

Nervous System Lyme Disease



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KEYWORDS

- Nervous system • Lyme disease • Neuroborreliosis
- Garin Bujadoux Bannwarth syndrome • Spinal fluid • Diagnosis • Treatment

KEY POINTS

- Lyme disease affects the nervous system in 10% to 15% of infected patients.
- Neuroborreliosis is qualitatively similar in patients infected with US and European strains.
- After the first 3 to 6 weeks of infection, peripheral blood 2-tier serologic testing (enzyme-linked immunosorbent assay with positives/borderlines confirmed by Western blot) is highly sensitive and specific.
- Measurement of intrathecal antibody production (ratio of the proportion of cerebrospinal fluid to serum specific anti-*Borrelia burgdorferi* antibody) is highly specific. Sensitivity is not established but is probably high in central nervous system inflammatory disease.
- Treatment with oral doxycycline is probably effective in most cases of neuroborreliosis.

BACKGROUND

What we do not understand frightens us. For many patients, the most dreaded, difficult-to-comprehend medical disorders are those that affect the nervous system; losing our cognitive abilities or our self-sufficiency is often more frightening than dealing with cancer or heart disease.¹ Unfortunately, many non-neurologist physicians also find neurology intimidating and inexplicable, presumably because of its complexity and quite likely because of the way it is taught in medical school. When patients present with difficult-to-explain symptoms, and their physicians struggle to understand the underlying pathophysiology, there is a tendency to leap to the assumption that the disorder is neurologic. This phenomenon is particularly common with disorders affecting behavior, in which patient symptoms may be out of proportion to objective clinical findings. These symptoms that can arise for medical, physiologic,

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psychological, or other reasons.² What the physician often does not appreciate, however, is that by suggesting that the disorder is neurologic, patients' anxiety levels increase substantially, confounding, if not amplifying, the symptoms.

Much the same can be said of Lyme disease, perhaps because so much is made of what is thought to be nervous system involvement. Because of the focus of attention on the protean nature of Lyme disease, on how it is the great imitator, and how it can cause a subtle encephalopathy, these considerations have come to dominate the conversation.^{3,4} This circumstance has led to a remarkably confrontational atmosphere between patient advocacy groups and mainstream medicine—a confrontation that embodies the tensions between evidence-based and anecdote-based medicine and between patient advocacy and engagement in medical decision making versus fact-based diagnosis and treatment. This infusion of fear of neurologic disease into the conversation about what in the 1970s was a new and poorly understood infectious disease has fueled a debate that shows little sign of abating.

Donald Rumsfeld famously referred to 'known knowns, known unknowns and unknown unknowns.'⁵ The one permutation he omitted is the one that can best address the concerns associated with Lyme neuroborreliosis: the unknown knowns. In fact, there is a large body of information that should be informing this debate. Unfortunately, however, it is misunderstood or completely unknown to many involved in these discussions.

NEUROLOGY 101

Many disorders affect nervous system function; most are not neurologic. Neurologic disease encompasses the broad range of disorders that affect the structure, macroscopic or microscopic, of the peripheral or central nervous systems (PNS or CNS, respectively). Because of the limited regenerative capacity of the nervous system, these disorders tend to cause losses of function that either have limited reversibility or are progressive. In contrast to these intrinsic disorders of the nervous system, disordered nervous system function is ubiquitous. We have all experienced slowed cognition and impaired memory with fatigue, stress, and medical illness. All clinicians appreciate that patients with prominent immune activation, such as those with high fever and a significant infection, be it pneumonia, sepsis, or pyelonephritis, can be confused and exhibit surprisingly impaired function, impairment that disappears with resolution of the infection. Similarly, psychiatric disease can impact an individual's behavior and ability to function. Although many psychiatric disorders may fundamentally be neurochemical, at least at this time these are considered non-neurological disorders, as there is no demonstrable neuroanatomic substrate and because treatment and natural history of psychiatric and neurologic disorders are so fundamentally different.

Differentiating among neurologic disease, psychiatric disorders and the behavioral concomitants of systemic (non-neurologic) disease are usually straightforward.² The confusional state of medical illness is typically fairly acute in onset, fluctuates in time, and includes impairment of memory and orientation but does not seem to affect specific structures or localized functions of the brain. The behavioral abnormalities of psychiatric disease rarely affect orientation, at the extreme can include hallucinations and other evidence of disordered thought processes, but, again, do not affect specific structures or localized functions of the brain. Neurologic disease affects structures or systems; for example, a stroke or tumor can affect speech, unilateral strength, vision, or coordination, depending on location of the insult. A neuropathy affects strength, sensation, and reflexes in a pattern that follows neuroanatomic logic. Amyotrophic lateral sclerosis, Parkinson, and Alzheimer disease each affect specific functionally

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