

Case Report

First-degree atrioventricular block in 14-year-old child due to Lyme disease

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Abstract

Lyme disease is an infectious disease caused by bacteria of the *Borrelia burgdorferi sensu lato* (Bb) complex and is characterized by predominant lesions of the skin, cardiovascular system, nervous system and musculoskeletal system. We have described a clinical case of first-degree atrioventricular block in a 14-year-old boy caused by Lyme borreliosis. The disease started with the manifestations of cardiovascular system involvement. The patient and his parents did not recall observing a tick bite or manifestation of erythema migrans (EM). The boy was prescribed doxycycline. Three weeks after antibiotic therapy a second ECG examination was performed and showed no abnormalities.

Key words: Lyme disease; ticks; atrioventricular block; ECG; Lyme carditis.

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Introduction

Lyme disease is an infectious vector-borne disease caused by bacteria of the *Borrelia burgdorferi sensu lato* complex (Bb) [1].

Official registration of Lyme disease in Ukraine started in the year 2000. Since then, the incidence of Lyme disease has increased 29 times, especially in the Western region of the country. Unfortunately, to date no ticks have been tested for *Borrelia* in Lviv region and no endemic areas have been identified for the past 2 years. Until 2000, treatment of patients with Lyme disease in Ukraine was based only on the presence of the typical erythema migrans and the history of a tick bite. Most doctors in the country are unaware of the development of late-stage Lyme disease to this day. Lyme disease occurs without erythema migrans in 20-40% of cases, which significantly complicates the diagnosis of the disease and allows the possibility of its passing to the next stage [2].

In the absence of adequate therapy in the early localized stage of the disease, the infection can spread and manifest in a variety of forms depending on the

sites of secondary lesion, including the nervous, cardiovascular, and musculoskeletal systems.

Heart tissue damage associated with Lyme disease is a complex process. The pathogenesis of Lyme carditis consists either in circulating immune complexes that lead to impaired atrioventricular conduction or in the direct invasion of *Borrelia burgdorferi* into the myocardium [3]. However, Lyme carditis is not a frequent consequence of Lyme borreliosis and occurs in only 4-10% of untreated patients [4].

Lyme carditis in children can have a number of clinical symptoms, ranging from asymptomatic first-degree heart block to fulminant myocarditis [5].

Case report

At the end of August 2020, the mother of a 14-year-old boy was consulted by a doctor concerning the following complaints in her child: headache in the fronto-temporal area with increasing intensity, an episode of loss of consciousness. There was no history of tick bites. The child had been in contact with pets,

that were often noticed to have a large number of ticks. Taking into account the boy's history of loss of consciousness, Echo-CG and Holter monitor test were performed. Echocardiography did not reveal any abnormalities.

Holter conclusion: The patient underwent Holter monitor ECG in modified bipolar leads V1, V5, AVF for 24 hours. During the whole observation, a basic sinus rhythm with an average daily heart rate of 78 beats/minute with the first-degree Atrioventricular(AV) block (duration of maximal pq - 200 msec) was recorded. 32 supraventricular extrasystoles were recorded during the observation. Episodes of sinus bradycardia with a minimum heart rate of 51 beats/minute in the passive observation period were recorded. During physical activity, sinus tachycardia was observed, with a maximum heart rate of 152 beats/minute, which was 74% of the maximum heart rate for this age. An asymptomatic pause lasting 2.5 seconds due to second-degree atrioventricular block was recorded. The corrected QT interval (at a heart rate of 60 beats/minute) is 359 ms.

After receiving the data, the child was referred for the consultation and additional examination to a pediatric cardio-rheumatologist. During the examination: SpO₂ - 97%, RR -18 breaths per minute, HR - 76 beats per minute, BP - 100/700 mm Hg, a palpable femoral pulse was present. An ECG was performed and the diagnosis of first-degree atrioventricular block was confirmed (Figure 1).

To exclude streptococcal etiology and autoimmune process, a swab from the nose and throat for GABHS was taken and it was negative. Analyses for CRP, RF, ASO and CK-MB was performed. CBC, ASO, RF were within normal limits. CK-MB – 26 IU/L (normal ranges < 25 IU/L). CRP – 12 mg/L (normal range < 6 mg/L). CK-MB is a marker of cardiomyocyte damage and it was slightly elevated due to the possible myocarditis.

The patient was referred to a pediatric infectious disease specialist, who prescribed an IgM, IgG

Figure 1. Fragment of ECG that shows 1st-degree atrioventricular block (HR-44 bpm, PR-260 ms, P-120 ms, QRS-102 ms, T-200 ms).

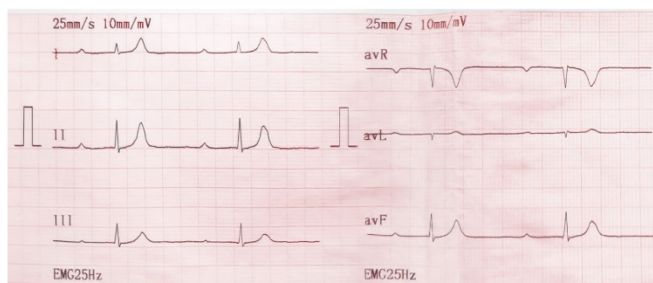


Table 1. Immunoblot results (euroimmune) IgM, IgG.

IgM immunoblot p 41	Positive
IgG immunoblot	
VlsE (<i>Borrelia afzelii</i>)	Positive
VlsE (<i>Borrelia burgdorferi</i>)	Positive
VlsE (<i>Borrelia garinii</i>)	Positive
p83	Positive
p 41	Positive
p 39	Positive
OspC (<i>B.afzelii</i>)	Positive
p18	Equivocal
IgG	Positive

antibodies to *Borrelia burgdorferi* and an IgM, IgG immunoblot to rule out a diagnosis of Lyme disease. The test results came positive. IFA (ELISA) - IgM - 26.23 IU/mL (positive > 22), IgG -160.95 IU/mL (positive > 22) (Table 1).

Lyme disease was diagnosed and doxycycline 100 mg b.i.d. was prescribed for 21 days.

Discussion

Rare manifestations of Lyme borreliosis in the cardiovascular system are myocarditis, myopericarditis, left ventricular dysfunction or cardiomegaly. Carditis can occur in combination with erythema migrans (EM) or acute damage of the nervous system, or as the only manifestation of Lyme disease with syncope and malaise associated with symptomatic AV block. ECG examination should be performed in all patients with acute disseminated Lyme disease, as cardiac conduction disorders may be subclinical [6]. Conduction disorders rarely occur in childhood and account for less than 2% of primary arrhythmias. First-degree AV-block can be asymptomatic, but in the presence of syncope, dizziness, seizure activity in the child additional tests should be performed to rule out an organic cause of the heart block [7].

In Lyme-endemic regions, in cases of atrioventricular conduction disorders, it is mandatory to exclude Lyme borreliosis as a possible cause of the disease [8]. Carditis is a potentially life-threatening manifestation of Lyme disease. To date, several deaths have been reported due to Lyme carditis. Yoon *et al.* [5] described a clinical case of fatal Lyme carditis in a 17-year-old adolescent who had clinical signs similar to an acute respiratory viral infection (sore throat, cough, and intermittent fever) for two weeks. The patient developed ventricular tachycardia, which required electrical cardioversion. Attempts to stabilize its rhythm were unsuccessful. Despite considerable resuscitation efforts, the heart rhythm rapidly shifted from ventricular fibrillation to pulseless electrical activity and asystole.

Lyme carditis should be suspected in young patients with symptoms of heart disease in the absence of other visible risk factors. Lyme carditis, including cases of high-grade AV block, is usually completely treatable with antibiotics [9]. In some cases, you may need to implant a pacemaker. Corticosteroids do not reduce the duration of the disease and usually are not recommended for the treatment of Lyme carditis.

As disorders of AV conduction can fluctuate and deteriorate rapidly, it is advisable to hospitalize and closely monitor patients with AV blockage of II and III degrees, or I degree with a PR (the time from the onset of the P wave to the start of the QRS complex) interval > 300 ms [10].

Conclusions

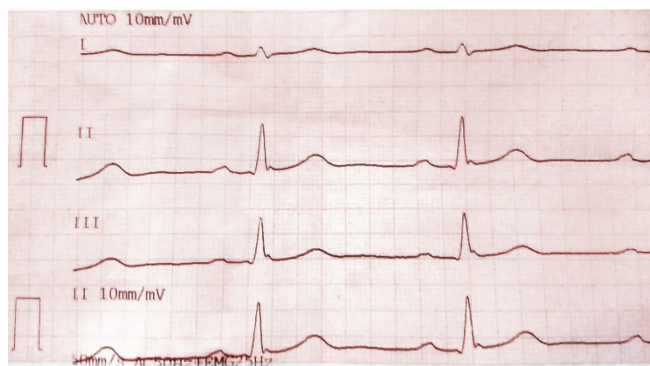
We described a thought-provoking and rare clinical case of first-degree atrioventricular block in a 14-year-old boy, which manifested with a headache in the fronto-temporal area and an episode of loss of consciousness.

After finding the cause of 1st-degree atrioventricular block - effective treatment of Lyme carditis was prescribed.

Three weeks after the end of the treatment, the child underwent a second ECG examination, which showed no abnormalities (Figure 2).

Despite the increasing incidence of Lyme disease in Ukraine, especially in the Western region, there is low vigilance among doctors of various specialties to early and late-disseminated stages of Lyme disease. Therefore, this clinical case highlights that physicians should always be aware of the symptoms of Lyme diseases and must not forget about late-stage Lyme disease.

Figure 2. Fragment of patient's ECG showing no abnormalities.



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