Herpes simplex encephalitis

Key concepts

- a hemorrhagic viral encephalitis with a predilection for temporal lobes
- definitive diagnosis requires brain biopsy
- optimal treatment: early administration of IV acyclovir

Herpes simplex encephalitis (HSE) AKA multifocal necrotizing encephalomyelitis, is caused by the herpes simplex virus (HSV) type I. It produces an acute, often (but not always) hemorrhagic, necrotizing encephalitis with edema. There is a predilection for the temporal and orbitofrontal lobes and limbic system.

Epidemiology

Estimated incidence of HSE: 1 in 750,000 to 1 million persons/yr. Equally distributed between males and females, in all races, in all ages (over 33% of cases occur in children 6 mos to 18 yrs), throughout the year.  

Presentation

Patients are often confused and disoriented at onset, and progress to coma within days.

Diagnosis

Diagnosis can often be made on the basis of history, CSF, and MRI.

1. CSF: leukocytosis (mostly monos), RBCs 500–1000/mm3, (NB: 3% have no pleocytosis), protein rises markedly as the disease progresses. HSV antibodies may appear in the CSF but takes at least = 14 days and is thus not useful for early diagnosis

Polymerase chain reaction (PCR) analysis of cerebrospinal fluid (CSF) has revolutionized the diagnosis of nervous system viral infections, particularly those caused by human herpesviruses (HHV). The PCR technique allows the detection of minute quantities of DNA or RNA in body fluids and tissues. Both fresh-frozen and formalin-fixed tissues may be utilized for PCR assays, with the latter making archival studies possible. CSF PCR has now replaced brain biopsy as the gold standard for the diagnosis of herpes simplex virus (HSV) encephalitis. PCR analysis of both CSF and nervous system tissues has also broadened our understanding of the spectrum of disease caused by HSV-1 and -2, cytomegalovirus (CMV), Epstein-Barr virus (EBV), varicella zoster virus (VZV) and HHV-6. PCR results obtained from tissue specimens must be interpreted cautiously, since this highly sensitive technique may detect portions of viral genomic material that may be present even in the absence of active viral
infection. Tissue PCR results in particular must be corroborated with clinical and neuropathologic evidence of central nervous system (CNS) infection. In several neurological diseases, negative PCR results have provided evidence against a role for herpesviruses as the causative agents 2).

2. EEG: periodic lateralizing epileptiform discharges (PLEDs) (triphasic high-voltage discharges every few seconds) usually from the temporal lobe. EEG may vary rapidly over a few days (unusual in conditions mimicking HSE)

3. CT: edema predominantly localized in temporal lobes (poorer prognosis once hemorrhagic lesions visible). In one review, 38% of initial CTs were normal 3) (many were on early generation CT scanners or were done within 3 days of onset). Hemorrhages were apparent in only 12% of the initially abnormal CTs

4. MRI: more sensitive than CT 4), demonstrates edema as high signal on T2WI, primarily within the temporal lobe, with some extension across sylvian fissure (“Transylvanian sign”) 5), especially suggestive of HSE if bilateral. Differentiate from MCA infarct (which may also span sylvian fissure) by typical arterial distribution of the latter. Enhancement doesn’t occur until the 2nd week

5. technetium brain scan: process localized to temporal lobes

6. brain biopsy: false negatives may occur 6).

**Brain biopsy**

see Brain biopsy for Herpes simplex encephalitis.

**Differential diagnosis**

There are a few cases reported in the literature in which a diagnostic dilemma between was raised between herpes simplex encephalitis and brain glioma, and a definitive diagnosis was difficult to be obtained

When confronted with confounding data that can pose a diagnostic dilemma between HSV encephalitis and glioma, brain biopsy and PCR of CSF samples could be able to verify the definite diagnosis 7).

**Complications**

Intracerebral hemorrhage and ischemic stroke are increasingly recognized complications of central nervous system (CNS) infection by herpes simplex virus (HSV).

Hauer et al. found distinct pathogenesis, cause, and outcome for HSV-related cerebral hemorrhage and infarction. Vessel disruption within a temporal lobe lesion caused by HSV-1 is the presumed mechanism for hemorrhage, which may potentially have a fatal outcome. Brain ischemia is mostly related to multifocal cerebral large vessel vasculitis associated with HSV-2, where the outcome is more favorable 8).
**Treatment**

**Herpes simplex encephalitis treatment**

**Case series**

Basaran et al. aimed to explore distinctive clinical and laboratory features of HSV-1 encephalitis. All of the adult patients with viral encephalitis hospitalized between 2011-2017 were enrolled, including 16 patients with HSV-1 encephalitis and 51 patients non-HSV-1 viral encephalitis. The determination of viruses in cerebrospinal fluid was performed by PCR tests. Female sex, hyponatremia, and abnormalities in MRI were independently associated with HSV-1 encephalitis (p < 0.05 for each). In particular, hyponatremia (< 135 mEq/L) was found in nine patients with HSV-1 encephalitis (56.3%) and 10 patients with non-HSV-1 viral encephalitis (19.6%) (p = 0.005). As serum sodium is determined easily and quickly in clinical practice, the presence of hyponatremia among patients with viral encephalitis could be helpful for the early diagnosis of HSV-1 encephalitis before cerebrospinal fluid PCR results were available. Moreover, the presence of positive findings in MRI could further support the diagnosis. This is the first study that compared the serum sodium levels among patients between HSV-1 and non-HSV-1 viral encephalitis. We thus propose the diagnostic value of hyponatremia for HSV-1 encephalitis.

**Case reports**

McLaughlin et al. presented the 40th known case of herpes simplex virus (HSV) encephalitis following the neurosurgical intervention and review the previously reported cases. In their review, the authors observed positive HSV polymerase chain reaction (PCR), which had initially been negative in several cases. In cases in which there is a high suspicion of HSV, it may be prudent to continue antiviral therapy and retest CSF for HSV PCR. Antiviral therapy significantly reduces mortality associated with HSV encephalitis.

A case of a 78-year-old woman with no known prior history of HSVE and declining mental status eleven days after posterior C3-T1 decompression and instrumented fusion following resection of an intradural extramedullary tumor confirmed to be meningioma on final pathology. Reactivation of HSV-1 encephalitis was suspected to be the underlying cause of her symptoms, though MRI scans of the brain for HSVE were negative. The patient reacted positively to a 21-day treatment of acyclovir and was discharged with a neurological status comparable to her preoperative baseline. This case contributes to the literature in that it is the first reported instance of HSVE reactivation after intradural cervical spinal surgery with negative MRI findings.

Heller et al. recommended utilizing multiple tests, including PCR, EEG, and MRI, for postoperative neurosurgery patients that have decreased mental status in order to quickly and correctly diagnose/treat patients who are HSVE positive. Clinicians should consider the possibility of receiving false-negative results from PCR, CSF, EEG, or MRI tests before terminating treatment for HSVE reactivation.
A 74-year-old man with a history of herpes simplex encephalitis suffered recurrent seizures. Brain magnetic resonance imaging revealed a mass lesion and resection was performed. A polymerase chain reaction using a brain biopsy specimen was positive for HSV DNA; thus, the patient was diagnosed with HSV-associated granulomatous encephalitis. After administering acyclovir, the patient showed improvement. HSV can cause granulomatous encephalitis in adults, and acyclovir can be used for its treatment.

References
