West Nile Virus Encephalitis in a Child with Left-Side Weakness

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West Nile virus typically causes self-limited fever with flulike symptoms; pediatric cases are rare. We report a unique case involving a 7-year-old girl with left-side weakness and focal temporal lobe findings resembling herpes encephalitis.

Case report. A 7-year-old girl presented with a 2-day history of fever (temperature, \( \leq 37.9^\circ\text{C} \)), headache, and vomiting. On the morning of hospital admission, the patient complained of left-side weakness with stiffness of her left arm; she was unable to walk. The patient had previously been healthy. She denied tick or animal exposure but had received multiple mosquito bites 4 days before hospital admission.

On arrival at a community hospital, the patient’s temperature was 40.3°C. Her peripheral WBC count was 19,200 cells/\( \mu\text{L} \), with 92% segmented neutrophils and 5% monocytes. A complete metabolic panel revealed an elevated serum glucose level (148 mg/dL) and normal liver transaminase levels. The findings of a CT of the brain without contrast were normal. Lumbar puncture revealed a WBC count of 140 cells/\( \mu\text{L} \), with 82% lymphocytes and 13% granulocytes, an RBC count of 30 cells/\( \mu\text{L} \), an elevated glucose level (93 mg/dL), and a normal protein level (44 mg/dL). The patient was treated with 1 dose of intramuscular ceftriaxone and transferred to our tertiary care children’s hospital.

At our emergency department, the patient had a temperature of 38.7°C, a pulse of 112 beats/min, a respiratory rate of 20 breaths/min, and blood pressure of 91/51 mm Hg. During the physical examination, the patient was alert and active, without evidence of photophobia, nuchal rigidity, or speech slurring. Examination revealed that the cranial nerves II–XII were intact.

Muscle strength was diminished, with 3/5 noted in the left arm, 4/5 in the left leg, and 5/5 on the right side. The patient demonstrated delay when prompted to move her left arm voluntarily. Deep tendon reflexes were normal. She also had an abnormal gait with occasional stumbling but no foot drop. Cerebellar function was normal. She had a diffuse, blanching macular rash over her trunk and lower extremities.

MRI of the brain revealed T2-weighted prolongation and a bright signal on diffusion-weighted imaging in the right posterior temporal lobe (figures 1 and 2). These findings were more suggestive of cerebritis than an infarct. Treatment with vancomycin, cefotaxime, and acyclovir was initiated.

Rapid clinical improvement was apparent within 24 h, with resolution of the headache and the rash. Low-grade fever persisted until the fifth hospital day. Lower-extremity weakness improved rapidly, and the patient was able to walk without assistance by the third hospital day. An electroencephalogram (EEG) revealed focal slowing in the right central temporal lobe and occasional discharge from the right temporal lobe, with epileptic potential but no periodic lateralizing epileptiform discharges. Clinical seizures were not apparent.

The results of CSF and blood cultures were negative, and antibiotic therapy was discontinued on the second hospital day. The results of PCR for the detection of herpes simplex virus (HSV) and enterovirus in CSF specimens were also negative. A second lumbar puncture was performed on hospital day 4. Examination of the CSF revealed an RBC count of 1 cell/\( \mu\text{L} \) and a WBC count of 108 cells/\( \mu\text{L} \), with 30% granulocytes and 62% monocytes. The result of a second HSV PCR test was negative. The results of viral cultures of throat and rectal specimens were negative. The results of serologic tests and PCR of a throat specimen for *Mycoplasma pneumoniae* were negative, and the results of serologic tests for Epstein-Barr virus were consistent with past infection. The result of a diagnostic study for hypercoaguability was also negative (i.e., normal levels of factor V Leiden, homocysteine, antithrombin III, and protein C and S were detected).

Given the focal temporal lobe findings on EEG and MRI, HSV encephalitis was considered the most likely diagnosis, despite the 2 negative results of HSV PCR tests of CSF specimens. The patient was discharged home on the sixth hospital day with orders to complete 21 days of acyclovir therapy through a percutaneous central catheter. At discharge, mild weakness of the left hand was the only apparent neurologic deficit.

One week after discharge, WNV infection was confirmed when the Centers for Disease Control and Prevention (CDC;
Atlanta, GA) laboratory reported that both the child’s serum and CSF specimens contained IgM antibody to WNV (IgM capture ELISA; Division of Vector-Borne Infectious Diseases, CDC, Fort Collins, CO). The IgM capture ELISA result was also positive for St. Louis encephalitis (SLE) virus. A serum dilution–plaque reduction neutralization titer (PRNT) was positive for WNV at 160 and negative for SLE virus. A CSF specimen was also sent to a commercial laboratory (Focus Technologies; Cypress, CA) for immunofluorescent antibody testing for other arboviruses. No antibodies to SLE virus, California virus, or eastern or western equine encephalitis viruses were detected. Convalescent-phase serologic testing was not done.

Acyclovir therapy was discontinued. Two weeks after hospital discharge, the patient had mild left hemiparesis and was having some learning difficulties. An additional MRI revealed atrophy of the right cerebral hemisphere (figure 3).

Four months after the onset of illness, the patient manifested inattentiveness, impulsivity, and learning problems in school, consistent with injury to the middle and inferior temporal gyri. She also complained of intermittent tinnitus. The findings of a mental status examination were notable for difficulties with calculations and mild comprehension abnormalities. No residual muscle weakness was detected, and the findings of an EEG were normal. Eight months after the onset of illness, the patient had persistent difficulties with memory and comprehension.

**Discussion.** Only 1 in 150 individuals infected with WNV develop significant neurologic symptoms [1, 2]. Encephalitis is more common than meningitis (63% vs. 29% of patients with neurologic symptoms) [3]. Muscle weakness is common. Acute flaccid paralysis was recently reported in 6 WNV-infected patients who developed acute-onset asymmetrical weakness and areflexia [4–6]. Neurologic findings for these 6 patients suggest involvement of the anterior horn cells of the spinal cord that resemble poliomyelitis. Ataxia, cranial nerve involvement, myelitis, optic neuritis, polyradiculitis, and seizures occur rarely [1]. The likelihood of symptomatic WNV infection, including neurologic symptoms, increases with age. Because WNV infection is diagnosed less frequently in children, the neurologic manifestations of WNV infection in children have not been well described.

In the 1999 outbreak of WNV infection in New York City, the median age of 59 hospitalized patients was 71 years (range, 5–90 years). The attack rate of encephalitis was 20 times greater in persons aged ≥50 years than in those aged <50 years. In fact, only 12% of the cases from 1999 were found in individuals aged <50 years, with 2 cases in children aged <16 years [3]. A 15-year-old boy presented with fever, confusion, cranial nerve deficits, ataxia, and brisk tendon reflexes, which are consistent with a rhomboencephalitis. CNS imaging findings were normal at presentation and 1 month later [7]. Mild neurologic findings lingered for several months after hospital discharge. A 5-year-old boy developed aseptic meningitis; he recovered completely without a complicated hospital stay [8].

In 2000, a total of 19 cases involving hospitalization were reported (age range of patients, 36–87 years); none of the cases involved children aged <16 years [8]. In 2001, a total of 66 documented cases of WNV infection occurred, with a mean patient age of 68 years (range, 9–90 years) [9]. It is unknown how many of these cases involved children aged <16 years.

As of 10 October 2002, a total of 37 preliminary cases of
WNV infection in children aged <11 years had been reported to the CDC. Twenty-three children had meningoencephalitis (Daniel O’Leary, CDC, personal communication). Details of the neurologic manifestations of disease in these children have not been published.

Few case reports describing WNV infection in children have been published. Mancias et al. [10] described an 11-year-old girl with aseptic meningitis and flaccid paralysis of the left arm. MRI of the cervical spine demonstrated signal abnormalities of the central gray matter on T2 sequences between C3 and C7, left greater than right. Findings from an MRI of the brain were normal.

Reports from regions where WNV is endemic provide limited data about disease in children. During 2000, 417 confirmed cases of WNV infection occurred in Israel, including 24 cases in children. Twenty-three of these 24 cases involved mild disease, with aseptic meningitis being the most common manifestation. The most severe pediatric case involved a 4-year-old immunocompromised boy with Hodgkin lymphoma [11]. He presented with lethargy and generalized seizures. He also developed a motor aphasia. The findings of CT of the brain were normal, and the patient made a complete recovery.

Deaths in children associated with WNV infection appear to be rare. During an outbreak of infection in southern Russia in 1999, a 16-year-old male patient died after developing meningoencephalitis; WNV was isolated from a brain tissue specimen [12]. Seven cases of WNV infection were identified in Romania that same year. The single fatality was a 16-year-old boy with meningoencephalitis complicated by a brain abscess [13].

The sudden onset of left-side weakness in our patient, along with clinical and radiographic findings involving the right temporal lobe, is a previously unreported presentation of WNV encephalitis. Clinically, this patient’s illness was suggestive of HSV encephalitis. Other arbovirus infections, including LaCrosse encephalitis, are known to mimic herpes encephalitis, with focal seizures involving the temporal lobe [14]. A case of western equine encephalitis masquerading as herpes encephalitis has also been reported [15]. Our patient resided in Kentucky, a state where infection with either of these viruses is unusual. In fact, no cases of arboviral encephalitis were reported in Kentucky in 2001, the year preceding our patient’s infection [16]. Enterovirus is the most common cause of viral meningoencephalitis in this area. Uncomplicated aseptic meningitis without focal neurologic findings is typical of enteroviral meningitis, although enterovirus 71 infection has been associated with rhomboencephalitis and acute flaccid paralysis [17].

WNV infection was considered in this patient because she had recent mosquito bites and resided in a neighborhood where there had been a confirmed case of WNV infection. This case underscores that a diagnosis of arbovirus infection, including WNV infection, should be considered for children who present with signs of viral encephalitis in warm-weather months. Moreover, unusual findings (such as those described in our case) should not discourage the clinician from pursuing the possibility of this etiology, especially when a specific cause cannot be elucidated.

WNV infection is generally considered to be a mild disease in children. This case highlights the fact that severe neurologic disease with long-lasting sequelae can occur in children.

References