

Aseptic meningitis

- Meningitis that is **NOT** caused by bacteria.

Causes:

- 1) Viral pathogens
- 2) Drug
- 3) Neoplastic
- 4) Neurosarcoidosis
- 5) Rheumatoid arthritis
- 6) Systemic lupus erythematosus
- 7) Vasculitis

Viral meningitis

- Has similar symptoms to bacterial meningitis.
- Fever (& other consequences) caused by bacterial meningitis > Fever caused by viral meningitis.
- Viral meningitis **rarely** produces focal neurological defects and profound alterations in consciousness (viral meningitis has more benign course & prognosis).
- Seasonal variations are found (there is a substantial increase in cases during the nonwinter months).
- There are more lymphocytes in viral meningitis cases (in the early stages of viral meningitis there are PMN too) while there are more PMN in bacterial meningitis cases.
- Glucose is normal.
- Protein varies between normal to elevated.
- We depend on the CSF specimen results to determine the exact pathogen. HOWEVER empiric antibiotic is given immediately after taking the CSF specimen (before results are known) and it is only stopped when results refers to viral meningitis (negative gram stain).
- Patients who are elderly, immunocompromised, or have received antibiotics prior to presentation should be given antibiotics even if viral meningitis is the suspected diagnosis.
- Repeat lumbar puncture (LP) may be indicated in patients with persistent symptoms who do not have a clear diagnosis.
- **Treatment** of almost all cases of viral meningitis is primarily **symptomatic** and includes use of analgesics, antipyretics, and antiemetics. Fluid and electrolyte status should be monitored.
- In **adults** → the prognosis for full recovery from viral meningitis is excellent.
- The outcome in **infants** and **neonates** (<1 year) → intellectual impairment, learning disabilities, hearing loss.

Diagnosis:

1. CSF examination
2. viral culture
3. PCR
4. Serology (detect antibodies against viruses in the blood) for enteroviral infections → detection of enteroviral IgM antibodies.

Common viral causes of acute meningitis:

1) **Enteroviruses (echoviruses & Coxsackie viruses)** → The leading cause of viral meningitis

- Fecal-oral transmission
- Cause gastrointestinal symptoms (vomiting & diarrhea)
- It is more common in younger ages <15 years
- in neonates → non specific symptoms (fever is accompanied by vomiting, anorexia, rash, and upper respiratory tract symptoms).
- In older children and adults → symptoms are milder with fever, headache, neck stiffness, and photophobia.

2) **Varicella zoster virus (VZV)** → diffuse vesicular rash

3) **Herpes simplex virus 2 (HSV 2)** → genital symptoms.

When we suspect one of the herpes viruses >>> we give antivirals (acyclovir).

4) **Epstein-Barr virus**

5) **HIV**

6) **Mumps virus** (less common) → CNS symptoms usually occur 5 days after the onset of parotitis (inflammation of the parotid gland).

Brain abscess

- Focal, suppurative infection within the brain parenchyma, surrounded by a vascularized capsule & (edema from the inflammation in the surrounding tissue). Cerebritis is a similar lesion with no capsule, and sometimes precedes abscess formation.

- Pathogen can spread from nearby ear, sinus, and dental infections, through blood vessels (hematogenous spread), or directly as in head trauma.

Causative agents:

- The organism usually depends on the primary focus (origin) of infection:

- ▶ Sinusitis & otitis media → *Streptococcus pneumoniae*, *Haemophilus influenzae*, *Enterobacteriaceae*, and *bacteroids*.

- ▶ Head trauma → *S. Aureus*

- ▶ In immunocompromised patients → *Nocardia spp*, *Toxoplasma gondii*, *Aspergillus spp* & *Candida spp*.

Symptoms:

- Headache, fever, seizures, and focal neurological signs are common. (location is important: site-specific symptoms).

Diagnosis:

- Brain imaging (MRI & CT scan), blood culture

- **Lumbar puncture is contraindicated** if there are focal symptoms or signs.

Treatment:

- Combination of high dose parenteral antibiotics and neurosurgical drainage.

- Empiric therapy: 3rd generation cephalosporin, in addition to antibiotics depending on suspicion. (e.g. head trauma increases chances of *S. aureus*, and *Vancomycin* can be added).

Subdural empyema (SDE)

- A collection of pus between the dura and arachnoid membranes.
- There is a predilection for young males.
- Occur after head trauma or due to an infection of the adjacent sinuses.
- The spread of the pathogen occurs very fast because in the subdural space there is a little number of mechanical barriers.
- Pathogens, pathophysiology, and clinical presentation in SDE is similar to a brain abscess.
- Aerobic and anaerobic streptococci, staphylococci, Enterobacteriaceae, and anaerobic bacteria are the most common causative organisms of sinusitis- associated SDE.

Symptoms:

- sinusitis, fever & progressively worsening headache.
- Direct effects of the SDE on the cortex
- Venous infarction

Contralateral hemiparesis or hemiplegia

Diagnosis:

- MRI is superior to CT in identifying SDE and any associated intracranial infections.
- **CSF examination should be avoided** in patients with known or suspected SDE because it is associated with the risk of cerebral herniation.

Treatment:

- Emergent neurosurgical evacuation of the empyema (through craniotomy, craniectomy, or burr hole drainage).
- Empiric antibiotic therapy: 3rd generation cephalosporin, vancomycin and metronidazole (depending on suspicion from patient's history).
- Specific diagnosis of the etiologic organisms is made based on Gram's stain and culture of fluid obtained via either burr holes or craniotomy.

Epidural abscess

- Suppurative infection between the inner skull table and dura.
- More commonly encountered after craniotomy procedures and cranial fractures. And rarely hematogenous.
- Epidural abscess spreads slower than SDE, and is usually smaller in size. Moreover, focal neurological deficits are uncommon.

Suppurative intracranial thrombophlebitis

pus formation

blood clot

inflammation of a vein

- Septic venous thrombosis of cortical veins and sinuses.
- MRI can show decreased blood flow in the affected veins.

Treatment:

- Antibiotics, hydration, and removal of infected tissue and thrombus.
- Anticoagulation with dose-adjusted intravenous heparin.