Opsoconlus Persisting During Sleep in West Nile Encephalitis

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Background: Recent outbreaks of West Nile virus infection have alerted the public to disabling paralysis as an outcome. Ocular motor involvement with West Nile virus is rare.

Objective: To describe a patient with West Nile virus encephalitis that resulted in opsoconlus-myoclonus syndrome with persistent ocular oscillation on electroencephalography during stage 2 sleep.

Patient: A 53-year-old man who presented with viral prodrome followed by intense vertigo and encephalopathy. In addition to multifocal myoclonic jerks in the extremities, his eye movements were disrupted by bursts of high-frequency, conjugate ocular oscillations that occurred in random directions.

Results: Electroencephalography showed eye movement artifacts during the awake state and stage 2 sleep. Opsoconlus-myoclonus syndrome remained disabling 3 months after onset but markedly improved 8 months after onset.

Conclusions: West Nile virus is another cause of opsoconlus-myoclonus syndrome that can occur in conjunction with encephalitis. The presence of an eye movement artifact on results of electroencephalography during stage 2 sleep should raise suspicion for opsoconlus.

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THOUGH 80% OF WEST Nile virus (WNV) infections are asymptomatic, infected patients may present with a variety of clinical neurological manifestations.1 In this report, we describe a serologically confirmed case of WNV encephalitis with opsoconlus-myoclonus syndrome (OMS) in which the patient showed persistent ocular oscillations during stage 2 sleep, remained disabled 3 months after the onset of his illness, and markedly improved 5 months thereafter.

REPORT OF A CASE

A 53-year-old man with chronic hypertension, coronary artery disease, and left leg traumatic amputation presented with malaise and irritability of 2 weeks' duration followed by high fever (temperature, 40.5°C), dysuria, and severe frontal and cervical pain. A urinary tract infection was diagnosed and gatifloxacin (Tequin) was administered, but the patient showed no improvement. A few days prior to hospitalization, he had developed involuntary eye movements and jerking of the muscles in his upper limbs, along with intense, brief attacks of vertigo. On examination, the patient was an ill-looking, tremulous man with neck stiffness. He was hemodynamically stable and had no rash or lymphadenopathy. He had a fluctuating clouding of consciousness with confusion. There were no signs of meningeal irritation. His language was normal but he exhibited scanning speech. Muscle strength and tendon reflexes were normal and symmetrical, with a flexor right plantar response. There were prominent, involuntary, myoclonic muscle jerks, with intermittent action tremor in the upper extremities. When asked to look at a target, the patient’s visual fixation was disrupted by bursts of high-frequency, conjugate ocular oscillations that had horizontal, vertical, and torsional components, all of which indicated opsoconlus (a video is available online at http://www.archneurol.com). Opsoconlus, but not myoclonus, was present during sleep (see the online video). The rest of the cranial nerve examination results were normal. He was unable to walk. Findings of a computed tomographic scan of the head were normal (a magnetic resonance image could not be obtained because of the patient’s cardiac pacemaker). An analysis of cerebrospinal fluid showed lymphocytic pleocytosis (white blood cell count, 81/µL; 87% lymphocytes, 12% monocytes, and 1% neutrophils), with a total protein level of 0.11 g/dL and a glucose level of 52 mg/dL (3.1 mmol/L). Gram stain and cultures yielded negative results, including stains and...
West Nile virus is a single-stranded RNA flavivirus and a member of the Japanese encephalitis virus serocomplex. Rare neuro-ocular invasions cause a variety of ocular syndromes. The ocular findings include multifocal chorioretinitis and optic neuritis. The report of a similar syndrome is encountered in patients with encephalitis, in association with certain neoplasms (notably, neuroblastoma in children and gynecological cancers in adults) and certain toxins. The onconeural antibodies associated with OMS are anti-Ri antibodies (gynecologic cancers) and, less frequently, anti-Hu, anti-Yo, and anti–Ma-2 antibodies. Epstein-Barr virus, Coxsackie virus, and enterovirus have been incriminated in OMS.

The pathophysiology of opsoclonus is debated. Horizontal saccades are generated by burst neurons lying in the paramedian pons, and vertical saccades are generated by burst neurons lying in the rostral midbrain. The activity of both populations of burst neurons is gated by omnipause neurons, which are glycinergic and lie in the pontine raphe. One current hypothesis for opsoclonus is that it arises from an inherent instability of the brainstem burst neuron network, which becomes evident when omnipause neurons fail to hold burst neurons in check. Opsoclonus is often precipitated or exacerbated by blinking or eyelid closure, both of which may suppress omnipause neurons. Although opsoclonus may persist during sleep, our documentation of eye movements during stage 2 sleep could be evidence that omnipause neurons were affected by brainstem encephalitis in our patient. During drowsiness, slow roving eye movements are frequently present on EEG, but no rapid, conjugate eye movements are recorded during non–rapid eye movement sleep. The persistence of opsoclonus and eye movements on the EEG during stage 2 sleep, as seen in our patient, suggested probable instability of the brainstem burst neuron network, with intact thalamocortical circuits generating sleep spindles. The published description of 2 patients with spinocerebellar atrophy who had slow saccades and abnormal sleep architecture suggested the involvement of neural circuitry in the brainstem. A subsequent study identified a possible switch mechanism, thought to be coordinated by 2 sets of pontine neurons. An alternative hypothesis is that opsoclo-
nus arises because of impaired control of the brainstem saccade-generating network by the cerebellum\(^12\); thus, our patient showed prominent ataxia. However, viral cerebellitis per se would not be expected to cause impaired consciousness, which was a feature of his illness. In any case, our demonstration of rapid eye movement during stage 2 sleep provides another detail of OMS that any hypothesis for this disorder must address.

In a 2003 outbreak of WNV infection in North America, 2 cases with OMS were reported. One of these occurred in a potentially immunocompromised subject with non–small cell lung cancer, which was the cause of death\(^13\); thus, there is some doubt as to whether WNV was primarily responsible for the OMS. The second case\(^14\) mimicked the symptoms of our patient (except for the prompt improvement upon hospital discharge) but without a recognized EEG or sleep abnormality.

In summary, we document a case of OMS due to WNV infection in which ocular oscillations persisted during stage 2 sleep. For electroencephalographers, the presence of rapid eye movement artifact during stage 2 sleep should raise the suspicion for opsonoclus.

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**REFERENCES**


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