

## Lyme disease: A rare cause of infective endocarditis



Manuel Gomez-Tschrnko, MD, John A. Guilfoose, MD, Vinay Badhwar, MD, and J. Hunter Mehaffey, MD, MSc, Morgantown, WVa

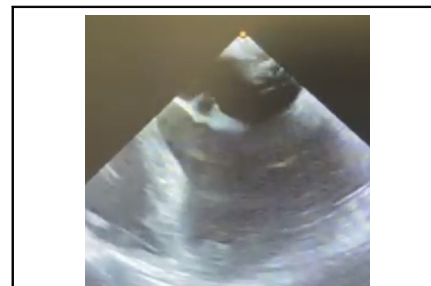
From the Department of Cardiovascular and Thoracic Surgery, West Virginia University, Morgantown, WVa. Received for publication Feb 17, 2024; revisions received March 26, 2024; accepted for publication March 27, 2024; available ahead of print April 12, 2024.

Address for reprints: J. Hunter Mehaffey, MD, MSc, Department of Cardiovascular and Thoracic Surgery, West Virginia University, 1 Medical Center Dr, Morgantown, WV 26501 (E-mail: [james.mehaffey@wvumedicine.org](mailto:james.mehaffey@wvumedicine.org)).

JTCVS Techniques 2024;25:78-80  
2666-2507

Copyright © 2024 The Author(s). Published by Elsevier Inc. on behalf of The American Association for Thoracic Surgery. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

<https://doi.org/10.1016/j.jtc.2024.03.023>



Transesophageal imaging of aneurysmal leaflet perforation.

### CENTRAL MESSAGE

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.

▶ Video clip is available online.

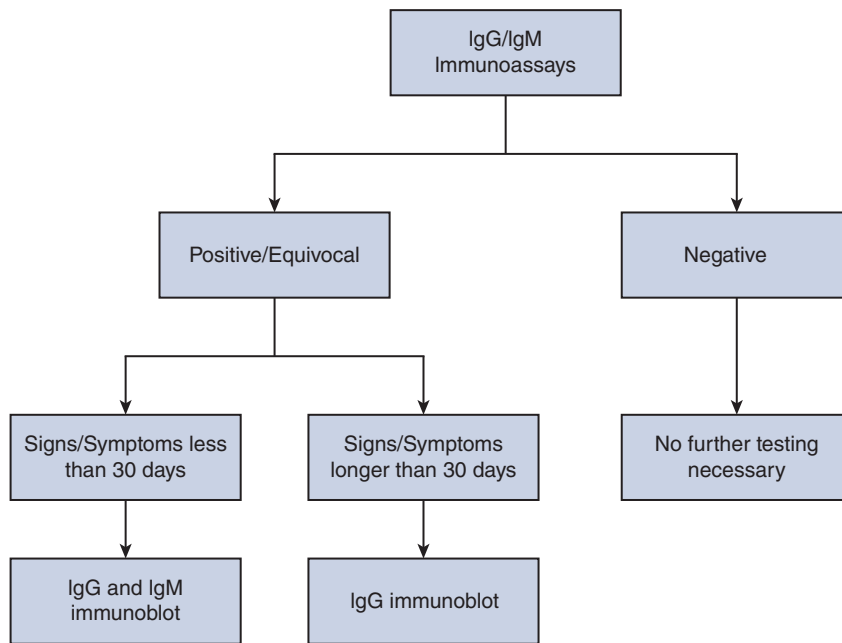
Lyme disease is a tick-borne illness caused by *Borrelia* species commonly found throughout North America and certain regions of Europe and Asia. Infection by this spirochete manifests itself with various clinical presentations, including heart involvement, most commonly as atrioventricular conduction disturbances.<sup>1</sup> Serologic testing is used to diagnose the infection (Figure 1), and valvular involvement is exceedingly rare and was first reported in 1993.<sup>2</sup> Isolated valvular endocarditis associated with Lyme disease confirmed by polymerase chain reaction (PCR) testing is very rare.<sup>3-5</sup> 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 September 23, 2023).

### CASE DESCRIPTION

A 40-year-old man 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 neurologic deficits had fully resolved, and he denied any other symptoms besides a headache. Findings of the physical examination were significant for an elevated blood pressure but were otherwise unremarkable. Computed tomography and magnetic resonance imaging of the brain 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 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, the findings of which redemonstrated the previously seen density on the mitral valve in addition to perforation of the valve leaflet with 4+ mitral regurgitation (Video 1). The patient was also found to have a calcified bicuspid aortic valve with 3+ aortic insufficiency and an ejection fraction of 55% to 60%.

Serologies for *Coxiella* and *Bartonella* were obtained because of the patient's exposure to cats and farm animals and his squirrel-hunting history. After discussion by the multidisciplinary endocarditis team, the patient was taken for surgical intervention 10 days after presentation and stable repeat brain imaging. The patient underwent a median sternotomy with cardioplegic arrest for aortic valve replacement and mitral valve repair. A standard left atriotomy was performed for mitral valve exposure, which revealed a large perforation at A2 and a cleft at the A3 segment. The perforation appeared more



**FIGURE 1.** Serologic testing for Lyme disease. *IgG*, Immunoglobulin G; *IgM*, immunoglobulin M.

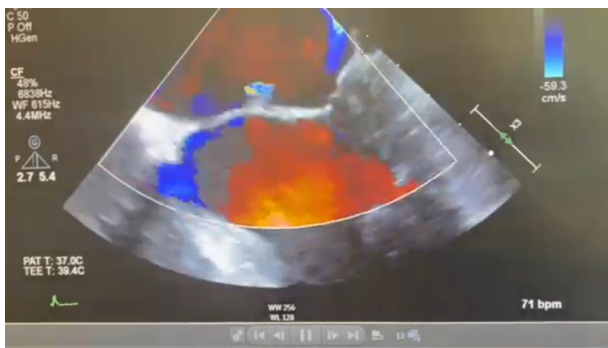
aneurysmal with excess thickened tissue protruding into the left atrium with a central perforation. The excess tissue allowed for primary closure of the defect after debridement with an interrupted 5-0 PROLENE suture (Ethicon). The A3 cleft was infectious in etiology and was debrided and closed with respectful resection technique supported with a Gore-Tex neochord (W. L. Gore & Associates, Inc).<sup>6</sup> 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 (Artivion) 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.

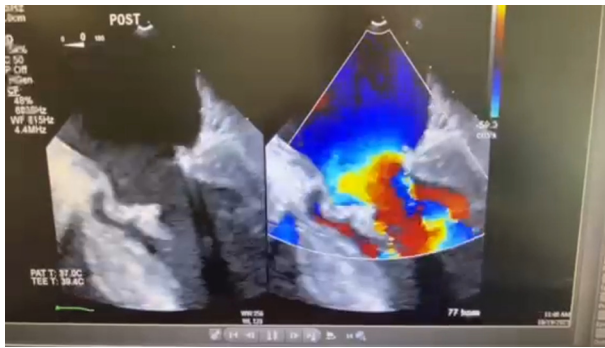
The patient’s postoperative course was uneventful and on day 5, intravenous vancomycin and ceftriaxone were discontinued and the patient was discharged on 6 weeks of oral cefadroxil. At this time, 4 sets of blood cultures and tissue cultures obtained in the operating room were negative for growth. *Coxiella* and *Bartonella* serologies were also negative. One week after the patient’s discharge 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 because of arthritis but was found to be negative. A Lyme immunoblot was obtained and was found to be reactive for 3 immunoglobulin M (23, 39, 41) and 10 immunoglobulin G (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 because of 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.<sup>4</sup> As a result, it is possible to miss the diagnosis of Lyme



**VIDEO 1.** Preoperative transesophageal echo demonstrating aneurysmal perforation of anterior leaflet. Video available at: [https://www.jtcvs.org/article/S2666-2507\(24\)00157-3/fulltext](https://www.jtcvs.org/article/S2666-2507(24)00157-3/fulltext).



**VIDEO 2.** Postoperative transesophageal echo demonstrating competent mitral repair. Video available at: [https://www.jtcvs.org/article/S2666-2507\(24\)00157-3/fulltext](https://www.jtcvs.org/article/S2666-2507(24)00157-3/fulltext).

endocarditis, especially when it presents in areas of the United 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, although it has a low sensitivity.

In our patient, multiple blood cultures and tissue culture were not successful in confirming the causative organism *B burgdorferi*. There was initially a low suspicion for Lyme endocarditis because of 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,<sup>3</sup> 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 particularly important in cases of culture negative endocarditis.<sup>7</sup> Although 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 diagnosis 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.

### Conflict of Interest Statement

The authors reported no conflicts of interest.

The *Journal* policy requires editors and reviewers to disclose conflicts of interest and to decline handling or reviewing manuscripts for which they may have a conflict of interest. The editors and reviewers of this article have no conflicts of interest.

### References

1. Steere AC, Batsford WP, Weinberg M, et al. Lyme carditis: cardiac abnormalities of Lyme disease. *Ann Intern Med.* 1980;93(1):8-16.
2. Anish SA. Case report: possible Lyme endocarditis. *N Engl J Med.* 1993;90(8):599-601.
3. Haddad O, Gillinov M, Fraser T, Shrestha N, Pettersson GB. Mitral valve endocarditis: a rare manifestation of Lyme disease. *Ann Thorac Surg.* 2019;108(2):e85-e86.
4. Paim AC, Baddour LM, Pritt BS, Schuetz AN, Wilson JW. Lyme endocarditis. *Am J Med.* 2018;131(9):1126-1129.
5. Rudenko N, Golovchenko M, Mokracek A, et al. Detection of *Borrelia bissettii* in cardiac valve tissue of a patient with endocarditis and aortic valve stenosis in the Czech Republic. *J Clin Microbiol.* 2008;46(10):3540-3543.
6. Roberts HG, Rankin JS, Wei LM, Cook CC, Salman M, Badhwar V. Respectful resection to enhance the armamentarium of mitral valve repair: is less really more? *J Thorac Cardiovasc Surg.* 2018;156(5):1854-1855.
7. Fowler VG, Durack DT, Selton-Suty C, et al. The 2023 Duke-International Society for Cardiovascular Infectious Diseases criteria for infective endocarditis: updating the modified Duke criteria. *Clin Infect Dis.* 2023;77(4):518-526.