

Case Report

Lyme Carditis: Complete Atrioventricular Dissociation with Need for Temporary Pacing

THEODOROS XANTHOS, PAVLOS LELOVAS, HARILAOS KANTSOS, ISMENE DONTAS, DESPINA PERREA, EVANGELIA KOUSKOUNI*

*Department of Experimental Surgery and Surgical Research, *Department of Microbiology, Aretaieion Hospital, University of Athens Medical School, Greece*

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Lyme borreliosis is a tick-borne disease. Cardiac manifestations of the disease are extremely rare. We report a case of Lyme carditis in an otherwise healthy male, who presented to the Accident & Emergency Department with chest pain, dizziness and generally symptoms indicating ischaemic heart disease. This patient, without documented history of Lyme disease, acutely developed third-degree atrioventricular block, which required placement of a transvenous pacemaker and resolved when the patient was administered doxycycline.

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Address:
Theodoros Xanthos

*Department of
Experimental Surgery
and Surgical Research
15B Agiou Thoma St.,
115 27 Athens, Greece
e-mail:*
theodoroxanthos@yahoo.com

Lyme borreliosis is a tick-borne disease¹ that is known to affect primarily the skin, heart, nervous system, and joints. Though the cardiac manifestation occurs in 4% to 10% of cases,² it still remains the least well-documented. Generally, cardiac complications occur in the early-disseminated phase. Disturbance of atrioventricular (AV) nodal conduction is the most common cardiac manifestation of Lyme disease.³ Cardiac involvement occurs four to eight weeks after the initial illness.² Other cardiac diseases associated with Lyme borreliosis are cardiomyopathy, congestive heart failure, myocarditis, pericarditis, atrial and ventricular tachycardias,⁴ and degenerative cardiac valvular disease.⁵

Here we present a patient with Lyme borreliosis, who was admitted with complete AV block and manifestations from the cardiovascular system. We also review the relevant literature.

Case presentation

A male patient aged 44 presented with diz-

ziness and chest discomfort. He normally lived in Dubai. He had a three-week history of a febrile illness following a recent trip to the USA. During this trip he had visited the woods and described multiple insect bites. Two days later he developed left shoulder pain, which lasted for three days. Since then he had experienced general malaise and night sweats. While in Dubai he experienced atypical chest discomfort and underwent a full blood count and biochemistry, which revealed alanine aminotransferase 47 IU/l and erythrocyte sedimentation rate 36. His regular medication included ibuprofen for arthritis of unknown aetiology. His risk factors for coronary artery disease were hyperlipidaemia and smoking. He denied any extramarital contacts. One day prior to admission, he complained of difficulty in climbing stairs because of nausea and dizziness.

On admission day, he developed a sweaty chest discomfort that lasted for 1 hour, was exacerbated by exercise and did not radiate to the chest. Discomfort was completely resolved in the accident and emergency department when he was given nitroglycer-

ine sublingually. On examination he was comfortable at rest. His pulse was 40-90 beats per minute and his blood pressure was 112/73 mmHg. His jugular vein pressure was +3 cm and his cardiac apex was in a normal position. No other pathology was found on examination of his cardiovascular system. All other systems were normal on examination.

Figure 1 shows the patient's ECG, revealing third degree AV dissociation with narrow and wide QRS escape rhythms, while Table 1 shows his full blood count and standard biochemistry.

The arterial blood gases showed the following: pH 7.487, partial oxygen pressure 96 mmHg, partial carbon dioxide pressure 42 mmHg, bicarbonate 28.9 mEq/l and base excess +5.9. There was no pathology on the chest X-ray.

The patient was admitted to the coronary care unit and given aspirin and nitroglycerine. Serial ECGs, echocardiogram, blood culture and viral titres were requested. During the first night of his admission he developed a second episode of third-degree AV block associated with hypotension, which responded to atropine 600 µg. Despite the treatment, later on the same night he experienced the same bradycardiac episodes and was given isoprenaline infusion intravenously. As his temperature was 38.5° C, he was also administered benzyl-penicillin.

The patient's response to isoprenaline was minimal and a temporary pacemaker was inserted. After coronary artery disease had been ruled out, IgM *Borrelia burgdorferi* was requested. The IgM titre for the aforementioned infectious agent was >1000 IU. His

antibiotics were changed to doxycycline 100 mg orally and his symptoms, including complete AV dissociation, receded completely within three days of the initiation of the antibiotic.

Differential diagnosis

The patient demonstrated problems that concern two specialities of internal medicine: infectious disease and cardiology. Factors implicating infection were fever lasting three weeks, and sweats. Physical signs included a temperature of 38.5° C and rigours. His white blood cell count revealed leukocytosis, as well

Table 1. Full blood count and standard biochemistry in our patient.

| | |
|-------------------------------------|---------------------------|
| Haemoglobin | 13.7 g/dl |
| White blood cells | 11.7 × 10 ⁹ /l |
| Platelets | Clumped |
| Erythrocyte sedimentation rate | 65 mm/h |
| Sodium | 134 mEq/l |
| Potassium | 4.1 mEq/l |
| Urea | 39 mg/dl |
| Creatinine | 0.8 mg/dl |
| Aspartate aminotransferase | 21 IU/l |
| Bilirubin | 14 µmol/l |
| Albumin | 42 g/l |
| Alkaline phosphatase | 136 IU/l |
| Creatine kinase | 39 IU/l |
| Troponin T | Negative |
| Total cholesterol | 252 mg/dl |
| Low density lipoprotein cholesterol | 214 mg/dl |
| Triglycerides | 234 mg/dl |



Figure 1. Patient's ECG revealing high-degree atrioventricular block with narrow and wide QRS escape rhythm.

as elevated erythrocyte sedimentation rate and C-reactive protein.

Factors favouring cardiac pathology were chest discomfort on exertion, dizziness and dyspnoea, New York Heart Association class II. He had at least two risk factors for coronary artery disease.

The patient's overall clinical condition clearly had an infectious component. Viral myocarditis could not easily be excluded given his borderline temperature. Syphilis was unlikely, since he denied any extra-marital contacts. Aortic root abscess and bacterial endocarditis also sounded unlikely, given that the patient was not toxic on examination. His recent trip to Connecticut and his report of various insect bites made Lyme disease possible. In any case, an atypical manifestation of coronary artery disease, developing with a borderline fever and complete AV dissociation, needed to be ruled out.

Discussion

The primary established vectors of the disease are various species of the genus *Ixodes*. In Europe the main vector is *I. ricinus*, in Eurasia *I. persulcatus* and in North America *I. scapularis* and *I. pacificus*. *Borrelia* belongs to the spirochete family, which is grouped in the *Borrelia burgdorferi sensu lato* species complex and further subdivided into at least eleven genomic species.⁶ Because of the variety of the clinical presentation of the disease between Europe and North America, many investigators have maintained that there is an association between the different genomic types of *Borrelia* and its distribution worldwide, as well as the clinical manifestation of the disease.⁷

The clinical manifestation is divided into three stages. The first stage is the acute illness, where the main clinical signs are tick bite, *erythema migrans*, lymphadenitis and systemic symptoms (headache, fever, malaise, myalgia, arthralgia). In the second stage, or dissemination phase, which occurs weeks to months later, there are symptoms from the central nervous system and the heart. The third stage, or late chronic phase, is characterised by destructive chronic arthritis, *Acrodermatitis atrophicans* and neuropathy.⁸

Lyme carditis is a rare manifestation of the disease. It occurs in 1.5%-10% of cases in North America and 0.5%-4% in Europe. Cases of Lyme carditis from Europe and North America have been reviewed and compared, and the male:female ratio has been reported to be 3:1. Cardiac manifestations have been reported to occur in the early phase of the illness and

the most frequent cardiac symptom is AV block.⁹ In a previous study third-degree AV block was present in 49% of all patients, while only 16% had second-degree and 12% first-degree AV blocks. Third degree AV block with severe Adams-Stokes attacks has been reported in patients with Lyme borreliosis.⁷ It has also been documented that 98% of the patients with AV conduction disturbances had first-degree AV block at some time during the course of the disease, while Wenckebach periodicity occurred in 40% and complete AV block in 50%. Progression from first degree to third degree AV block can occur within minutes.¹⁰ The site of the conduction block occurs at, or above the AV node, especially within the AV conduction system, though sinoatrial and intra-atrial conduction disturbances have also been described. All these conduction disturbances predict a benign prognosis.¹⁰ Other conduction disturbances in Lyme disease with unfavourable prognosis are: i) low escape rhythms with severe AV block, which are slow and of wide QRS pattern; ii) transient lack of any escape rhythm, with brief asystoles; and iii) fluctuating bundle branch block depicting either transient His-Purkinje involvement or intranodal AV block.¹¹

Temporary cardiac pacing may be required in up to a third of cases of Lyme carditis and complete recovery occurs in more than 90% of patients.

It has been suggested that the mechanism by which Lyme disease affects the conduction system is the result of the direct dissemination of spirochetes into cardiac tissues, the inflammatory response associated with the infection, or both.¹²

Diagnosing Lyme disease can be very challenging. Though *erythema migrans* is a very specific symptom of Lyme disease, in the acute phase it is not present in all cases. Tick bites, in combination with the rest of the symptoms in Lyme carditis, are very suggestive of the disease, but not all the patients recall or mention such a bite.

There is therefore a need for a sensitive and specific test for the diagnosis of the disease. The most specific examination is the culture of *B. burgdorferi*, but this has a very low sensitivity.¹³ Serologic examination is readily available in clinical practice, but false negative and false positive results may be obtained. The most frequent assays used are enzyme-linked immunosorbent assay (ELISA), immunofluorescence assays and Western blotting.¹⁴ In the USA a two-step protocol for the evaluation of *B. burgdorferi* antibodies in sera has been recommended.¹⁵

Antibiotic therapy in the early stages of the disease

has been reported to prevent or ameliorate later complications.¹² Patients with minor cardiac involvement (first-degree AV block with PR interval <0.3 s) could be treated orally with doxycycline, tetracycline, or amoxicillin.¹⁶ Administration of doxycycline is preferable because of its higher efficacy in other tick borne diseases (babesiosis, ehrlichiosis, anaplasmosis) that could be co-transmitted^{17,18} and might aggravate the outcome.¹⁹

Patients with more severe conduction system disturbances (first-degree AV block with a PR interval >0.3 s, second or third-degree AV block) should be hospitalised in a coronary care unit and given either intravenous ceftriaxone or high-dose intravenous penicillin G. Insertion of a temporary transvenous pacemaker may be necessary according to the needs of each specific case. Permanent pacing was required in one case of AV block refractory to aggressive pharmacological therapy. In all other cases where permanent pacemakers were inserted this was done prior to the definitive diagnosis of Lyme disease.^{10,16,20}

To conclude, in all patients with AV block, febrile illness and a recent trip to an endemic region Lyme borreliosis should be suspected and the patients should be investigated accordingly.

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