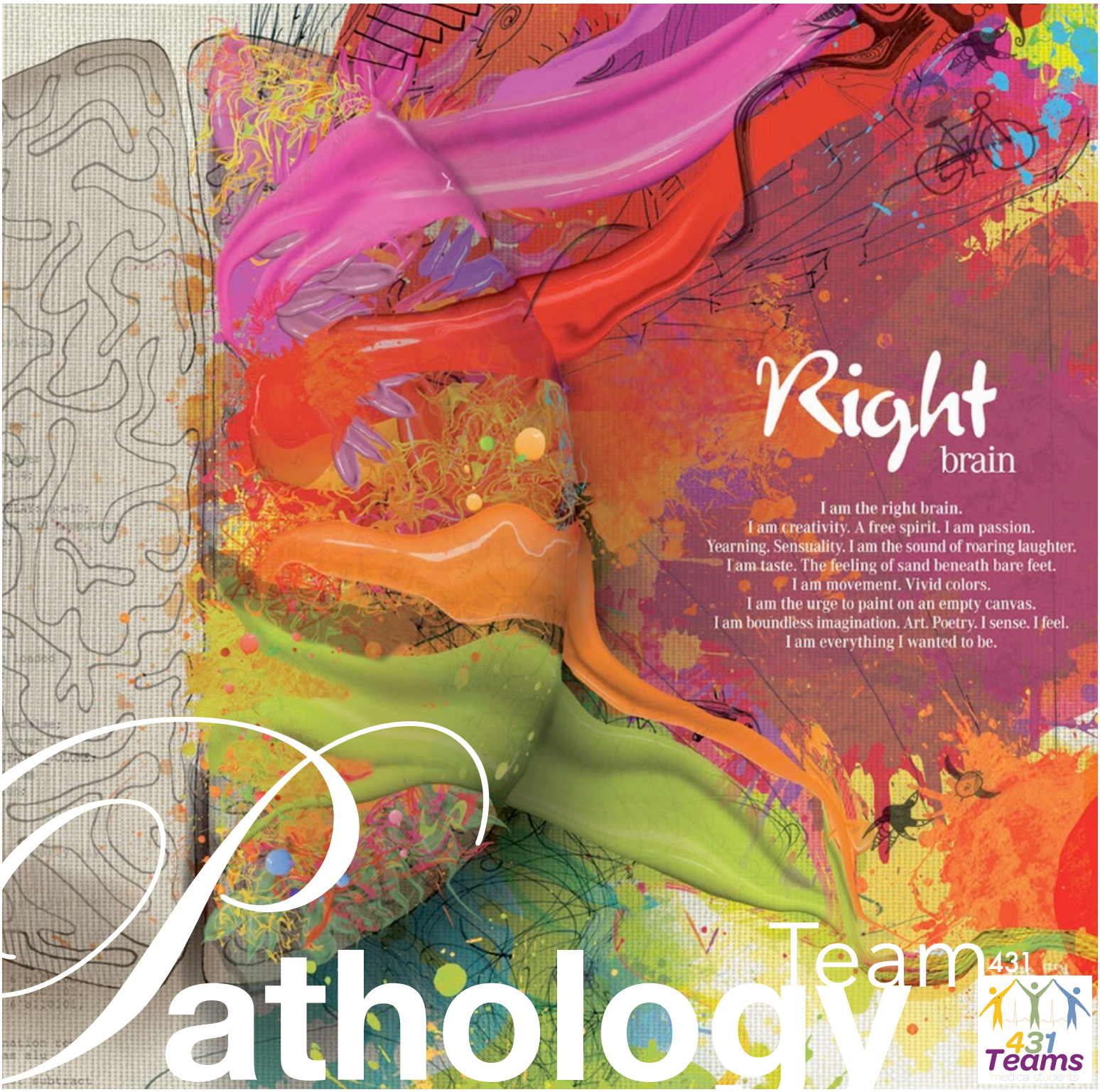


Pathology

Team 431

431 Teams medical students

Practical

CNS Block

Done by:

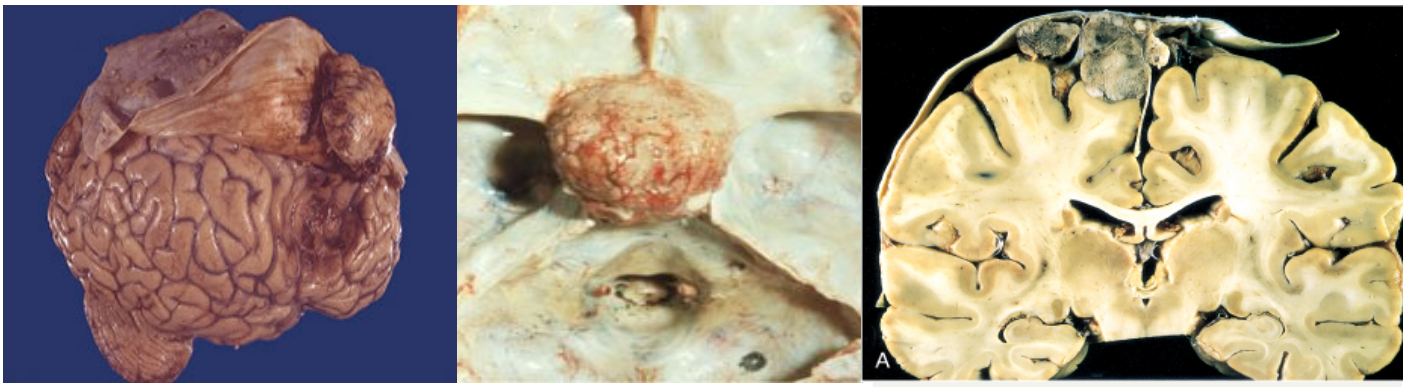
Turki Al turki, Sadeem Al dawas, & Hadeel Helmi

Notes:

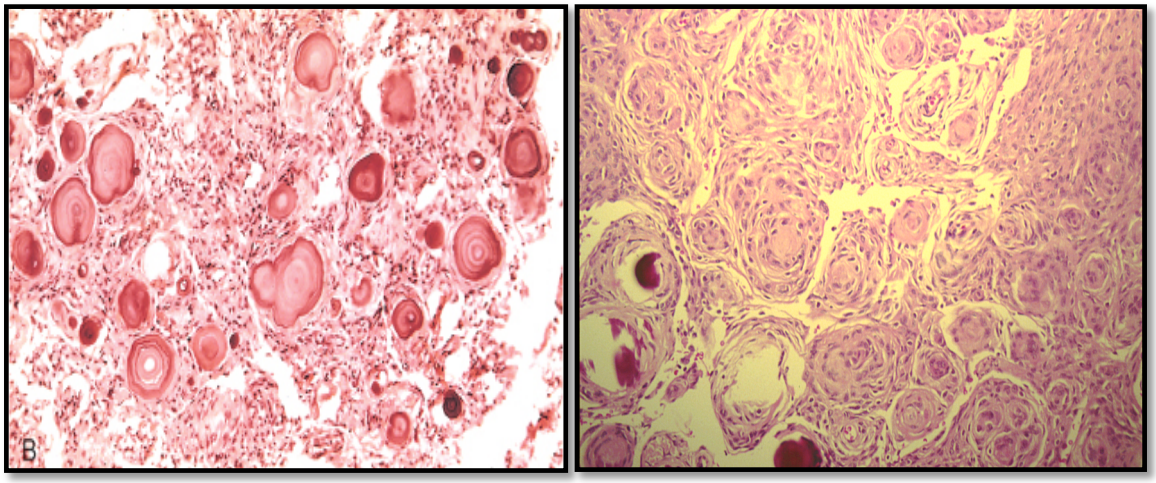
- The last two cases where not mentioned by Dr Shaesta in her revision.
- Dr shaesta emphasized on the importance of knowing the stain used in each microscopic slide.
- The most important cases are marked by a blue star.
- The format of the Qs will be: given case/scenerio, questions about the findings, gross and microscopic description and an extra general Q about the diagnosis.

Case 1: Meningioma

43 years old female complained of headache and two attacks of seizures in the past 4 months . Brain MRI revealed a 3 cm. extra-axial mass in the parietal region. It was dural based with mild edema in surrounding brain tissue.



GROSS:
parasagittal multilobular meningioma attached to the dura (subdural) compressing the underlying brain without invasion of brain tissue.



MICROSCOPY SECTION SHOWS:

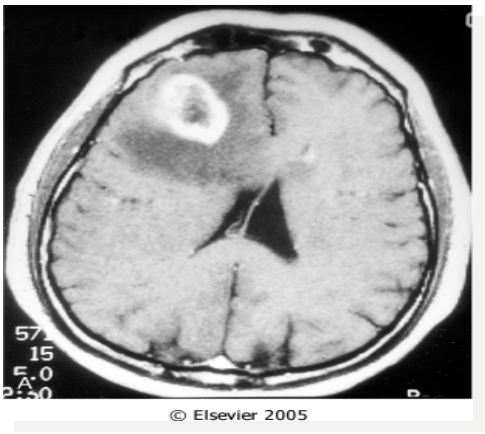
- Whorls of fibrocellular tissue.
- Cells are oval, spindle shape or elongated and lack mitosis (because it is low grade)
- Psammoma bodies (spherical calcified particles) are also seen within the tumor.

Types of meningiomas:

Transitional	Fibroblastic
Psommametous	Meningiothelial (syncytial)
Secretory	Angiomatous
Microcystic	Lipomatous

Case 2: Glioblastoma multiforme

55 years old man complained of headache for the last 2 months . Brain MRI reveals a 3 cm. frontal intra-parenchymal space occupying lesion with rim enhancement on contrast studies.

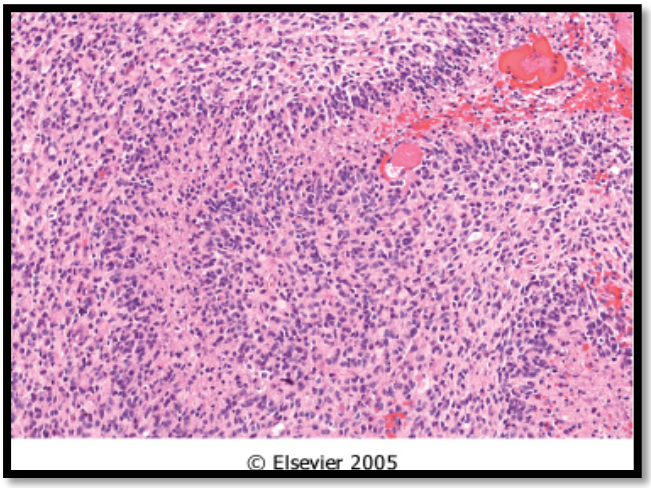


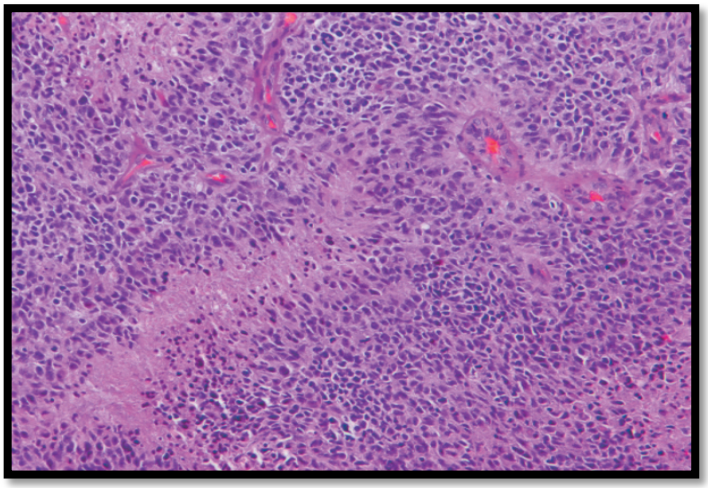
Computed tomographic (CT) scan of a large tumor in the cerebral hemisphere showing signal enhancement with contrast material and pronounced **peritumoral edema.**

GROSS SECTION SHOW:

Glioblastoma multiforme appearing as

- a necrotic
- hemorrhagic
- infiltrating mass.



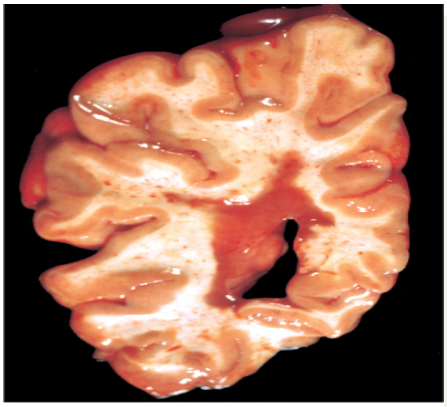


MICROSCOPY:

- Foci of necrosis
- Pseudopalisading of malignant nuclei
- Proliferation of cappilary wall whose endothelial cells appear plump

Case 3: Multiple sclerosis

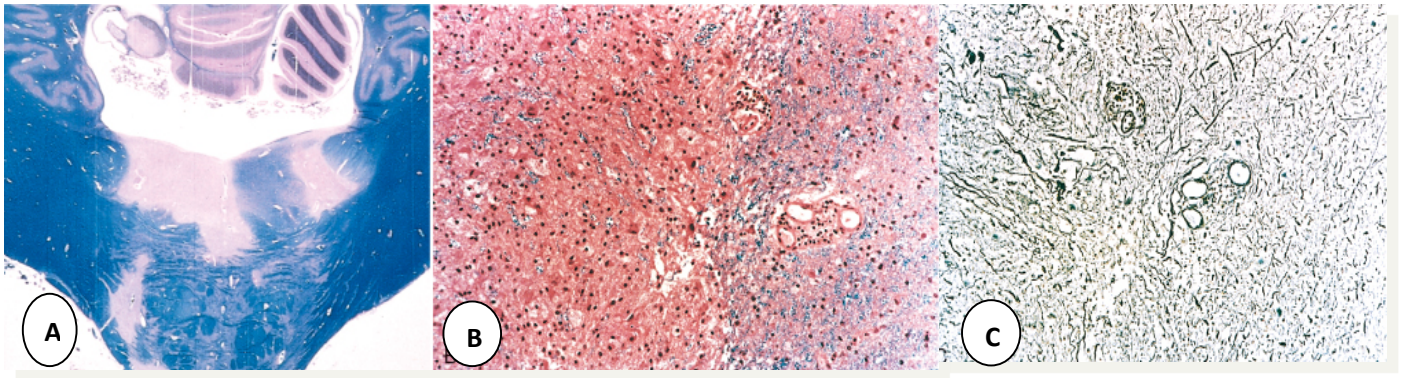
27 years old woman presents with a sudden onset of right sided blindness and weakness in her left leg. There is no history of trauma. However, she experienced a similar episode 8 months ago and was diagnosed as aseptic meningitis.



GROSS SECTION SHOW :

Multiple sclerosis Section of fresh brain showing a **periventricular brown plaque** around occipital horn of the lateral ventricle.

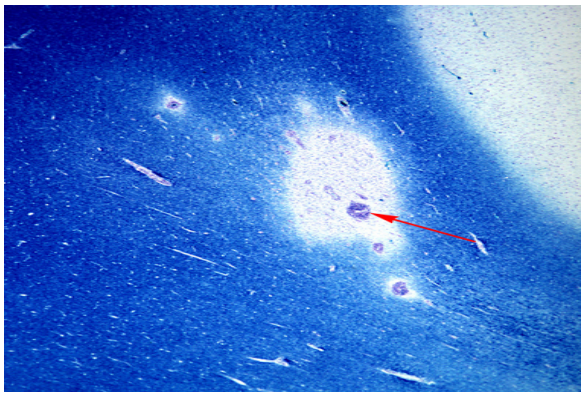
MICROSCOPIC SECTIONS SHOW:



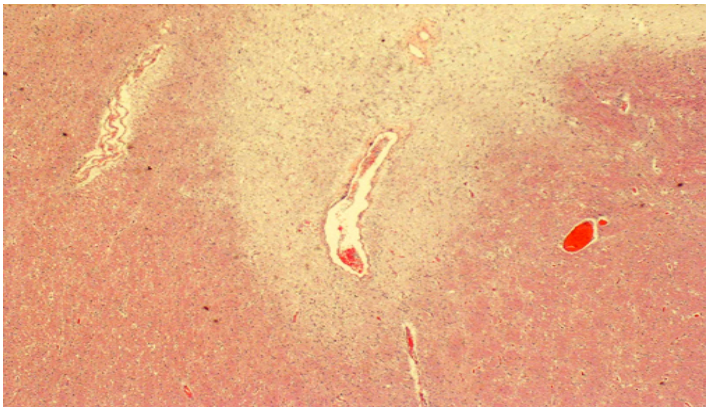
A, Unstained regions of demyelination(MS plaques) around the fourth ventricle (Luxol fast blue PAS stain for myelin)

B, Myelin-stained section shows the sharp edge of a demyelinated plaque and perivascular lymphocytic cuffs.

C, The same lesion stained by silver stain to show relatively preserved axons.



This is a myelin stain (luxol fast blue/PAS) of an early lesion. The lesion is centered around a small vein (arrow) which is surrounded by inflammatory cells.



This is an H&E stained sections from a patient with long standing MS. This lesion is centered on a vein. In this older lesion, however,there is very little inflammation around the vein. Loss of myelin can be seen by H&E stain; appears as a pale lighter pink area demarcationg the diseased cells that lack myelin. (myelin stain is used for confirmation).

The key microscopic features of multiple sclerosis are:

Perivenous mononuclear inflammation (lymphocytes, plasma cells and macrophages)

Loss of myelin and variable loss of oligodendrocytes.

Relative preservation of axons.

Reactive astrogliosis (sclerosis).

However, MS lesions do vary depending on their age.

Early (acute) lesions are characterized by perivascular and parenchymal infiltration by inflammatory mononuclear cells, and myelin breakdown and phagocytosis by macrophages. Astrogliosis is not yet profound and axons are relatively preserved.

As the lesion progresses, there are fewer inflammatory cells and more astrogliosis.

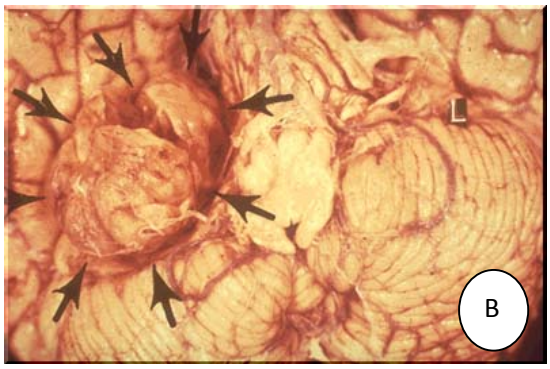
Chronic lesions have few mononuclear cells, almost complete demyelination, and severe astrogliosis. There can be oligodendrocyte loss and some secondary axonal loss in advanced cases.

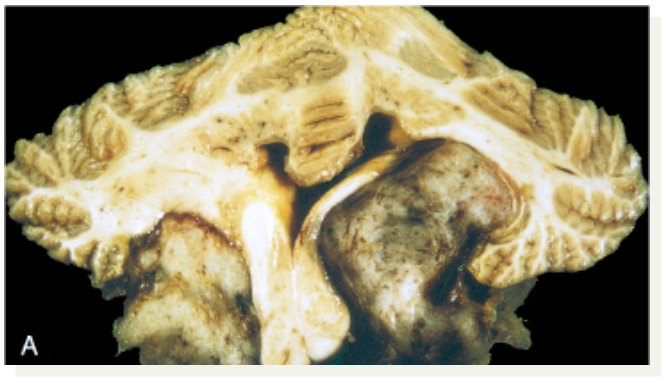
Multiple sclerosis is the most common disease of CNS myelin; prevalence of 1:1000.
Central nervous system myelin is selectively destroyed (axons are relatively preserved)
Onset is frequently in 30 and 40 year old age groups.
The disease is typically progressive with relapsing and remitting accumulations of focal neurologic deficits.
The etiology is thought to be autoimmune in nature.
Symptoms include:

Fatigue	Depression	Memory change
Pain	Spacticty	Vertigo
Tremors	Affected vision	Muscle weakness
Unsteadiness	Numbmess	Speech disturbance
Bladder or bowel dysfunction	Cognitive difficulties	Tingling

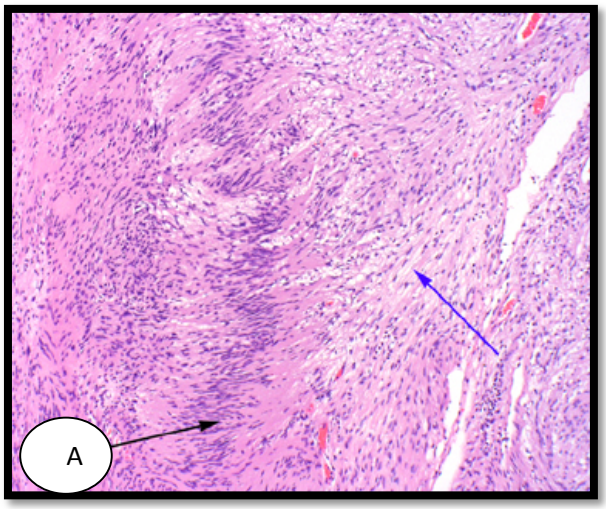
Case 4: Schwannoma

39 years old man complains that he had noticed a progressive hearing loss over a 2 years period. Except for occasional headache, he has no other complaints . Evaluation discloses severe sensorineural hearing loss of the left side . MRI shows 1.5 cm. mass at the left cerebellopontine angle.





GROSS:
A,Bilateral eighth nerve schwannomas, suggestive of NF2 Syndrome.
B,Mass at the cerebello-pontine angle (most common location for this type of tumor).



MICROSCOPIC:

typically has dense hypercellular areas called Antoni A (black arrow) and looser myxoid (mucous-like) areas called Antoni B (blue arrows).

In the Antoni A zone:
The cells are elongated (spindle shaped) and the nuclei have a tendency to line up at the periphery surrounding the eosinnophillic cell processes known as Verocay bodies. (B, far right)

These benign tumors also known as a neurilemmoma; neoplasm composed of a proliferation of Schwann cell and are associated with neurofibromatosis type 2.

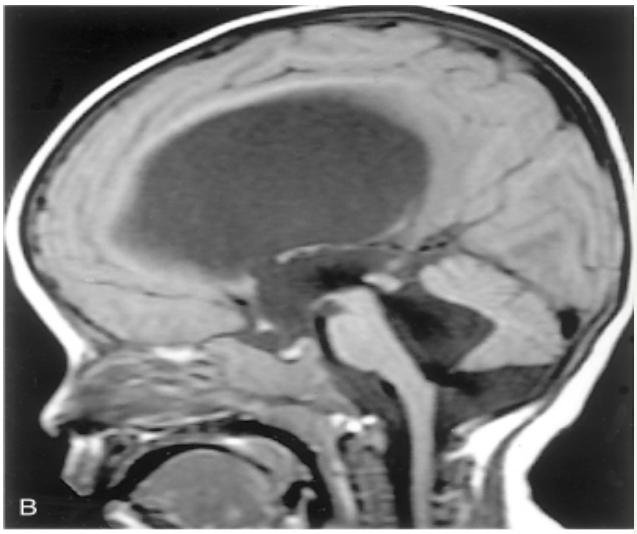
Pathogenesis is unknown

Within the cranial vault, the most common location is in the cerebello-pontine angle, where they are attached to the vestibular branch of the eighth nerve.

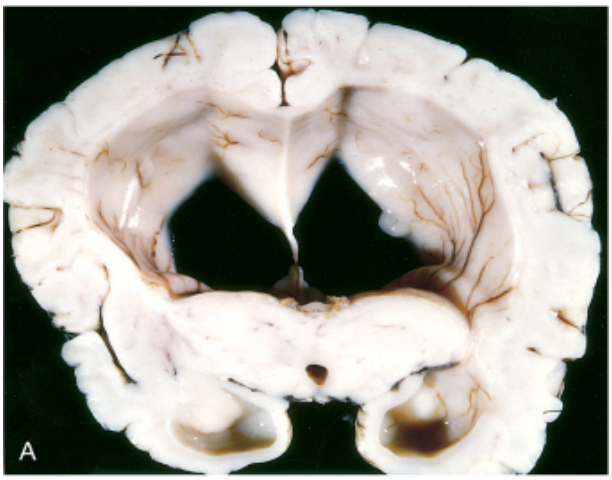
Patients often present with tinnitus and hearing loss

Case 5: Hydrocephalus

9 months infant was suffering from enlarged head size and admitted to hospital with convulsions, went into coma and died. Autopsy was done and the brain was large with dilated ventricles.



Midsagittal magnetic resonance image of a child with communicating hydrocephalus, involving all ventricles.



GROSS SECTION SHOWS:
Hydrocephalus.

Dilated lateral ventricles seen in a coronal section through the midthalamus.

Hydrocephalus is secondary to increased production, or decreased reabsorption or obstruction of the CSF.
Complications include:

Infants below 1 year: increased head size

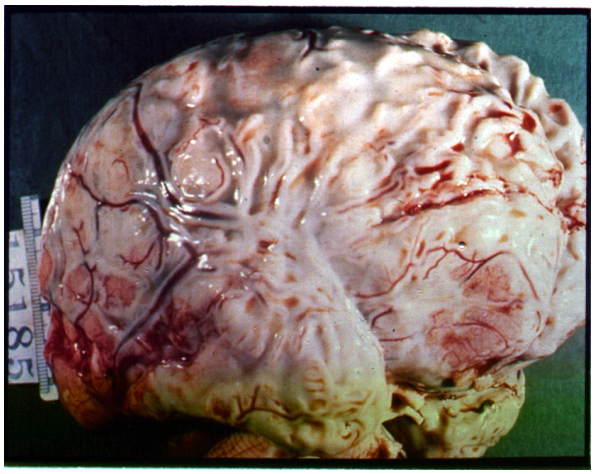
Above 1 year of age: increased intracrinal pressure leading to herniation and death.

CSF cycle:

Secreted by the choroid plexuses found in the walls of the 4 ventricles of the brain → from the lateral ventricles it flows through the interventricular foramena into the third ventricle,then to the 4th ventricle via the cerebral aqueduct → enters the subarachnoid space via 3 openings: median foramen of Magendi and 2 lateral foramina of Leushka → resorbed via arachnoid villi into dural venous sinuses

Case 6: bacterial – pyogenic meningitis

4 years old child who was treated from otitis media and suddenly complained from headache, vomiting, fever and stiff neck. CSF was found to be clouded with abnormal increase of neutrophils, increased protein and absence of sugar. Gram stain of the CSF fluid showed meningiococci .



GROSS SECTION SHOW :

1-Gross picture of brain covered by inflamed meninges and engorged vessels.

2-Gross picture of the brain showing purulent exudate covering all the meninges.

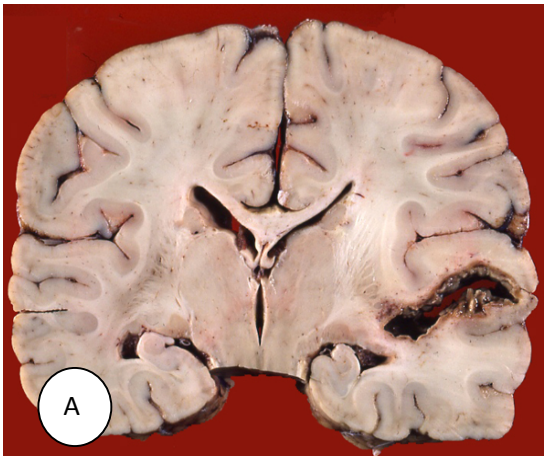
CSF in pyogenic meningitis will show:

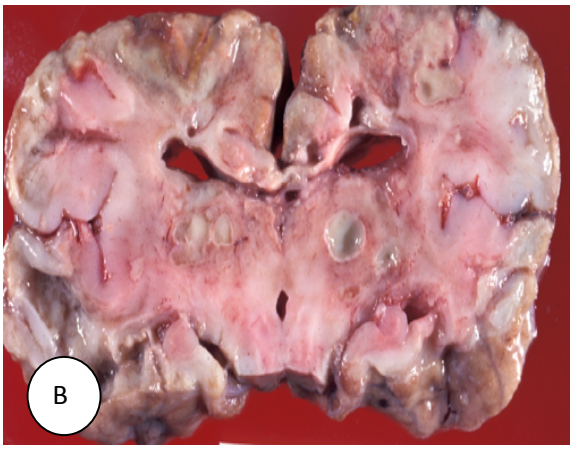
Low glusoce and high protein levels

Case 6: Brain abscesses:

35 years old lady complains from otitis media . Suddenly she suffers from headache and convulsions. Brain MRI reveals 5 cm. fluid filled cavity in the temporal lobe. Examination of the CSF shows increased pressure with lymphocytes and increased protein but there is no change of sugar content.

GROSS SECTION SHOWS:





A, Brain abscess surrounded by granulation tissue capsule.

B, Multiple brain abscesses (cystic spaces) surrounded by granulation tissue capsules.

Cause:

Streptococci and staphylococci are the most common.

Predisposing factors:

- **Acute bacterial endocarditis (usually give multiple microabscesses)**
- **Cyanotic congenital heart disease in which there is a right-to-left shunt**
- **Loss of pulmonary filtration of organisms (e.g, bronchiectasis)**

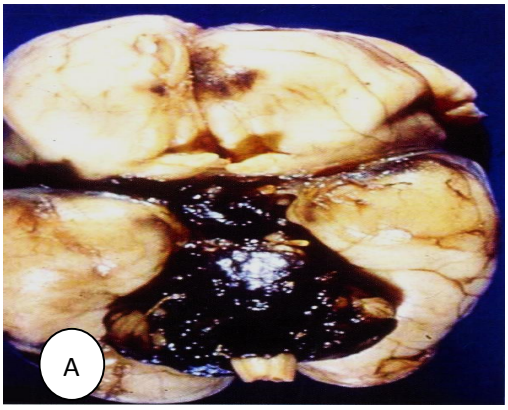
Complications of Brain abscess:

- **Herniation with increased ICP is fatal**
- **Rupture of abscess into subarachnoid space or ventricle and cause meningitis and ventrculitis**

Case 7: Subarachnoid hemorrhage

A previously healthy 31-year-old woman experiences a severe headache and loses consciousness within an hour. An emergent head CT scan reveals extensive subarachnoid hemorrhage at the base of the brain. She is a febrile. A lumbar puncture yields cerebrospinal fluid with many red blood cells, but no white blood cells. The CSF protein is slightly increased, but the glucose is normal.

GROSS SECTION SHOW :



A,Ruptured berry aneurysm causing subarachnoid Hemorrhage

B, View of the base of the brain, dissected to show the circle of Willis with an aneurysm of the anterior cerebral artery (arrow).

MICROSCOPY SECTION SHOWS:

Section through a saccular aneurysm showing the hyalinized fibrous vessel wall replacing the normal layers of an artery which makes it a weak point.

Causes of subarachnoid hemorrhage:

- Our case: ruptured berry aneurysm result of high pressure on it. Common site is the circle of Willis.
- vascular malformation
- trauma rupture of an intracerebral hemorrhage into the ventricular system (most imp cause)
- hematologic disturbances, tumors or trauma

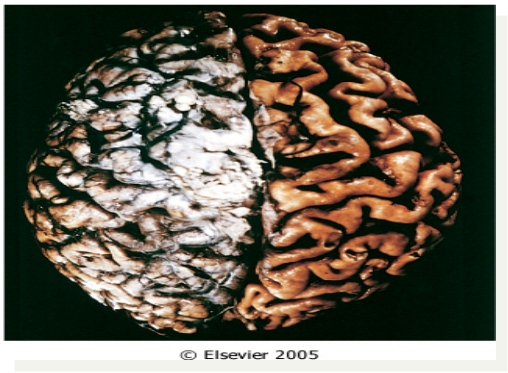
* About 90% of saccular aneurysms occur in the anterior circulation near major ar arterial branch points.

Initially patient will present with “worst headache ever”, followed by loss of consciousness and death in most cases.

Case 8: Alzheimer disease

An 85 years old man complains of progressive loss of memory, disorientation and alterations in mood and behavior since 20 years. He was admitted to hospital because he was disabled and immobile and he died in hospital after one week of admission. Autopsy was done and the brain cortex was found to be atrophied.

Gross section show:



Alzheimer disease with cortical atrophy most evident on the right, where meninges have been removed with thin shrunken gyri and prominent widened sulci.

MICROSCOPY SECTION SHOW:

A, Neuritic plaque with a rim of dystrophic neurites (arrow) surrounding an amyloid core (white *) *stained by congo red (amyloid) stain*

B, Neurofibrillary tangles (arrowheads) are present within the neurons. H&E stain

C, Silver stain showing a neurofibrillary tangle within the neuronal cytoplasm.

D, Congo red stain of the cerebral cortex showing amyloid deposition in the blood vessels (amyloid angiopathy) and the amyloid core of the neuritic (senile) plaque (arrow)

Case 9: Parkinsonism:

Parkinsonism is a clinical syndrome characterized by diminished facial expression, stooped posture, slowness of voluntary movement, abnormal gait rigidity, and a "pill-rolling" tremor.

degeneration of neurons of the substatia nigra and locus ceruleus → leading to motor disturbance.

The typical macroscopic findings are pallor of the substantia nigra and locus ceruleus.

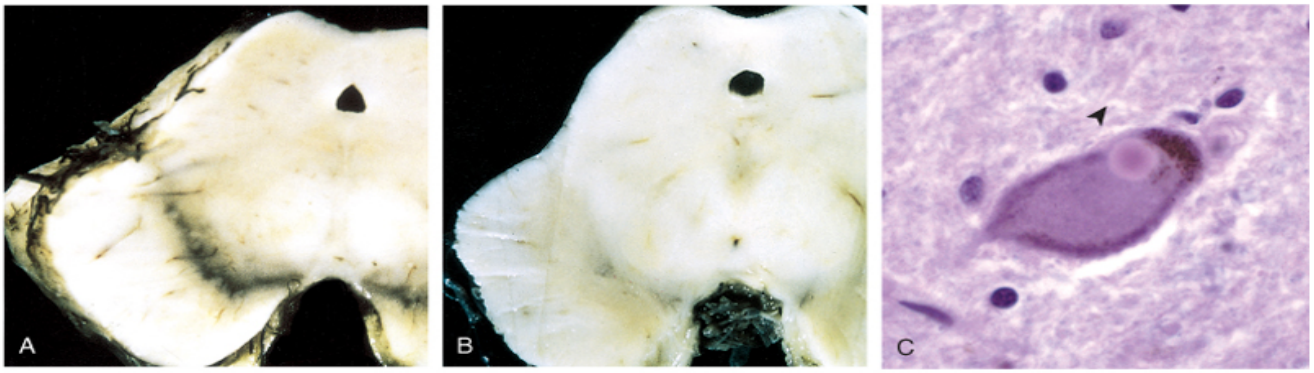
m/E: there is loss of the pigmented neurons in these regions, associated with gliosis.

Lewy bodies may be found in some of the remaining neurons.

These are single or multiple, cytoplasmic inclusions

Ultrastructurally, Lewy bodies are composed of fine filaments, composed of

α-synuclein.



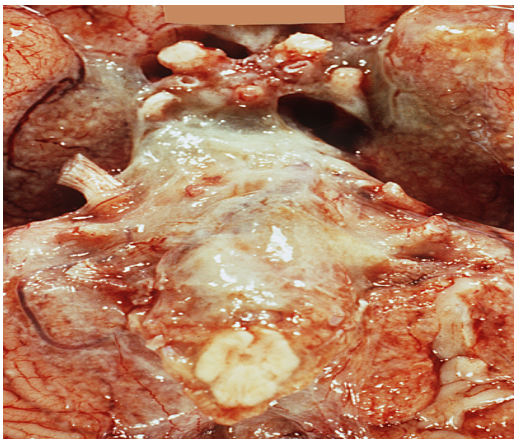
A) Normal Mid brain
B) Loss of the dark pigmentation of the substantia nigra and locus ceruleus.
C) Lewy bodies: Single or multiple, intracytoplasmic, eosinophilic, round to elongated inclusions that often have a dense core surrounded by a pale halo

Case 10: TUBERCLOSIS

t is well-circumscribed intraparenchymal mass and tuberculous meningitis .

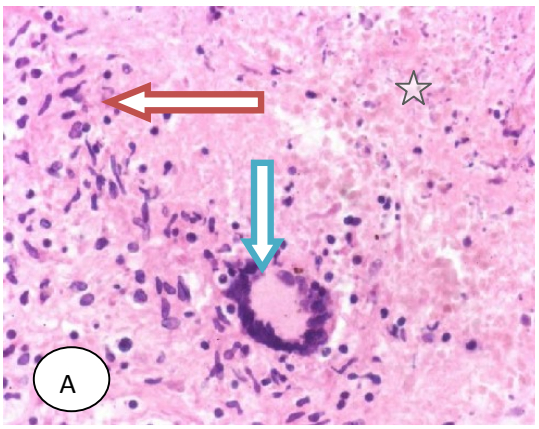
ɔn microscopic examination, there is usually a central core of caseous necrosis surrounded by a typical tuberculous granulomatous reaction.

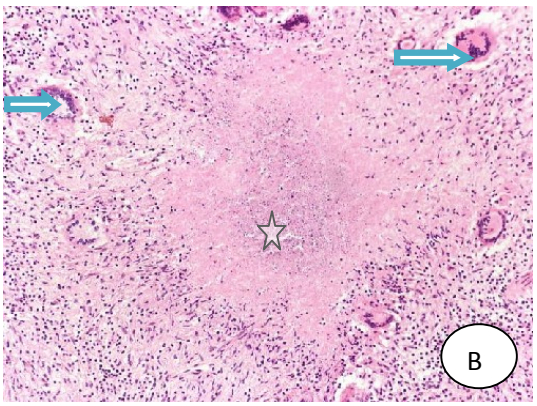
Gross section show :



TB meningitis:
Exudate at the base of the brain.

Microscopy section show :





A ,M/E: Granuloma with epithelioid cells (Red arrow), langhan's gaint cells (blue arrow), and caseous necrosis (*).

B, Granuloma with epithelioid cells (Red arrow), langhan gaint cells (blue arrow), and caseous necrosis (*).