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Lyme Neuroborreliosis Masquerading as a Brainstem Tumor In a 15-Year-Old

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A 15-year-old boy had onset of unilateral facial weakness. A few days later, he experienced mild vertigo, double vision, and headache. Examination confirmed a peripheral right seventh nerve weakness in addition to an internuclear ophthalmoplegia. The neurologic features suggested a pontine glioma. A T_2-weighted MRI scan revealed demyelinating lesions in the pons and in several areas of the cerebrum, including the periventricular region. Subsequent history revealed that he had been diagnosed with Lyme arthritis 7 years earlier while living in Connecticut. The radiographic studies favored a diagnosis of multiple sclerosis. However, studies of blood and cerebrospinal fluid established a diagnosis of Lyme neuroborreliosis.

Curless RG, Schatz NJ, Bowen BC, Rodriguez Z, Ruiz A. Lyme neuroborreliosis masquerading as a brainstem tumor in a 15-year-old. Pediatr Neurol 1996;15:258-260.

Introduction

North American Lyme disease or borreliosis results from infection by the tick-borne spirochete *Borrelia burgdorferi*. The organism is uncommon in temperate climates. The geographic distribution reported by the Centers for Disease Control in *Morbidity and Mortality Weekly Report* reveals only 12 cases of Lyme disease reported in Florida as compared with 6,418 in New York and 1,478 in Connecticut by 1990 [1]. In the endemic regions, Lyme disease is often included in a differential diagnosis because of the protean clinical manifestations involving skin, heart, musculoskeletal, and nervous systems. The clinical features of Lyme neuroborreliosis (LN) have been described in previous publications [2-7]. Encephalopathy may be manifested by behavioral changes; signs and symptoms of increased intracranial pressure, including a sixth nerve palsy; and unilateral or bilateral facial paralysis. There has not been a description of intranuclear ophthalmoplegia. The case we report is unique because of the abrupt signs of brainstem dysfunction suggesting a single lesion that might have resulted from neoplasia.

Case Report

A 15-year-old Floridian boy was referred for evaluation of a Bell's palsy. Two weeks earlier, he awakened with speech difficulty, numbness, and reduced movement of the right side of his face. For the next 4-5 days, he complained of periodic numbness in his right arm and leg, occipital headaches, double vision, and mild vertigo. The next week, the numbness, vertigo, and headache ceased, but the double vision became more pronounced.

A neurologic review of systems revealed no previous history of unsteadiness, paresthesias, transient visual loss, or a change in personality or cognitive abilities. He had a 2-3 day episode of double vision 6 months before the present illness. Additional history revealed a diagnosis of Lyme arthritis 7 years earlier when the patient lived in Connecticut. Although neither a tick nor a bite was identified, he was treated with an intravenous antibiotic for an uncertain period of time. Nine months before the current illness, he was in St. Louis, Missouri, where he states he was bitten by a "dog tick" on two occasions.

The neurologic examination revealed a cooperative, intelligent teenager with right facial weakness and reduced eye movements. Cranial nerve examination revealed a right lower motor neuron seventh nerve paresis with minimal hypesthesia to pain and light touch over the right face. The ocular examination demonstrated a bilateral medial rectus weakness (left > right) and abducting eye nystagmus consistent with bilateral internuclear ophthalmoplegia. The remaining cranial nerves were normal. Extremity muscle strength, deep tendon reflexes, and plantar reflexes were also normal. Cerebellar function was normal in the upper extremities, but the gait revealed marked unsteadiness accentuated by rapid turning. Position sense was normal, and the Romberg test was mildly positive.

An MRI scan revealed multiple high-signal foci in the white matter on proton-density-weighted and T_2-weighted images (Figs 1 and 2). Periventricular lesions with an elongated (ovoid) shape and orientation perpendicular to the ventricular margin resembled the "Dawson's fingers" pattern of perivascular demyelination of multiple sclerosis (MS) (Fig 1). The hyperintense focus in the corpus callosum abutted the callosal-septal interface (Fig 2). None of the lesions identified on proton density- or

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Received February 23, 1996; accepted May 29, 1996.

PII S0887-8994(96)00172-5 • 0887-8994/96/$15.00

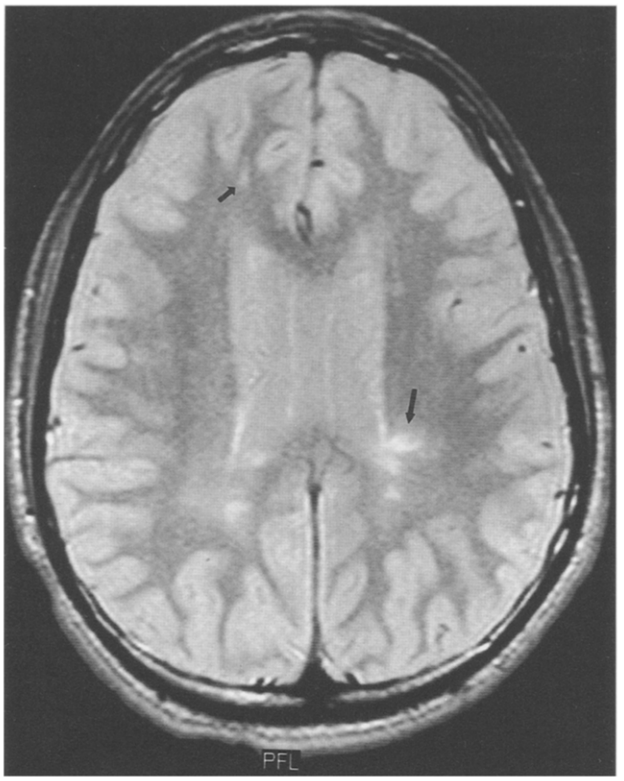


Figure 1. Multiple MRI signal abnormalities in the periventricular white matter. An axial proton density-weighted image demonstrates that some lesions (long arrow) are ovoid, with their major axes perpendicular to the ventricular margin. A subcortical white matter lesion (short arrow) is also evident.

T_2-weighted images had an associated mass effect or enhancement on post-gadolinium T_1-weighted images.

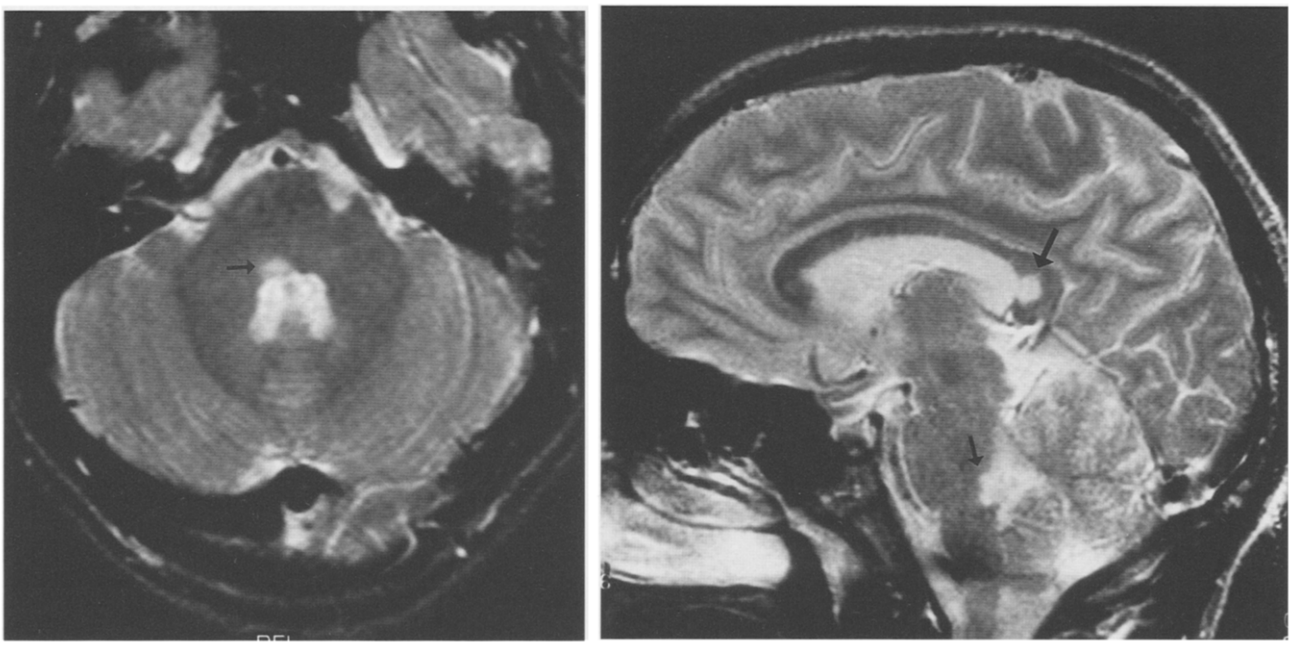
Laboratory workup revealed a normal blood Lyme disease demonstrated by antibody serology by enzyme-linked immunosorbent assay technique. A Lyme IGG antibody demonstrated by Western blot in blood was also negative. The blood Lyme lymphocyte antigen stimulation assay was positive, with a stimulated cpm of 11,120 and a positive Lyme stimulation index. A cerebrospinal fluid (CSF) Lyme antibody index was 0.845 (high). However, the IgM Western blot of CSF was positive, indicating the presence of antibody to at least two specific borrelia proteins. The CSF contained 725 erythrocytes and eight monocytes. The protein level was 36 mg/dl, and the glucose level was 52 mg/dl. The myelin basic protein was 4.0 (normal = 0-4.0).

Treatment with 1 g intravenous ceftriaxone every 12 hr was initiated and continued for 14 days. Neurologic examination 1 week later revealed definite improvement in the patient's right facial movement and ophthalmoplegia.

A repeat MRI scan with and without gadolinium enhancement was obtained 13 months after the first study. The original lesions were unchanged. A new area of increased T_2-weighted signal was noted near the genu of the internal capsule on the right side. No other MRI studies were obtained. The neurologic examination at that time revealed no deficits. All previous signs and symptoms had cleared entirely.

Discussion

Our patient is an unusual example of LN because of the abrupt onset of pontine findings in a teenager, suggesting a glioma. An MRI scan raised the strong probability of MS, but because of the remote history of Lyme arthritis, LN was added to the differential diagnosis. The laboratory analysis of blood and CSF confirmed exposure to the organism. A diagnosis based on the positive CSF Western blot and borderline CSF antibody index of intrathecal antibody production is supported by improvement in neurologic symptoms after parenteral antibiotic therapy. The MRI scan performed 13 months later revealing minimal change from the original study does not alter the differential diagnosis.



A *B*

Figure 2. MRI signal abnormalities in the tegmentum of the pons (short arrow) and in the splenium of the corpus callosum (long arrow). On axial (A) and sagittal (B) T_2-weighted images, the lesions are hyperintense and located near the midline.

White matter abnormalities with periventricular involvement is a common MRI scan finding in MS [8]. Callosal lesions are reported by some researchers to be sensitive and specific for MS [9], but they have been observed in other conditions, including acute disseminated encephalomyelitis. Although MS-like clinical and radiologic features have been described in some LN patients, the frequency of these specific MR findings is not known.

In a series of eight LN children, one had a single periventricular lesion and another had a brainstem lesion [5]. There was no attempt to correlate neurologic symptoms and signs with the MRI scan changes. A report of MRI scan abnormalities in six adults with LN demonstrated a variety of locations for white matter lesions, including the brainstem, subcortical, and periventricular regions [10]. Information about neurologic signs and spinal fluid borrelia studies was not provided.

Neurologic manifestations of borreliosis are less common in children than in adults. In reports of 139 LN patients, only five were less than 18 years of age [2,3,6,11]. All five had Lyme meningitis. Three of the five also had a unilateral facial palsy. Excellent recovery followed antibiotic therapy in each case. In 46 children with Lyme arthritis, a 10 year follow-up revealed neurologic symptoms in only four [12]. The symptoms included headache and memory impairment in two, seizures in one, and optic neuropathy with myelopathy in one. The neurologic complaints in these patients began 4 to 12 years after the onset of arthritis.

In a review of 103 LN patients, Halperin et al. reported 12 adults with a clinical picture of MS, a positive borrelia serology, but no spinal fluid evidence of borrelia infection [2]. They suggested the possibility of the coexistence of MS in patients exposed to the *Borrelia* spirochete in an endemic area. They identified 21 adults and one child with acute-onset encephalomyelitis. The child had no focal abnormalities, but 20 of the 21 adults had focal central nervous system deficits and/or a peripheral facial paralysis. Sixteen had MRI scan abnormalities and 14 demonstrated good neurologic recovery on antibiotics. Four of 15 patients with acute meningitis exhibited facial weakness and two exhibited abducens palsy. Five of the 15 were 18 years of age or more, and three of the five exhibited facial palsy. Excellent recovery followed antibiotic therapy in this group.

Western blot increases the specificity of serologic testing in Lyme disease [13]. In addition, a polymerase chain reaction analysis of CSF is now available to identify *Borrelia burgdorfei* DNA [14]. As with other microorganisms, DNA analysis is highly specific, with only 3% false-positives. However, 54% of definite or probable cases have false-negative or indeterminate results.

The abrupt onset of focal brainstem symptoms in LN has not been documented in children or adults. Childhood neuroborreliosis presents as acute meningitis in most cases, and the neurologic findings of facial paralysis and/or the nonfocal encephalopathic complaints of headache and disturbed mentation are the neurologic features in more than 90%. The uncommon occurrence of LN in children is emphasized by the 9% incidence in a large group of children with Lyme arthritis. However, the potential for neurologic improvement with antibiotic therapy emphasizes the importance of considering the diagnosis even in regions with a low incidence of Lyme disease.

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