



# Clinical Guide for Lyme Neuroborreliosis

## CLINICAL EXAM FINDINGS

- Neck pain/stiffness
- Lhermitte's sign
- Vibration sense deficit
- Memory and concentration deficits
- Dysautonomia: dizziness with change in position, Postural orthostatic tachycardia, abnormal sweating
- Tremors/motor tics
- Fasciculations
- Muscle weakness
- Myoclonus
- Cranial Nerve Findings
  - ▶ Convergence/tracking deficit
  - ▶ Facial Asymmetry - uneven smile & mild ptosis
  - ▶ Balance deficit
  - ▶ Pain with eye movement/vision loss

## DIAGNOSTIC CATEGORIES

- Cranial nerve palsy
- Cranial Neuropathy /Cranial neuritis (i.e. Optic, Trigeminal)
- Encephalopathy / Encephalitis / Encephalomyelitis
- Transverse myelitis
- Meningoradiculitis
- Meningitis
- Headache
- Insomnia
- Demyelinating lesions
- Neuropathy: Large and Small Fiber
- Dysautonomia
- Postural orthostatic tachycardia syndrome
- Fibromyalgia
- Chronic inflammatory demyelinating polyneuropathy (CIDP)
- Multiple Sclerosis-like, ALS-like, Parkinsons-like illness
- Dementia (Fronto-Temporal, Alzheimer's-like)
- Radiculopathy, radiculitis
- Stroke, cerebral vasculitis
- Pseudotumor cerebri or increased intracranial pressure
- Psychiatric disease (bipolar, depression, anxiety, psychosis, OCD, suicidal ideation)
- Pediatric Acute-onset Neuropsychiatric Syndrome
- Seizures

## MECHANISM OF NEURONAL INJURY:

- As *Borrelia burgdorferi* enter the central nervous system (CNS) they encounter local immune cells, leading to the **production of proinflammatory cytokines and chemokines**. The chemokine CXCL13 plays a pivotal role in attracting B-lymphocytes into the CNS, resulting in the production of borrelia-specific antibodies which can be measured in the CSF. Antibodies, via molecular mimicry, may inadvertently **target neural antigens, contributing to autoimmune inflammation and demyelination**. *B. burgdorferi* directly adhere to neural and glial cells, causing cytotoxicity and inflammation and the release of neurotoxic substances – nitric oxide and quinolinic acid. These factors exacerbate the **damage to the myelin sheath and disrupt nerve function**, producing findings such as those listed above (Rupprecht et al., 2008).

## IDENTIFY NECESSARY TESTS:

- Evaluating the patient utilizing an academically validated and peer-reviewed questionnaire for Lyme **General Symptom Questionnaire (GSQ)**
- **Lumbar puncture:** Results may support but cannot rule out Lyme disease. Check opening pressure, cell count, protein, glucose, paired Lyme antibody in CSF and blood to look for intrathecal antibody production, PCR and culture (low sensitivity) +/- other infectious studies, encephalitis panel, oligoclonal bands
- **MRI** for lesions / enhancement
- **Electromyography** for large nerve fiber neuropathy
- **Skin punch biopsy** (3mm) for small fiber neuropathy
- **PET scan** for brain metabolic deficit
- **Autonomic testing** w/ tilt table test, Middle cerebral artery doppler, orthostatic BP measurement
- **Hearing test**
- **Ophthalmology** evaluation
- **Electroencephalography (EEG)**
- **Sleep study**

## CONSIDER REFERRAL TO:

- **Neuropsychologist** for testing of cognition / memory; Treatment recommendations; Followup testing for response to treatment; Communicate deficits to school / work for accommodations
- **Mental health provider** to support the patient & family during the recovery process
  - ▶ **Lyme patients are at increased risk of suicide - a strong support system is advised**
- **Physical therapy / Occupational therapy** for work / school specific rehabilitation and pain management
- **Speech therapy** for rehabilitation of cognitive and speech deficits
- **Case management** for assistance with insurance coverage, transportation, appointment coordination, etc.

For references on this clinical tool and for more information on vector-borne illness please visit our **American Academy of Family Physicians accredited CME and resource library** at:

<https://learn.invisible.international>