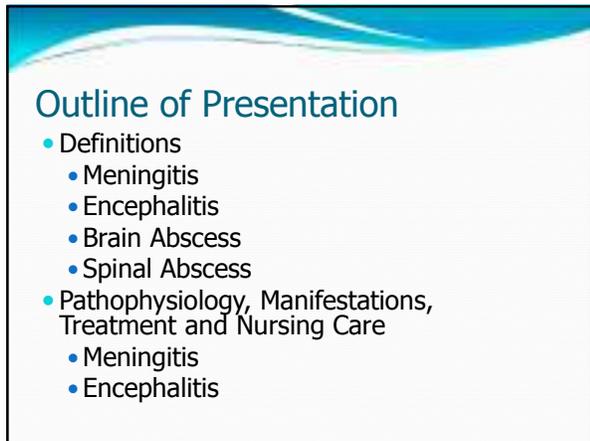
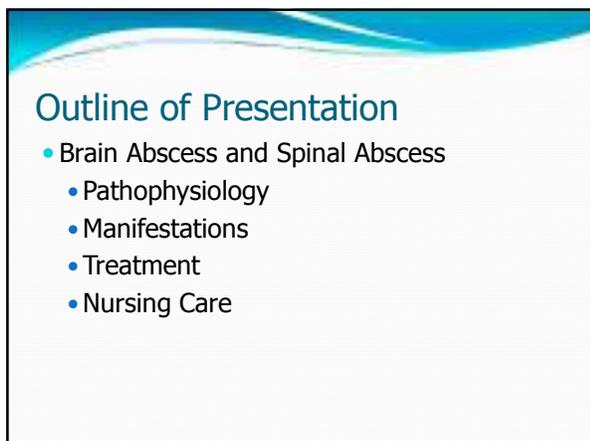


Infectious Disorders
CNA Certification Exam
Tracy Snell RN



Outline of Presentation

- Definitions
 - Meningitis
 - Encephalitis
 - Brain Abscess
 - Spinal Abscess
- Pathophysiology, Manifestations, Treatment and Nursing Care
 - Meningitis
 - Encephalitis



Outline of Presentation

- Brain Abscess and Spinal Abscess
 - Pathophysiology
 - Manifestations
 - Treatment
 - Nursing Care

Infections of the CNS

- The brain, spinal chord and its surrounding structures can be infected by a large spectrum of germs
- Bacterial and viral infections are the most common
- Parasites, fungi and others can also infect the CNS

Viral Infections

- Are an uncommon complication of systemic illnesses cause by human pathogens
- After viral multiplication in the extraneural tissue is complete, dissemination to the CNS occurs by a hemtogenous route or spread along nerve fibres
- Manifest themselves in three ways
 - Viral (aseptic) meningitis
 - Encephalitis
 - Myelitis

Schlossberg (2008)

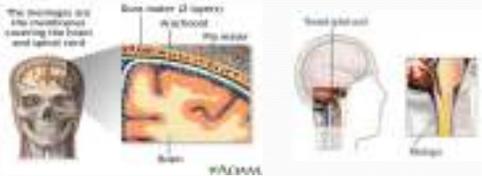
Bacterial Infections

- Gain access to the ventriculo-subarachnoid space by way of
 - Septicemia – blood poisoning
 - Metastasis – lungs, heart or other viscera
- Meninges may also be invaded by a septic focus in the skull, spine or parenchyma of the CNS
- Organisms can also gain entrance through fractures of the skull, nasal sinus or mastoid

Schlossberg (2008)

Meningitis

- Meningitis (viral, bacterial or fungal) is an infection of the meninges (membrane covering the brain and spinal cord).



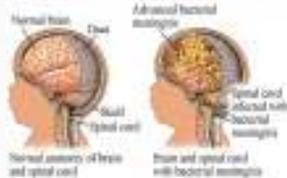
Viral Meningitis

- Also known as acute benign lymphocytic meningitis and acute aseptic meningitis



Bacterial Meningitis

- Is a pyogenic infection that involves the pia-arachnoid layers of the meninges



Encephalitis

- Encephalitis (viral, bacterial, fungal, or parasitic) is an inflammation of the parenchyma



Hickey (2011)

Brain Abscess

- A brain abscess is caused by an infection which extends into the cerebral tissue or by organisms carried from other sites of the body.



Hickey (2011)

Spinal Abscess

- Is the swelling, inflammation and collection of infected material in or around the spinal chord
- Epidural is the most common followed by intradural



Duggdale, Vyas & Zieve (2012)

Pathophysiology

Virus invasion

- Invasion of the CNS occurs as part of a generalized viral infection
- After the virus enters the body either patient's IgA and previous exposure neutralises the virus or
- No previous exposure leads to a viraemia
- Once the viraemia overcomes the defence system of the CNS it will invade either through the capillary and veins or along the peripheral nerves

Lindsay & Bone (1997)

Pathophysiology

- After the virus has penetrated the CNS, the clinical picture depends upon the particular virus and the cells of the nervous system it is invading

A blue arrow points from left to right. On the left side of the arrow, under the heading 'Common viruses', are listed: Enteroviruses, Mumps, Herpes simplex type 1, and Epstein-Barr. On the right side of the arrow, under the heading 'Rare viruses', are listed: Lymphocytic choriomeningitis, HIV, and West Nile. At the tip of the arrow, the text reads: 'Enters the meninges and causes VIRAL MENINGITIS'.

Lindsay & Bone (1997)

Pathophysiology

Encephalitis

- Viral infections cause neuronal and glial damage with associated inflammation and oedema

A blue arrow points from left to right. On the left side of the arrow, under the heading 'Common Viruses', are listed: Mumps, Varicella Zoster, Epstein Barr, and arboviruses. On the right side of the arrow, under the heading 'Rare Viruses', are listed: Western equine, West Nile, and Pow viral illnesses resulting in CNS infection. At the tip of the arrow, the text reads: 'Enters the parenchyma and causes ENCEPHALITIS'.

Bacterial Infections

- Neuroinvasion occurs in the context of a systemic disease
- Bacteria invade the CNS either through the blood-brain barrier or the blood-choroid barrier
- Extracellular bacteria produce a polysaccharide capsule that allows them to resist lysis
- Once bacteria has invaded the CNS, defence mechanisms are inadequate compared to other areas of the body and therefore can cause diseases to be more severe

Drevets, Leeman & Greenfield (2004)

Signs and Symptoms Meningitis

- Common signs of meningitis include
 - Fever
 - Bacterial can vary between 38 to 39.5
 - Temperature remains high throughout
 - Viral usually has a low grade fever
 - Headache
 - Headache is usually severe
 - Caused by the irritation of the pain sensitive dura

Meningeal Irritation

- A stiff neck is usually an early sign of meningeal irritation
- Attempts to flex the neck forward can prove difficult
- This is caused by the spasms of the extensor muscles of the neck
- Photophobia is another common sign
- Two signs are Kernig's sign and Brudzinski's sign.
- Kernig's sign is elicited by flexing the upper leg at the hip to 90 degrees and then trying to extend the knee



Scholsberg (2008)

©ADAM

Meningeal Irritation

- Brudzinski's sign is positive when both the upper leg at the hip and the lower leg at the knee flex in response to passive flexion of the neck and head to the chest

• Brudzinski's sign



Scholsberg (2008)

Signs and Symptom continued

- Cerebral dysfunction
 - Confusion
 - Delirium
 - Declining LOC

Scholsberg (2008)

Signs and Symptoms continued

- As the meningitis progresses signs of increased intracranial pressure may also develop
- Coma
- Hypertension
- Bradycardia
- Palsy of cranial nerve 3

Scholsberg (2008)

Diagnosis of Meningitis

- Examination of the CSF through a lumbar puncture
- Bacterial has
 - high opening pressure (>180mm H2O)
 - white count is elevated (1000-5000 cells/mm squared)
 - Usually a neutrophilic predominance
 - Decreased glucose (<40 mg/dL)
 - Protein is elevated (100-500mg/dL)
 - Positive gram stain

• Lumbar Puncture



Scholsberg (2008)

Treatment

Viral Meningitis

Usually supportive care
Depending on the virus different antiviral could be administered
Acyclovir –herpes simplex infections
Ganciclovir/foscarnet –CMV infections

Bacterial Meningitis

Antimicrobial therapy
Penicillin, ceftriaxone, vancomycin or chloramphenicol
Supportive care
Dexamethasone may be used to increase penetration of the drug into the CSF
Mannitol may be used to decrease the cerebral edema
Anticonvulsants
Sedatives
Antipyretics
Analgesics
Appropriate therapy for any coexisting conditions

Hickey (2011)

Nursing Considerations

- Assessment
 - Vital signs and neurological status
- Basic supportive care
 - ABC's
 - Safety of patient

Nursing Considerations

- Watch for complications
 - Skin breakdown
 - Blood clots
 - Seizures
 - Chest infections

Brain Abscess Pathophysiology

- The source of infection can be spread
- Haematogenously - indirectly through an artery or vein
 - Bacterial endocarditis
 - Congenital heart disease
 - Bronchiectasis
 - Pulmonary abscess

Brain Abscess Pathophysiology

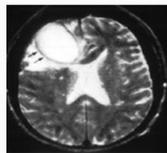
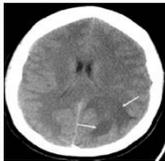
- Locally – direct penetration of the dura
 - Fractures (compound, basal)
 - Sinusitis
 - Infected dental caries
 - Otitis
 - Mastoiditis

Pathophysiology continued

- Pus may accumulate in the extradural space, subdural space or the brain parenchyma
- Four stages of the maturation of a brain abscess
 - Early cerebritis
 - Late cerebritis
 - Early capsular formation
 - Final maturation of the capsule

Stages of Brain Abscess

- Stage one
- Stages two, three and four



Brain Abscess Signs and Symptoms

- Headache is the most frequent initial sign
- Fever is present in about 50%
- Edema of the brain tissue can cause
 - Increased Intracerebral pressure which can be seen by
 - Drowsiness and confusion
 - Focal or generalized seizures

Rowland, Pedley (2010).

Signs and Symptoms continued

- Cerebral symptoms of a stroke
 - Focal motor, sensory or speech disorders
 - Sudden worsening of headache could be a sign of the abscess rupturing into the ventricular space

Rowland, Pedley (2010)

Treatment

- Diagnosis of brain abscess is by CT or MRI
- Current recommended treatment is CT-guided stereotactic needle aspiration
- Appropriate antimicrobial therapy
- Type of organism tends to vary with the source of the abscess
- Staphylococcal ---- accidental or surgical trauma
- Empiric organism --- otitic infections --- tx is combination of cefotaxime (cephalosporins) with flagyl
- Anaerobic streptococci --- lung and paranasal sinuses --- tx penicillin G and flagyl
- Antiepileptic medication may be used prophylactically
- Corticosteroids may also be used prophylactically

Rowland, L.R., Pedley, T.A., (2010)

Nursing Considerations

- Can be viewed in two stages:
 - Acute initial invasion
 - Assessment of neurological status
 - Managing symptoms
 - Providing supportive care
 - Administering drug treatment

Nursing Considerations continued

- When abscess behaves like a space occupying lesion
 - Administering appropriate treatment
 - Caring for a post op patient

Spinal Abscess Pathophysiology

- Uncommon condition with an estimated occurrence of .2-2.0/10 000 admissions
- Are a result from a haematogenous spread of bacteria that occurred from a cutaneous or mucosal source
- Staphylococcus/streptococcus are the most common recognized causative organisms spinal abscesses

Dugdale et al. (2012)

Spinal Abscess Pathophysiology continued

- Sources of bacteria include furuncles, pharyngitis and dental abscesses
- Epidural abscesses are primarily located in the posterior aspect of the spinal column
- Post operative abscesses occur 16% of the time

Dugdale et al. (2012)

Spinal Abscess

Pathophysiology continued

- Blunt trauma is reported to precede the symptoms of an epidural abscess 15-35% of the time and it has been postulated that an epidural hematoma may become infected and become an abscess
- 20% occur anterior to the spinal chord
- Can occur any where along the spinal column, most are seen in the lower thoracic and lumber regions

Duggdale et al. (2012)

Spinal Abscess

Signs and Symptoms

- Fever or chills
- Spinal pain and tenderness
- Radiating root pain followed by limb weakness/sensation below the level of the abscess
- Loss of bladder or bowel

Treatment

- MRI is the best test to be able to recognize the extent and location of the abscess
- CT and myelography may also be used to diagnose and spinal abscess
- Surgery to remove the abscess and relieve pressure on the spinal column

Treatment continued

- Antimicrobial treatment should be bactericidal, started early and given in high doses and continue well into the postoperative period
- Parental treatment should be continued for 4 weeks postoperatively

Nursing Care

- ABC's and vital signs
- Assessment of neurological changes
- Administration of ordered antibiotics
- Care for the post operative patient
- Post operative teaching
- Bowel and bladder training if needed

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