Inflammatory Conditions

Inflammatory Conditions- Meningitis, Encephalitis, Brain Abscess and Neurosyphilis

- Originate commonly via the blood stream, but can extend from a primary location
- Long-term deficits are possible those who recover from a CNS infection

Meningitis

Acute inflammation of the meninges surrounding the brain and spinal cord involving the pia, arachnoid matter and the CSF.

- Causes: viral, bacterial, fungal, or protozoa; usually preceded by an URI.
- Risk Factors:
- Transmission: Respiratory droplet, direct contact transmission, bloodstream

Pathophysiology

- Organism enters the CNS via the bloodstream or extension from a localized site
- Then crosses the BBB into the CNS
- Body reacts with inflammation of the meningeal tissues
- Inflammatory response causes increased CSF production and thus increases ICP
- In bacterial meningitis purulent secretions develop
- BBB is damaged, protein spills into the CSF thickening the CSF and glucose is lowered in bacterial meningitis as all the bacteria use the glucose to grow and thrive.

Bacterial Meningitis

- Causes: Streptococcus pneumonia and Neisseria meningitides
- Emergency: If left untreated, bacterial meningitis mortality rate very high

A. Clinical manifestations of Bacterial Meningitis
   a. Headache, photophobia
   b. Fever, N/V
   c. Classic Signs
      i. Nuchal Rigidity-stiff and painful neck
      ii. Positive Brudzinski's Sign-examiner flexes the patient's neck which then causes a flexion of the patient's knees and hips
      iii. Positive Kernig Sign-patient lying down on back with thigh flexed. Leg can't be extended because of muscle rigidity, inflamed nerve roots
   d. skin rash and petechiae possible with meningococcus (Neisseria)

B. Complications
   a. IICP
      i. altered mental state- decreased LOC
      ii. seizures, coma, death
      iii. Cranial nerve involvement: due to irritation of the nerves
         1. CN 2-optic nerve: compressed
         2. CN 3,4,6-ocular: ocular movements affected
         3. CN 5- Trigeminal: sensory losses and loss of corneal reflex
         4. CN 7- Facial: facial paresis
         5. CN 8-Vestibulocochlear: tinnitus, vertigo, deafness

b. Waterhouse-Friderichsen syndrome- results in a severe vascular dysfunction, bleeding of the adrenal gland

C. Diagnosis
   a. Cultures & Sensitivity: Blood, sputum, nasopharyngeal cultures obtained prior to initiation of antibiotics.
   b. Imaging- CT Scan
   c. Lumbar Puncture

Analysis	Bacterial
CSF pressure	Increased
Appearance of CSF	Cloudy
Protein Level	Increased
Glucose Level	Decreased
WBC	Increased (neutrophils)

D. Medical Management
   a. Rapid Diagnosis and treatment is needed
   b. Cultures-collect immediately, upon first thought of possible meningitis
   c. Antibiotics-started immediately after cultures
- High doses antibiotics are needed to penetrate the BBB
- Ampicillin, penicillin, vancomycin
- Long extended treatment of IV then followed by PO antibiotics
   d. Dexamethasone (Decadron) steroid may be used in conjunction

E. Nursing care
   a. Assessments-
   b. Respiratory isolation- until causative agent determined (Viral vs Bacterial)
   c. Fever support
   d. Headache- analgesics, nonpharm techniques
   e. Environment

F. Recovery
   a. Convalescence
   b. Headaches
   c. Muscle rigidity
   d. Residual deficits vary

G. Prevention
   a. Meningococcal vaccine for N. Meningitides
   b. Prevent Upper Respiratory infections
   c. HIB vaccine

Viral Meningitis-

- Associated with viral infections such as enteroviruses, arboviruses, HSV, HIV
- Self- limiting disease process

- usually resolves in 2 weeks and a full recovery is expected
- less neurological involvement

A. Symptoms of Viral Meningitis
   a. Headache and photophobia
   b. Fever
   c. Stiff neck, myalgias, and nausea

B. Diagnosis
   a. Xpert EV rapid test using CSF sample
   b. CSF fluid examination

Analysis	Viral
CSF pressure	Increased
Appearance of CSF	Clear to slightly cloudy
Protein Level	Increased
Glucose Level	Normal to low possible
WBC	Increased (mainly lymphocytes)

   c. PCR (polymerase chain reaction) test to detect viral specific DNA/RNA

C. Treatment
   a. Symptomatic support only

Encephalitis

Encephalitis- Acute inflammation of the brain tissue usually caused by some kind of virus

A. Causes
   1. Mosquitoes and ticks can transmit the virus to a human via an insect bite
   2. May occur as a complication of viruses such as measles, mumps, chickenpox, Herpes Simplex Virus, and Cytomegalovirus

B. Pathophysiology
   - Virus enters host via bite or contact
   - Virus uses living host to reproduce and spread
   - Gains access to CNS via circulation
   - Diffuse inflammation of brain tissue

C. Clinical manifestations
   A. ~2-3 days after onset, mild to severe symptoms
      1. flu like: headache, high fever, n/v, body aches
      2. Mental status changes from minimal confusion, irritability to a coma
      3. May have seizures, memory impairment, motor disturbances depending on severity of the inflammation and increased ICP.

D. Diagnosis
   A. Early diagnosis for best outcome
      1. Question about recent travel or viral infections
   B. Imaging

1. MRI, CT

C. PCR Test (polymer chain reaction test) or IgM titer

E. Management

A. Medications

1. Antivirals- Acyclovir
2. Corticosteroid- Dexamethasone (Decadron)

F. Nursing Care

A. Monitor: VS, Neuro checks

B. Symptomatic care as needed for fever, HA, seizures

G. Prevention- public education for protection from mosquito/tick borne illness

Brain Abscess

Brain Abscess- localized collections of pus within the brain tissue

A. Occur:

1. infection by direct extension
2. trauma or neurosurgery
3. bloodstream and septic emboli

B. Primary Causative Organisms

1. Streptococci & staph aureus

C. Increased risk to those who are immune suppressed

D. Pathophysiology

- Localized infection leads to acute inflammation in the brain by direct extension
- Acute inflammation leads to tissue necrosis within brain
- Pus then forms and the tissue liquefies
- The tissues becomes encapsulated in thick fibrous wall-becomes abscess

E. Clinical manifestations

a. Headache
b. fever, chills, nausea, vomit, malaise
c. Deficits related to IICP (decreased LOC, confused, drowsy, seizure)
d. Focal S&S-dependent on abscess location

F. Diagnosis

a. WBC and ESR may be increased
b. Cultures of the ear nose, throat to attempt to identify origin of infection
c. Imaging-CT scan or MRI

G. Medical management

a. IV antibiotics-high doses to penetrate BBB
b. craniotomy-to remove or drain abscess
c. Symptomatic treatment for symptoms

H. Prognosis- Untreated = 100% mortality

Neurosyphilis

Neurosyphilis- bacterial infection of the brain or spinal cord. It usually occurs in people who have had untreated syphilis for many years

A. Cause- "treponema pallidum"-the bacteria that causes syphilis which is an STD

B. Patho

- Untreated syphilis infection may or may not develop into neurosyphilis
- can invade CNS in as little as a few months of original untreated syphilis infection or up to 10-20 years later if untreated as organism can lie dormant for up to 10 years

B. Diagnosis

a. RPR (rapid plasma regain-syphilis specific test)

C. S&S

1. progressive ataxia
2. pain in legs
3. slapping gait
4. loss of DTR (deep tendon reflexes) and proprioception (position of self)
5. Charcot's joints-enlarged joints with instability and loss of pain sensation

D. Treatment

a. Medication- PCN

b. Neuro deficits will likely be lifelong