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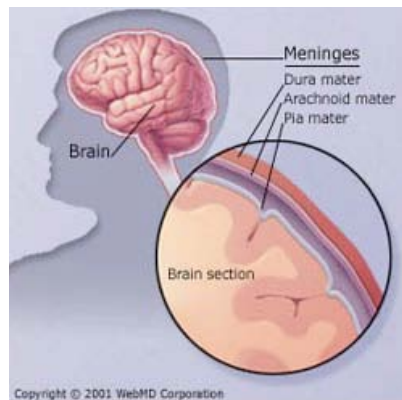
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Aurora Health Care – South Region EMS 2010 1st Quarter CE Packet

“Meningitis”

Meningitis is an inflammatory disease of the leptomeninges. Leptomeninges refer to the pia matter and the arachnoid matter of the brain.



Meningitis reflects infection of the arachnoid mater and the cerebrospinal fluid (CSF) in both the subarachnoid space and in the cerebral ventricles. Meningitis may develop in response to a number of causes, most prominently bacteria, viruses and other infectious agents, but also physical injury, cancer or certain drugs. The cause of most cases of meningitis is a viral infection. The severity of the inflammation and the best treatment depend on the cause of the infection. Bacterial meningitis is generally much more serious than viral meningitis, and timely treatment is necessary. This learning activity will focus on bacterial meningitis.

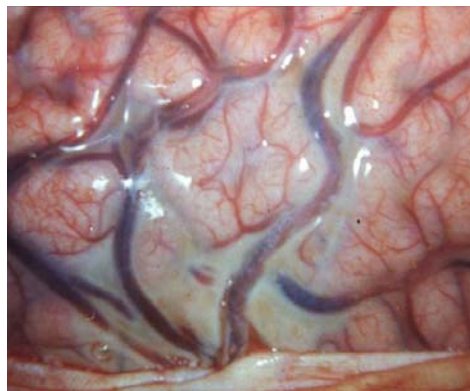
Worldwide bacterial meningitis accounts for approximately 1.2 million cases annually. In the past, most meningitis cases occurred in children younger than 5 years. But as a result of the protection offered by current childhood vaccines, most meningitis cases now occur in young people between the ages of 15 and 24. Older adults also tend to have a higher incidence of meningitis than do young children. Meningitis is among the ten most common infectious causes of death and is responsible for approximately 135,000 deaths throughout the world each year. Neurologic sequelae are common among survivors.



Bacterial meningitis is a neurological emergency that is associated with significant morbidity and mortality. Prompt recognition and administration of antibiotic therapy is essential in improving the patient's outcome. Therefore any patient who is suspected of having meningitis is a time sensitive patient and transport should be expedited.

Pathophysiology

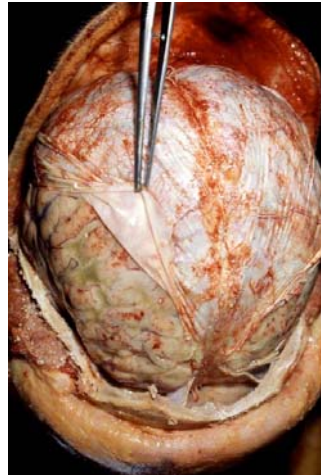
Pathogenic organisms gain access to the subarachnoid space and meninges. Exudate forms in the subarachnoid space, and inflammation of the meninges occurs. This results in congestion of tissues and blood vessels, as well as hyperemia of meningeal vessels. Intracranial hypertension may result from hydrocephalus or brain edema.



This shows puss accumulation in the leptomeninges in bacterial meningitis.

Specific Pathogens

- **Streptococcus pneumonia (pneumococcus)** is the most common cause of bacterial meningitis. It can also cause pneumonia, ear and sinus infections. When pneumococcal meningitis is associated with an ear infection, it is not always clear which came first, because they usually occur together.



An autopsy demonstrating signs of pneumococcal meningitis. The forceps are retracting the dura mater. Underneath the dura mater are the leptomeninges, which are edematous and have multiple small hemorrhagic foci.

- **Neisseria meningitidis (meningococcus)** is another leading cause of bacterial meningitis. It most frequently occurs in children and young adults, but also accounts for 20 percent of cases of bacterial meningitis in adults. It commonly occurs when bacteria from an upper airway respiratory infection enters the blood stream. It is often accompanied by diffuse petechial rash.



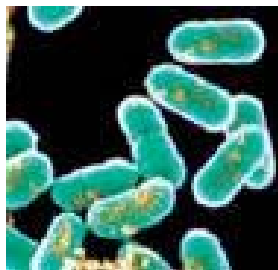
This infection is highly contagious and may cause local epidemics in college dorm rooms, boarding schools and military bases.



Haemophilus influenzae (haemophilus) Before the 1990s, Haemophilus influenzae type b (Hib) bacterium was the leading cause of bacterial meningitis. But new Hib vaccines — available as part of the routine childhood immunization schedule in the United States — have greatly reduced the number of cases of this type of meningitis. When it occurs, it tends to follow an upper respiratory infection, ear infection (otitis media) or sinusitis.



Listeria monocytogenes (listeria) These bacteria can be found almost anywhere — in soil, in dust and in foods that have become contaminated. Contaminated foods have included soft cheeses, hot dogs and luncheon meats. Many wild and domestic animals also carry the bacteria. When Listeria invades the blood stream, it targets the CSF and deep brain structures, especially in the midbrain and brainstem. Fortunately, most healthy people exposed to listeria don't become ill, although pregnant women, newborns and older adults tend to be more susceptible. Listeria can cross the placental barrier, and infections in late pregnancy may cause a baby to be stillborn or die shortly after birth.



Signs and Symptoms



Patients with bacterial meningitis are usually quite ill and often present soon after the onset of symptoms.

- The classic triad of symptoms for bacterial meningitis consists of fever, nuchal rigidity and a change in mental status, although an appreciable number of patients do not have all three. However, virtually all patients have at least one of the findings of the classic triad. Most patients have a high fever (greater than 100 degrees), but a small percentage have hypothermia. Almost no patients have a normal temperature.

In addition to the classic findings, a number of other manifestations, both neurologic and non-neurologic, can occur in patients with bacterial meningitis:

- Headache is also common and is typically described as severe and generalized. It is not easily confused with a normal headache.
- Nausea and vomiting associated with the headache.
- Significant photophobia
- Seizures
- Certain bacteria, particularly *N. meningitidis*, can cause characteristic skin manifestations, such as petechiae and palpable purpura. Some patients with meningococcal meningitis have a maculopapular rash.

Examination for Nuchal Rigidity

Although patients may not specifically complain of a stiff neck, it is easy to demonstrate nuchal rigidity. Passive or active flexion of the neck will usually result in an inability to touch the chin to the chest. Difficulty in lateral motion of the neck is a less reliable finding.

Kernig's Sign:

Maneuver: Place supine with hip flexed at 90 degrees. Attempt to extend leg at the knee.

Positive Test: The test is positive when there is resistance to extension at the knee to greater than 135 degrees or pain in the lower back or posterior thigh.

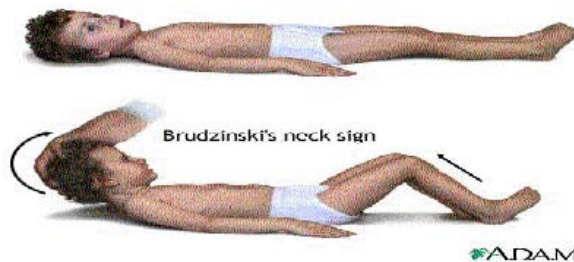


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Brudzinski's Sign:

Maneuver: Place patient in the supine position and passively flex the head towards the chest.

Positive Test: Test is positive when there is flexion of the knees and hips of the patient.



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Jolt Accentuation of Headache:

Maneuver: Patient rotates his/her head horizontally two – three times per second.

Positive Test: Test is positive if patient reports exacerbation of his/her headache with this maneuver.



Management

- Airway protection in patients with altered mental status.
- Evaluate and treat patient for shock or hypotension.
- Seizure precautions. Treat seizures per protocol.
- Rapid transport.
- Prevent disease transmission: BSI; droplet precautions.

Complications

Immediate Septic shock, DIC, coma with loss of protective airway reflexes, seizures (30 – 40% of children, 20 – 30% of adults), cerebral edema, septic arthritis, pericardial effusions, hemolytic anemia.

Delayed Decreased hearing or deafness, other cranial nerve dysfunction, multiple seizures, focal paralysis, subdural effusions, hydrocephalus, intellectual deficits, ataxia, blindness, peripheral gangrene.