Lyme Carditis: A Case Report and Review of Management

Hospital Pharmacy
2018, Vol. 53(4) 263–265
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DOI: 10.1177/0018578717749927
journals.sagepub.com/home/hpx

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Abstract

Purpose: A case report of a patient who presented with an acute onset, fluctuating atrioventricular (AV) block and was diagnosed with Lyme carditis is presented. **Summary:** A 55-year-old man with progressively worsening generalized malaise, flu-like symptoms, dyspnea on exertion, and near syncope was admitted with bradycardia (heart rate was between 20 and 30 beats per minute upon admission). He endorsed having several tick bites after which he developed erythema migrans on his arm and abdomen. An electrocardiogram (ECG) revealed a second-degree AV block, fluctuating between Mobitz type I and Mobitz type II heart block, with a P-R interval of 300 ms. A presumptive diagnosis of Lyme carditis was made based on a confirmed history of tick exposure, presence of erythema migrans, and AV block. The patient was started on ceftriaxone. On day 3 of hospitalization, patient's heart rate was between 50 and 60 beats per minute. A diagnosis of Lyme disease was confirmed based on serologic testing. A repeat ECG revealed a first-degree AV block with a P-R interval of 300 ms. On day 5 of hospitalization, a peripherally inserted central catheter line was placed and the patient was discharged to his home on a 28-day course of ceftriaxone. Patient's heart rate was 65 beats per minute on discharge day. **Conclusion:** Considering Lyme carditis as a differential diagnosis in patients with an AV block of an unknown etiology can result in a timely diagnosis and treatment of Lyme carditis.

Keywords

cardiovascular, critical care, infectious diseases, cardiac agents

Lyme disease is the most common vector-borne disease in the United States, with approximately 300 000 cases reported each year.¹ Lyme disease is caused by spirochete *Borrelia burgdorferi*, which is transmitted in the United States primarily by *Ixodes scapularis*, the deer tick.² Lyme disease can evolve into a multisystem disease, and its clinical presentation can vary widely depending on the stage of the illness. Lyme disease can be divided into 3 stages—(1) early localized stage (days to weeks after the tick bite, presenting with erythema migrans and nonspecific flu-like symptoms), (2) early disseminated stage (weeks to months after the tick bite, presenting with cardiac and/or neurologic manifestations), and (3) late stage (months to years after the initial infection, presenting with arthritis and/or neurological symptoms).³ Carditis is an uncommon presentation of Lyme disease and occurs during the early disseminated stage of Lyme disease.

This report details the case of a patient who presented with an acute onset, fluctuating atrioventricular (AV) block and was diagnosed with Lyme carditis.

Case Report

A 55-year-old, 89.3-kg, Caucasian male, who was transferred from an outside hospital, presented with bradycardia

(heart rate was between 20 and 30 beats per minute upon admission) in August 2016. He was admitted to the outside hospital a day prior to being transferred with a 3-week history of progressively worsening generalized malaise, flu-like symptoms, and dyspnea on exertion. He also reported experiencing dyspnea on exertion and near syncope for the past week and a half. He denied experiencing any chest pain, heart palpitations, or cold intolerance. His medical history included myocardial infarction, coronary artery disease, status post stent placement in 2011, hypertension, Crohn's disease, and gastroesophageal reflux disease. His home medications included aspirin 81 mg once daily, carvedilol 6.25 mg twice daily, folic acid 1 mg daily, isosorbide mononitrate extended-release 60 mg once daily, lisinopril 2.5 mg once daily, mercaptopurine 100 mg twice daily, mesalamine 800 mg twice daily, ranolazine extended-release 1000 mg twice daily, and simvastatin 40 mg once daily. He had no

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known drug allergies. He denied tobacco, alcohol, or illicit drug use. Notably, he worked as a taxidermist at a farm. Upon initial examination, he noted having several tick bites a few weeks ago while working at his job, after which he developed erythema migrans on his right arm and abdomen. He denied any recent travel history.

Physical examination revealed a heart rate of 40 beats per minute, blood pressure of 134/74 mmHg, respiratory rate of 20 breaths per minute, and temperature of 98.6 degree Fahrenheit. The review of systems was remarkable for an erythematous macular rash with central clearing on the anterior aspect of right arm. Laboratory tests, including troponin I (reference <0.04 ng/mL), were unremarkable. An initial electrocardiogram (ECG) revealed a second-degree AV block, fluctuating between Mobitz type I and Mobitz type II heart block, with a P-R interval of 300 ms. The patient was transferred to cardiovascular intensive care unit (CVICU) for closer monitoring. Enzyme-linked immunosorbent assay (ELISA) and Western immunoblot tests were performed and sent to the laboratory for analysis. A presumptive diagnosis of Lyme carditis was established based on the confirmed history of tick exposure, presence of erythema migrans, and AV block. The patient was started on ceftriaxone 2 g every 24 hours. In addition, heparin 5000 units/mL subcutaneous injection every 12 hours was initiated for venous thromboembolism prevention. All of the patient's home medications, except carvedilol and lisinopril, were restarted. Carvedilol, a nonselective β -blocker and α_1 blocker, was held to prevent the patient's heart rate from dropping further and worsening his bradycardia. Cardiac Electrophysiology Service was consulted and agreed with the primary team's plan for conservative management and did not see a need for a pacemaker placement.

On day 3 of hospitalization, patient's heart rate was found to be between 50 and 60 beats per minute. The diagnosis of Lyme disease was confirmed based on the presence of *Borrelia* antibodies demonstrated by ELISA and Western immunoblot findings (positive for IgG and IgM anti-*Borrelia* antibodies). A transthoracic echocardiogram revealed an ejection fraction of 60% to 65%, normal right ventricular systolic function, and no significant valve disease. A repeat ECG revealed a first-degree AV block with a P-R interval of 300 ms. When compared with the initial ECG, the patient was no longer in second-degree AV block. As the patient's second-degree heart block had resolved, he was transferred from the CVICU to the general medicine floor, where he continued to receive ceftriaxone 2 g every 24 hours.

On day 5 of hospitalization, there was a marked improvement in the patient's clinical status; though, he continued to experience weakness and fatigue. After the placement of a peripherally inserted central catheter line, the patient was discharged to his home on a 28-day course of ceftriaxone 2 g every 24 hours. On the day of discharge, the patient's vitals were as follows: heart rate of 65 beats per minute, blood pressure of 138/74 mmHg, respiratory rate of 20 breaths per minute, and temperature of 98 degree Fahrenheit. The patient

did not develop any neurologic symptoms of Lyme disease over the course of his hospital stay. Upon discharge, all of patient's home medications, including carvedilol and lisinopril, were restarted. In addition, the patient was instructed to follow-up with his primary care physician and cardiologist on an outpatient basis.

Discussion

Lyme carditis is an uncommon manifestation of Lyme disease, occurring in approximately 4% to 8% of patients with untreated Lyme disease.³ Lyme carditis results from direct invasion of cardiac tissues by spirochetes, and can involve all layers of the heart.^{4,5} Patients with Lyme carditis most commonly present with some degree of AV conduction blockade, which can fluctuate rapidly and progress from a first-degree block to a His-Purkinje block within a few minutes.⁶ A review of 105-patient case reports of patients with Lyme carditis revealed that 49% of patients experienced third-degree AV block, 16% of patients experienced second-degree AV block, and 12% of patients experienced first-degree AV block.⁷ The highest risk of progression to complete AV block was noted to be in patients with a P-R interval of ≥ 300 ms.⁷ Even though the most common manifestation of Lyme carditis is AV block, patients can also present with endocarditis, myocarditis, pancarditis, pericarditis, and QTc interval prolongation.⁴ Notably, 3 cases of sudden cardiac death due to Lyme carditis have been reported to date.⁸ While patients with Lyme carditis can be completely asymptomatic, patients with a high-degree AV block usually present with symptoms such as chest pain, palpitations, shortness of breath, light-headedness, and/or syncope or near-syncope.³ The degree of severity of some of these symptoms typically increases as the degree of heart block progresses.

Diagnosis

There are no standardized diagnostic criteria for Lyme carditis. Diagnosis of Lyme carditis is established primarily by clinical and epidemiological findings. Serologic testing, through detection of antibodies to *Borrelia burgdorferi*, is used to support the clinical diagnosis.⁶ When performing serologic testing, a 2-tiered approach is recommended in which a positive or equivocal ELISA is followed by a confirmatory Western immunoblot test.⁸ However, as the majority of patients with established late stage Lyme disease infection are seropositive, seropositivity alone is not sufficient to confirm a diagnosis of Lyme carditis.⁶ It is imperative that serological testing be interpreted in the light of clinical presentation and possible exposure to establish a diagnosis.⁶

Management

Patients who are experiencing (1) syncope, dyspnea, or chest pain; (2) a second- or third-degree AV block; or (3) a

first-degree AV block and have a P-R interval of ≥ 300 ms should be hospitalized.⁹ Continuous monitoring is recommended for all hospitalized patients.

Antibiotic therapy. Lyme carditis can be self-limited; however, antibiotics are required to shorten the disease course, minimize cardiovascular complications, and prevent other sequelae of Lyme disease.³ With appropriate treatment, resolution generally occurs within 3 to 4 weeks, but may take considerably longer when diagnosis and treatment are delayed.³ Recommended classes of antibiotics include those that have demonstrated the greatest effectiveness against *Borrelia* spirochete, with β -lactams, particularly cephalosporins, and tetracyclines as preferred agents.³ Treatment guidelines established by the Infectious Diseases Society of America recommend that patients with Lyme carditis be treated with either oral or parenteral antibiotic therapy for a duration of 14 days.⁹ The preferred parenteral agent for Lyme carditis is ceftriaxone, and the preferred oral agents include amoxicillin, doxycycline, and cefuroxime axetil.⁹ Even though no evidence exists to suggest that parenteral antibiotic therapy is more efficacious than oral antibiotic therapy, a parenteral antibiotic is recommended for initial treatment of hospitalized patients.⁹ The parenteral antibiotic should be continued until the high-degree AV block has resolved and the P-R interval has decreased to <300 ms, after which the patient should be transitioned to an oral antibiotic for completion of therapy.⁹

Device therapy. A temporary pacemaker may be required in patients with advanced heart block during the duration of the block, and the pacemaker may be discontinued when the advanced heart block has resolved.⁹ Implantation of a permanent pacemaker is rare. An evaluation of 105 case reports of patients with Lyme carditis revealed that 35% of patients required a temporary pacemaker, and only 5.7% of patients required a permanent pacemaker of which only 1 patient remained pacer dependent.⁷ In a systematic review of 45 patients with Lyme carditis, only 2 patients required a permanent pacemaker.⁶

The patient in this case report was treated with ceftriaxone, as he required hospitalization due to the severity of his symptoms. He received ceftriaxone for a total duration of 33 days, which includes 5 days of therapy during hospitalization and 28 days of therapy on an outpatient basis, even though the guidelines recommend only 14 days of therapy. Arguably, he could have been transitioned to oral therapy upon discharge as his second-degree AV block had reverted to first-degree AV block 2 days prior to discharge. It is unclear why the patient received a longer than recommended duration of antibiotic therapy and why he was not transitioned to oral therapy upon discharge. This highlights the importance of health care practitioners being aware of and adhering to the guideline recommendations, and presents an opportunity for pharmacists to ensure that the discharge pharmacologic therapy is in accordance with guideline recommendations.

This case report illustrates an acute onset, rapidly fluctuating AV block in a patient with Lyme carditis. As the AV block in Lyme carditis can progress rapidly from a first-degree to a complete block within minutes, especially when the P-R interval is ≥ 300 ms, it is vital that hospitalized patients with a presumptive diagnosis of Lyme carditis are admitted to the telemetry unit for close monitoring. In addition, Lyme carditis should be considered as a differential diagnosis in patients with an AV block of an unknown etiology. Appropriate antibiotic therapy should be initiated soon after establishing a diagnosis of Lyme carditis to minimize cardiovascular complications and prevent other sequelae of Lyme disease.

Conclusion

This case report highlights the importance of considering Lyme carditis as an etiology of acute onset, fluctuating AV block. An accurate and timely diagnosis of Lyme carditis can result in appropriate treatment which can prevent potentially severe cardiac arrhythmias; unnecessary interventions, such as pacemaker insertion; and later complications of Lyme disease.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

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