

Menigitidis

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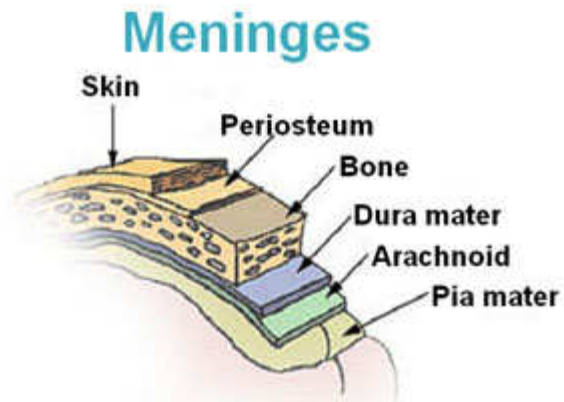
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Review Normal Microanatomy



Dura mater -- outer layer lining skull
Arachnoid (mater) -- contains blood vessels
Subarachnoid space -- filled with CSF
Pia mater -- covers brain

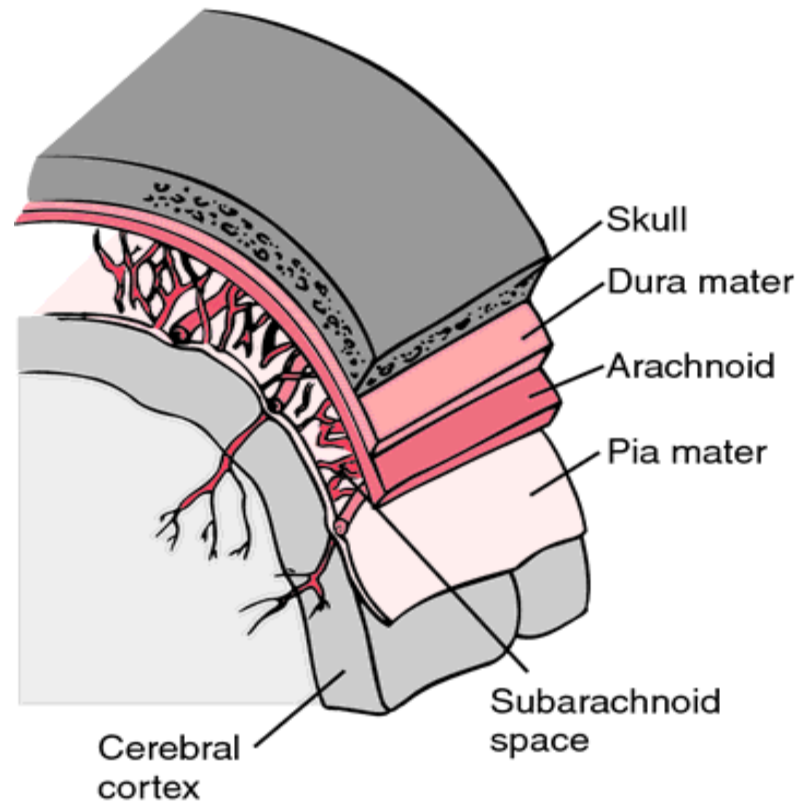


Image Ref: www.histology-world.com



Normal Histology - Meninges



Light micrograph (LM) of the meninges covering the monkey brain. The dura mater (DM), the most superficial meningeal layer, is dense, fibrous connective tissue. Underlying the arachnoid (Ar), a more delicate connective tissue, is the subarachnoid space (+), which, in life, contains cerebrospinal fluid. Arterial (A) and venous (V) branches of cerebral vessels traverse this space. The pia mater (PM) is the innermost, thinnest meningeal layer. Although not well seen at this magnification, tissue of the CNS is separated from the pia by a thin layer, called the outer glia limitans, which is formed by astrocyte end-feet. The subdural space (SDS) (between dura and arachnoid) is a preparation artifact. 270 \times , H&E.

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Overview

Definition: Inflammatory process of the leptomeninges and CSF into the subarachnoid space.

Meningitis – inflammation of meninges, usually by an infection.

However, chemical meningitis can occur from irritants introduced into the subarachnoid space.

Meningeal carcinomatosis – metastasis by carcinoma cells into subarachnoid space.

Secondary deposits by lymphoma - lymphomatosis



Infective Causes

- **Generally classified as:**
 - Acute pyogenic (bacterial)
 - Aseptic (Viral)
 - Chronic (any agent; PNG – TB, fungal (cryptococcal species)).
- **This classification is based on the clinical picture & CSF examination**



Causes – Pyogenic Meningitis

- ▶ Bacterial causative agent varies with age.
- ▶ Neonates – *E. coli* & Group B streptococci
- ▶ Infants & children – *H. influenzae*
- ▶ Young adults & adolescents – *N. meningitidis*
- ▶ Elderly – *S. pneumoniae* & *L. monocytogens*



Bacterial Meningitis – Clinical Presentation

- ▶ Systemic signs of infection (fever, malaise etc)
- ▶ Signs of meningeal irritation: head ache, photophobia, irritability, clouding of consciousness, neck stiffness.
- ▶ CSF examination
 - ▶ Raised neutrophils and protein
 - ▶ Decreased glucose
 - ▶ Culture and microscopy may show bacteria
- ▶ Immuno-suppressed patient: causative agent may be different e.g. Klebsiella or an anaerobic organism
 - ▶ Clinical presentation: atypical picture.



Morphology – Bacterial Meningitis

Macroscopic examination:

- Cloudy CSF or frank pus
- Suppurative exudate on brain surface
- Engorged meningeal vessels
- Location of exudate varies with agent:
 - H.influenzae – base of brain
 - Pneumococcal – cerebral convexities near sagittal sinus
- Pus may extend into ventricles



Morphology – Bacterial Meningitis

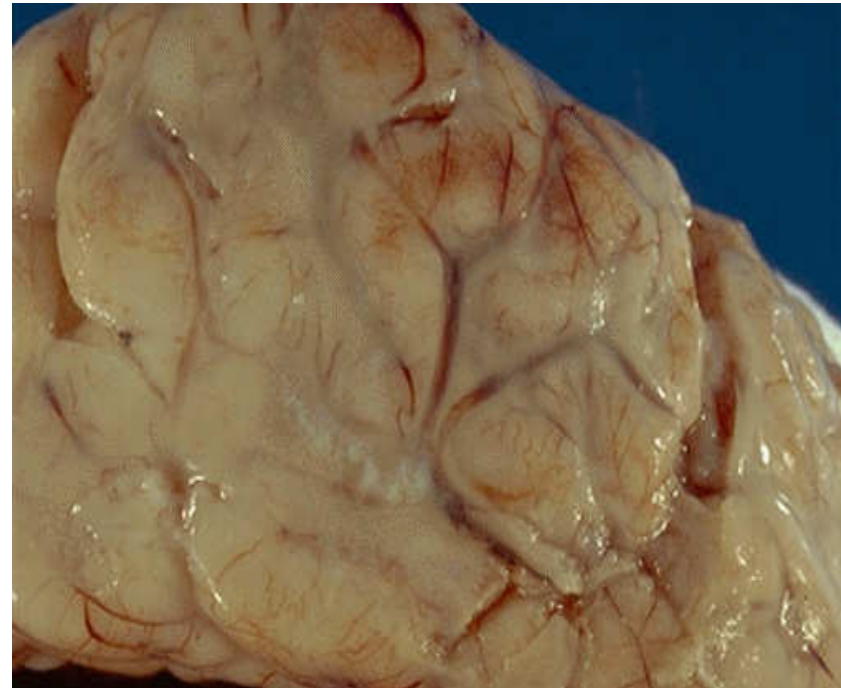
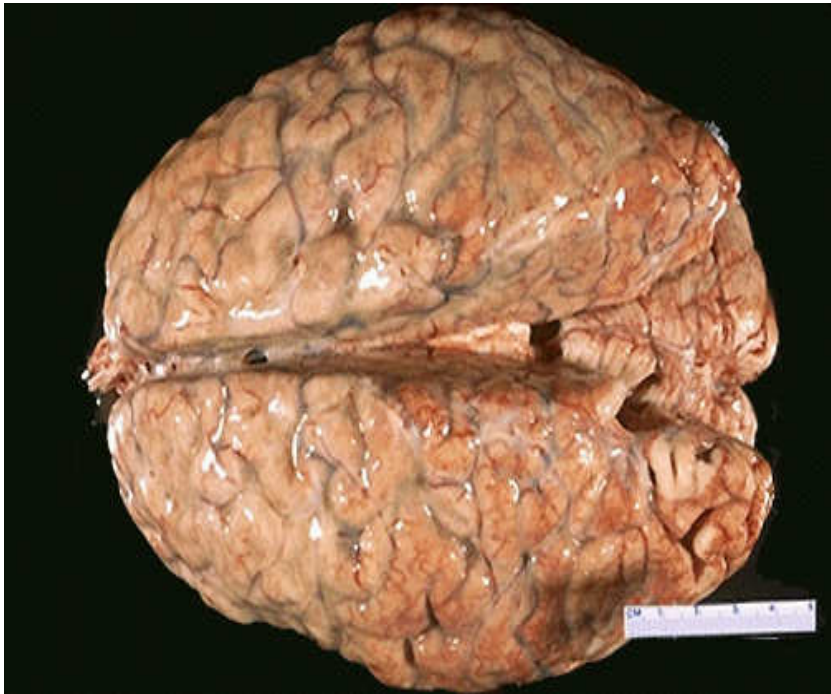
Microscopic examination:

- ▶ Neutrophils fill entire subarachnoid space in severe cases
- ▶ Mild – neutrophils around leptomeningeal blood vessels.

- ▶ Complications:
 - ▶ Focal cerebritis – extension of infection
 - ▶ Phlebitis of brain blood vessels
 - ▶ Haemorrhagic infarction of occluded vessels from phlebitis
 - ▶ Hydrocephalus – from fibrosis of leptomeninges
 - ▶ Chronic adhesive arachnoiditis (pneumococcal)



Gross Pathology – Pyogenic Meningitis

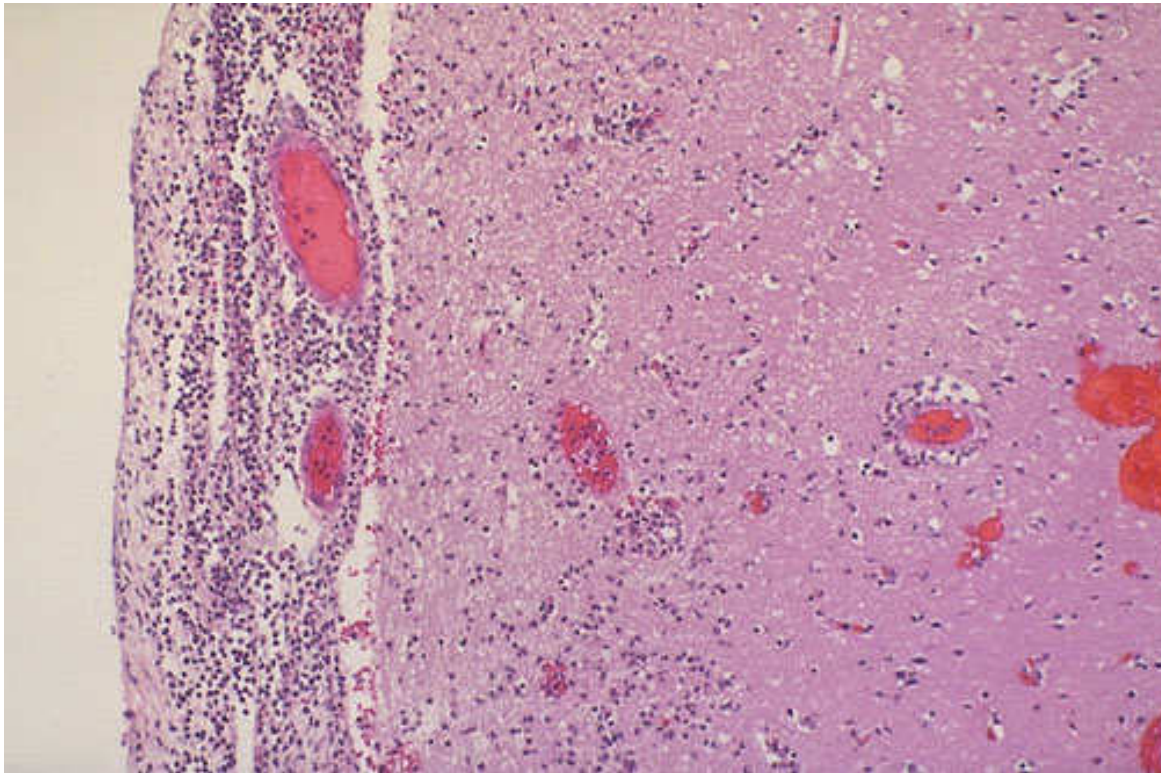


Suppurative exudate on brains surface. Engorged meningeal blood vessels

Ref Images from: www.library.med.utah.edu/WebPath/



Micro – Pyogenic Meningitis



Neutrophil exudate in subarachnoid space. Dilated and engorged blood vessels. Edema of brain cortex

Ref Images from: www.library.med.utah.edu/WebPath/



Aseptic (Viral) Meningitis

- ▶ **Causative Agents:** 90% are caused by viruses. Rarely other agents or bacteria.
 - ▶ 70% - enteroviruses
 - ▶ 80% echoviruses, coxsackie virus, non-paralytic polio virus
- ▶ **Clinical presentation:**
 - ▶ Mild symptoms
 - ▶ Usually self-limiting and treatment is supportive.
- ▶ **CSF:**
 - ▶ Lymphocytic pleocytosis
 - ▶ Moderate increase in protein
 - ▶ Glucose nearly always normal



Morphology – Aseptic Meningitis

- ▶ No distinctive macroscopic findings
- ▶ Brain swelling in some cases

- ▶ Microscopic:
 - ▶ No abnormalities
 - ▶ Mild-moderate: lymphocytic infiltrate of leptomeninges



Chronic Meningitis - TB

- ▶ Clinical presentation: head ache, malaise, mental confusion and vomiting.
- ▶ CSF:
 - ▶ Moderate CSF pleocytosis – predominantly mononuclear cells
 - ▶ Mixture of mononuclear and polymorphonuclear cells.
 - ▶ Elevated protein
 - ▶ Glucose moderately low or normal



Morphology – Chronic Meningitis TB)

▶ Macroscopic:

- ▶ Gelatinous or fibrous exudate, often at base of brain.
- ▶ Exudate may block cisterns and encase cranial nerves.
- ▶ Discrete white granules scattered over leptomeninges
- ▶ Tuberculoma (if TB): well-circumscribed intra-parenchymal mass.

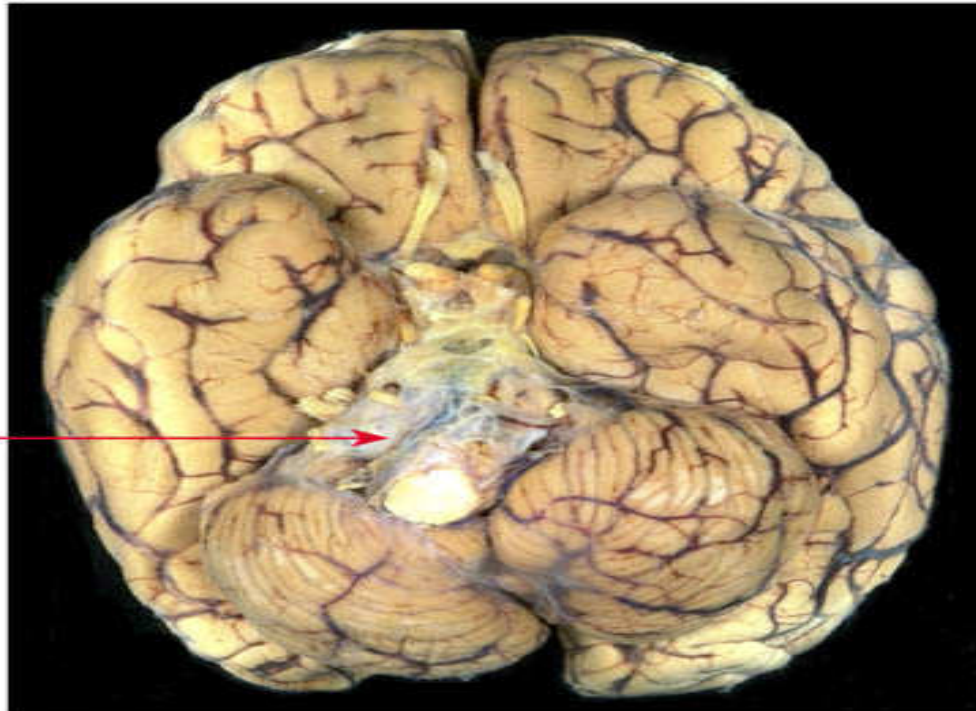
▶ Microscopic:

- ▶ Mixture of lymphocytes, plasma cells and macrophages in subarachnoid space
 - ▶ Well-formed granulomas with caseous necrosis and giant cells
 - ▶ Obliterative endarteritis of arteries running through subarachnoid space
 - ▶ Obliterative arteritis with inflammatory infiltrate in arterial walls and marked wall thickening.
 - ▶ AFB if stained
 - ▶ Tuberculoma: central core necrosis surrounded by granulomatous reaction. Calcification may be present.
-



Macroscopic – TB Meningitis

Thick grey shaggy
exudate encasting
cranial nerves
& blood vessels

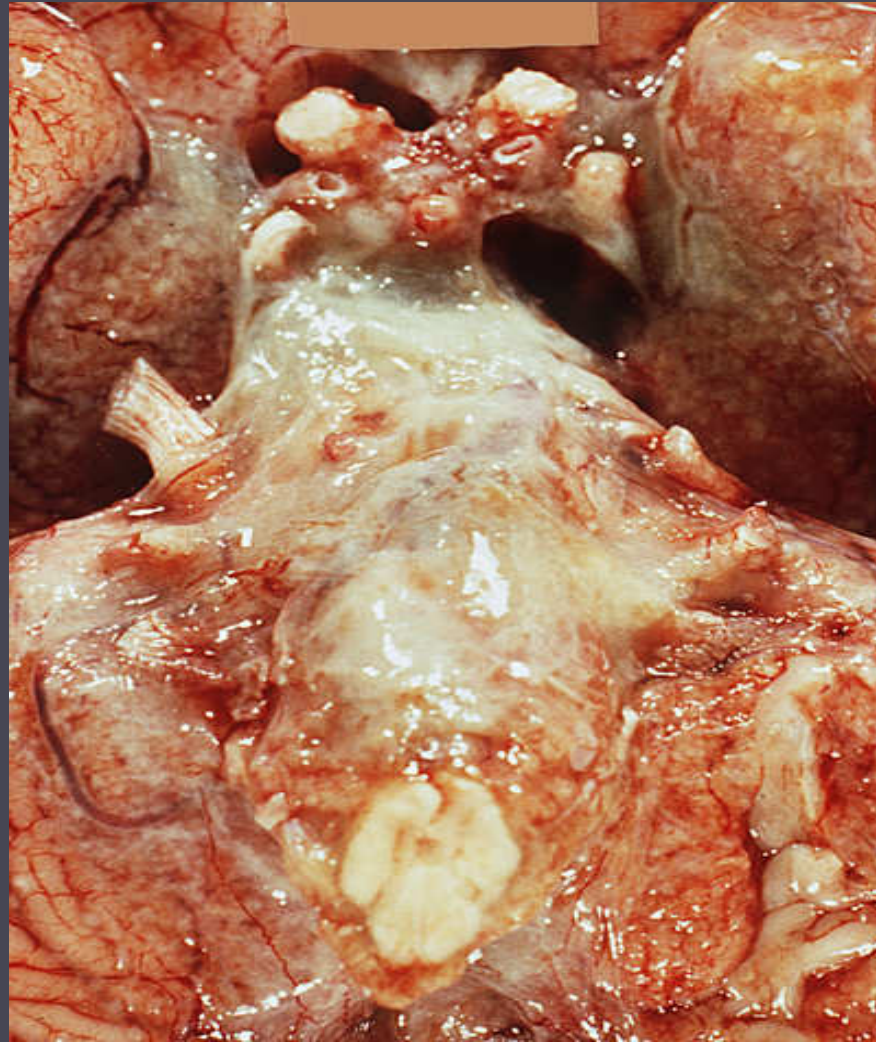


Tuberculous Meningitis

V.60

Image Ref: www.patho.hku.hk/

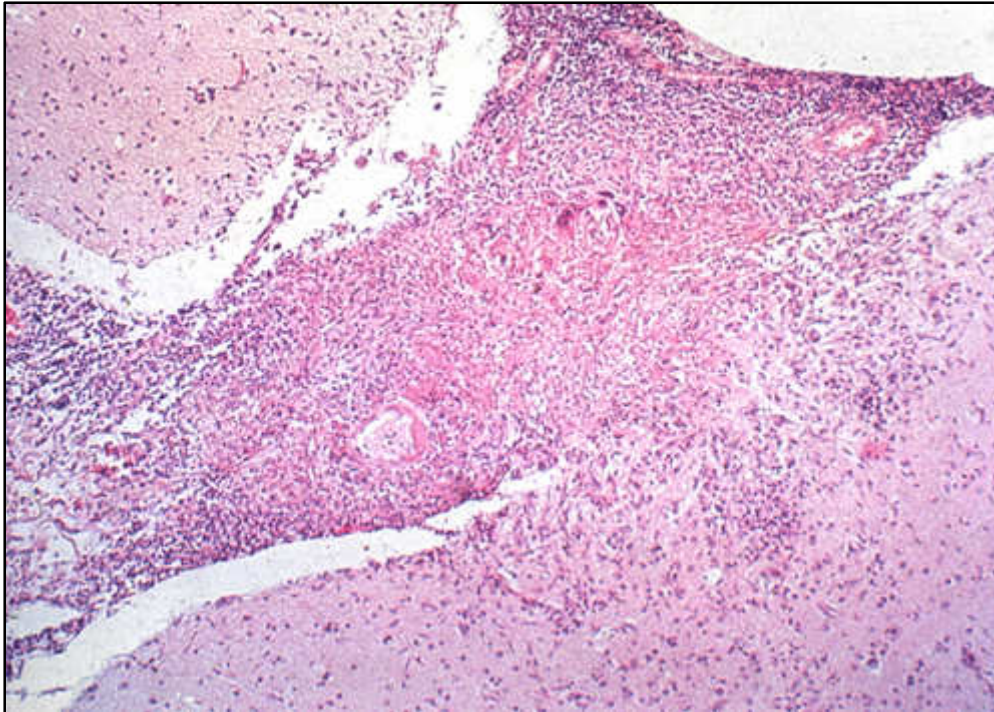
Macroscopic – TB Meningitis



Thick exudate at
base of brain

Image Ref: www.neuropathology-web.org/

Microscopy – TB Meningitis

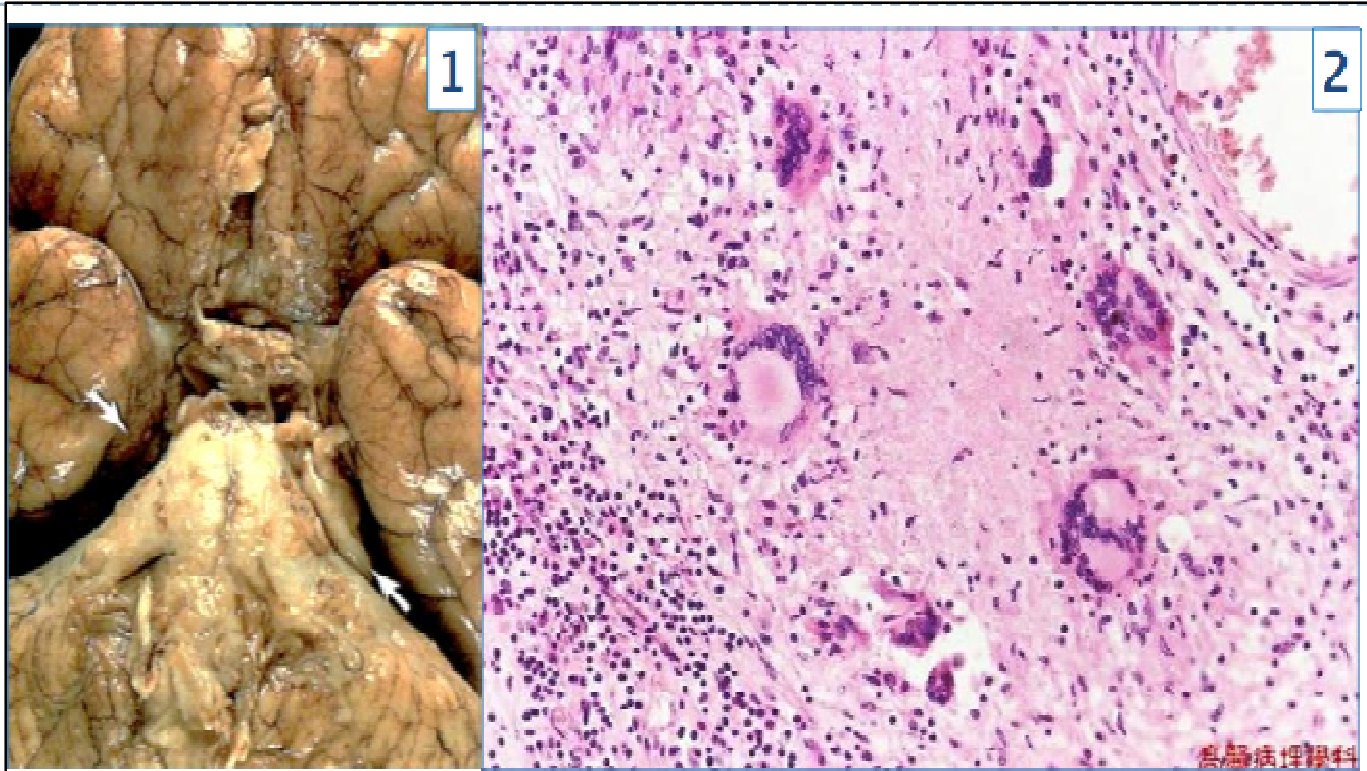


Necrotic lesion of subarachnoid space with superficial invasion of brain parenchyma

Image Ref: www.neuropathology-web.org/



Tuberculoma



Grey-green gelatinous/fibrous exudate in SAS. Location: basal cistern and around spinal cord. Micro: granuloma

Image Ref: www.studyblue.com/

End

- ▶ Robins Pathological Basis of Diseases – what ever edition you have.
- ▶ PDF format of presentation & study guides will be available on:

www.pathologyatsmhs.wordpress.com

Useful website: <http://library.med.utah.edu/WebPath/>

