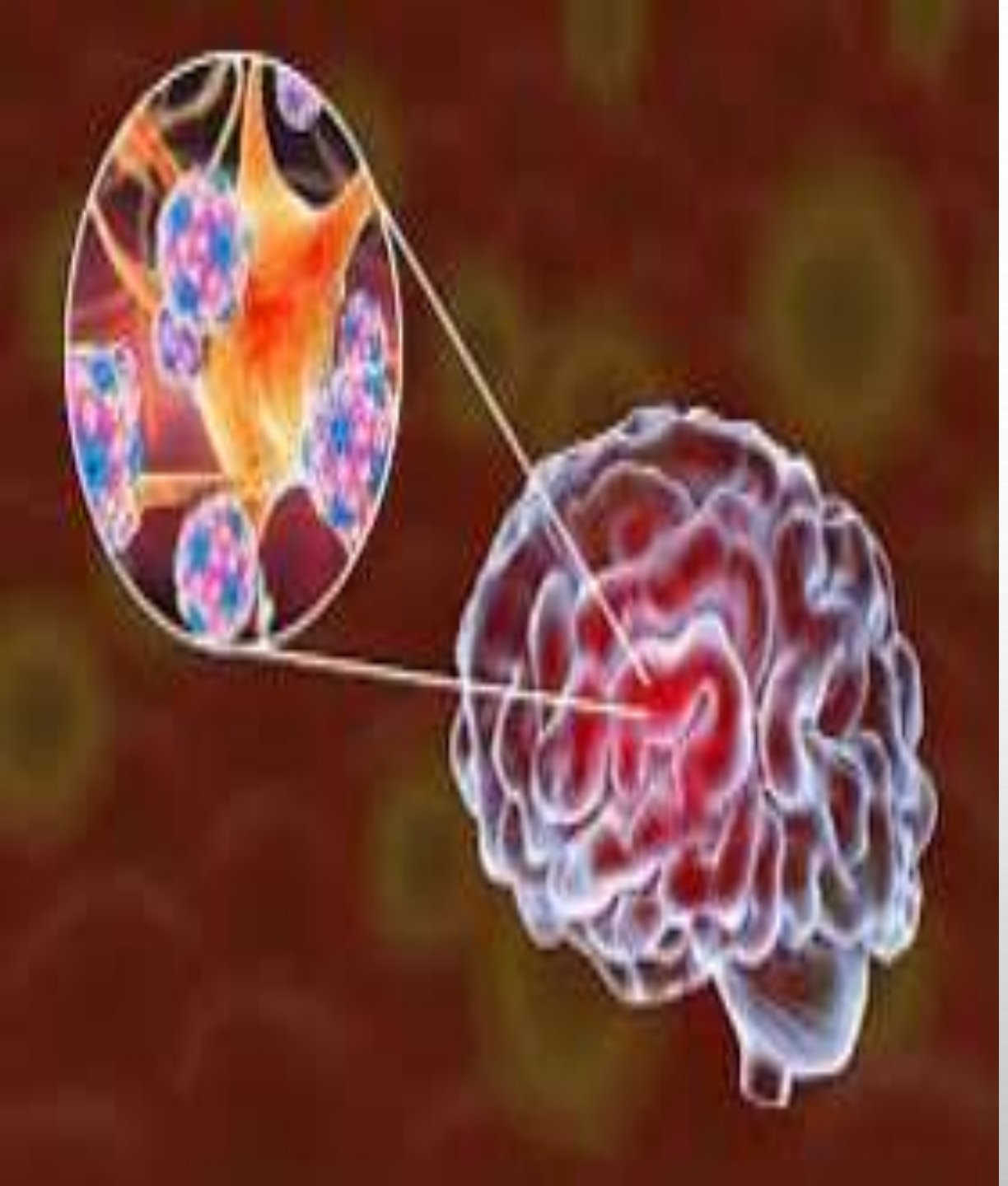


INTERNAL MEDICINE MENINGITIS AND ENCEPHALITIS

BY:

Omar Maloul

Yazan Maloul

Layth Baker Saleh

Belal Jaradat

Hamza AL-Trad

Hala AL-Dahameen

ENCEPHALITIS

WHAT IS ENCEPHALITIS?

Encephalitis is an inflammation of the active tissue of the brain. The exact cause of encephalitis is often unknown. But when the cause is known, the most common is a viral infection.

Bacterial infections and non-infectious inflammatory conditions also can cause encephalitis.

Encephalitis often causes only mild flu-like signs and symptoms (such as a fever or headache) or no symptoms at all. Sometimes the flu-like symptoms are more severe. Encephalitis can also cause confused thinking, seizures, or problems with senses or movement.

- Rarely, encephalitis can be life-threatening. Timely diagnosis and treatment are important because it's difficult to predict how encephalitis will affect each individual.

❖ **Encephalitis could be:**

1. Acute.
2. Post infection encephalomyelitis (brain+spinal cord).
3. Chronic degenerative, slow viral infection.

Encephalitis has 2 mechanisms:

1. Direct infection.
2. Immune mediated response in the CNS that begins several days after the extraneural manifestation of an infection.

The virus or another pathogen can reach to brain by:

1. Direct implantation of organism.
2. Hematogenous by crossing BBB by infect the same cell or destruction of tight junction.
3. Other.

There are two main types of encephalitis:

1. Primary encephlitis.
2. Secondary encephlitis.

❖ PRIMARY ENCEPHALITIS:

- This condition occurs when a virus or other agent directly infects the brain. The infection may be concentrated in one area or widespread and the symptoms vary according to the area affected by the pathogen.
- A primary infection may be a reactivation of a virus that had been inactive after a previous illness.

❖ SECONDARY ENCEPHALITIS:

- This condition results from a faulty immune system reaction to an infection elsewhere in the body and attacks NMDA receptors, VGKC brain protein complex, GABA-A and GABA-B receptors may also be targeted.
- Instead of attacking only the cells causing the infection, the immune system also mistakenly attacks healthy cells in the brain.
- Also known as post-infection encephalitis, secondary encephalitis often occurs two to three weeks after the initial infection and symptoms vary depending on the associated antibody.

❖ COMMON VIRAL CAUSES:

The viruses that can cause encephalitis include:

- Herpes simplex virus (HSV).

It cause encephalitis, meningoencephalitis and hemorrhagic necrosis And its sever more the other pathogen which the death rate ranges to 70%if not treated and 20 % if treated early.

Both HSV type 1 (associated with cold sores and fever blisters around your mouth) and HSV type 2 (associated with genital herpes) can cause encephalitis.

Encephalitis caused by HSV type 1 is rare but can result in significant brain damage or death.

HSV1 can cause encephalitis in any age group but is most common in children &young adult where as HSV2 more common in adults and neonates born by vaginal delivery to women with active HSV2 genital infection.

- **Epstein-Barr virus.**

Which commonly causes infectious mononucleosis.

- **Varicella-Zoster virus.**

Which commonly causes chickenpox and shingles.

- **Enteroviruses.**

These viruses include the poliovirus and the coxsackievirus, which usually cause an illness with flu-like symptoms, eye inflammation and abdominal pain,

In few 1%of cases it secondarily invades the CNS and causes damage, loss of motor neurons in spinal cord and brain stem

- **Mosquito-borne viruses.**

These viruses can cause infections such as West Nile virus, La Crosse virus, St. Louis virus, and western equine and eastern equine encephalitis. Symptoms of an infection might appear within a few days to a couple of weeks after exposure to a mosquito-borne virus.

➢ Tick-borne viruses

The Powassan virus is carried by ticks and causes encephalitis in the Midwestern United States. Symptoms usually appear about a week after a bite from an infected tick.

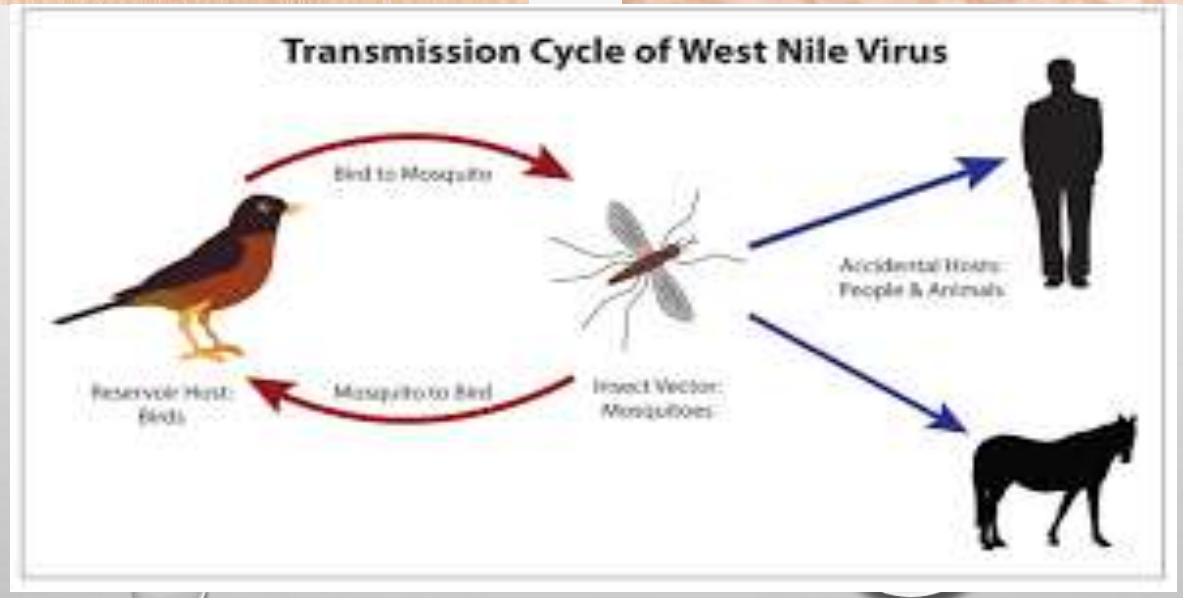
➢ Rabies virus.

Infection with the rabies virus, which is usually transmitted by a bite from an infected animal, causes a rapid progression to encephalitis once symptoms begin. Rabies is a rare cause of encephalitis in the United States.

➢ Childhood infections.

Common childhood infections such as measles (rubeola), mumps and German measles (rubella) used to be fairly common causes of secondary encephalitis. These causes are now rare in the United States due to the availability of vaccinations for these diseases.

Encephalitis can also result from certain viruses carried by mosquitoes, ticks and other insects or animals.



COMPLICATIONS:

- The complications of encephalitis vary, depending on factors such as:

1. Age.
2. The cause of infection.
3. The severity of initial illness.
4. The time from disease onset to treatment.

- People with relatively mild illness usually recover within a few weeks with no long-term complications.
- Complications of severe illness include severe injury of the brain, possibly resulting in coma or death.

- **Other complications — varying greatly in severity — may persist for months or be permanent. These complications can include:**

- Persistent fatigue.
- Weakness or lack of muscle coordination.
- Personality changes.
- Memory problems.
- Paralysis.
- Hearing or vision defects.
- Speech impairments.

ADEM (ACUTE DISSEMINATED ENCEPHALOMYELITIS)

- It is an immune-mediated inflammatory demyelinating condition that predominately affects the white matter of the brain and spinal cord.
- The disorder manifests as an acute-onset (abrupt development) encephalopathy associated with multifocal neurologic deficits and is typically self-limiting.
- Commonly develops after childhood viral infection (measles, chickenpox, or vaccination).
- Resembles MS (multiple sclerosis).
- Relapses occur in 14% of patient within 1 year

- So for summary the meningitis occurs in meninges and patient come with headache, fever neck stiffness, Photophobia but encephalitis occurs in brain parenchyma and has neurological defect.

DIAGNOSIS:

1. History.
2. Imaging: MRI or CT scan.
3. Lab tests: CSF, blood or urine .
4. Physical Examination.

❖ IMAGING:

➢ Brain imaging.

MRI or CT images can reveal any swelling of the brain or another condition that might be causing your symptoms, such as a tumor.

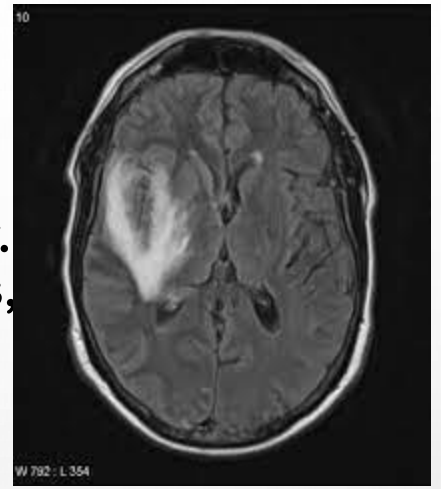
➢ Spinal tap (lumbar puncture).

A needle inserted into lower back (L3, l4) taking a sample of cerebrospinal fluid (CSF) , the protective fluid that surrounds the brain and spinal cord. Changes in this fluid can indicate infection and inflammation in the brain.

Sometimes samples of CSF can be tested to identify the virus or other infectious agent.

- **Electroencephalogram (EEG).**

  Electrodes affixed to the scalp record the brain's electrical activity. Certain abnormal patterns may indicate a diagnosis of encephalitis, on temporal lobe which are characteristic of HSV infection.



MRI of a patient with herpes simplex encephalitis

❖ LABS:

- **CSF.**

  - It shows: lymphocytic pleocytosis. Slight elevating protein.
    Normal glucose.
  - In HSV :protein and RBC are increased.
    Extreme elevated levels of protein and reduction of glucose (TB, carcinomatosis, cryptococcal infection).
  - The CSF occasionally may be normal.

- **Serologic studies.**

(arbovirus, EBV, mycoplasma)

- **Culture stool.**
- **PCR test.**

For HSV, enterovirus and other viruses.

- **Other lab tests.**

Samples of blood, urine or excretions from the back of the throat can be tested for viruses or other infectious agents.

- **Brain biopsy.**

It may be necessary for definitive diagnosis (only if symptoms are worsening and treatments are having no effect).

- In patients with focal neurologic finding.
- Severe encephalopathy with no clinical improvement if diagnosis is obscure.
- HSV, rabies encephalitis, prior related disease (kuru, jakob) diagnosed with culture Of brain biopsy.
- Identify arbovirus, enterovirus, TB, fungal infection.
- Non infective illness (primary CNS vasculopathies, malignancies).

~ The cause of encephalitis in 1/3 of cases is undetermined.

FINDINGS ON PHYSICAL EXAMINATION

- Look for supporting evidence of viral infection .

- The signs of encephalitis may be diffuse (more widespread area of the body) or focal (Specific region of the body) .

- At the extremes, 80% of patients with HSE (herpes simplex encephalitis) present with focal findings .

- The Typical findings include the following :

1- Altered mental status .

2- Personality changes and behavior abnormalities .

3- Focal neurological findings or signs such as hemiparesis (weakness at one side of the body), aphasia (disorder that results from damage to areas of the brain that produce and process language), cranial nerve lesion, seizures may also be present (a sudden, uncontrolled electrical disturbance in the brain), autonomic dysfunction .

4- Movement disorders .

5- Ataxia (group of disorders that effect co-ordination, balance, speech) .

6- Meningismus (symptoms of meningitis without meningitis) .

7- Acute disseminated encephalomyelitis or post-infectious encephalomyelitis (an acute central nervous system demyelinating disorder which typically follows an autoimmune response secondary to a post-viral infection, symptoms such as fever, fatigue, headache, nausea and vomiting, and in the most severe cases, seizures and coma) .

- Findings of HSV infection in neonates (aged 1-45 day) may include the following :

1- Herpetic skin lesions.

2- Keratoconjunctivitis (inflammation of cornea and conjunctiva) .

3- Oropharyngeal involvement, particularly buccal mucosa and tongue.

4- Encephalitis symptoms such as seizures, irritability, bulging fontanelles (occurs when fluid builds up in the brain or the brain swells, causing increased pressure inside the skull - ICP) .

5- Additional signs of disseminated, severe HSV include jaundice, hepatomegaly, and shock.

Important clinical manifestations :

° Prodrome of non-specific symptoms (early signs or symptoms of an illness that appear before the major signs or symptoms start) (cough, sore throat, fever, headache, abdominal complaint) .

° Progressive lethargy, behavioral change, neurologic deficits .

° Seizures are common .

° Maculopapular rash (type of rash characterized by a flat, red area on the skin that is covered with small confluent bumps) .

° Transverse myelitis (inflammation of the spinal cord may be caused by Viral (Herpes viruses), bacterial and fungal infections)

° Coma, Polio- like illness, peripheral neuropathy .

DIFFERENTIAL DIAGNOSIS :

➢ **Diagnosis established with:**

1- Neurologic signs : mental confusion and seizures .

2- Evidence of infection in –

A- CSF (CSF is under increased pressure, usually with a lymphocytosis - elevated lymphocyte count **, raised protein and normal glucose) , and Lumbar puncture is the key to the diagnosis .**

B- EEG (electro-encephalo-gram) shows characteristic periodic complexes may be present over the temporal region.

C- brain imaging (CT scan or MRI) to exclude mass lesions and show brain swelling , Imaging by CT scan may show low-density lesions in the temporal lobes but MRI is more sensitive in detecting early abnormalities.

3- Brain biopsy is rarely required since the advent of MRI and PCR .

TREATMENT

- The goals of treatment are to reduce morbidity and prevent complications. Death and serious disability still result , particularly when diagnosis and treatment are delayed. **Antivirals** are used to manage treatable viral encephalitis . **Corticosteroids** may be considered for post-infectious or non-infectious encephalitis and The patient, however, require Supportive Measures OR Treatment and control for worsening cerebral oedema.

- **Antivirals** : **The goal of the use of antivirals for herpes simplex encephalitis (HSE) and varicella-zoster encephalitis is to shorten the clinical course, prevent complications, prevent the development of latency and/or subsequent recurrences, decrease transmission, and eliminate established latency.**

- ✓ **IV acyclovir (10 mg/kg 3 times a day for 14–21 days) Acyclovir has demonstrated inhibitory activity directed against both herpes simplex virus type 1 (HSV-1) and HSV-2 >>> Acyclovir should be started early if the diagnosis is suspected without waiting for results of detailed CSF studies and without brain biopsy >>> Acyclovir-resistant herpes is treated with foscarnet (especially HIV-positive patients)**

- ✓ **Foscarnet** : It inhibits replication of known herpes viruses, including cytomegalovirus (CMV) , HSV-1 and HSV-2

- ✓ **Ganciclovir** : if cytomegalovirus (CMV) infections suspected

- ➢ **Corticosteroids** : are anti-inflammatory agents used for treatment of post-infectious encephalitis and acute disseminated encephalitis with high dose IV corticosteroids. These drugs are commonly presented as treatment alternatives, though supporting data are limited. (Steroid therapy has both anti inflammatory and immunosuppressive property)

- ✓ **Dexamethasone** is used to treat various allergic and inflammatory diseases. It may decrease inflammation by suppressing migration of polymorphonuclear leukocytes and reversing increased capillary permeability.

➢ **Diuretics** : These agents are used in patients with hydrocephalus and increased intracranial pressure (ICP) when more aggressive diuresis is desired.

✓ **Furosemide (Lasix)** is loop diuretic that increases excretion of water.

- The proposed mechanism for furosemide in lowering intracranial pressure include :

(1) lowering cerebral sodium uptake

(2) Affecting water transport into astroglial cells by inhibiting the cellular membrane cation-chloride pump

(3) decreasing cerebrospinal fluid production by inhibiting carbonic anhydrase

✓ **Mannitol** may reduce pressure in the subarachnoid space by creating an osmotic gradient between cerebrospinal fluid in the arachnoid space and plasma. This agent is not intended for long-term use.

➢ **Benzodiazepines** : These agents are used to treat seizures associated with encephalitis

✓ **Lorazepam** is increasing the action of gamma-aminobutyric acid (GABA), which is a major inhibitory neurotransmitter in the brain and It functions to reduce neuronal excitability by inhibiting nerve transmission

SUMMARY :

- Encephalitis : acute inflammation of the brain.
- caused by either a viral infection or the immune system mistakenly attacking brain tissue.
- Early symptoms are fever, and headache .
- Encephalitis is rarely life-threatening.
- Encephalitis most often affects children, older adults, and those with compromised immune systems.
- Complications of encephalitis can include epilepsy and memory loss.

References

- Davidson principles and practice in medicine 22th edition
- KUMAR AND CLARKS CLINICAL MEDICINE 8TH EDITION
- MEDSCAPE
- LECTURE NOTES: NEUROLOGY
- PAST YEARS LECTURES

Thank you