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Case Report

Early-onset Lyme carditis with concurrent disseminated erythema migrans

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Abstract: Background: Lyme disease is an infection that is estimated to affect over 300,000 people in the United States annually. Typically, it presents with erythema migrans (EM), an annular rash at the site of tick attachment, within 3 to 30 days of inoculation. Untreated patients may progress to early disseminated disease. A further complication, Lyme carditis is rare but may occur several weeks later. It commonly manifests as a variable atrioventricular (AV) conduction block, with a high-grade AV block occurring in only 1% of untreated patients. This case demonstrates an unusually early presentation of Lyme carditis with complete heart block. Case presentation: A 21-year-old male was transferred from an outside emergency department (ED) for possible pacemaker placement due to symptomatic third-degree AV block. Four days earlier the patient presented to the outside ED with fever, chills, and unrecognized EM on his right neck. He was discharged with antipyretics, but no antibiotic therapy. On the day of transfer, he returned with persistent fevers, EM now on his trunk and upper extremities, lightheadedness, and substernal chest pressure. An electrocardiogram revealed the third-degree AV block leading to transfer. Upon arrival, the patient was promptly diagnosed with Lyme carditis. Pacemaker implantation was deferred, and intravenous (IV) ceftriaxone was initiated. Within 48 hours his third-degree AV block improved to a first-degree block. By this time, his EM had also resolved. He was discharged with oral doxycycline and a 30-day event monitor, which ultimately showed persistent first-degree AV block. Conclusions: This case reinforces a unique presentation of Lyme carditis. Disseminated EM and Lyme carditis may present concurrently within 2 weeks of tick attachment. Early recognition and treatment is important for preventing progression to disseminated infection. Lyme-associated AV block will reverse within 48 to 72 hours of initiating IV antibiotic therapy and will not require pacemaker implantation. Lyme carditis should be considered in patients without heart disease who present with any degree of AV block.

Keywords: Lyme disease, carditis, erythema migrans, AV block, bradycardia

Introduction

Lyme disease, caused by the spirochete *Borrelia burgodorferi* and transmitted by the *Ixodes* tick, is the most common vector-borne infection in the United States and Europe [1]. Although 30,000 cases are reported in the United States annually, actual incidence is estimated to approximate 330,000 cases per year [2-4]. The pathogenesis occurs in stages, with erythema migrans (EM), a localized target lesion at the site of tick attachment developing within days (**Figure 1A**) [1]. If patients remain untreated, dissemination of the infection follows [5]. Sequelae of this spread may include Lyme carditis and atrioventricular (AV) block. Our case demonstrates the rare combination of third-degree AV block and disseminated EM in a 21-year-old male presenting at an abnormally early stage [6].

Case presentation

A 21-year-old male with no cardiac disease history was admitted with symptomatic third-degree AV block, disseminated EM, and a 2-week history of fever and chills. The patient had been evaluated at an outside emergency department (ED) four days earlier; however, the EM on his right neck was not recognized. After receiving acetaminophen, the patient was discharged home without antibiotics. He returned with persistent fevers, lightheadedness, and substernal chest pressure. An EKG showed a

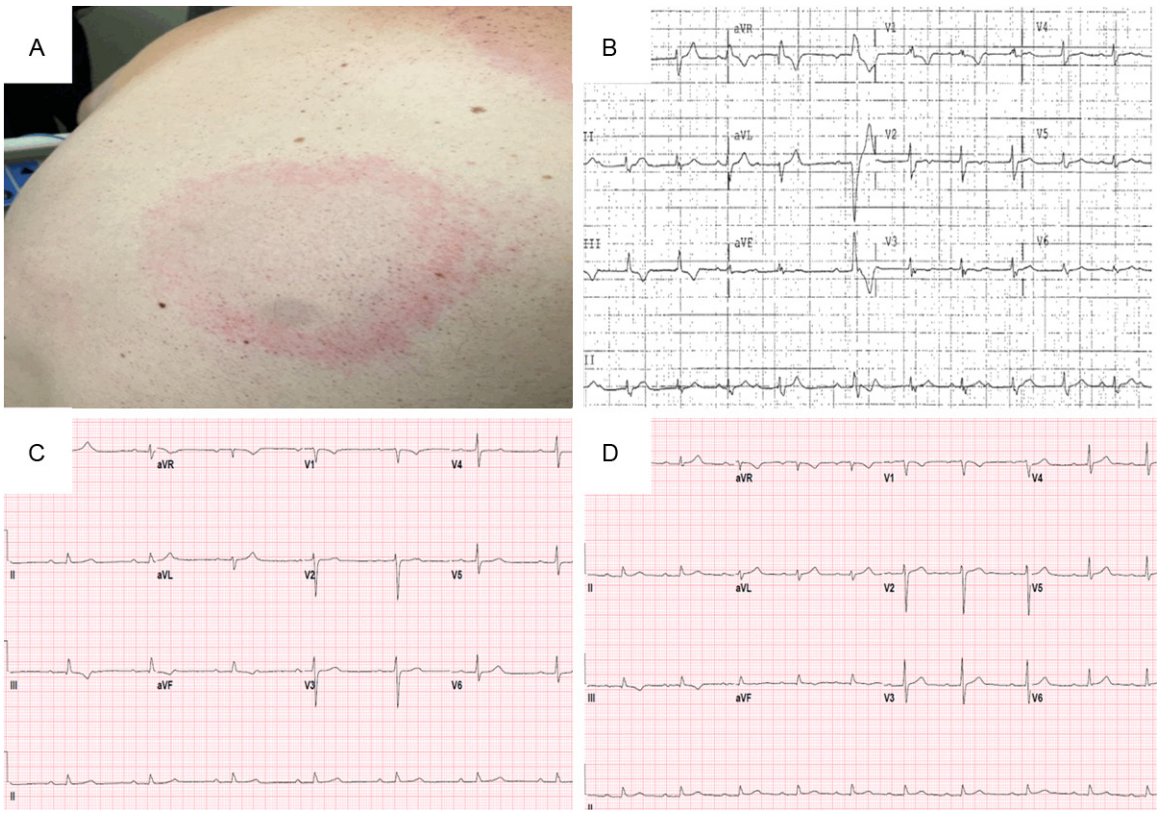

Figure 1. Erythema migrans (EM) target lesion with multiple surrounding erythematous annular lesions seen on the patient indicative of disseminated EM (A). EKG from the outside facility demonstrating third degree AV block (B). Monitoring EKGs showing first degree AV block following 48 hours of IV ceftriaxone therapy and then resolution of the bradycardia (C, D).

third-degree AV block prompting a transfer to our facility for cardiac monitoring and possible pacemaker implantation (**Figure 1B**). On arrival, the patient was febrile with multiple EM involving his trunk and upper extremities. A follow-up EKG showed bradycardia in addition to the third-degree AV block. A transthoracic echocardiogram demonstrated normal left ventricular ejection fraction without evidence of a dilated cardiomyopathy. Early disseminated Lyme disease with carditis was suspected, and, on further questioning, the patient reported spending time working in a heavily wooded area only a few days prior to symptom onset. In agreement with the electrophysiology and infectious diseases consultants, pacemaker placement was deferred, and IV ceftriaxone was initiated. Within 48 hours of antibiotic therapy, the patient's third-degree AV block evolved into a second-degree block and quickly into a first-degree block with resolution of bradycardia (**Figure 1C**, **1D**). The disseminated EM completely resolved. Serum Lyme serology and Western blot confirmed the diagnosis of Lyme disease. After six days of IV ceftriaxone and improvement to first-degree AV block, the patient was discharged with a 3-week course of oral doxycycline and a 30-day event monitor. Upon outpatient follow-up, the 30-day event monitor revealed the persistence of first-degree AV block.

Discussion

Although Lyme carditis typically occurs several weeks after the initial tick bite, this case shows that cardiac involvement may occur within the first two weeks of infection. Disseminated EM with Lyme associated third-degree AV block is a very unusual presentation of early infection in an immunocompetent host. Even with nonspecific presenting symptoms, Lyme disease should be evaluated with a thorough history and physical exam including exposures and assessment for rashes. This is especially true in endemic areas of the United States including

the coastal Northeast, the Great Lakes region, and northern California [7]. Lyme disease is classified in stages starting with the localized EM rash, which develops within 3 to 30 days in 70% to 80% of patients [1]. Treatment of early localized disease prevents progression to a disseminated infection, characterized by fever, chills, achiness, regional lymphadenopathy, and fatigue. Disseminated EM occurs in 20% of untreated patients within 2 to 3 weeks due to hematogenous spread [5]. Lyme carditis, usually presenting as some variable atrioventricular (AV) block, occurs several weeks after the initial tick bite in 5% of untreated patients [7]. Among published case reports, Lyme carditis mostly affects young males with high-grade blocks occurring in only 1% of these cases [8]. Other cardiac complications that have been reported include endocarditis and degenerative valve disease, myocarditis, pericarditis, coronary aneurysm, dilated cardiomyopathy, and congestive heart failure. Furthermore, sudden cardiac death from unrecognized Lyme disease has been reported in which spirochetes were found in myocardial tissue during autopsy [9, 10]. Patients with cardiac symptoms or high-grade AV block require hospitalization for cardiac monitoring and IV antibiotic therapy, preferably IV ceftriaxone. Advanced arrhythmias typically improve within 48 to 72 hours of appropriate IV antibiotic therapy, avoiding permanent pacemaker placement [11].

Conclusion

Lyme carditis should be considered in patients without coronary artery disease or structural heart abnormalities who present with any degree of AV block, particularly in young males with a compatible history. Early recognition and treatment of Lyme disease is important for preventing progression to disseminated infection and further complications.

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Disclosure of conflict of interest

None.

Authors' contribution

KPP: conception, writing, and final approval; PDF: editing, critical revision, and final approval; AHA: conception; JJJ: writing, interpretation, and critical revision; JDM: final approval and overall responsibility.

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