

Lyme Carditis Accompanied with Pseudomonal Pneumonia: A Case Report

Dov Vachss, Yasna Yusuf, Dylan Bobrow, Patrick Geraghty*

Department of Medicine, State University of New York Downstate Health Sciences University,
450 Clarkson Avenue, Brooklyn, NY 11203, USA

*Corresponding author: Patrick.Geraghty@downstate.edu

Received December 14, 2022; Revised January 22, 2023; Accepted February 05, 2023

Abstract Lyme disease is a vastly underdiagnosed disease, and its frequency is steadily rising. It is commonly diagnosed clinically and treated empirically, due to the time required for testing and the inefficiency of laboratory testing methods. Although there are a few reported cases of Lyme carditis, the variation in the clinical presentation and the treatment provided differ significantly. Herein, we present the case of a man who presented in July 2022 with a non-productive cough and low-grade fever along with mild body aches. The patient had an incidental atrial flutter with a 2:1 atrioventricular block, a large thick-walled cavitory lesion in the apex of the left lung, left upper lobe ground-glass opacities, and scattered micronodules in the left lower lobe. He was clinically diagnosed with Lyme carditis despite testing negative for Lyme antibodies. This was in combination with Pseudomonal pneumonia. Here we review recent cases of Lyme carditis and discuss the difficulty of the efficiency of serological testing for Lyme disease.

Keywords: Lyme disease, Lyme carditis, clinical diagnosis, Pseudomonal pneumonia

Cite This Article: Dov Vachss, Yasna Yusuf, Dylan Bobrow, and Patrick Geraghty, "Lyme Carditis Accompanied with Pseudomonal Pneumonia: A Case Report." *American Journal of Medical Case Reports*, vol. 11, no. 2 (2023): 19-22. doi: 10.12691/ajmcr-11-2-3.

1. Introduction

Lyme disease frequency and detection is increasing since the early 2000s [1]. It is increasing both in the incidence of diagnosis and in the dispersion of geographic location in the United States. Approximately 35,000 cases are reported annually, but the estimated number of cases is approximately 330,000 annually between the years 2005-2010 [2]. Between the years 2010-2018, this number has risen to about 475,000 annually [3]. The highest numbers of Lyme disease are observed in individuals ages 5-9 and 65-69, with a greater incidence observed in males. It is most seen between June and July. The top 10 states for reported Lyme disease are Connecticut, Maine, Maryland, Massachusetts, Minnesota, New Hampshire, New Jersey, New York, Pennsylvania, and Wisconsin [4].

Lyme disease is a diagnosis frequently missed, due to its presentation being often nonspecific and variable between cases. Patients frequently do not know that they were bitten by a tick, and thus the clinical suspicion for it is low. Rashes are often atypical and can present differently on various skin tones and may be missed by the patients themselves. If left untreated, more severe Lyme symptoms are observed, with effects on the cardiac conduction system, neurological effects, and arthritis, so when Lyme disease is suspected, a thorough history and physical are strongly recommended prior to diagnosis.

Travel history with a focus on any visits to woodland areas can help. Detection of common bacteria originating from ticks is useful. *Borrelia burgdorferi* is the most prevalent tick-associated bacteria linked to Lyme disease in the United States, but there are other borrelia species that can cause Lyme disease. In European countries, *Borrelia afzelii* and *gareinii* are the most commonly offending agents for Lyme disease and yield the same disease presentation as *B. burgdorferi*.

With regards to the risks of developing Lyme Carditis, a recent study determined that only 0.6% of Lyme disease cases developed carditis. This is most likely to be found in males 20-24 years old with an odds ratio of 2.4 (95% Confidence interval 1.6-3.6), and males between 15-29 had the greatest risk of complete heart block [5]. Herein, we present the case of a man with clinically determined Lyme carditis.

2. Case Presentation

A 66-year-old male presented in July 2022 with a non-productive cough and low-grade fever along with mild body aches. He had no nausea, vomiting, or diarrhea, and no recent weight loss. No rashes or joint pain or swelling was noted, and he reported no bites from ticks, spiders, or other organisms. He lived in Brooklyn, New York, and had just returned from a trip to Maine where he reported living in a cabin in the woods. He had also

visited North Carolina one month earlier. His past medical history was unremarkable, apart from well-controlled allergy-induced asthma. He had no exercise limitations and was an avid runner and played basketball. In the emergency department, he was found to have leukocytosis with a count of 28,000 and an incidental atrial flutter with a 2:1 atrioventricular (AV) block. His procalcitonin was 13.64 ng/ml. However, laboratory studies and vital signs were otherwise unremarkable. He was started on azithromycin and ceftriaxone for possible pneumonia and diltiazem for the a-flutter. Legionella and strep pneumonia antigen were both negative. Blood cultures were negative, as were the respiratory viral panel. A chest CT-scan showed a large thick-walled cavitory lesion in the apex of the left lung, left upper lobe ground-glass opacities, and scattered micronodules in the left lower lobe. An endobronchial ultrasound showed bronchiectasis in the right upper and middle lobes, and copious white mucus in the left upper lobe. A couple of lymph nodes were biopsied in the left apical and posterior segments. Bronchoalveolar lavage was performed, returned positive for *Pseudomonas*, and negative for *Tuberculosis*. Fungal cultures were negative, as were the aspergillus antibody and histoplasmosis screening.

About 10 days later, upon another examination, an erythematous rash that appeared as two adjacent circles about a quarter each was noted on the left flank in the anterior axillary area. There was no “bull’s eye” appearance noted, however, the patient had a darker skin tone that may have masked that phenomenon. The “suspicious index in Lyme carditis” score [6] was 8, which is consistent with high suspicion of Lyme carditis. The patient was treated with meropenem for pneumonia, a course that was extended to 21 days following repeat imaging that showed improvement of the cavitation but tracking into the right lung. The a-flutter and AV block resolved, and the patient’s ceftriaxone was switched to doxycycline for a combined total of 21 days. Although the Lyme antibody returned negative, it was presumed to be a false negative, as the test was performed several days post antibiotic treatment. Autoimmune serology was performed but was negative for antinuclear antibodies and antineutrophil cytoplasmic antibodies. At the time of discharge, the patient had recovered from the cardiologic symptoms. The pneumonia showed signs of improvement but was still present and treatment continued.

3. Discussion

Here, Lyme disease and carditis were diagnosed clinically as the likely source of the patient’s pathology, despite the lack of serology. The rash and exposure to a woodland area in a Lyme-endemic area in the summer months play a significant role in the clinical diagnosis here. Also, the cardiac phenomena that reversed following antibiotics in the context of a lack of any cardiac history, are characteristic of Lyme carditis and further contribute to the diagnosis. The concomitant Pseudomonas pneumonia may have also exacerbated the cardiac complications. Multiple reasons could explain the negative antibody test, such as the time of testing; the test was performed after the patient was already on antibiotics. Also, it can take a

significant amount of time for the antibodies to increase within the body after a recent infection. Lastly, the negative test may be due to its low sensitivity. Therefore, physicians need to use their clinical experience to diagnosis Lyme disease.

When patients present with suspected Lyme carditis, a clinical diagnosis of patients presenting with high-degree atrioventricular block could help avoid the implantation of permanent pacemakers. Testing the serology of patients with atrioventricular block is recommended when Lyme disease is suspected and then empirically treating with antibiotics. In those with symptomatic bradycardia, temporary-permanent pacing is recommended [6]. Serology and other tests take time to return, and medical decisions are often made before results are available [7], like in our case. However, considering that Lyme disease has a variable presentation and is sometimes difficult to diagnose clinically, laboratory methods of diagnosis can later help determine the correct course of treatment. Laboratory testing for Lyme disease takes two basic strategies (direct or indirect). In direct testing, the infectious agent itself is detected. It’s currently mostly in the preclinical research stage for Lyme disease. Indirect testing, however, looks for the signs the bacteria leaves in the human body, and thus it can look at the substances the body uses when *borrelia* is present, such as antibodies. However, there is a variable “window period” from days to weeks before the antibodies are detectable. The standard testing method uses a two-tiered test, the first higher in sensitivity and the second higher in specificity. The two-tiered method is 14% sensitive in the first week of a single erythema migrans and 86% between 22-30 days post-infection. The modified two-tier test was recommended by the FDA in 2019 as an acceptable alternative in laboratory testing for Lyme disease [8].

We considered whether the presentation of our patient with both Lyme carditis and *Pseudomonas pneumonia* acquired in the outpatient setting was a coinfection or a coincidence. The most common infections that present with Lyme disease are Bartonella species, *Yersinia enterocolitica*, *Chlamydophila pneumoniae*, *Chlamydia trachomatis*, and *Mycoplasma pneumoniae*. They can have similar presentations, complicating the diagnosis, and they can exacerbate the disease course. Often, they require a different antibiotic; while doxycycline can work for all of them, ceftriaxone will only cover Lyme disease. So, in later-stage Lyme disease like carditis, these co-infections would warrant an extra antibiotic. A few tick-borne infections can coincide with Lyme disease, namely ehrlichiosis, anaplasmosis, and babesiosis. Ehrlichiosis and babesiosis are primarily of concern as co-infections in the United States vs. Europe and can present as influenza-like illnesses with fevers and multiple other symptoms. While ehrlichiosis and anaplasmosis are treated with doxycycline, babesiosis is treated with atovaquone, azithromycin, and clindamycin, and sometimes joined by quinine. Therefore, considering our patient, it seems that while Lyme carditis and *Pseudomonas pneumonia* coincided, they were likely not connected from a pathophysiological standpoint. However, it should be noted that *Pseudomonas pneumonia* is uncommonly community-acquired, and thus its intersection with Lyme carditis would be rare, even as a coinfection [9].

Table 1. Recent case reports of Lyme carditis

Reference	Demographic	Presenting Symptoms	Cardiac Phenomena	Sequela After Antibiotics	Pacemaker
[10]	28-year-old male, lived in Lyme-endemic area, tick bite 1-2 months ago	syncope, chest pain X4 days, dyspnea, general malaise	ECG – junctional rhythm at 70 bpm	Day 2 – high-deg AV block; echo with mild hypokinesia primarily in the inferior and inferoseptal walls Day 8 – conduction 1:1, prolonged PR interval Day 12 – pacemaker removed and discharged 5 Weeks – normal sinus	Externalized permanent pacemaker w screw-in endocardial lead
[11]	24-year-old male student	Syncope X2	ECG - high-grade AV block, prolonged PR interval & accelerated junctional escape rhythm >>> Primarily junctional rhythm but episodic heart blocks of varying magnitudes >>> That evening - 3rd syncope due to 25 second ventricular asystole with spontaneous resolution	Accelerated junctional rhythm with varying degrees of AV dissociation Day 8 - Discharged on ceftriaxone in junctional rhythm Day 22 – sinus with 1 st deg AV block Day 29 – PR interval 170 3 months – pacemaker removed	Permanent pacemaker
[12]	72-year-old male	Presyncope, chest tightness, lightheadedness, mild dyspnea on exertion	ECG – unremarkable Overnight – HR 30-40 bpm Next morning – Mobitz Type 1	Day 8 – Discharged in normal sinus	None
[13]	42-year-old male Tick bite Upstate NY 2 weeks ago	weakness, presyncope, dyspnea on exertion all worsening over past 2 weeks erythema marginatum on back to left flank X 2 days	diaphoretic, HR 30 bpm, hypotensive ECG - complete heart block with ventricular escape >>> asystole & loss of consciousness >>> CPR and transcutaneous pacing restored rhythm	Day 2 – 1 st deg block. Day 3 - pacemaker removed Day 4 -discharged with PR interval of 240	Transvenous
[14]	36-year-old male camped in Upstate NY 3 weeks ago	lightheaded and dizzy Fatigue and myalgias X3 weeks Fever and cough for 3 days since resolved	Palpitations HR 30-70 bpm with canon A waves observed at the jugular ECG - 3rd-deg AV block	Day 6 – pacing stopped Day 8 – discharged	Transcutaneous
[15]	26-year-old male on active military duty	headache, fever and eye pain, multiple erythematous patches on many body areas, diagnosed as viral 6 weeks later – rash resolved; exercise tolerance and weight decreased	6 weeks ECG – read as 1 st deg block	6 weeks – given antibiotics and referred to cardio due to positive Lyme serology 8 weeks – initial ECG re-read as 3rd deg block with junctional rhythm, but repeat now normal sinus, Admitted overnight & discharged	None
[16]	14-year-old male Hunting and fishing in Lyme-endemic area	Syncope X2, headache, vomiting, altered mental status, past two weeks - rhinorrhea, cough, abdominal pain, headache & nausea	ECG - third-deg block, wide-complex escape of RBBB-like morphology and right axis deviation Telemetry - transient asystole	Day 6 – pacing stopped Day 8 – normal sinus, discharged w cardiac monitor	Ventricular
[17]	66-year-old male Tick bite 3 months ago	Dyspnea on exertion, lightheaded, dizzy X1 week 2 weeks ago – fatigue, malaise 1 month ago-myalgias	ECG - PR interval of 320 atop an old RBBB >>> third-degree block, ventricular rate 32 bpm	3 hours later – sinus rhythm with PR interval of 230 Day 4 discharged Six weeks later – PR interval normal	None
[18]	31-year-old female Multiple tick bites	Now with multiple episodes of syncope Already had erythema migrans, diagnosed w Lyme disease & had received 2 weeks of doxycycline	ECG normal Overnight – syncope while sitting; Telemetry showed 12 seconds of asystole; ECG – 2 nd -deg sinoatrial exit block with Wenckebach periodicity.	Sinoatrial block resolved after a few days and discharged with loop recorder	None
[19]	40-year-old male employed by the military Multiple tick bites	Palpitations	HR at 40 bpm ECG - 2 nd -degree AV block with 2:1 and 4:1 conduction	Day 2 - HR 29 bpm & 4:1 block >>> 1 st -deg block, PR interval of 320 at 45 bpm >>> Mobitz Type 1 Day 4 – 1 st deg AV block PR interval 315, HR 66 bpm Day 9 – sinus, PR 205 Day 10 – discharged	None

AV – atrioventricular; bpm – beats per minute; HR – heart rate; deg – degree; RBBB – Right bundle branch block; PR intervals - units in milliseconds.

Finally, there are several recent cases of Lyme carditis documented in the literature. Table 1 outlines several cases that demonstrate the variation in the clinical presentation of these patients and the treatment provided. They all had the clinical symptoms of cardiac involvement confirmed by ECG. Unlike our patient, all these patients outlined in Table 1 were serologically positive for Lyme disease. It bears noting that antibiotics are the mainstay of treatment for the conduction abnormalities that present in Lyme carditis, with IV ceftriaxone commonly used. Simultaneously, the patient needs to be stabilized and so pacing the heart can be utilized to do so, if needed. Later, once the patient is ready for discharge, doxycycline can be substituted to complete the course outpatient in an oral formulation. These cases all ultimately showed positive serology for Lyme disease and were discharged to complete the antibiotic course outpatient.

From Table 1, six of the patients were male and one was female. Ages ranged from 14-56. They all presented with either second or third-degree atrioventricular block accompanied by signs of Lyme disease and carditis. Their Suspicious index in Lyme carditis scores ranged from 5-12. They were all treated with 7-10 days of ceftriaxone and then finished a 21-day total course of antibiotics with doxycycline. None were given a permanent pacemaker, although two of them needed a temporary pacemaker because of symptomatic bradycardia. They were all discharged with 1:1 cardiac conduction determined with a stress test. Three of them still had a first-degree block on discharge; their PR interval was less than 300 milliseconds and was normal at a 4–6-week follow-up. These seven patients were followed for 14-44 months; the median was 20.8. They were back to performing usual physical activities, and they showed no signs of long-term effects. All were in normal sinus rhythm with no conduction abnormalities observed [20].

4. Conclusions

Lyme Disease is a vastly under-diagnosed disease, and its frequency is steadily rising. Even when it is diagnosed, it is commonly diagnosed clinically and empirically treated, due to the time required for testing and the laboratory testing methods are inefficient. Clinically, the “suspicious index in Lyme carditis” seems a valuable tool, although like most things associated in the diagnostics of Lyme disease and carditis, it requires further study. The presentation of Lyme carditis is variable, although there is a commonality that is seen while reviewing patient presentations. Typically, a male predominance is seen, although studies differ with respect to the numbers. People usually recover from Lyme carditis if appropriately treated. However, prevention is key. Trying to avoid getting ticks and quickly removing them if they do attach is essential to avoid Lyme disease and its ensuing complications.

Acknowledgements

This work was not funded.

References

- [1] K. J. Kugeler, A. M. Schwartz, M. J. Delorey, et al., “Estimating the Frequency of Lyme Disease Diagnoses, United States, 2010-2018,” *Emerg Infect Dis*, vol. 27, no. 2, pp. 616-619, 2021.
- [2] C. A. Nelson, S. Saha, K. J. Kugeler, et al., “Incidence of Clinician-Diagnosed Lyme Disease, United States, 2005-2010,” *Emerg Infect Dis*, vol. 21, no. 9, pp. 1625-1631, 2015.
- [3] A. M. Schwartz, K. J. Kugeler, C. A. Nelson, et al., “Use of Commercial Claims Data for Evaluating Trends in Lyme Disease Diagnoses, United States, 2010-2018,” *Emerg Infect Dis*, vol. 27, no. 2, pp. 499-507, 2021.
- [4] C. f. D. C. a. Prevention, “Surveillance Data,” in *Lyme Disease*, 2022.
- [5] N. A. Kwit, C. A. Nelson, R. Max, et al., “Risk Factors for Clinician-Diagnosed Lyme Arthritis, Facial Palsy, Carditis, and Meningitis in Patients From High-Incidence States,” *Open Forum Infect Dis*, vol. 5, no. 1, pp. ofx254, 2018.
- [6] G. Besant, D. Wan, C. Yeung, et al., “Suspicious index in Lyme carditis: Systematic review and proposed new risk score,” *Clin Cardiol*, vol. 41, no. 12, pp. 1611-1616, 2018.
- [7] A. Baranchuk, C. Yeung, “Suspicious index in Lyme carditis: Construction of a new risk model in the absence of guidelines,” *Clin Cardiol*, vol. 41, no. 12, pp. 1619, 2018.
- [8] P. J. Mead P, Hinckley A. , “Updated CDC Recommendation for Serologic Diagnosis of Lyme Disease. ,” in *MMWR Morb Mortal Wkly Rep*, pp. 703, 2019.
- [9] W. Berghoff, “Chronic Lyme Disease and Co-infections: Differential Diagnosis,” *Open Neurol J*, vol. 6, pp. 158-178, 2012.
- [10] C. Wang, S. Chacko, H. Abdollah, et al., “Treating Lyme carditis high-degree AV block using a temporary-permanent pacemaker,” *Ann Noninvasive Electrocardiol*, vol. 24, no. 3, pp. e12599, 2019.
- [11] M. A. Stypula, J. Bright, D. C. Beck, “Lyme carditis: An atypical cause of syncope,” *JAAPA*, vol. 34, no. 12, pp. 22-25, 2021.
- [12] I. Aljadba, K. Suresh, K. M. Hussain, “Lyme Carditis Manifesting as Wenckebach Heart Block,” *Cureus*, vol. 13, no. 11, pp. e19251, 2021.
- [13] S. Brissett, K. T. Myint, Y. Lopez, et al., “A curious case of Lyme carditis in an urban hospital,” *IDCases*, vol. 25, pp. e01179, 2021.
- [14] A. Bamgboje, F. O. Akintan, N. M. Gupta, et al., “Lyme Carditis: A Reversible Cause of Acquired Third-Degree AV Block,” *Am J Case Rep*, vol. 22, pp. e927885, 2021.
- [15] M. Burns, P. Robben, R. Venkataraman, “Lyme Carditis With Complete Heart Block Successfully Treated With Oral Doxycycline,” *Mil Med*, 2021.
- [16] N. Maxwell, M. M. Dryer, A. Baranchuk, et al., “Phase 4 block of the right bundle branch suggesting His-Purkinje system involvement in Lyme carditis,” *HeartRhythm Case Rep*, vol. 7, no. 2, pp. 112-116, 2021.
- [17] P. Samarendra, S. Kapoor, “Diagnosing Lyme Carditis Presenting With Complete Heart Block,” *J Med Cases*, vol. 11, no. 7, pp. 224-227, 2020.
- [18] A. Buscher, F. Doldi, L. Eckardt, et al., “Lyme carditis manifesting with sinoatrial exit block: a case report,” *Eur Heart J Case Rep*, vol. 6, no. 1, pp. ytac022, 2022.
- [19] C. Yeung, M. Al-Turki, A. Baranchuk, “The Value of the Surface ECG for the Diagnosis and Management of Lyme Carditis: A Case Report,” *Curr Cardiol Rev*, vol. 17, no. 1, pp. 5-9, 2021.
- [20] C. N. Wang, C. Yeung, A. Enriquez, et al., “Long-term Outcomes in Treated Lyme Carditis,” *Curr Probl Cardiol*, vol. 47, no. 10, pp. 100939, 2022.

