West Nile virus meningoencephalitis during pregnancy: Case report with MR imaging findings

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Abstract MR imaging findings of West Nile virus meningoencephalitis during pregnancy are unknown. We report the first case of serologically proved West Nile virus meningoencephalitis complicating pregnancy with MRI findings. MR imaging of the brain revealed abnormal hyperintensity in the periventricular white matter near the left frontal horn and insular left lobe on fluid-attenuated inversion recovery and T2-weighted images. Evolution was favorable, and no obvious fetal consequences of infection were noted after birth. Recognition of the MR imaging appearance of this entity is important because of the expanding epidemic.

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1. Introduction

West Nile virus (WNV) is an important public health problem in several countries. It is the most widespread arbovirus in the world (1). WNV is maintained in nature in a cycle between birds and mosquitoes (2). In Tunisia, two peaks of epidemic meningitis and meningoencephalitis due to WNV were reported: one in 1997 and the other in 2003 (3).

MR imaging suggests abnormalities in the brain and meninges of WNV-infected patients presenting with Cerebral Nervous System (CNS) disease (4–6). However, most of these studies were performed retrospectively. Thus, the results do not provide predictive capabilities to WNV infection (2).

2. Case report

A healthy 29-year-old (gravida 2, para 1) woman from the south of Tunisia presented to the Infectious Diseases Department at 38 weeks gestation with a 7-day history of fever, headache and dysarthria. The patient was febrile to 38.5 °C (101.3°F). No nuchal rigidity or focal neurologic signs were revealed. Cerebrospinal fluid (CSF) showed 80 nucleated cells...
predominantly of lymphocytes (95%). The CSF protein and glucose concentrations were 68 and 50 mg/dL, respectively, and Gram’s stain showed no bacteria. Serum glucose was 101 mg/dL at the time of the lumbar puncture. Brain magnetic resonance imaging (MRI) revealed abnormal hyperintensity in the periventricular white matter near the left frontal horn and insular left lobe on fluid-attenuated inversion recovery (FLAIR) and T2-weighted images (Fig. 1). A discrete hypointensity was noted on T1-weighted images. Diffusion-weighted (DW) imaging was normal. Antibiotic therapy was begun using ampicillin 2 g i.v. every 4 h, cefotaxime 3 g i.v. every 4 h and acyclovir 750 mg i.v. every 8 h. The antiviral treatment was discontinued when CSF herpes simplex virus polymerase chain reaction returned negative. Her fever resolved, and she noted improvement in her symptoms within 5 days of admission. Tests for common bacterial, mycobacterial, viral and fungal causes of meningitis were negative. Ultrasonography and fetal heart rate monitoring were normal. Serologic testing subsequently secured the diagnosis of WNV with the detection of IgM and G antibodies in the serum and CSF. Antibiotics were discontinued when recent WNV infection was confirmed. Supportive measures were instituted for her symptoms. After 2 weeks, she vaginally delivered a newborn in good health conditions. Follow-up MRI 3 months later showed persistence of the T2 hyperintense regions seen previously and noted a new lesion at the right semi-oval center on FLAIR sequences (Fig. 2). There was no enhancement after intravenous contrast administration. After 6 months of follow-up, the patient and newborn were in good health.

3. Discussion

Many WNV infections are asymptomatic. Symptoms may develop in 20–40% (7). Less than 1% of infected individuals

![Figure 1](https://example.com/figure1.png)

**Figure 1** Images at the time of admission, in the case of a 29-year-old pregnant woman with serologically proved West Nile virus meningoencephalitis. (A) Axial fluid-attenuated inversion recovery MR image reveals hyperintensity in periventricular white matter near the left frontal horn. (B) Axial fluid-attenuated inversion recovery MR image reveals hyperintensity in insular left lobe. (C) Axial fast spin-echo T2-weighted MR image shows hyperintensity in periventricular white matter near the left frontal horn. (D) Axial fast spin-echo T1-weighted MR image shows a discrete hypointensity in periventricular white matter near the left frontal horn.
develop severe neuroinvasive diseases that can be classified into three clinical syndromes: West Nile meningitis, West Nile encephalitis, and acute flaccid paralysis (8).

Serological testing of serum and CSF remains the gold standard for the diagnosis of human WNV infection (9,10). Typical CSF findings in WNV neuroinvasive disease include pleocytosis (polymorphonuclear or lymphocytic predominance), with elevated protein but normal glucose levels (11). There is a report of 3 women who had WNV encephalitis during pregnancy (12–14). MRI of the brain revealed non-specific inflammatory changes. Our patient is the first reported case of a pregnant woman with MRI findings.

MRI is preferred over computed tomography for detecting the brain involvement in viral encephalitis as it has superior contrast resolution. The incidence of acute MRI abnormalities in WNV neuroinvasive infection was extremely variable (4,6,15). In a recent series of 39 consecutive cases including meningitis and meningoencephalitis with WNV, MRI was unremarkable in all except one patient (4). However, in two more recent series (5,6), around 70% of WNV-infected patients with CNS diseases had abnormal MRI findings. In the first study, (5) 24% (4/17) had abnormalities only on DW imaging involving the corona radiata and internal capsule, 18% (3/17) had abnormal signal intensity on FLAIR or T2-weighted sequences (in the cortical gray and white matter, cerebellum, basal ganglia, thalamus, internal capsule, pons and midbrain), 12% (2/17) had meningeal enhancement, and 18% (3/17) had abnormalities involving the spinal cord, cauda equina or nerve roots (10). So, lesions are typically hyperintense on T2-weighted and FLAIR sequences and normal intensity and nonenhancing on T1-weighted images (5,16).

Restricted water diffusion may be seen on DW images in up to 50% of patients and can assist in the confirmation of subtle abnormalities seen on T2 or FLAIR sequences (6). Periventricular hyperintensities were also reported in 6–14% of cases (5,6,16). Patients with normal MRI or only DW-images abnormalities had the best prognosis, whereas those with T2 and FLAIR abnormalities had worse outcomes (10).

Although anterior horns of spinal cord are the major site affected in WNV infection, inflammatory changes may also involve spinal sympathetic neurons and ganglia, explaining the autonomic instability seen in some patients (17,18).

A WNV MRI registry was established by the CDC in the hope that, as imaging data are accumulated and consolidated, a more comprehensive picture of the imaging characteristics of WNV infection will emerge (10,15).

The teratogenic potential of WNV remains unknown and requires further study. Guidelines were published for evaluating pregnant women with WNV infection (19). Those patients should undergo regular prenatal checkups including ultrasound examinations to assess fetal development.

At present, there is no specific therapy for WNV infection and current treatment remains largely supportive (10,20).

4. Conclusion

In this case of serologically proved WNV meningoencephalitis during pregnancy, hyperintensities were observed in the periventricular white matter near the left frontal horn and insular left lobe on FLAIR sequences and T2-weighted images. The recognition of MRI features of WNV infection will aid in the diagnosis of a disease that often presents with a protean clinical picture.

Conflict of interest statement

No conflict of interest.

References


