Encephalitis

• Inflammation of the brain parenchyma that arises from penetration of the blood–brain barrier or overlying meninges.
• In meningitis the inflammatory response is limited largely to the meninges.
• Meningitis is more common than encephalitis.
• Viral infections are the most common cause of encephalitis.

Viral spread to the CNS:

1. Hematogenous spread.
2. Neurotropic spread (Ex: VZV, Herpes Simplex Virus, Rabies virus).
3. Through infected leukocytes (Ex: EBV+HIV).

• Microglia → Innate immune cells that reside in the CNS parenchyma, deploy innate immune mechanisms to control virus spread shortly after CNS infection.
Nonredundant (no other cells in the body can perform their role) antigen-presenting cells in the CNS that regulate adaptive immune responses after infection.
Activated when they sense damage in the brain.
Involved in CNS damage (secrete TNF-alpha and IL-1, pro-inflammatory cytokines that attract WBCs) following the acute phase of viral encephalitis, which does not stop after virus elimination from the CNS.

Symptoms:

- Fever, headache and symptoms of accompanying meningitis (if present).
- Altered level of consciousness (hallucinations, agitation, personality change, behavioural abnormalities).
- Depressed level of consciousness ranging from mild lethargy to coma.
- Neurologic signs and symptoms (aphasia, ataxia, upper or lower motor neuron patterns of weakness).
- Seizures.
- Cannot be distinguished only by clinical examination.

• Herpesviruses (HSV, VZV, EBV) ⟶ Sporadic cases of acute encephalitis in immunocompetent adults.
• Arboviruses (viruses that are transmitted by arthropod vectors). Ex: West nile virus (WNV) ⟶ Epidemics of encephalitis.

Rabies virus as a cause of encephalitis:

- Rabies is a zoonotic infection that occurs in a variety of Mammals, transmitted to humans through bites.

-In encephalitic (furious) rabies, episodes of hyperexcitability are typically followed by periods of complete lucidity that become shorter as the disease progresses.

- Brainstem dysfunction progresses rapidly, and coma—followed within days by death—is the rule unless the course is prolonged by supportive measures.

- The virus can be isolated from tears and saliva of infected individuals.
- Physicians rely on symptoms like hydrophobia (laryngeal spasm when the patient is near water), fever, headache, and altered mental status to diagnose the disease.
- Post exposure prophylaxis (PEP) must be initiated immediately after an animal bite to minimize the risk of rabies replication in muscles. PEP involves wound care and passive immunization with (IV) rabies Igs.
- Postpartum patients who died from rabies ⟶ Negri bodies in the cytoplasm of Purkinje cells.

Diagnosis:

- Lumber puncture: CSF profile is in indistinguishable from that of viral meningitis (lymphocytic pleocytosis, mildly elevated protein& normal glucose concentration).
- PCR : The primary diagnostic test for viral CNS infections.
- Serology: Anti WNV IgM antibodies in the CSF are diagnostic for WNV encephalitis.
- Neuroimaging: helpful in Herpes viruses (destructed frontal lobe with other encephalitis indicators).

Management:

- Careful monitoring of vital signs and ICP (intensive care Unit).
- Acyclovir is of benefit in the treatment of HSV (and VSV and EBV severe infections)
- Many patients with WNV infection have sequelae, including cognitive impairment; weakness; and hyper- or hypokinetic movement disorders, including tremor, myoclonus, and parkinsonism.

Prions

• Abnormal, pathogenic agents that are transmissible and are able to induce abnormal folding of specific normal cellular proteins called prion proteins (PrP) ⟶ transmissible spongiform encephalopathies (TSEs).

Transmissible spongiform encephalopathies (TSEs)

• Group of diseases that affect the brain and nervous system of humans and animals. The diseases are characterized by a degeneration of cerebral cortex & cerebellum tissue giving it a sponge-like appearance.

• TSEs in humans include:

1- Creutzfeldt–Jakob disease (CJD):

- Sporadic (sCJD): made by an error of the cell machinery that makes proteins. Occur with aging(>60).
- Hereditary/Familiar (fCJD) : there is a mutation.
- Iatrogenic (iCJD) : occurred with corneal transplantation, contaminated (EEG) electrode implantation, and surgical procedures.
- Variant form (vCJD): acquired by eating meat from cattle affected by BSE, "mad cow" disease.

2- Kuru.

3- Fatal familial insomnia (FFI).

• TSEs in animals include:

1- Scrapie in sheep and goats.

2- Bovine spongiform encephalopathy (BSE) in cows (Madcow disease).

Signs & Symptoms of CJD:

• Rapidly progressive dementia. • Rigidity.

• Myoclonus (persists during sleep).

• Ataxia. • speech impairment. • changes in gait.

Diagnosis:

• Electroencephalography (EEG)

• Magnetic resonance imaging (MRI)

• The only way to confirm a diagnosis of CJD is by brain biopsy or autopsy.

Treatment:

• There is no known cure or effective treatment for CJD.

• Treatment is Palliative.