Lyme myocarditis with third-degree heart block successfully treated with an early transition from IV ceftriaxone to oral doxycycline-case report

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ABSTRACT

Background: Lyme disease is a common parasitic disease that can cause varied and potentially serious manifestations. The recommendations for treating some manifestations of Lyme are based on low-quality evidence, including for myocarditis. Treatment guidelines vary and are based on very low-quality evidence. IV ceftriaxone is typically recommended until the heart block resolves.

Case Presentation: We report a case of a 31-year-old male admitted to our inpatient service with syncope and bradycardia. He was diagnosed with a third-degree heart block from Lyme disease. He was started on IV ceftriaxone, and his heart block improved. He had an ongoing second-degree atrioventricular block when he requested to be discharged on oral antibiotics rather than continuing IV ceftriaxone. Our patient received four doses of ceftriaxone before discharging from the hospital. He completed 2 weeks of oral doxycycline after discharge. In a follow-up phone call, he reported complete resolution of symptoms.

Conclusion: This case supports the current Infectious Disease Society of America guideline of using intravenous ceftriaxone followed by oral doxycycline after the patient has improved. It also suggests that it may be safe to shorten the period of intravenous antibiotics and hospitalization. Shortening this period would reduce expenses and be more convenient for patients. More research is needed on the duration and preferred agent for treating the complications of Lyme.

Keywords: Lyme, heart block, myocarditis, case report, doxycycline.

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Background

Lyme disease is the most common vector-borne illness in North America and is common in Europe as well. It is caused by Gram-negative spirochetes from the *Borrelia* genus, primarily *Borrelia burgdorferi sensu lato* in North America. It is transmitted by *Ixodes scapulars,* commonly known as the "deer tick." Lyme disease has numerous and varied clinical manifestations, including rash, arthritis, meningitis, neuritis, and myocarditis [1]. It can cause multiple clinical syndromes when it infects the heart, including but not limited to myocarditis, pericarditis, and new arrhythmias. Lyme carditis is considered an uncommon complication of Lyme disease, with recent studies reporting an incidence of 1.5% to 10% in the United States and 0.3% to 4% in Europe [2]. Other manifestations of Lyme do not appear to have a predisposition in male or female patients, but cardiac involvement is more common in males. Electrical abnormalities are varied, but atrioventricular block (AV) blocks are the most common presentation of Lyme carditis. Reports vary, but approximately half of the patients experience at least a transient third-degree block, which can develop suddenly and have the potential to be fatal if left untreated [3,4]. Other conduction abnormalities include sinus bradycardia, intra-atrial block, atrial fibrillation, sinus node disease, supraventricular tachycardia, ventricular tachycardia, ventricular fibrillation, and asystole [2,3]. Patients may present with shortness of breath, edema, palpitations, syncope, elevated biomarkers, and chest pain [5].

Case presentation

A 31-year-old male presented to his local emergency department with palpitations of 4 days duration and an episode of witnessed syncope at home. He has no previous medical history. His only other exposure to healthcare was a walk-in clinic visit 2 weeks prior where he was diagnosed with Lyme. No labs or diagnostics were done at that visit; the diagnosis was based on a known tick bite and a large erythema migrans rash. He had been prescribed 2 weeks of doxycycline but had not started taking it.

On admission, he had a normal physical exam apart from a heart rate of 31 with a third-degree heart block and fading erythema migrans rash on his thigh. His initial

rhythm is shown in Figure 1. On review of systems, he endorsed diaphoresis, fatigue, decreased activity tolerance, abdominal pain, nausea, presyncope, and the rash on his leg.

He was started on ceftriaxone 2 g every 24 hours for suspected Lyme carditis and IV dobutamine for his heart rate. Cardiology and infectious disease were consulted. Serology confirmed Lyme infection. Other tick-borne co-infections common to the area, such as anaplasmosis, ehrlichiosis, and babesiosis were ruled out by serology. Over the following 2 days, he demonstrated intermittent third-degree heart block with second-degree AV block, both types 1 and 2. He never required pacing and was weaned off the dobutamine. On day four of hospitalization, he needed to be discharged based on responsibilities he had at home, and at this time had a consistent second-degree AV block type 1 with intermittent type 2. His heart rate was consistently in the 60'seconds. Our cardiology team felt he was safe to go home. Given the ongoing heart block, our ID consultant recommended ongoing IV ceftriaxone due to ongoing heart block. Our patient declined to have a peripherally inserted central catheter (PICC) placed. Our patient preferred to take the doxycycline at home. He had 100 mg doxycycline tablets at home to take twice daily for 14 days which he had not started taking. His rhythm strip at discharge is shown in Figure 2 with ongoing wenkeback, his second-degree type 2 block is not shown here but was intermittently seen on his telemetry monitor.

Our patient chose not to attend his follow-up appointment with cardiology or with a primary care provider. We were able to reach him by phone 57 days after admission. He declined further testing or follow-up, but he completed his 14-day doxycycline course. He was willing to share that he was asymptomatic and feeling back to normal.

Discussion and Conclusion

Given its varied electrical manifestations, diagnosing Lyme carditis can be a challenge. Providers working in endemic areas, especially during the summer months, must have a high index of suspicion in patients presenting with new-onset AV block. A scoring system called the Suspicious Index in Lyme Carditis (SILC) can be used to aid in the diagnosis by estimating the probability that a new-onset high-grade AV block is due to Lyme carditis. For patients with new-onset, high-degree AV block and a SILC score >2, Lyme serology and empiric antibiotic therapy should be started. Those with a high-degree AV block and a SILC score <2 should receive standard treatment for AV block only [2].

Lyme carditis has a good prognosis, and typically electrical manifestations can be completely reversible with prompt antibiotic therapy. The AV block typically resolves sequentially from third-degree to second, to first, and then to normal conduction within 1-2 weeks of treatment. Current recommendations advise against the implantation of a permanent pacemaker, but temporary transvenous pacing may be indicated [2-4]. Severe Lyme carditis has been defined as either first-degree AV block with a PR interval ≥300 milliseconds, second-degree AV block, or third-degree AV block [3,6].

Firstline treatment for severe Lyme carditis is ceftriaxone 2 g IV daily. Recommendations for the total duration and the decision of if and when to switch to oral antibiotics are weak and based on low-quality data [2-7]. Current Centers for disease control and Infectious disease society of America (IDSA) guidelines agree on initial IV ceftriaxone, then switching to oral therapy such as doxycycline after symptoms and high-grade AV block resolve for a total duration of 14-21 days of treatment [5,6]. The rationale stands that prolonged IV therapy poses a greater risk of toxicity than oral, and oral has not been found to be any

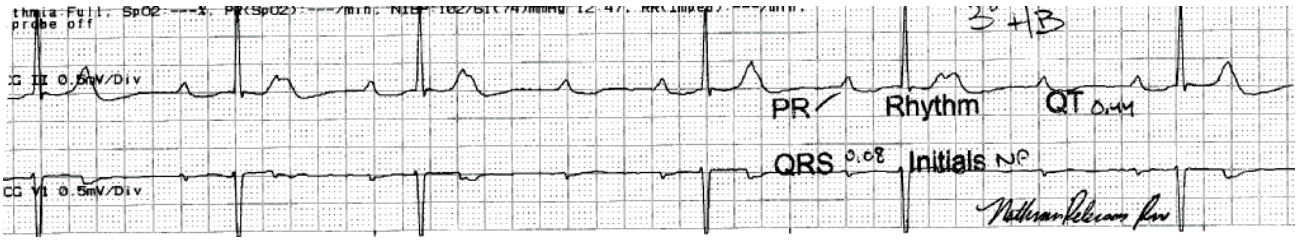

Figure 1. *Telemetry rhythm strip on admission.*

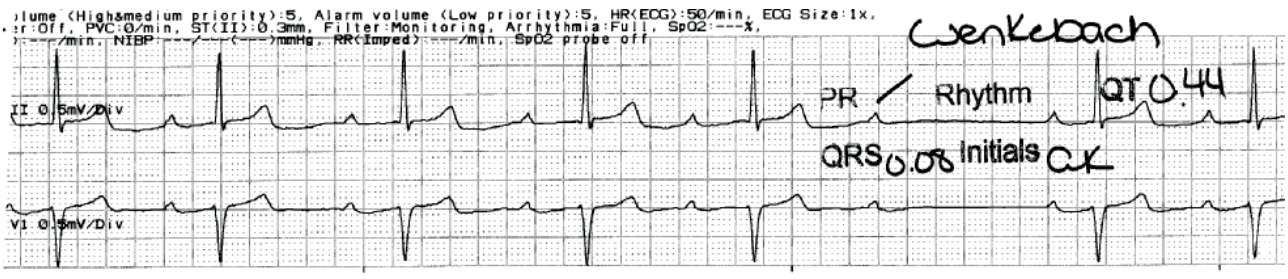

Figure 2. *Telemetry strip prior to discharge.*

less effective than IV treatment [5]. There are published case reports where oral doxycycline was used successfully as the initial agent to treat Lyme carditis [8,9].

Our case is limited by the lack of good follow-up. Our patient was not willing to do any follow-up visits or diagnostics. Despite that limitation, his case is important and adds to the medical literature. The oral doxycycline helped our patient meet all of his patient-centered goals. He got out of the hospital sooner without a PICC line and he was able to get back to work and to his family sooner. We were not able to document disease-oriented outcomes such as the resolution of the heart block. The other cases we mention which had follow-up data indicate that doxycycline can be effective in treating Lyme carditis with heart block.

Our case demonstrates the plausibility of an early switch to oral antibiotics in Lyme carditis. Although we are unable to obtain Electrocardiogram (EKG) documentation of his heart block being completely resolved, he is feeling back to normal 2 months after the start of his symptoms. The current IDSA and European guidelines recommend changing to oral as soon as the heart block has resolved and avoiding outpatient IV antibiotics. These recommendations are based on low-quality evidence and no randomized trials have been done to support them. Our case supports the current recommendations and may indicate that an earlier switch to doxycycline may be possible.

What is new?

Lyme disease can cause conduction abnormalities in the heart. This can be effectively treated with intravenous antibiotics. The authors case suggest that transition to oral antibiotics can be made before the heart block is resolved.

List of Abbreviations

AV block	Atrioventricular block
CDC	Centers for disease control
IDSA	Infectious disease society of America
PICC	Peripherally inserted central catheter

Conflict of interest

The authors declare that there is no conflict of interest regarding the publication of this article.

Funding

None.

Consent for publication

Written and informed consent was taken from patient to publish this case report.

Ethical approval

Our hospital institutional review board (IRB) has given approval for the writing of de-identified case reports so long as the patient has provided written consent.

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Summary of the case

1	**Patient details**	A 31 year old male with no prior medical care. Works as a farmer. No diagnosed comorbid conditions during his illness
2	**Symptoms**	Syncope and presyncope, Erythema Migrans rash
3	**Final diagnosis**	Lyme myocarditis
4	**Medication**	Doxycycline
5	**Clinical procedures**	None
6	**Clinical specialty**	Hospital Medicine