

Unveiling Lyme Carditis: Third-Degree Heart Block as the Initial Presentation

Abstract

Background: Lyme disease is a tick-borne bacterial disease caused by spirochetes within the Borreliaceae family. Lyme carditis is a manifestation of the early disseminated stage of Lyme disease and typically arises one to two months after the initial infection.

Case presentation: We present the case of a previously healthy 31-year-old man admitted to the emergency department with a third-degree atrioventricular block. Lyme carditis was diagnosed based on positive serology and Western immunoblot assay results, despite the absence of the characteristic erythema chronicum migrans skin lesion. Following initiation of appropriate antibiotic treatment with doxycycline, there was a complete reversal of the atrioventricular block.

Conclusion: Lyme carditis, a manifestation of the early disseminated stage of Lyme disease, should be considered in patients presenting with conduction abnormalities. Prompt antibiotic therapy offers a favorable prognosis, allowing for the avoidance of unnecessary permanent pacemaker implantation.

Keywords

Lyme carditis • Lyme disease • atrioventricular block • temporary pacemaker • Borrelia

Introduction

A 31-year-old man presented to his primary care physician with complaints of epigastric pain, diarrhea, and orthostatism. Over the past three days, he had also experienced presyncope during exercise. Clinical examination revealed a slow heart rate and a 12-lead electrocardiogram (ECG) indicated a third-degree atrioventricular (AV) block and ventricular escape

Case Report

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rhythm with a rate of 26 beats/min (Figure 1). The rapid response team was summoned bedside and the patient was transferred to the emergency department for further evaluation.

Upon admission, the patient, with no current medication use, reported a personal history of psoriasis and a family history of sudden cardiac death his father succumbed at the age of 50 while engaged in sports activities (etiology was unknown, but not related to Lyme disease). The patient had not consulted a cardiologist previously. He denied recent insect bites, fever, arthralgia, or myalgia and had not traveled outside Europe recently. Initial laboratory results and transthoracic echocardiography showed no abnormalities. Borrelia serology (IgG and IgM) returned positive the next day, later confirmed by a Western immunoblot assay. Lyme carditis was diagnosed,

and treatment with doxycycline was initiated. Continuous intravenous isoprenaline was administered, and the patient was admitted to the Coronary Care Unit.

During hospitalization, the patient's cardiac rhythm progressively recovered to a regular sinus rhythm with normal AV conduction after two days (Figure 2). No temporary pacing was required. After a 10-day hospital stay, the patient was discharged, and doxycycline treatment continued for 28 days. At a follow-up two months later, Holter monitoring revealed no major arrhythmias. Additionally, since the family history of sudden cardiac death, genetic screening for familial idiopathic cardiomyopathy was performed and yielded negative results.

Discussion

Lyme disease, caused by spirochetes within the Borreliaceae family, is primarily transmitted by ticks of the Ixodes family. In Europe, *Borrelia afzelii* and *Borrelia garinii* are prevalent, while *Borrelia burgdorferi sensu stricto* is the primary causative agent in North America [1,2]. The *Ixodes Ricinus* subgroup is the primary vector in Europe, with humans acting as incidental hosts [3,4]. The incidence of Lyme disease has surged over the last decades, a population-weighted average incidence rate in

Western Europe has been estimated to be 22.04/100 000 person-years [5]. Lyme carditis is a rare manifestation of Lyme disease and occurs in approximately one out of a hundred cases [6].

Lyme disease manifests in three stages: early localized disease marked by erythema chronicum migrans (ECM), early disseminated disease characterized by additional ECM lesions, neurologic manifestations, and/or carditis, and late Lyme disease presenting as arthritis, rare neurological manifestations, and acrodermatitis chronica atrophicans [7,8]. Notably, patients may exhibit symptoms of the second or third stage without presenting with ECM initially [7,8]. Only 40% of Lyme carditis patients report a preceding ECM [4].

Lyme carditis typically arises one to two months after the initial infection and is associated with early disseminated Lyme disease [4]. A direct infiltration of the myocardium by the spirochetes and subsequent inflammatory reaction is presumed to be important in the pathophysiology [9]. Histological findings in animal models indicate transmural inflammation with infiltration of lymphocytes and macrophages in heart tissue, primarily at the base of the heart, interventricular septum, and perivascular areas [4, 10].

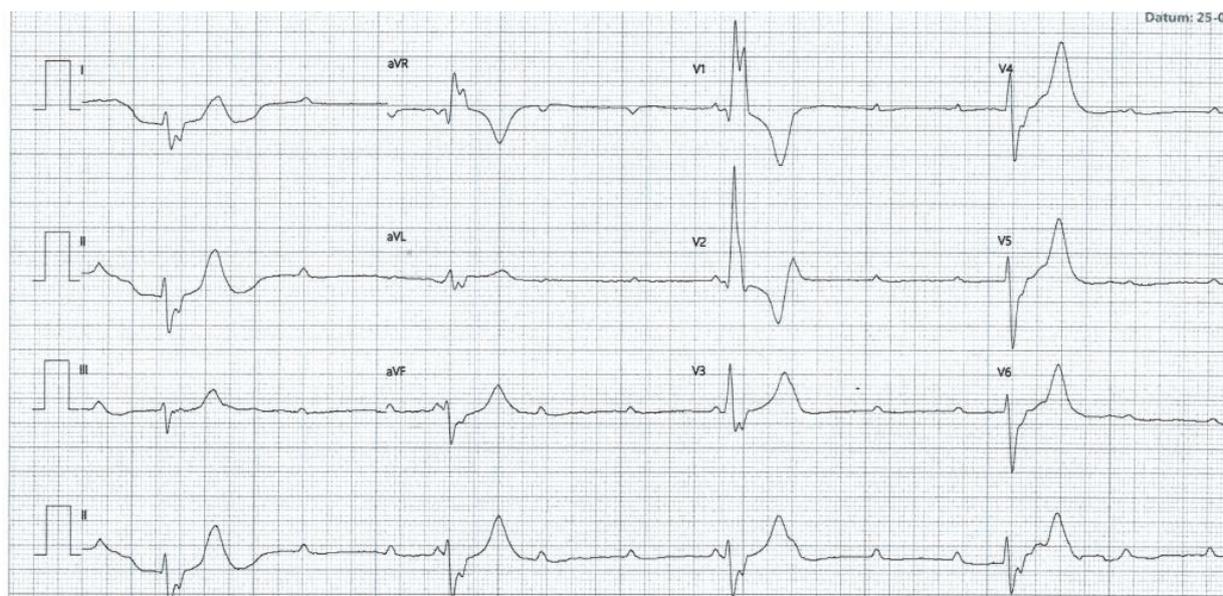


Figure 1. ECG on admission showed a third-degree AV block and ventricular escape rhythm with a rate of 26 beats/min.

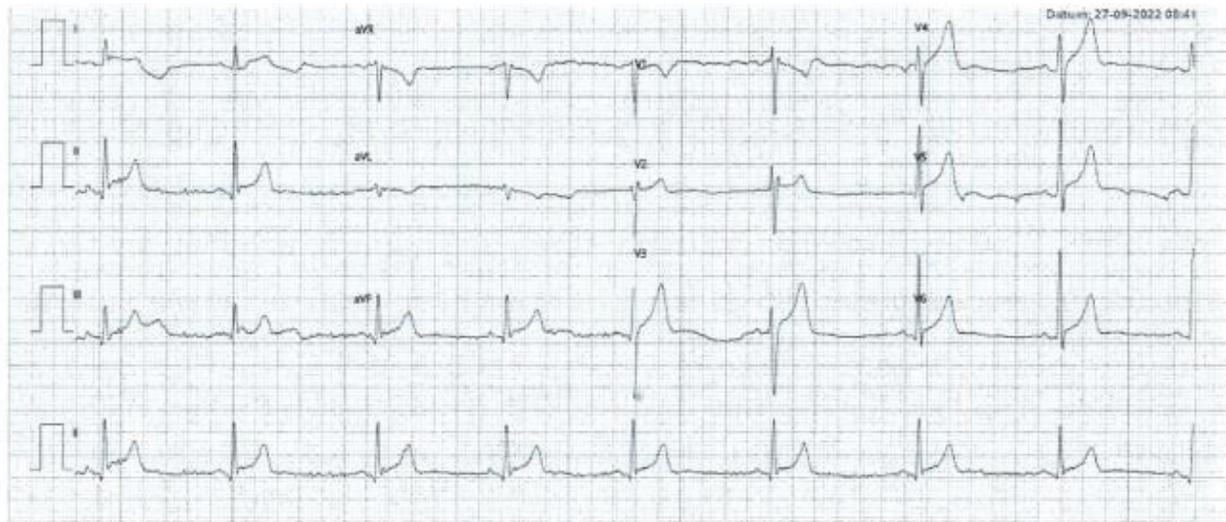


Figure 2. ECG on day 2 showed a complete reversal of the AV block with a sinus bradycardia of 49 beats/min and a normal PR interval of 134 ms.

Cardiac manifestations of Lyme disease range from conduction abnormalities to myopericarditis and chronic cardiomyopathy. The most common manifestation is an AV block (90%), of which two-thirds of the cases present as an high-degree AV block [11]. The degree of AV block can progress over minutes to days and is often transient, resolving with antibiotic treatment, although temporary pacing may be required [7,11].

Early diagnosis relies on clinical evaluation, history, potential exposure, and the presence of ECM. IgM and IgG antibodies become detectable within two to six weeks following ECM onset. A two-step testing strategy is recommended for the serologic diagnosis of Lyme disease. A positive enzyme immunoassay or indirect fluorescent antibody test should be followed by Western Blot to confirm the diagnosis, especially in suspected Lyme carditis cases with symptoms like syncope, palpitations, lightheadedness, chest pain, or dyspnea [12]. Standardized criteria state that a positive Western blot requires 2 of 3 particular bands for a positive IgM immunoblot within 30 days of symptom onset and 5 of 10 particular bands for positive IgG blots [4,13]. Recently, the use of a second enzyme immunoassay as an alternative for Western Blot has been approved to confirm the serologic diagnosis [14]. Furthermore, ECG and echocardiography may aid in assessing cardiac involvement [11,15].

Lyme carditis necessitates antibiotic treatment to shorten disease duration and prevent complications. Hospitalisation is recommended for patients with specific conduction abnormalities (first-degree AV block with a PR interval greater than 300 msec, a second- or third-degree AV block or other arrhythmias) or clinical manifestations of perimyocarditis. Experts advise initial intravenous antibiotic therapy with ceftriaxone (2 g once daily) until there is clinical improvement with subsequent transition to oral antibiotics (doxycycline, amoxicillin, cefuroxime, and azithromycin) for a total antibiotic course of 14 to 21 days [2,12]. The prognosis is favorable, with a low likelihood of permanent pacemaker implantation due to the frequent complete recuperation of the AV block [11].

Conclusion

In summary, Lyme carditis, a manifestation of early disseminated Lyme disease, presents with atrioventricular blocks, notably high-degree blocks, typically resolving with prompt antibiotic therapy. Histological evidence reveals infiltration of lymphocytes and macrophages into the myocardium, contributing to our understanding of the pathophysiology. Diagnosis, often challenging due to the absence of characteristic erythema chronicum migrans, relies on a two-tiered serologic testing strategy and clinical symptoms. Timely initiation of antibiotic therapy is crucial for effective management. Despite its complexity, Lyme

carditis generally carries a favourable prognosis, reducing the necessity for permanent pacemaker implantation in the majority of cases.

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Conflict of Interest

None to report.

Consent to publish

Written informed consent for publication of his clinical details and/or clinical images was obtained from the patient.

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