Meningitis

- Most common viral CNS infection
- Usually follows high titer secondary viremia
- Relatively benign, self-limited illness

Encephalitis

- Usually viral
- Associated with increased morbidity and mortality

Viral meningitis

- Usually epidemic in nature
- Enteroviruses cause 60-90% of cases
- Arboviruses cause 10-30% of cases
  - EEE, WEE, Japanese encephalitis, HSV, lymphocytic choriomeningitis virus
  - Mumps infection is also commonly associated with encephalitis.

Symptoms of viral meningitis

- Influenced by host physiology and viral etiology
• Long term prognosis is excellent.
• Typically a mononuclear infiltrate is seen in the CSF.

**Enteroviral Meningitis**

• Seen in the summer and early autumn.
• Host physiology plays a critical role in seriousness of infection.
• Symptoms: fever, malaise and headache
• 50% - nausea and vomiting
• Nuchal rigidity

**Enterovirus 71**

• Major cause of flaccid paralysis
• Causes hand-foot and mouth disease
• Progression to meningoencephalitis
• MRI - lesions of the thalamus, basal ganglia, hippocampus
• Long term effects

**Diagnosis of viral meningitis**

• CSF - mononuclear infiltrate
• Polymerase chain reaction

**Other causes of "Aseptic" meningitis**

• Spirochetes, mycobacteria
• Fastidious bacteria
• Coccidiomycosis, *Cryptococcus*
• Hematologic malignancies
• Drug-induced
Encephalitis

- Neurologic symptoms vary
- Rapid onset
- Progression
- Sequelae
  - Mental retardation
  - Paralysis
  - Parkinsonism

Symptoms of Encephalitis

- Reflect location and degree of involvement
- Case fatality rates vary with the virus

Pathogenesis

- Viral factors
- Host factors
  - Age
  - Sex
  - Genetics

Encephalitis

- Neurons
  - Primary infected cells
- Developmental stage influences course of infection
Causes of viral encephalitis

- Arboviruses
  - Leading cause
  - Asymptomatic infections predominate
  - Case fatality rate is 5-70%
- Herpes Simplex virus
  - Affects all ages
  - No seasonal variation
  - Major causes of fatal endemic encephalitis
  - Temporal lobe lesion
  - If left untreated, 70% mortality

Causes of encephalitis outside of North America

- Japanese B encephalitis
- Rabies
- Post-infectious encephalitis

Other viruses that cause encephalitis

- Cytomegalovirus
- Varicella zoster virus
- Polio and other enteroviruses
- Mumps
- HIV
- JC virus
**Diagnosis**

- Epidemiologic trends
- Patient history
- Laboratory data
  - CSF
    - Pleocytosis
    - Slightly elevated protein
    - Glucose levels are usually normal
  - PCR
  - MRI

**Treatment and prognosis**

- Therapy for treatable infections
- Anticipate complications
- Supportive therapy

**Other causes of encephalitis**

- Infectious
- Post-infectious
- Non-Infectious
- Drug induced
- Tumors
- Poisons, toxins
Access to the CNS

- Hematogenous spread
  - Disruption of blood brain barrier
  - Incomplete blood-brain barrier
- Viruses
  - polio
  - HIV
  - Mumps
  - Measles
  - Other neurotropic viruses

Neuronal spread

- HSV, Rabies virus, some enteroviruses
- Replication at primary site of infection
- Virus is taken up at axon termini
- Transport to CNS

Neuronal Cell Injury

- Poorly understood
- Cytopathic effects
- Inflammation
- Vasculitis
- Apoptosis
• Apoptosis
  • Triggering of programmed cell death
  • Activation of caspases - ser/thr proteases

Post-infectious encephalitis

• Acute demyelinating process
• Measles
• Inflammatory reaction
• Defective virus

REFERENCES:


