West Nile Virus Encephalitis with Status Epilepticus Treated with High Dose Steroids: A Case Study

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Introduction

- WNV neuroinvasive disease is very uncommon, with 25,849 cases reported from 1999 to 2020 and 9% mortality rate.[1] WNV neuroinvasive disease is the presence of encephalitis, meningitis, or acute flaccid paralysis.[2] Patients can uncommonly present with status epilepticus.
- There is no clear evidence-based treatment for WNV infection other than supportive therapy. There is some limited, but conflicting, data regarding the use of steroids as a potential treatment for WNV neuroinvasive disease.

Case Presentation

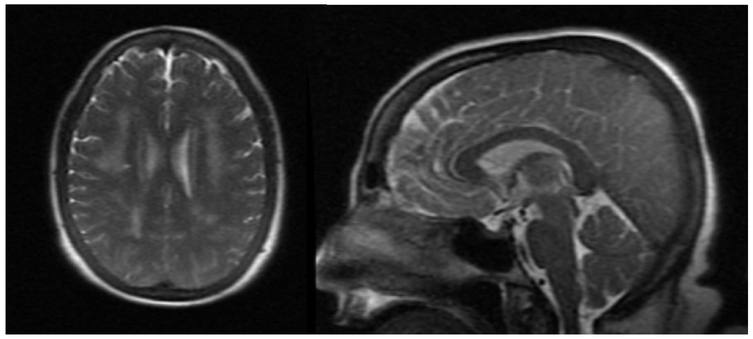
- A 55-year-old female with past medical history of hypertension, migraines, and osteoarthritis, presented to the emergency department for altered mental status. The patient's history was obtained from her husband who reported that she had a severe headache from the day prior. On the day of presentation, the husband found the patient on the bathroom floor; she was only able to respond 'yes' and was unable to get up. The husband noted that the patient did have a cough for the past few days.
- Upon admission, patient was aphasic and tried to follow commands with her right arm but showed no movement in other extremities. Her physical exam was otherwise unremarkable. Admission Computed Tomography (CT) Head showed no acute abnormalities. Magnetic Resonance Imaging (MRI) Head showed findings of extensive nonspecific non-enhancing periventricular and subcortical white matter.
- Overnight, the patient was found to be septic. With concern for infectious cause, cultures were drawn, and empiric antibiotics were started.
- Electroencephalography (EEG) showed background activity consisted of well-regulated 2-3 rhythmic sharp wave activity intermittently throughout the recording and corresponding video showed generalized clonic activity, which indicated clinical status epilepticus.
- Patient was given lorazepam, fosphenytoin, levetiracetam. Patient was intubated and sedated, propofol drip was initiated, phenobarbital was added. Patient was placed on continuous EEG monitoring, showed frequent seizures and other epileptiform discharges. Summary of continuous EEG findings are in the table. Antibiotics were switched to ceftriaxone, ampicillin, vancomycin, acyclovir for better empiric coverage of nervous system causes of infection.
- After lumbar puncture, empiric antibiotics were discontinued once negative cultures came back. Patient was started on high dose methylprednisolone 1g intravenously for possible autoimmune cause as some labs were still pending. Lumbar puncture (LP) findings are in the table.
- West Nile Virus meningoencephalitis was diagnosed following the review of the patient's LP results. IV steroids were continued. Patient remained on maintenance doses of phenobarbital, fosphenytoin, and levetiracetam.
- Patient was intubated for a total of 11 days; sedation was weaned, and patient was extubated. Seizures continued until day ten on EEG, improved and eventually resolved after steroids and antiepileptics at which point patient was transitioned to oral antiepileptics. After being in the hospital for 19 days, the patient was determined to be a suitable candidate for inpatient rehabilitation and was discharged.

Vitals / CSF Findings

Value (Reference)	Admission	Overnight
Temperature (98.6°F)	98.4	102
Heart Rate (60-100 bpm)	113	118
Respiratory Rate (12-20 breaths/min)	18	18
Blood Pressure (120/80 mmHg)	137/82	153/88
WBC Count (5,000-10,000/mm3)	11.5	17

Lab (Reference value)	Patient results
WBC (0-5 cells/µL)	125
Protein (15-40 mg/dL)	73
Glucose (50-80 mg/dL)	59
CSF VDRL	Negative
HSV ½	Negative
Cryptococcus	Negative
West Nile IgG	Negative
West Nile IgM	Positive

Magnetic Resonance Imaging



MRI Head showing findings of extensive nonspecific non-enhancing periventricular and subcortical white matter.

Electroencephalography

Day	Description of Findings
Day 1	Seizures, generalized periodic epileptiform discharges, and burst suppression
Day 2	Presence of frequent seizures and other epileptiform discharges
Day 3	Several short seizures and periods of burst suppression
Day 5	Presence of delta as well as rhythmic activity
Day 8	Presence of generalized rhythmic delta activity
Day 10	Abnormal EEG, no seizures, no epileptiform discharges
Day 12	No indication of seizures, epileptiform discharges

Discussion

- WNV neuroinvasive disease has a wide variety of clinical manifestations. Supportive care is currently the standard of care. Long term outcomes appear mixed in prior studies, however, patients with neuroinvasive disease generally have worse outcomes.[3]
- Several case reports show WNV neuroinvasive disease treated with high dose steroid therapy.[4] Meanwhile, a clinical investigation by Murray et al. (2008) showed that patients with WNV neuroinvasive disease had no difference in hospitalization duration with treatment with steroids or just supportive therapy.[5]
- One case presented a patient with WNV neuroinvasive disease in status epilepticus. The patient was treated with multiple antiepileptic medications, without any IV steroids. The patient ended with a poor outcome.[6]
- Further research is needed to determine the effect steroids has on the course of WNV neuroinvasive disease. Steroids can be anti-inflammatory, helping decrease the immune mediated injury and perivascular inflammation.[7] Steroids can be immunosuppressive, which can help manage elevated levels of pro-inflammatory cytokines in WNV neuroinvasive disease.[8]
- In this case, the patient did remarkedly well with her severity of disease, when treated with high dose IV steroids and antiepileptic medications. Patients in this age range with WNV neuroinvasive disease have poor outcomes or have permanent neurological deficits.

Conclusion

- There are currently no definitive guidelines for management of WNV neuroinvasive disease other than supportive measures.
- This case shows rapid resolution of symptoms with high dose IV steroids. Further research should be directed towards the role of steroids as an avenue for treatment.

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