Atypical presentation of Lyme neuroborreliosis related meningitis and radiculitis

Iman Dabiri, Nicholas Calvo, Feryal Nauman, Mahsa Pahlavanzadeh, Ahmet Z. Burakgazi
Department of Medicine, Virginia Tech Carilion School of Medicine, Roanoke, VA, USA

Abstract
Lyme disease related central and peripheral nervous system manifestations can occur in isolation or together. Radiculitis or inflammation of the nerve root can be seen 3-5% of the time in acute neuroborreliosis affecting the PNS with a typical presentation and meningitis affecting the CNS is usually seen 1% of the time. The appropriate diagnosis and management of neuroborreliosis can be challenging and require meticulous medical approaches. Herein we present a unique case of Lyme disease with neurologic manifestations including both radiculitis and meningitis due to its atypical and challenging clinical presentation and management with updated literature review.

Introduction
Lyme disease (LD) and its known pathogen *Borrelia burgdorferi* is an arthropod-born disease transmitted by the *Ixodes* species of ticks commonly seen in the northern hemisphere. Neurological manifestations of LD, first described by Garin and Bujadoux in 1922, have been seen to occur isolated in 12% of acute Lyme cases and may present as early as 2-18 weeks after exposure.¹,² Central nervous system (CNS) as well as peripheral nervous system (PNS) manifestations can occur in isolation or together.¹,² PNS involvement of cranial or peripheral nerves is the more common neurological findings and occurs in roughly 10% of infected untreated patients.³,⁴,⁵,⁶ Radiculitis or inflammation of the nerve root can be seen 3-5% of the time in acute neuroborreliosis affecting the PNS with a typical presentation involving intractable pain, as well as muscle denervation and areflexia over one or a few adjacent dermatomes.¹ Meningitis affecting the CNS is usually seen 1% of the time, these cases may present variable symptoms and patients may rarely develop brain parenchymal or spinal cord inflammation.¹-⁴ There have been 262,481 confirmed cases of LD in the United States (U.S.) between 2007-2016 though it is believed these numbers are significantly underreported and there may actually be up to 300,000 people diagnosed with LD per year in the U.S.⁷⁻⁹ Herein, we will discuss a case of LD with CNS and PNS manifestations including radiculitis and meningitis.

Case Report
A 43-year-old man with a past medical history of gout presented to our hospital with one-month history of progressive lower extremity weakness, gait instability, and acute back pain. The patient reported he was subjectively diagnosed with viral meningitis one month prior to presentation to the emergency department (ED) with symptoms at the time including cough, fever, anorexia, malaise, fatigue, myalgias, cervicalgia/neck stiffness with flexion and extension, mild photophobia, headache and two-week history of scaly erythematosus macular rash on his proximal medial upper and lower extremities. The patient refused to undergo lumbar puncture at the initial onset of his symptoms and thus a diagnosis of any infectious intracerebral/intrathecal process was never confirmed. At the onset of the patient’s symptoms, he had tried over-the-counter analgesics with some relief of his headaches though his generalized pain persisted. He initially underwent extensive laboratory studies at the onset of his symptoms ordered by his primary care physician one month prior to his presentation including rheumatologic evaluation and screening tests for tick-borne infections including Lyme serologies, however they were unremarkable, except for mildly elevated AST 79 and ALT 79, elevated CRP 4.95 mg/dL, and complement C3 227 mg/dL. His symptoms persisted and changed requiring hospital evaluation.

At presentation to our hospital, the patient reported progressive weakness and severe radicular lancinating pain going from his lower back to his heels worse on the right side that is worsened with sitting and supine, emotional lability along with depression and anxiety. He had also noticed occasional action tremor in hands interfering with fine motor tasks, and mentioned feeling tremor in his legs causing imbalance and instability though with no falls. He denied any bowel and bladder dysfunction, although he reported an episode of premature ejaculation a couple weeks prior to presentation.

His neurological exam was normal including strength, sensory, and reflex testing except for an unsteady wide based gait. We obtained a magnetic resonance imaging of lumbar spine with and without contrast that showed slightly thickened enhancement along the surface of the conus medullaris as well as enhancement of the nerve roots of the cauda equina, pronounced degenerative disc disease at L4-L5 with a broad-based disc-osteophyte complex, and mild bilateral facet arthropathy at L4-L5 results in mild-moderate bilateral neural foraminal stenosis as shown in Figure 1. The nerve conduction studies and electromyography of his bilateral lower extremities were normal. A lumbar puncture was performed and the patient’s cerebrospinal fluid (CSF) analysis showed lymphocytic pleocytosis with white blood cell count of 225 and elevated protein of 77 and decreased glucose 38. Ultimately his serum LD Western Blot came back reactive with time on a 30-second delay.

Correspondence: Ahmet Z. Burakgazi, Neuroscience Section, Department of Medicine, Virginia Tech Carilion School of Medicine, 3 Riverside Circle, Roanoke, VA 24016, USA.
Tel.: +1.540-521-4592.
E-mail: dburakgazi@yahoo.com

Key words: Lyme disease; Borrelia burgdorferi; meningitis; radiculitis.

Contributions: the authors contributed equally.

Conflict of interest: the authors declare no potential conflict of interest.

Funding: none.

Received for publication: 21 September 2019. Accepted for publication: 11 October 2019.

This work is licensed under a Creative Commons Attribution NonCommercial 4.0 License (CC BY-NC 4.0).

©Copyright: the Authors(s), 2019

Licensee PAGEPress, Italy

Neurology International 2019; 11:8318
symptoms, while he still had some ambula-
tory difficulties.

**Discussion**

Herein we present a unique case of LD with neurologic manifestations including both radiculitis and meningitis due to its atypical and challenging clinical presenta-
tion. Classically, this combination of painful radiculoneuritis and lymphocytic pleocytosis in the CSF, often associated with cranial nerve involvement and peripheral paresis is referred to as Bannwarth Syndrome.10,11 When neuroborreliosis affects the peripheral nervous system, it is believed to be a variant form of a mononeu-
ropathy multiplex syndrome.1,3

Consideration of neuroborreliosis in an individual with neurologic complaints requires an understanding of the complex seasonality and transmission of *B burgd-
oferi* to humans. The nymphal stage of the *Ixodes* tick is when *B burgdoferi* is most likely to be transmitted to humans.12 A key reason for this is due to the small size of the nymphal ticks (<2mm), which permits the nymphal tick to avoid detection and remain attached to the host, as the minimal period for transmission of an infectious dose of *B burgdoferi* is 2 days.12 Nymphal ticks become active in early summer starting in mid-May, their activity peaks in activity in June, and then declines during late July. The incubation period between the tick bite and development of LD takes approximately two weeks, thus the onset of LD typically occurs mainly during the summer months of June, July, and August.13,14 Interestingly, in our case, he was seen at the hospital in July and he developed his initial symptoms in June.

Diagnosis of LD is made using a two-
tiered approach to serologic testing for anti-
bodies to *B burgdoferi*. This two-tiered approach entails an initial Enzyme-Linked Immunosorbent Assay (ELISA) followed by a Western Blot test and is highly sensi-
tive and specific for diagnosis of LD. It typ-
ically takes 4-6 weeks of infection with *B Burgdoferi* for the immune system to develop antibodies detectable on serologic testing. This was recognized in our case, when anti-Borrelia antibodies were not initially present in the serum when tested at the time the patient first developed symptoms one month prior to presentation to the hospital, however were observed on serologic testing during his hospital admission. Typically, CSF analysis shows a lymphocytic predom-
inant pleocytosis, though monocytes may be present as well. The pleocytosis will have a median white blood cell count of 160 cells/microL.15 Additionally, there is a moderately elevated protein with an upper limit of 200-300 mg/dL, and usually the glucose is normal. Neuroborreliosis much like neurosyphilis can elicit a prominent B cell response so patients can have increased IgG synthesis within the CNS and even oligoclonal bands seen in their CSF. This was observed in our patient. Patients with increased IgG production in the CNS will have production of anti-B Burgdoferi anti-
bodies. Measurement of this is determined by comparing the ratio of CSF IgG specific to the organism to the corresponding in serum.4

In patients with strong suggestive fea-
tures of Lyme neuroborreliosis, treatment remains straightforward with use of antibi-
otics. Treatment duration as evident by vari-
ous randomized controlled trials (RCT’s) is of 7-14 days for early Lyme neuroborrelio-
sis, extending it to 2-3 weeks for Late (chronic) Lyme neuroborreliosis.16,17 In a meta-analysis after reviewing 5779 records including eight RCT’s and eight non ran-
domized studies (NRS), no statistically sig-
nificant difference was found between the use of oral doxycycline versus intravenous 

**Figure 1.** A) T1 Post-Contrast Saggital view showing slightly thickened enhancement along the surface of the conus medullaris as well as enhancement of the nerve roots of the cauda equina. B) T1-Post-Contrast Axial view showing slightly thickened enhancement along the surface of the conus medullaris as well as enhancement of the nerve roots of the cauda equina.

**References**

1. Halperin JJ. Nervous system Lyme dis-