

Meningitis

PATHOGENESIS

Direct entry:

- Contiguous infection: sinusitis, mastoiditis, preorbital cellulitis
- Trauma, neurosurgery, CSF leak (usually staph)
- Medical devices: CSF shunts, cochlear implants (usually staph)

note:

- CSF not prepared to fight infx
- in meningitis-->aware
- in encephalitis-->decreased consciousness

Predisposing Factors:

- Congenital or acquired immunodeficiency:
 - > asplenia (could be autosplenectomy-->sickle cell)
 - > complement deficiency
 - > hypogammaglobulinemia
 - > HIV
 - > Steroids
 - > DM
- Anatomic defects of the spinal cord: dermal sinus, brain, or inner ear (allows direct entry)
- Recent infx (respiratory & ear)
- Contact with meningitis pt
- travel to endemic area (eg.sub-Saharan Africa)

Notes:

- CSF has no neutrophils, no immunoglobulins
- BBB strong protective mechanism
- In the newborn the BBB is poorly developed-->Meningitis
- 20% of sepsis cases may be associated with meningitis due to poor BBB in the newborn

MICROBIOLOGY

• Infants <3 months

- > GBS
- > E. coli, peruses, klebsella, pseudomonas
- > Listeria monocytogenes (susceptible to ampicillin)

Notes:

- in this age the microorganisms are from the maternal lower GI OR lower GU tracts
- 90% are viral

• Older infants and children

- > S. pneumoniae
- > N. meningitidis
- > H. influenzae (B), and other gram-negative organisms.

• Adolescents

- > N. meningitidis

HSV



Notes:

- The mother might have genital herpes that could be asymptomatic; couple small on the cervix
- usually presents in the head; temporal lobe
- Acyclovir

ENTEROVIRUS



Notes:

- When hands and soles are involved; enteroviruses should be on the top of differentials

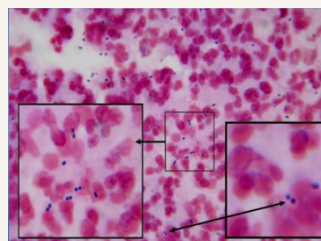
MENINGOCOCCAL RASH



Notes:

- due to micro septic emboli to skin
- doesn't blanch when pressed on it
- peptic lesions could be present
- give antibiotic dose as soon as possible
- in the GOLDEN HOUR !
- Early detection is the key-->very responsive to abx

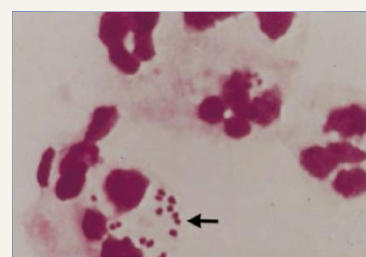
Strep.pneumonia



Heamophilus Influenza B



Nisseria Meningitidis



CLINICAL PRESENTATION

Infants :

- Fever, hypothermia
- Bulging fontanel (increased IOP)
- lethargy, irritability
- Seizures:
 - early:usually no role in prediction
 - late: bad sign! if after 3rd day- higher chance of developing epilepsy later on

chance of developing epilepsy later on

- Respiratory distress
- Poor feeding, vomiting

Notes:

–Shrunken fontanel—>dehydration

–febrile seizures not related to meningitis

Children:

- Fever
- Headache
- Photophobia
- Meningismus
- Nausea/vomiting
- Confusion, lethargy, irritability

LABS

- Blood culture.
- CBC with differential and platelet count (make sure no thrombocytopenia)
- Inflammatory markers :CRP, procalcitonin (more specific in bacterial infx)
- Serum electrolytes, BUN, creatinine, glucose. • PT, INR, and PTT
- Lumbar puncture
 - cell count and differential
 - glucose
 - protein concentration
 - Gram stain
 - Culture
 - PCR (Strep pneumoniae, MRSA, HSV, Enteroviruses)

notes:

–normal white cell count in CSF 5 or less

–normal glucose in CSF is 2/3 of plasma or higher

–if there is RBC in CSF deu to trauma the count should reduce as you go further

- Contraindications to LP
 - cardiopulmonary compromise,
 - clinical signs of increased intracranial pressure,
 - papilledema,
 - focal neurologic signs, and
 - skin infection over the site for LP.

CSF IN MENINGITIS

- Opening pressure 200–500 mm H2O

note: always measure opening pressure—>helps in case of ICP

- White blood cell count 1000–5000/mm³ Percentage of neutrophils >80%
- Protein 100–500 mg/dL Glucose <40 mg/dL
- CSF : serum glucose <0.4

Typical cerebrospinal fluid findings in central nervous system infections*

	Glucose (mg/dL)		Protein (mg/dL)		Total white blood cell count (cells/microL)		
	<10 ⁵	10 to 40 ⁴	100 to 500 ⁶	50 to 300 ⁵	>1000	100 to 1000	5 to 100
More common	Bacterial meningitis	Bacterial meningitis	Bacterial meningitis	Viral meningitis Nervous system Lyme disease (neuroborreliosis) Encephalitis Neurosyphilis TB meningitis ³	Bacterial meningitis	Bacterial or viral meningitis TB meningitis	Early bacterial meningitis Viral meningitis Neurosyphilis TB meningitis
Less common	TB meningitis Fungal meningitis	Neurosyphilis Some viral infections (such as mumps and LCMV)		Early bacterial meningitis	Some cases of mumps and LCMV	Encephalitis	Encephalitis

Clinical and laboratory features of viral and bacterial meningitis in children

Feature	Viral meningitis	Bacterial meningitis
Seasonal pattern	Enteroviral infections (the most common cause of viral meningitis) occur mostly in summer and fall	No characteristic seasonal pattern
Clinical features		
Fever, headache, stiff neck, photophobia	Common	Common
Ill appearance	Uncommon	Common
Petechiae or purpura	Absent	May be present
Other manifestations of enteroviral infection (eg, rash, conjunctivitis, herpangina, pharyngitis)	Common	Uncommon
Symptoms after LP	Often, there is improvement	No improvement
CSF parameters		
WBC count	Typically 10 to 500 cells/microL	Typically >1000 cells/microL, but can be lower, particularly early in the course
Differential	Mononuclear predominance	Neutrophil predominance
Glucose	Normal or slightly reduced Usually ≥40% of serum value	Usually <60% of serum value Often <40 mg/dL
Protein	Normal to slightly elevated Usually <150 mg/dL	Typically 100 to 500 mg/dL

Contacts

- Prophylaxis should be given to contacts of HIB and Meningococcal infections
- Prophylaxis for Meningococcal meningitis Give to ALL household or very close contact regardless of age
- Risk of secondary case is 1%
- Rifampicin, or ceftriaxone, or ciprofloxacin
- PLUS meningococcal vaccine

Complications

- death 3–5%
- Subdural effusion/empyema
- Hearing deficit 7–30%
- decreased IQ 30–50%
- Hemiparesis
- Other neurological deficit

Neuroimaging

Indications for neuroimaging before LP

- severely depressed mental status (coma)
 - papilledema
 - focal neurologic deficit (with the exception of cranial nerve VI or VII palsy)
 - history of hydrocephalus and/or presence of a CSF shunt
- recent history of CNS trauma or neurosurgery

Management

1-Supportive care

- Ensure adequate oxygenation, ventilation, and circulation
- Obtain venous access
- Cardio-respiratory monitoring while obtaining
- laboratory studies.
- Keep the head of bed elevated at 15 to 20°.
- Treat hypoglycemia, acidosis, and coagulopathy

2-Antimicrobial therapy

- Antibiotic therapy should be initiated immediately following the LP if the clinical suspicion for meningitis is high
- Vancomycin (15 mg/kg IV)
- Ceftriaxone (50 mg/kg IV) or cefotaxime (100 mg/kg IV)

3-Dexamethasone

- (0.15 mg/kg IV) in patients with certain risk factors:
 - unimmunized patients,
 - young children [age ≥6 weeks to ≤5 years],
 - children with sickle cell disease,
 - asplenic patients) or
 - if there is known or suspected Haemophilus influenzae

infection (eg, based on Gram stain results).

- should be administered before, or immediately after, the first dose of antibiotic

Duration of therapy

- N meningitidis 7 d H influenzae 7 d
- S pneumoniae 10–14 d
- S agalactiae (GBS) 14–21 d
- Aerobic gram-negative bacilli 21 days or 2 wks beyond the first sterile culture (whichever is longer)
- L monocytogenes 21 d or longer