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Maryam Barkhordarian
Hackensack Meridian Health-Palisades Medical Center, NJ, USA, marybarkhordar@gmail.com

Mark Grijalva
Hackensack Meridian Health-Palisades Medical Center, NJ, USA

Avani Kolla
Hackensack Meridian Health-Palisades Medical Center, NJ, USA

Aaron Stein
Hackensack Meridian Health-Palisades Medical Center, NJ, USA

Dmitry Nemirovsky
Hackensack Meridian Health, NJ, USA

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CASE REPORT

Harbinger of Lyme Carditis: From Atrioventricular Block to Atrial Fibrillation

Maryam Barkhordarian [a,*], Mark Grijalva [a], Avani Kolla [a], Aaron Stein [a], Dmitry Nemirovsky [b]

[a] Hackensack Meridian Health-Palisades Medical Center, NJ, USA
[b] Hackensack Meridian Health, NJ, USA

Abstract

Introduction: **Lyme disease is a tick-borne illness that is most commonly caused by *Borrelia burgdorferi* and transmitted by the Ixodes tick. Common manifestations are fevers, headache, arthralgia, erythema migrans, and, if left untreated, can progress to neuropathy and carditis. Lyme carditis most commonly presents with high degree atrioventricular block, however, may present with other arrhythmias.**

Case presentation: **We present a case of a 70 year old male with past medical history of hypertension and polycythemia vera who presented to the hospital with lightheadedness and bradycardia following 2 weeks of fever. His electrocardiogram showed atrial fibrillation with regularized conduction at 40 bpm suggesting complete heat block and a junctional escape rhythm. Lyme antibody screen index and lyme IgM and IgG were positive. His echocardiogram showed a normal ejection fraction with moderate pulmonary hypertension. He was started on antibiotics and anticoagulation. Later, given the unresolved atrial fibrillation, the patient underwent cardioversion to sinus rhythm.**

Discussion: **Lyme carditis is a rare but potentially fatal complication of Lyme disease. It may rarely present with atrial fibrillation. In the appropriate clinical context, testing for Lyme disease may be indicated in the setting of atrial fibrillation and evidence of AV block. Further investigation is necessary to determine if patients who develop atrial fibrillation in the setting of Lyme carditis can stop their anticoagulation once the carditis has resolved and sinus rhythm is maintained.**

Conclusion: **Awareness of atypical cardiac presentations of Lyme carditis, such as atrial fibrillation, may help minimize misdiagnosis and facilitate early treatment.**

Keywords: Lyme carditis, *Borrelia burgdorferi*, Atrioventricular block, Atrial fibrillation

1. Introduction

Lyme disease is a tick-borne illness that is reported in up to 35,000 people a year in the United States.[1] The disease is most commonly caused by the spirochete bacteria, *Borrelia burgdorferi*, which is transmitted by the Ixodes tick. Early localized, or stage I, disease commonly manifests as fevers, chills, fatigue, headache, arthralgias, myalgias and Erythema migrans. If disease progresses to the early disseminated phase, or stage II, symptoms may include arthritis, neuropathy, and carditis.[1-5] The late stage is characterized by central nervous system involvement and/or Lyme arthritis.[4]

Carditis occurs in approximately 1−5% of all reported cases of Lyme disease.[1,3,6] Cardiac disease may be the initial and sole symptom of Lyme disease, with symptoms typically manifesting one to two months after exposure.[5] As a result, patients with Lyme carditis may often be misdiagnosed or experience delays in diagnosis and treatment. Ninety percent of Lyme carditis cases manifest as atrioventricular (AV) block, with a majority being high degree.[1,3] Less commonly, Lyme carditis may present with other arrhythmias.[3,5] Awareness of these atypical cardiac presentations may help minimize misdiagnosis and facilitate early treatment. Herein, we report a rare case of Lyme carditis

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* Corresponding author.
E-mail address: Marybarkhordar@gmail.com (M. Barkhordarian), Mark.grijalva@hmhn.org (M. Grijalva), Avanikolla95@gmail.com (A. Kolla), Aaron.stein@hmhn.org (A. Stein), Dmitry.nemirovsky@hmhn.org (D. Nemirovsky).

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presenting with atrial fibrillation and evidence of AV block.

2. Case presentation

A 70 year old male with a past medical history of controlled hypertension and polycythemia vera presented with two weeks of fever to the emergency department during the summer. The patient reported a maximum temperature of 103 °F with associated headache and back pain. He remembered having an insect bite about two months prior to presentation but denied any skin manifestations, including rash or local cellulitis. He denied a prior history of heart disease or arrhythmia. He presented to emergency department a few days before this visit, the patient was found to have patchy infrahilar opacity concerning for pneumonia, for which he was treated with Ceftriaxone and Azithromycin. He was discharged the following day with Cefpodoxime and Azithromycin. A few days later, the patient presented to the emergency department with lightheadedness. His ECG showed atrial fibrillation with complete heart block and a junctional escape rhythm at 40 bpm (Fig. 1). Telemetry showed a heart rate of 40 beats per minute (BMP) during the day and 30 BPM during the night. Cardiology was consulted and Lyme antibody was ordered.

The patient's respiratory pathogen panel from previous admission was negative. However, the Lyme antibody screen index was 9.33 (Positive >1.09). Lyme antibody blot IgM (Lyme 23 KD, 39 KD, 41 KD IgM) and IgG (Lyme 28 KD, 39 KD, 41 KD IgG) were also positive. There were no electrolyte or thyroid abnormalities. Erythrocyte sedimentation rate was 19. Echocardiogram on admission showed an ejection fraction of 60%, mild to moderate pulmonary hypertension and right ventricular systolic pressure of 50 mmHg with no structural heart disease, normal atrial sizes, no left ventricular hypertrophy, no valvular abnormalities and no wall motion abnormalities. The patient was previously on Metoprolol, which was discontinued due to the bradycardia. Additionally, he was started on Apixaban 5 mg every 12 h and Ceftriaxone 2 g IV every 24 h for 3 weeks. During outpatient follow-up with cardiology his heart block had resolved, however his atrial fibrillation persisted. Three months after initial presentation, he underwent cardioversion to normal sinus rhythm with a 200 J synchronous biphasic shock. He has since maintained sinus rhythm.

3. Discussion

Lyme carditis is a rare but potentially fatal complication of Lyme disease, and represents the main cause of mortality in these patients.[3] Lyme disease is described in three stages; localized, disseminated, and persistent. Localized infection is the initial inoculum after the bite from the *Ixodes* tick, which can present with the erythema chronicum migrans rash approximately five to seven days after the bite. This rash, however, is only described in approximately 40% of patients with Lyme.[6] Disseminated disease includes the development of Lyme carditis with electrical abnormalities. These arrhythmias typically present a few days to months after erythema chronicum migrans, with a median time of onset of 21 days.[7] Although heart block is most common, atrial fibrillation is another electrical abnormality that has been associated with Lyme carditis.[7]

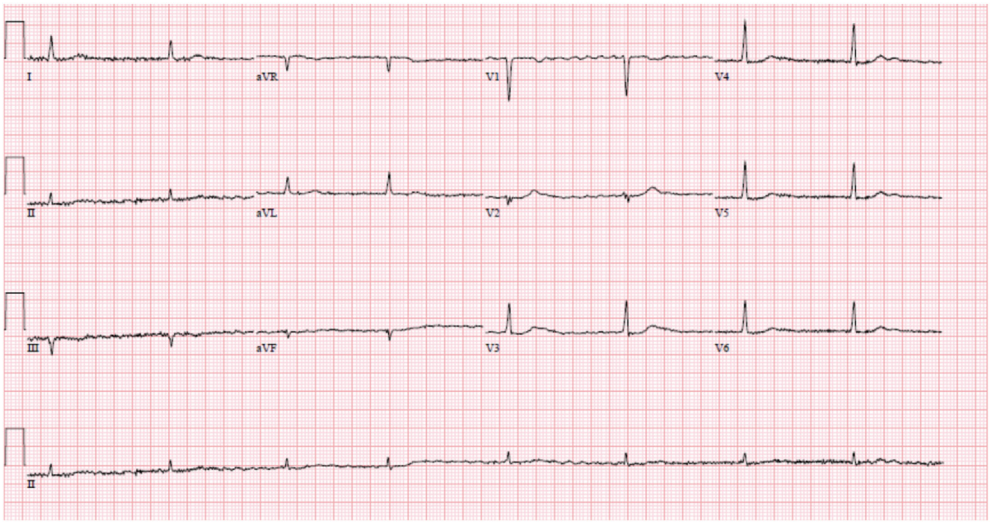

Fig. 1. Atrial fibrillation with complete heart block and a junctional escape rhythm (rate 55 BPM).

The pathophysiology of Lyme carditis is thought to involve direct myocardial invasion by the spirochete as a result of *Borrelia's* tropism for cardiac tissue.[3,5,8] Specifically, the spirochete invades the connective tissue of the heart base, interventricular septum, perivascular regions. Though less common, the spirochete may also infiltrate blood vessels, valves, pericardium, and/or endocardium.[5] This infiltration induces a significant inflammatory cascade that results in subsequent cardiac tissue injury. Additionally, there may be a component of autoimmune injury secondary to cross-reactive antibodies formed during the initial bacterial exposure. Depending on the area of involvement, this injury can lead to arrhythmias, myopericarditis, or pancarditis.[5,8]

Symptoms of Lyme carditis include lightheadedness, syncope, dyspnea, palpitations, or chest pain, though some patients may be asymptomatic.[2,5] While Lyme carditis most commonly presents with second or third degree AV block on EKG, there are also reports of its association with bundle branch block, supraventricular tachycardia, ventricular fibrillation/tachycardia, ST depressions or T wave inversions, and atrial fibrillation.[2,3,5,9-11] Its association with atrial fibrillation has been described in only a handful of case reports.[3,9-11] Three patients' initial ECG showed atrial fibrillation with heart rates ranging from 60 to 107 BPM, which then reverted to sinus rhythm with first or second degree AV block.[3,9,11] The fourth patient had an initial ECG showing atrial fibrillation with complete AV block, widened QRS with escape rhythm of 45 BPM and a bundle branch block.[10] Lyme carditis most commonly presents in the summer months as AV block, but can rarely present as atrial fibrillation, as described in this report.[2,3,5,6,9-11] Clinicians should consider including Lyme carditis in the differential diagnosis for new onset atrial fibrillation. This reversible manifestation in an endemic area should spark clinicians to consider *Borellia* as a potential cause for new onset cardiac electrical abnormalities.

Addressing underlying and reversible conditions causing atrial fibrillation should be investigated. In the context of a viral prodrome, it may be reasonable to include Lyme disease in this work-up. When Lyme disease is suspected, obtaining isolates can be challenging. With most infectious diseases, the gold standard for diagnosis remains isolating the pathogen.[6] However, since *Borellia* can not be cultured, diagnosis is based on clinical suspicion and supplemented with indirect serologic testing. The standard of care remains the two-step serologic testing method.[6] Initially, a high sensitivity Enzyme-linked immunosorbent assay (ELISA) is the primary screening test. If this yields a positive or borderline IgG or IgM, a confirmatory Western blot assay will confirm the diagnosis. There have been documented cases of PCR amplified *Borellia* DNA, as well as evidence of Spirochetes visualized on Warthin-Starry stain, in endocarditis.[12] However, this is not always the case and cannot be relied upon for diagnosis for endocarditis or induced heart block.

Lyme carditis can progress causing further electrical abnormalities, and can be fatal if left untreated.[13] For severe Lyme carditis in patients who are symptomatic, or in 2nd or 3rd degree block with PR > 300 ms, the preferred treatment regimen is Ceftriaxone 2g IV once a day for 14–21 days.[14] The treatment of non-valvular atrial fibrillation involves deciding between rate or rhythm control and risk stratification for anticoagulation based on the CHA2DS2-VASc scoring system.[15] Further investigation is necessary to clarify the need for longer term anticoagulation in patients with resolved Lyme carditis and atrial fibrillation.

4. Conclusion

The paucity of Lyme confirmed Atrial fibrillation illustrates the rarity of this potentially underappreciated and reversible cause. In patients with significant clinical suspicion, as in our patient as evidence on epidemiology, history and physical exam, it is not unreasonable to investigate for Lyme induced carditis.

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Conflicts of interest

There is no conflict of interest.

References

1. CDC. Lyme Disease. Centers for Disease Control and Prevention. (https://www.cdc.gov/lyme/stats/humancases.html).
2. Rostoff P, Gajos G, Konduracka E, Gackowski A, Nessler J, Piwowarska W. Lyme carditis: epidemiology, pathophysiology, and clinical features in endemic areas. *Int J Cardiol*. 2010;144(2):328–333. https://doi.org/10.1016/j.ijcard.2009.03.034.
3. Zainal A, Hanafi A, Nadkarni N, Mubasher M, Lingutla D, Hoefen R. Lyme carditis presenting as atrial fibrillation. *BMJ Case Rep*. 2019;12(4):e228975. https://doi.org/10.1136/bcr-2018-228975. Published 2019 Apr 29.
4. Bobe JR, Jutras BL, Horn EJ, et al. Recent progress in lyme disease and remaining challenges. *Front Med*. 2021;8:666554. https://doi.org/10.3389/fmed.2021.666554. Published 2021 Aug 18.
5. Yeung C, Baranchuk A. Diagnosis and treatment of lyme carditis: JACC review topic of the week [published correction

appears in J Am coll cardiol. 2019 nov 26;74(21):2709-2711]. *J Am Coll Cardiol*. 2019;73(6):717−726. https://doi.org/10.1016/j.jacc.2018.11.035.
6. Rivera OJ, Nookala V. Lyme carditis. In: *StatPearls. Treasure island (FL)*. StatPearls Publishing; March 2, 2023.
7. Steere AC, Dhar A, Hernandez J, et al. Systemic symptoms without erythema migrans as the presenting picture of early Lyme disease. *Am J Med*. 2003;114(1):58−62. https://doi.org/10.1016/s0002-9343(02)01440-7.
8. Radesich C, Del Mestre E, Medo K, et al. Lyme carditis: from pathophysiology to clinical management. *Pathogens*. 2022;11(5):582. https://doi.org/10.3390/pathogens11050582. Published 2022 May 15.
9. Shabbir MA, Saad Shaukat MH, Arshad MH, Sacco J. Lyme carditis presenting as atrial fibrillation in a healthy young male. *BMJ Case Rep*. 2019;12(6):e229261. https://doi.org/10.1136/bcr-2019-229261. Published 2019 Jun 4.
10. Wenger N, Pellaton C, Bruchez P, Schläpfer J. Atrial fibrillation, complete atrioventricular block and escape rhythm with bundle-branch block morphologies: an exceptional presentation of Lyme carditis. *Int J Cardiol*. 2012;160(1):e12−e14. https://doi.org/10.1016/j.ijcard.2012.01.004.
11. Kennel PJ, Parasram M, Lu D, et al. A case of lyme carditis presenting with atrial fibrillation. *Case Rep Cardiol*. 2018;2018:5265298. https://doi.org/10.1155/2018/5265298. Published 2018 Sep. 2.
12. Muehlenbachs A, Bollweg BC, Schulz TJ, et al. Cardiac tropism of *Borrelia burgdorferi*: an autopsy study of sudden cardiac death associated with lyme carditis. *Am J Pathol*. 2016;186(5):1195−1205. https://doi.org/10.1016/j.ajpath.2015.12.027.
13. Marx GE, Leikauskas J, Lindstrom K, et al. Fatal lyme carditis in new england: two case reports. *Ann Intern Med*. 2020;172(3):222−224. https://doi.org/10.7326/L19-0483.
14. Sanchez E, Vannier E, Wormser GP, Hu LT. Diagnosis, treatment, and prevention of lyme disease, human granulocytic anaplasmosis, and babesiosis: a review. *JAMA*. 2016;315(16):1767−1777. https://doi.org/10.1001/jama.2016.2884.
15. Saksena S, Slee A, Waldo AL, et al. Cardiovascular outcomes in the AFFIRM Trial (Atrial Fibrillation Follow-Up Investigation of Rhythm Management). An assessment of individual antiarrhythmic drug therapies compared with rate control with propensity score-matched analyses. *J Am Coll Cardiol*. 2011;58(19):1975−1985. https://doi.org/10.1016/j.jacc.2011.07.036.