CNS infections

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Types of CNS infections

- Meningitis
- Meningo-encephalitis
- Encephalitis
- Ventriculitis
- Cerebral abscess
- Cerebral malaria
- Other parasitic infections

Clinical features of CNS infections

- Features of any other infection like fever
- Specific clinical features due to type of infection
- Features due to cerebral edema
- Features due SIADH

Meningitis

- Inflammation of meninges
- Can be viral, bacterial or chemical
- Tubeculosis

Clinical features

- High fever, vomiting, headache, photo-phobia, skin rashes
- May have seizures
- Drowsiness but GCS not altered
- Signs of meningism due to inflamed meninges

    neck stiffness

    kerning sign

    Brudzinski sign

These manures results in stretching of nerve roots, which carry meninges around them up to a certain distance. Positive signs are due to spasm of muscles resulting from irritation of nerve roots supplying them.

Neck stiffness(**Nuchal rigidity)**

- Explain the child what you are trying to do
- Place the child supine without a pillow
- Turn the head side to side to assess the muscle tone (increase muscle tone due to any cause result in neck stiffness – what are they?)
- Hold the head with both hand and flex it on to the chest
- Feel if there is resistance
- Normally chin can reach the chest
- Not diagnostic of meningism – any painfull neck condition cause it

Kernig sign

- Place the child in supine position
- Flex the knee and hip at right angles
- Keep your left hand behind the knees to feel hamstring tendons
- With your right hand extend the knee
- Note resistance to extension and tightening of hamstring tendons
- Pain is not positive Kerning sign- it is strait leg raising test

A.D.A.M.

Brudzinksi sign

- As neck is short neck stiffness is not reliable in infants – become positive only at very advanced stages
- Kerning sing is also not reliable in infants
- So elicit Brudzinksi sign instead
- Place the child supine and flex the neck
- If positive there will be flexion at the hips

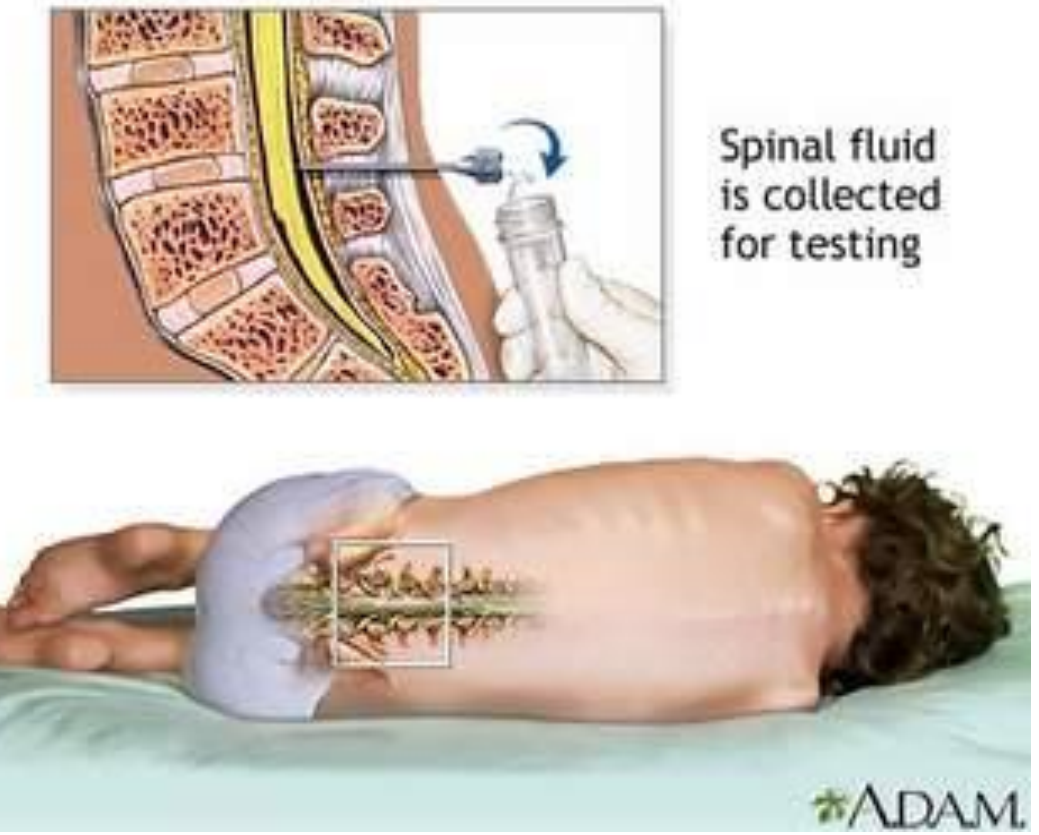
Viral or bacterial

- Often difficult to differentiate clinically
- If bacterial child may more ill and toxic
- Skin rashes are suggestive of bacterial
- Common bacteria are *H influenza, S pneumoniae and N meningitides*
- Check immunization history
- Need lumber puncture for confirmation

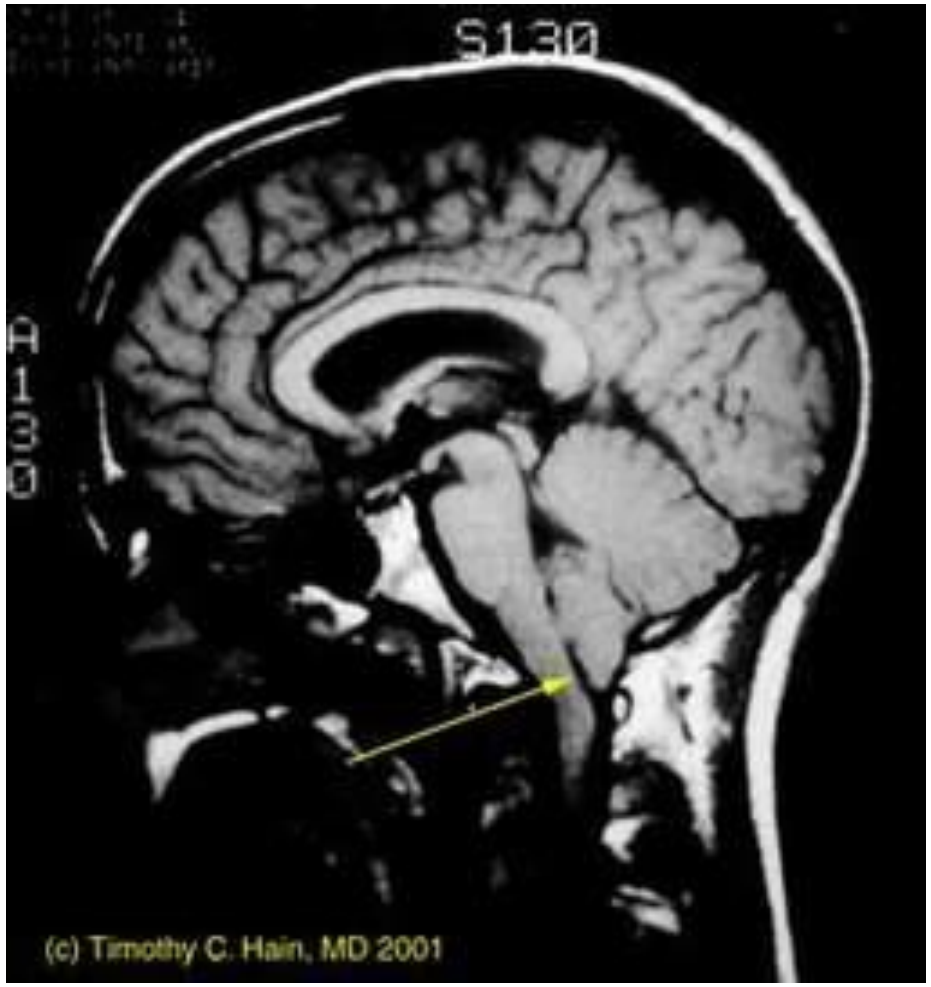
Lumbar Puncture

- Better do it before starting antibiotics – Why ?
- Most senior person should get the informed written consent from parents
- Exclude cerebral edema
- Contraindicated if focal fits or focal neurological signs are present
- Do it in supine lateral position with aseptic precautions
- Place the beveled side of the needle laterally
- If blood stained wait for a while and see whether it clears, if not repeat later
- Send samples to lab as soon as possible
- Never refrigerate culture samples

Lumbar Puncture procedure



Cerebellar herniation



Interpretation of LP results

- At the time – gushing out, under pressure indicate raised IC pressure
- Appearance – Turbid if bacterial, uniformly blood stained – SAH
- Cells RBC – nil unless traumatic

  Neutrophils – nil if normal, even one is evidence of bacterial

  Lymphocytes- up to 5 normal, increased in viral, bacterial/ partially treated

Proteins - very very high if TB, very high if Bacterial, high in viral

Sugar - normal in viral, low in bacterial, may be low if partially treated

Partially treated meningitis

- With antibiotics CSF changes of pyogenic meningitis will reverse
- Even oral antibiotics given prior to LP can cause this
- First to reverse is smear and culture
- Then sugar become normal
- Then the cell count
- Finally the proteins return to normal
- There can be difficulty in differentiating viral meningitis from partially treated pyogenic meningitis

management

- IV antibiotics for 10 – 14 days depending on clinical response
- Why IV antibiotics
- Use antibiotics that cross blood brain barrier freely
- Maintain nutrition and hydration
- Maintain fluid balance
- Temperature control
- In cases of Meningococcal and Haemophilus treat unimmunized contacts
- Look for complications

Complications

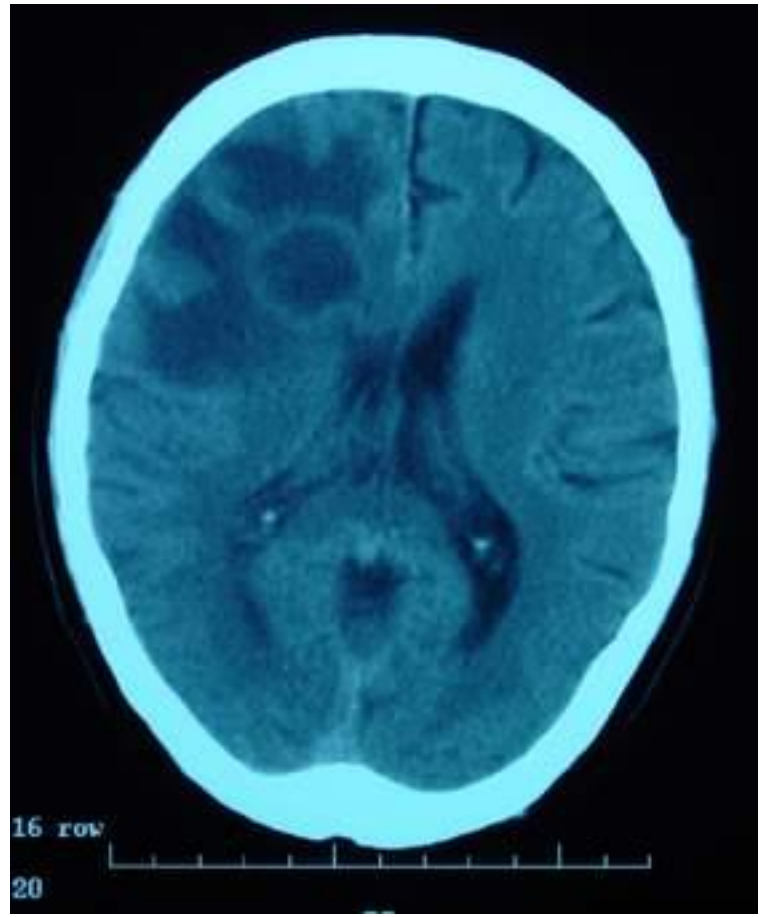
- Acute –
  - Septicaemia
  - Hydrocephalus
  - Cerebral abscess
  - Subdural collections
  - ventriculitis
  - SIADH
  - seizures

Complications

- Chronic
    * hydrocephalus
    * deafness
    * blindness
    * cerebral palsy
    * educational difficulties
    * epilepsy

Cerebral abscess

- Can occur in children with right to left cardiac shunts
- Symptoms will depend on site of abscess
- Focal neurological signs and focal fits should alert of this possibility
- Rapid rise in CSF pressure can lead to bulging fontanelle and suture separation (suture diastasis)
- CT/MRI scan indicated - focal hypodense area with ring enhancement
- Need drainage and continuation of IV antibiotics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Viral meningitis management

- Antibiotics not indicated
- General management

Encephalitis/meningo-encephalitis

- This caused by viruses
- Can also involve meninges – meningo-encephalitis
- As brain matter is involved compared to meningitis in encephalitis there is behavior changes, impaired level of consciousness and seizures are more likely
- Many viruses can cause it but treatment is only available for Herpes simplex type 1
- CT/ MRI will show cerebral edema- diminished grey/white demarcation

Encephalitis/meningo-encephalitis

- EEG will show generalized slow waves
- CSF changes similar to viral meningitis – RBC can present in herpes
- No specific management other than for herpes
- Symptomatic management, maintaining nutrition/fluid & electrolyte balance and managing complictions

Cerebral malaria

- A complication of malaria due *P falciparum*
- Clinical features are thought to be due interference with cerebral circulation than direct neuronal damage by the parasite
- Cardinal clinical feature is unarousable coma
- High mortality
- Now not seen in Sri Lanka at present