

Psychiatric manifestations of Lyme disease

Padala Olga, olga.padala@gmail.com ORCID:0000-0003-1469-0877

1st Department of Psychiatry, Psychotherapy and Early Intervention Medical University of Lublin,
Gluska Street 1, 20-439 Lublin, Poland

Krupa Adrianna, adriannakrp@gmail.com ORCID:0000-0003-0866-3952

Department of Human Anatomy, Medical University of Lublin, Jaczewskiego 4 Street, 20-090
Lublin, Poland

Maciej Putowski, putowski.maciek@gmail.com ORCID:0000-0002-7575-2456

Department of Experimental Hematooncology, Medical University of Lublin, Chodźki 1 Street, 20-
093 Lublin, Poland

Michał Konopelko, mm.konopelko@gmail.com ORCID:0000-0003-4103-7400

Department of Otolaryngology and Laryngological Oncology, Medical University of Lublin,
Jaczewskiego 8, 20 954, Lublin, Poland

Ewa Piasek, ewa.piasekk@gmail.com, ORCID:0000-0003-3344-4022

I Clinic of Anaesthesiology and Intensive Therapy, Medical University of Lublin, Jaczewskiego 8,
20 954, Lublin, Poland

Abstract:

Introduction: Lyme disease is an infectious disease caused by *Borrelia* bacteria. Characteristic symptoms are erythema migrans, facial nerve palsy, aseptic meningitis, acquired heart blocks, chronic arthritis and radiculitis. The psychiatric manifestations of Lyme disease are known. They include cognitive, emotional and behavioral symptoms and syndromes.

Purpose: The aim of the review was to present psychiatric disorders caused by *Borrelia* infection.

State of knowledge: There are three basic types of infections causing neuropsychiatric symptoms: the meningovascular form associated with cerebrovascular infarcts; infection within the central nervous system which is the atrophic form of Lyme meningoencephalitis and is associated with cortical atrophy, gliosis and dementia and the last is infection outside the CNS causing immune and other effects within the CNS that contribute to neuropsychiatric symptoms. A range of psychiatric manifestations of borreliosis include psychosis, sleep disorders, anxiety disorders, depression, obsessive-compulsive disorder, intrusive symptoms, cognitive impairments and rapidly developing dementia.

Summary: Lyme disease is a common problem in medical practice of many health professionals. It is important that physicians of different specialties, including psychiatrists, consider Lyme disease in differential diagnosis. Appropriate pharmacotherapy can stop the progression of the disease and improve the patient's quality of life.

Key words: Lyme disease; borreliosis; neuroborreliosis; psychosis; mental disorders

Introduction:

Lyme disease (borreliosis) is an infectious disease caused by *Borrelia burgdoferi*, *Borrelia garinii*, *Borrelia afzelii*, *Borrelia lusitaniae* and other spirochetes. [1] It is a zoonosis, a disease that exists in animals like deers, sheeps and rodents and is transmitted by *Ixodes ricinus* and *Ixodes persulcatus* ticks. [1,2] The number of patients is constantly increasing. [2] Lyme disease is a multistage and multisystem disorder. Predominantly affects the skin, but also involves the joints, cardiovascular system and nervous system. [3] Characteristic symptoms of boreliosis are erythema migrans, facial nerve palsy, aseptic meningitis, acquired heart blocks, chronic arthritis and radiculitis. The disease may be associated with less characteristic symptoms like weakness and fatigue, memory impairment, sleep disorders, difficulties in concentration. [1]

Early localized infection

Lyme disease usually proceeds in stages characterized by different clinical symptoms. In the early phase it is most often manifested by a primary change - erythema migrans, the most common pathognomonic early symptom of borreliosis, or rarely borrelial lymphocytoma. Erythema occurs 3-30 days (usually 7 days) after the bacteria penetration and migrates from the reddened lump at the bite of the tick, changes into a ring-shaped, flat enlarging, more than 5 cm in diameter lesion with a brighter spot in the center. Another type of primary change is borrelial lymphocytoma - painless, red-blue bump, most often localized on the ear lobe, nipple or scrotum. In the same time patient may suffer general symptoms like weakness, fever and enlargement of the local lymph nodes. Erythema migrant usually disappears spontaneously within 3-4 weeks without any treatment. [1,2]

Early disseminated infection

Within a few weeks or few months the transmission via blood and lymphatic vessels to various organs may be observed. Numerous secondary annular lesions appear on the skin, which are usually smaller than the original one. Patients present cardiac symptoms, like atrio-ventricular block, changes in the eye - iritis or uveitis and neuroborreliosis symptoms including meningitis symptoms - fever, headache, stiff neck, stimuli hypersensitivity, Brudzinski's signs, Kernig's sign), facial

nerve palsy or other cranial nerves paralysis, as well as symptoms of peripheral neuritis. Arthritis is often observed. Borreliosis usually affects knees, ankles and elbows. [1,4]

Late disseminated infection

After several months or years untreated or inadequately treated patients may develop chronic symptoms. Among them acrodermatitis chronica atrophicans (ACA) should be mentioned. ACA rash is most evident on the extremities. It begins with an inflammation with bluish red discoloration and swelling, and concludes several months or years later with an atrophic phase when skin is thin with purple discoloration, deprived of hair. Chronic arthritis is also typical of late Lyme disease. It is usually mild inflammation of muscles, bursa or tendons. Attention should be given to chronic neuroborreliosis, which is manifested by radiculitis, peripheral neuropathy and chronic encephalomyelitis. [4] In rare cases, untreated Lyme disease may cause psychiatric disorders. A broad range of findings associated with Lyme disease include psychosis, sleep disorders, anxiety disorders, depression, obsessive-compulsive disorder, intrusive symptoms, cognitive impairments and rapidly developing dementia. [5]

Purpose: The aim of the review was to present psychiatric disorders caused by *Borrelia* infection.

State of knowledge:

Main mechanisms causing psychiatric manifestations

Borrelia bacteria cause chronic infections. They evade and suppress the immune system, that is why inflammation can persist without adaptive immunity. There are three basic types of infections causing neuropsychiatric symptoms: the meningovascular form associated with cerebrovascular infarcts; the second is infection within the central nervous system which is the atrophic form of Lyme meningoencephalitis and is associated with cortical atrophy, gliosis and dementia and the third is infection outside the central nervous system causing immune and other effects within the central nervous system that contribute to neuropsychiatric symptoms. Patient suffering from borreliosis with neuropsychiatric symptoms may have one or more than one of these three types of infections. [5,6]

Borreliosis and depression

Although depression is not prevalent in the early stages of Lyme disease in patients who are diagnosed and treated early and effectively, in the later stages of borreliosis, the prevalence of depression is significantly higher. It is estimated there are possibly over 1200 Lyme and associated diseases suicides in the US per year. [7] In the research conducted by Bransfield in 2018, authors analyzed retrospective LD chart reviews and compared 50 homicidal with 50 non-homicidal patients diagnosed with Lyme borreliosis in terms of some symptoms and syndromes. In the first group before infection 6% reported depression while post infection 98%. In the second group (non-homicidal patients) it was 0% pre infection and 76% post infection. Furthermore in both groups symptoms like sudden abrupt mood swings, anhedonia, decreased libido were significantly increased post infection. [8]

Borreliosis and symptoms of psychosis

There are some case reports of patients diagnosed with Lyme disease who developed psychosis symptoms such as hallucinations, delusions, disorientation in time and space, associative thinking, depersonalization, derealization and dissociative episodes. [8,9,10] Pharmacotherapy including psychotropics and antibiotics may help improve functioning and prevent further disease

progression. [5]

Borreliosis and different psychiatric conditions

The psychiatric manifestations of Lyme disease may be cognitive, emotional and behavioral. Symptoms and syndromes can be associated with almost any diagnosis in the ICD 10 or DSM 5 classification. [5] Sleep disorders acquired as a result of Lyme disease are quite significant and include early, mid and late insomnia, non-restorative sleep, restless leg, paroxysmal nocturnal leg movements, obstructive and central sleep apnea, nightmares, circadian rhythm shift and narcolepsy with sleep attacks, cataplexy, sleep paralysis and hypnagogic hallucinations. [11] Different types of anxiety may be caused by borreliosis. An early manifestation of hyperarousal may present as hypervigilance or low frustration tolerance. Further symptoms may then include mixed anxiety or different anxiety disorders, such as panic disorder, social anxiety disorder, generalized anxiety disorder, obsessive compulsive disorder and posttraumatic stress disorder. [8] Obsessive compulsive disorder has been reported with Lyme disease. This condition can have an autoimmune pathophysiology and can have a very sudden onset. Type of symptoms that may be present with obsessive compulsive disorder are intrusive symptoms. They are also associated with posttraumatic disorder. Intrusive symptoms include aggressiveness, altered sexual imagery, bizarre and horrific image. [5,8,12] Among cognitive impairments connected with Lyme disease it is necessarily to mention memory loss, attention and concentration impairments, memory complaints, mental fatigue, difficulty finding words, confusion, inattention, a conference presentation with impairments of reasoning, memory and attention with speaking, listening, reading and/or writing. The infections can contribute to a more rapidly developing dementia—the meningovascular form with cerebrovascular infarcts and the atrophic form with meningoencephalitis, cortical atrophy and gliosis. [13] In children suffering from Lyme disease following symptoms can be observed: short-term memory problems, schoolwork deterioration, brain fog, distractibility, word-finding problems, sensory hypersensitivity, word-finding problems, dyslexia symptoms. [14]

Summary: Lyme disease is a common problem in medical practice of many health professionals. The infection can cause many nonspecific symptoms. Because of that, it is often diagnosed at a late stage. It is important that physicians of different specialties, including psychiatrists, consider Lyme disease in differential diagnosis. The use of appropriate pharmacotherapy including antibiotics acting on *Borrelia* bacteria can stop the progression of the disease, significantly improve the patient's quality of life and enable him or her to return to social functions.

References:

1. Kuchar E. Borelioza z Lyme. [Lyme boreliosis] mp.pl Choroby zakaźne. <https://www.mp.pl/pacjent/choroby-zakazne/choroby/zakazenia-bakteryjne/158905,borelioza-zlyme> (dostęp: 2019.07.22)
2. Ross Russell AL, Dryden M, Pinto AA, Lovett J. Lyme disease: diagnosis and management. *Practical Neurology*, practneurol 2018–001998.
3. Koedel U, Fingerle V, Pfister HW. Lyme neuroborreliosis—epidemiology, diagnosis and management. *Nature Reviews Neurology*, 2015, 11(8), 446–456.
4. Flisiak R, Szechiński J, Mrukowicz. Borelioza z Lyme. [Lyme boreliosis] mp.pl INTERNA <https://www.mp.pl/interna/chapter/B16.II.18.5.1>. (dostęp: 2019.07.24)
5. Bransfield RC. Neuropsychiatric Lyme Borreliosis: An Overview with a Focus on a Specialty Psychiatrist’s Clinical Practice. *Healthcare* 2018, 6, 104.
6. Bransfield RC. The psychoimmunology of Lyme/Tick-Borne diseases and its association with neuropsychiatric symptoms. *Open Neurol. J.* 2012, 688–693.
7. Bransfield RC. Suicide and Lyme and associated diseases. *Neuropsychiatr Dis Treat.* 2017;13:1575–1587.
8. Bransfield RC. Aggressiveness, violence, homicidality, homicide, and Lyme disease. *Neuropsychiatr. Dis. Treat.* 2018, 14, 693–713.
9. van den Bergen HA, Smith JP, van der Zwan A. Lyme psychosis. *Ned. Tijdschr. Geneesk.* 1993, 137, 2098–2100. (In Dutch)
10. Brodziński S, Nasierowski T. Zaburzenia psychotyczne w przebiegu zakażenia *Borrelia burgdorferi*—część II: opisy przypadków. *Psychiatria Polska*, 2019, 53(3).
11. Bransfield RC. Sleep disorders impacting Lyme patients. In *Proceedings of the 15th Annual ILADSScientific Conference*, Washington, DC, USA, 10 October 2014.
12. Bransfield RC. Intrusive symptoms and infectious encephalopathies. *Neurol. Psychiatry Brain Res.* 2016, 22, 3–4.
13. Kaplan RF, Jones-Woodward L. Lyme encephalopathy: A neuropsychological perspective. *Semin.Neurol.* 1997, 17, 31–37.
14. Tager FA, Fallon BA, Keilp J, Rissenberg M, Jones CR, Liebowitz MR. A controlled study of cognitive deficits in children with chronic Lyme disease. *J. Neuropsychiatry Clin. Neurosci.* 2001;13:500–507.