# MENINGITIS

Acute infection of the meninges presenting with the characteristic combination of: headache, fever and meningism.

Meningism consists of stiffness of the neck, often with other signs of meningeal irritation:

- Kernig's sign: with the hip joint flexed, extension of the knee causes spasm in the hamstrings.
- Brudzinki's sign: passive flexion of the neck causes flexion of the knees and thighs.

CAUSES OF MENINGITIS

| **INFECTIVE** | **NON-INFECTIVE (sterile)** |
|---|---|
| BACTERIAL<br>• Causative organisms vary at different age groups<br><br>VIRUSES<br>• Enteroviruses (coxsakie, polio)<br>• Mumps<br>• Influenza<br>• HSV<br>• VZV<br>• EBV<br>• HIV<br>• Lymphocytic choriomeningitis<br><br>PROTOZOA AND PARASITES<br>• Toxoplasma<br>• Amoeba<br>• Cysticercus<br><br>FUNGI<br>• Cryptococcus neoformans<br>• Candida<br>• Histoplasma | MALIGNANT DISEASE<br>• Breast cancer<br>• Bronchial cancer<br>• Leukemia<br>• Lymphoma<br><br>INFLAMMATORY DISEASE<br>• Sarcoidosis<br>• SLE |

BACTERIAL CAUSES OF MENINGITIS

| AGE OF ONSET | COMMON | LESS COMMON |
|---|---|---|
| **NEONATE** | Gram neg bacilli (E-coli, proteus)<br>Group B streptococci | Listeria monocytogenes |
| **PRE-SCHOOL CHILD** | H. Influenza<br>Neisseria meningitidis<br>Strep pneumoniae | Mycobacterium TB |
| **OLDER CHILD AND ADULT** | Neisseria meningitides<br>Strep pneumonia | Listeria monocytgenes<br>Mycobacterium TB<br>Cryptococcus neoformans (immuno-compromised pts)<br>Staph aureus (skull fractures)<br>H. influenzae |

**APPROACH TO A PATIENT WITH MENINGITIS**

- resuscitate and stabilise patient, do initial tests ( blood cultures, infective markers)
- If drowsy or has focal signs, defer lumbar puncture, do ct brain
- If no contraindications. Do LP
- Empirical antibiotics while waiting for results

| Condition | Cell type | Cell count | Glucose | Protein | Gram stain |
|---|---|---|---|---|---|
| Normal | Lymphocytes or none | 0-4 | >60% of sglucose | Up to 0.45 | Neg |
| Viral | Lymph | <500 | Normal or higher than half serum value | Normal or <1g | Neg |
| Bacterial | Polymorph | 1000-5000 | Low | >1g | Pos |
| TB | Poly/lymph/mixed | 50-5000 | Low | High | Often neg |
| Fungal | Lymph | 50-500 | Low | High | +/- |
| Malignant | Lymph | 0-100 | Low | Normal or high | neg |

**VIRAL MENINGITIS**

- Most common cause
- Benign self-limiting disease, no specific therapy
- Less serious illness than bacterial meningitis, unless ass encephalitis.
- Meningitis may also occur as a complication of a viral infection primarily involving other organs eg mumps, measles, herpes zoster, hepatitis.

Clinical features

- Children or young adults
- Acute onset of headache, irritability and rapid development of meningism
- Headache is the more severe feature
- +/- fever
- Focal signs do not occur since there's seldom parenchymal involvement
- CSF features below

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- illness is benign and self-limiting, no specific treatment required
- symptomatic management
- recovery within days

## BACTERIAL PYOGENIC MENINGITIS

- usually secondary to a bacteraemic illness
- infection may also be from direct spread from an adjacent focus of infection in the ear, skull fracture or sinus

Pathology

- The pia arachnoid is congested and infiltrated with inflammatory cells.
- A thin layer of pus forms and may layer organise to form adhesions.
- Adhesions may cause obstruction to the free flow of CSF leading to hydrocephalus or they may damage the cranial nerves at the base of the brain.
- The CSF pressure rises rapidly and the protein content increases and there is a cellular reaction that varies in type and severity according to the nature of the inflammation and the causative organism.
- An obliterative endarteritis of the leptomenigeal arteries passing through the meningeal exudate may produce secondary cerebral infarction.
- Pneumococcal meningitis is often associated with a very purulent CSF and a high mortality, especially in older adults.

Clinical features

- Headache, fever, drowsiness, neck stiffness
- Severe meningitis: patient may be comatose, and later there may be focal neurological signs.
- Meningococcal meningitis may present very rapidly, with abrupt onset of obtundation due to cerebral oedema. There may be a purpuric skin rash and circulatory collapse

Investigations

- LP if no contraindications
- Blood cultures

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- According to most likely causative organism
- Start treatment empirically while awaiting results

*Treatment of pyogenic meningitis of unknown cause*

| | |
|---|---|
| **Patients with a typical meningococcal rash** | Benzyl pen 2.4g qid iv |
| **Adults 18-50 yrs, no rash** | Ceftriaxone 2g 12hrly |
| **Penicillin resistant pneumococcal in suspected** | Ceftriaxone plus vancomycin 1g bd or rifampicin 600mg bd |
| **Adults >50 yrs suspicion of listeria (brain stem signs, immunosupp, diabetics, alcohol)** | Ampi 2g qid ivi or co-trimoxazole 50mg/kg in two divided doses |
| **Pen allergy** | Chloramphenicol 25mg/kg qid plus vancomycin 1g bd ivi |

*Treatment of pyogenic meningitis when cause is known*

| Pathogen | Regimen of choice | Alternative agents |
|---|---|---|
| N. meningitides | Benzyl pen 2.4g 4hrly 7 days | Cefuroxime, ampi, chloramphenicol |
| Strep pneumo (sens to b lactams) | Cefotaxime or ceftriaxone | Chloramphenicol |
| Strep pneumo (resistant to b lactams) | As for sensitivity<br>Add vanco or rifampicin | Vanco plus rifampicin |
| H. influenza | Cefotaxime or ceftriaxone | Chloramphenicol |
| Listeria | Ampi plus genta | Ampi plus co trimoxazole |

Prevention of meningococcal infection

Household and other close contacts of the patients

1. Oral rifampicin for two days
   - Age 3-12m 5mg/kg 12hrly
   - >1yr 10m/kg 12hrly
   - Adults 600mg 12hrly or a single dose of ciprofloxacin 500mg
2. Vaccines available for meningococci groups A and C but not for B which is the most common serogroup isolated.

TB MENINGITIS

- The usual local source of infection is a caseous focus in the meniges or brain substance adjacent to tge CSF pathway.
- The brain is covered by a greenish, gelatinous exudate especially around the base, and numerous scattered turbercles are found on the meninges.

Symptoms

- **Headache**
- **Vomiting**

- Low grade fever
- Lassitude
- Depression
- Confusion, behaviour changes

Signs

- Meningism (may be absent)
- Oculomotor palsies
- Papilloedoema
- Depressed LOC
- Focal hemisphere signs

Treatment: anti TB chemotherapy: Rifafour

Prognosis: fatal if untreated. Complete recovery is a rule if treatment is started before the appearance of focal signs or stupor.

## CRYPTOCOCCAL MENINGITIS

- Commonly affects immunocompromised patients
- AIDS defining illness in HIV positive patients, must start ARVs regardless of CD4 count
- Headache, nausea, vomiting, lethargy, mental changes (confusion, hallucinations)
- Complications if untreated include: coma, hearing loss, hydrocephalus
- Treatment: amphotericin B for 14 days, fluconazole 400mg for 8 weeks followed by fluconazole 200mg dly lifelong treatment or until cd4 >200

# DEMENTIA

DEFINITION

Dementia represents a deterioration of memory and cognitive functions when compared to the patient's previous level of functioning as determined by the history of deterioration in capabilities and by dysfunctions that have been determined by clinical examination and neuropsychologic tests.

A diagnosis of dementia cannot be made in the presence of delirium.

CAUSES

Primary dementia

- Alzheimer's disease
- Pick's disease

Neurological disease associated with dementia

- Parkinson's disease
- huntington's chorea

Systemic disease

- hypothyroidism
- hypophosphataemia
- uremia
- wernicke's encephalopathy

**ALZHEIMER'S DISEASE**

- Most common cause of dementia, occurring mostly in patients over 45 years.
- Genetic factors are important particularly if age of onset is under 65 years.

PATHOLOGY

- Macroscopically, the brain is atrophic, particularly the cerebral cortex and hippocampus.
- Histology reveals the presence of senile plaques and neurofibrillary tangles in the cerebral cortex.
- Many different neurotransmitter abnormalities have been described, in particular, impairment of the cholinergic transmission, though noradrenaline 5-HT, glutamate and substance P are also involved.

CLINICAL FEATURES

- Key clinical feature is delayed recall (inability to remember information acquired in the past)
- Both short term and long term memory affected, but defects of long term memory are more obvious.
- Later in the course of the disease, typical features are apraxia, visuo-spatial impairment and aphasia.
- Early in the disease, the patients themselves complain of difficulties but in the later stages patients commonly deny that there is anything wrong (anosognosia)
- Depression is common.

INVESTIGATIONS AND MANAGEMENT

- Investigation is aimed at excluding treatable causes of dementia
- No known treatment but recently donepezil and rivastigmine (inhibitors of the cerebral acetylcholinesterase) have shown some benefits and improvement in cognitive function.
- Management consists largely of providing a familiar environment for the patient, and providing support for the carers.

**PICK'S DISEASE**

- Much rarer than Alzheimer's.
- Degeneration predominantly affects frontal and temporal lobes.
- Histology is characterized by agryophilic cytoplasmic inclusion bodies (Pick's bodies) and chromatolytic ballooned neurons (Pick's cells)
- Patients may present with personality change due to frontal lobe involvement or with progressive aphasia
- Memory is relatively preserved in the early stages.
- No specific treatment.

**WERNICKE-KORSAKOFF DISEASE**

- Deficiency of thiamine (vit $B_1$) usually presents with an acute confusional state (Wernicke's encephalopathy) and brain stem abnormalities such as ataxia, nystagmus, and extraocular muscle weakness (lateral rectus).
- If inadequately treated, this result in a dementia characterized by a profound disturbance in short term memory associated with a tendency to confabulate, called korsakoff's syndrome.
- The deficiency can arise as a result of malnutrition (including that occasioned by chronic alcohol misuse), malabsorption or even protracted vomiting (as in hyperemesis gravidarum).
- Diagnosis made clinically or biochemically by finding a reduced red cell transketolase.
- Treatment consists of administering high dose vitamins, often intravenously in the initial stages, followed by oral thiamin.