufficiency and an ejection fraction of 55-60%.

Serologies for Coxiella and Bartonella were obtained due to exposure to cats, farm animals and squirrel hunting history. After multidisciplinary endocarditis team discussion, the patient was taken for surgical intervention 10 days after presentation and stable repeat brain imaging. Patient underwent a median sternotomy with cardioplegic arrest for aortic valve replacement and mitral valve repair. Standard left atriotomy was performed for mitral valve exposure revealing a large perforation at A2 and a cleft at the A3 segment. The perforation appeared more aneurysmal with excess thickened tissue protruding into the left atrium with a central perforation. The excess tissue allowed for primary closure of the defect after debridement with interrupted 5-0 prolene suture. The A3 cleft was infectious in etiology and was debrided and closed with respectful resection technique supported with a Gor-Tex neocord. The annulus was then sized to a 34 mm flexible band which was placed in standard fashion to support the repair. The result was a competent mitral valve (Video 2). The calcified bicuspid valve was then replaced via standard transverse aortotomy with a 27 mm On-X mechanical prosthetic valve with no evidence of infection on the aortic valve. The patient was weaned off cardiopulmonary bypass uneventfully. Tissue samples were sent off for culture and cytopathology.

Postoperative course was uneventful and on day 5, IV vancomycin and ceftriaxone were discontinued, and patient was discharged on 6 weeks of oral cefadroxil. At this time, four sets of blood cultures and tissue cultures obtained in the operating room were negative for growth. Coxiella and Bartonella serologies were also negative. One week after discharging from the hospital, 16s rRNA PCR and sequencing results from mitral valve tissue returned positive for Borrelia burgdorferi, so his antibiotic was transitioned to doxycycline. PCR was repeated and noted to be positive. The patient had been tested for Lyme disease in 2020 due to arthritis but was found to be negative. A Lyme immunoblot was obtained and was found to be reactive for three IgM (23, 39, 41) and ten IgG (18, 23, 28, 30, 39, 41, 45, 58, 66, 93) bands. Testing of the bicuspid aortic valve were consistent with congenital bicuspid
fibrocalcific aortic valve disease. At his postoperative follow-up clinic visit, the patient was found to be recovering well from surgery and continuing doxycycline therapy without any symptoms.

Comment:

Diagnosing Lyme endocarditis can prove to be a clinical challenge due to its rarity and lack of a nonspecific presentation. Cultures are ineffective in confirming *Borrelia* infection and serology testing does not distinguish whether a patient has a current or past infection. As a result, it is possible to miss the diagnosis of Lyme endocarditis, especially when presenting in states that do not have a high incidence of Lyme disease. PCR testing and sequencing is an important tool to assist in finding a causative organism, though it has a low sensitivity.

In our patient, multiple blood cultures and the tissue culture did were not successful in confirming the causative organism being *Borrelia burgdorferi*. There was initially a low suspicion for Lyme endocarditis due to the lack of previous erythema migrans or recollection of recent contact with ticks however, the patient was an outdoorsman and underwent Lyme testing in 2020 after a bout of arthritis. Importantly, convalescent serology was never rechecked 3 weeks after this initial presentation and consequently he went undiagnosed allowing for late complications to arise that may have been avoided with follow up titers.

As reported by Haddad and colleagues the appearance of the mitral valve defect was not characteristic for acute endocarditis and appeared more chronic and aneurysmal in nature. Ultimately, it was through PCR and molecular sequencing that the diagnosis was made, and the patient was able to be treated with the appropriate antimicrobials. Nevertheless, this was only possible after debridement of valvular tissue to be sent for analysis. In mid-2023 the Duke criteria were modified to include consideration for PCR data which is particular important in cases of culture negative endocarditis. Though exceptionally rare, it is imperative to be aware that *Borrelia* species are a documented cause of infective endocarditis. It is important to keep this rare causative organism in the
differential in cases of culture negative endocarditis when the valve pathology suggests an unusual pattern and it is critical to send tissue for PCR to confirm the diagnosis.

References:


Figure 1: Serologic Testing for Lyme Disease

Video 1: Preoperative Transesophageal Echo Demonstrating Aneurysmal Perforation of Anterior Leaflet

Video 2: Postoperative Transesophageal Echo Demonstrating Competent Mitral Repair