

Central Nervous System

Pathology Practicals

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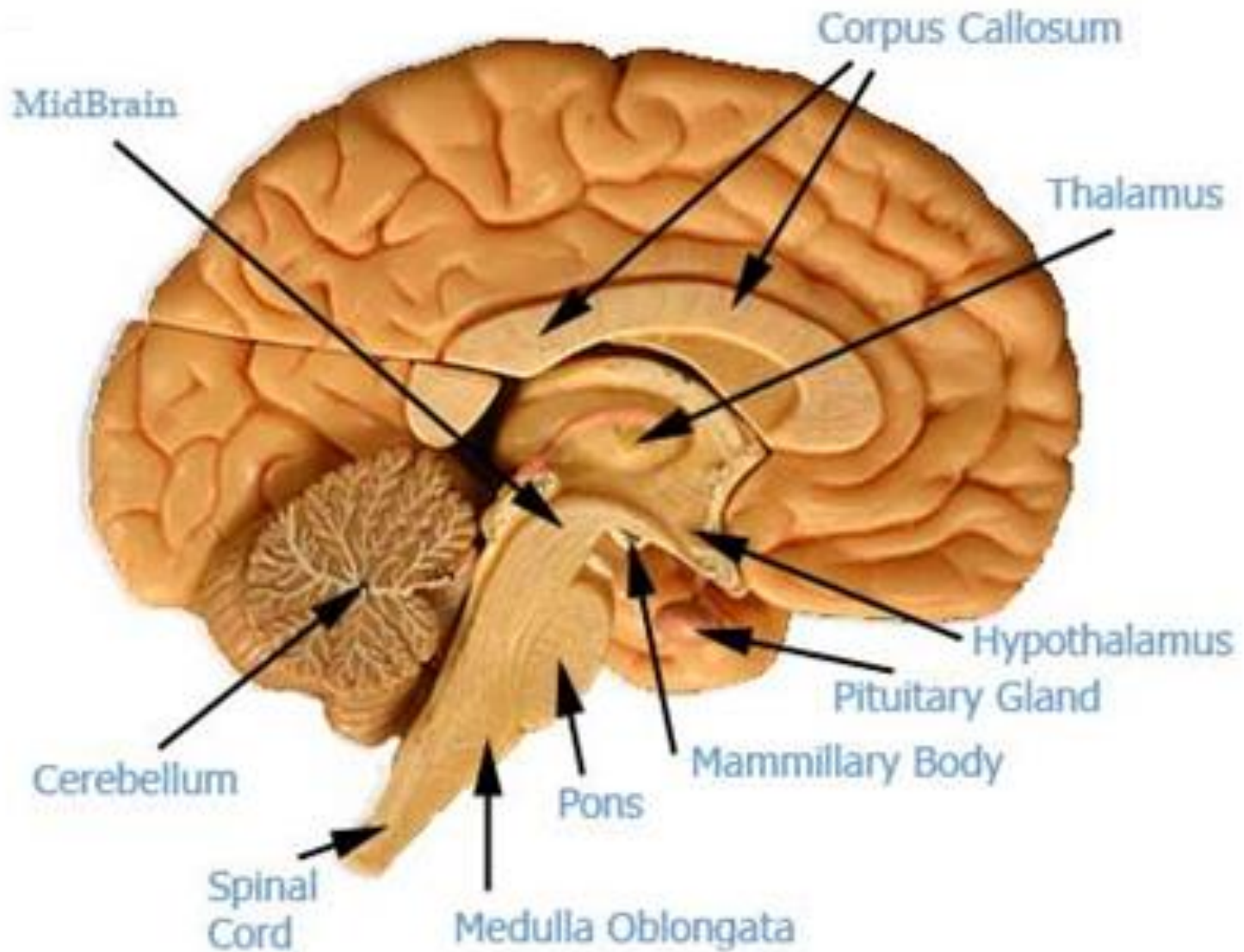
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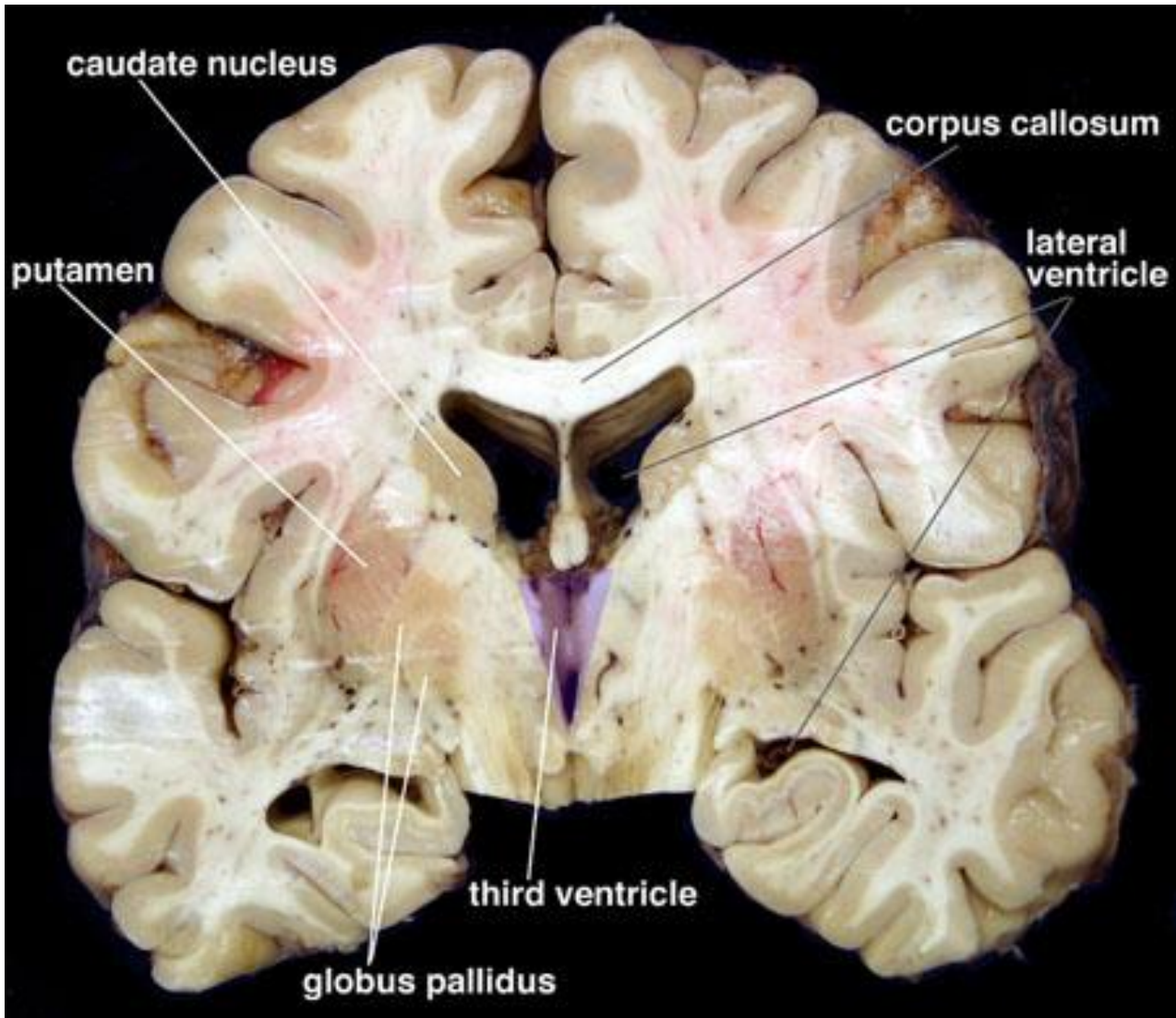
First Practical Session

*Brief review of normal anatomy
and histology of nervous tissues*

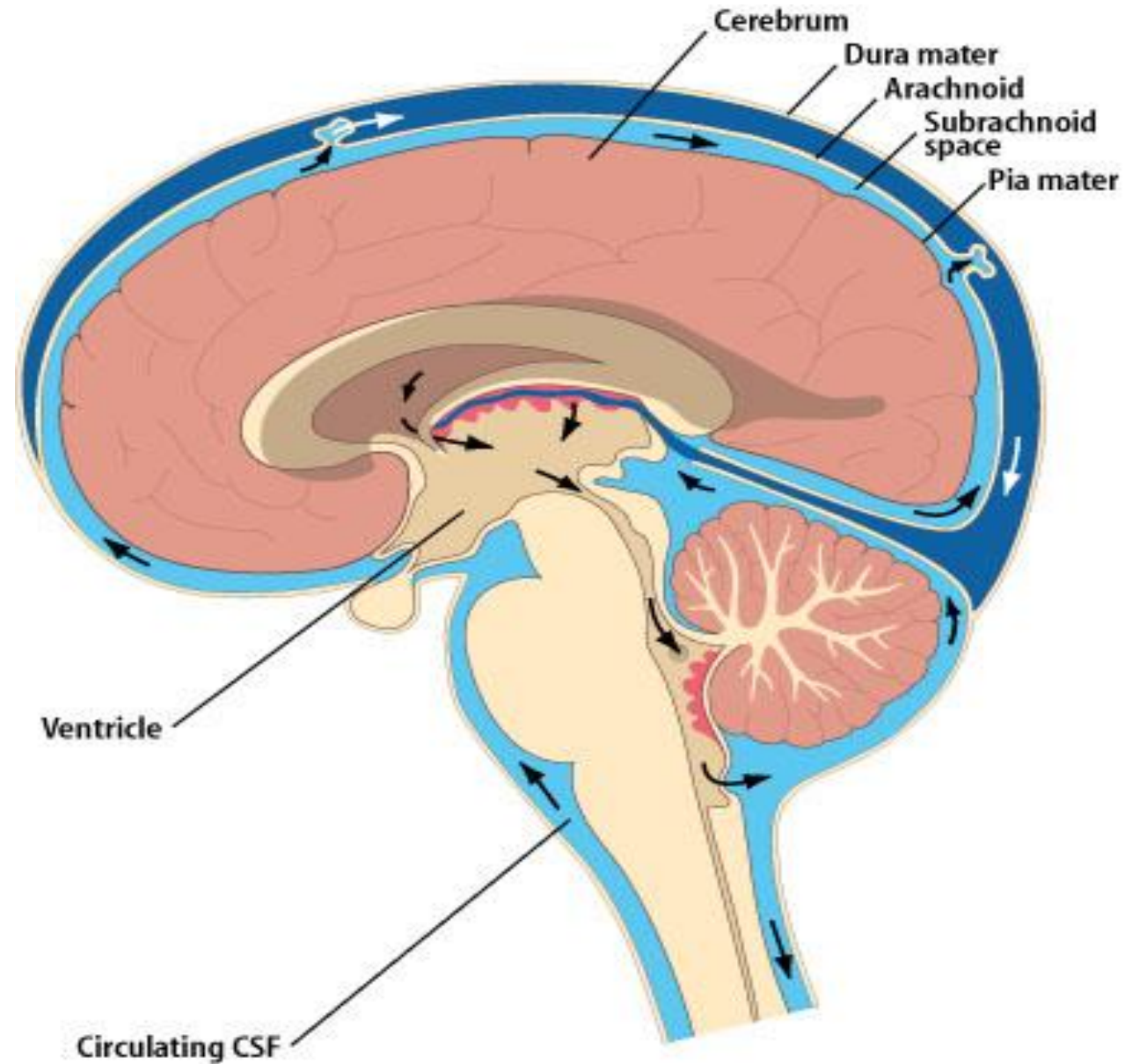
Brain Anatomy – Sagittal Section



Brain Anatomy – Cut Section

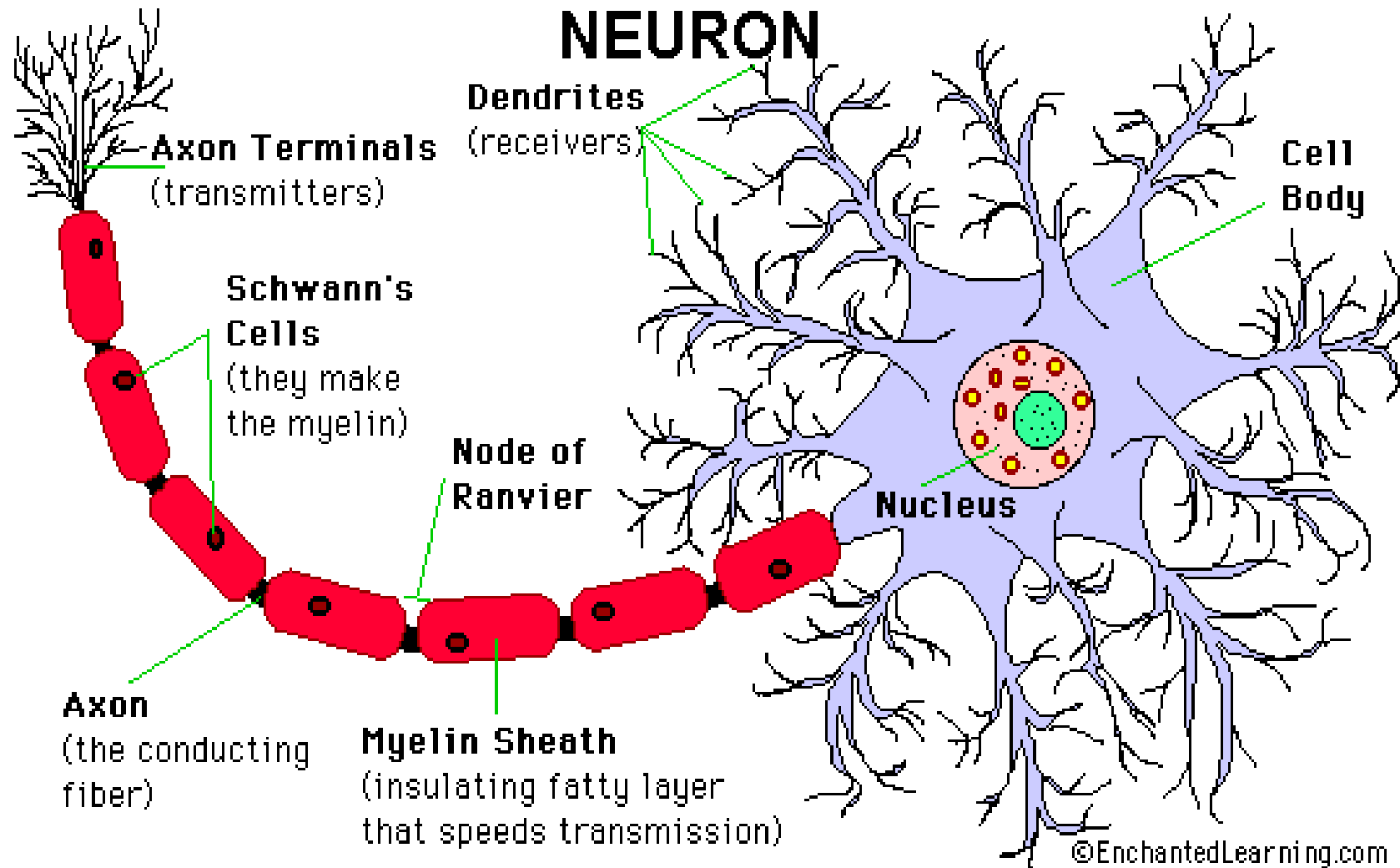


Meningees

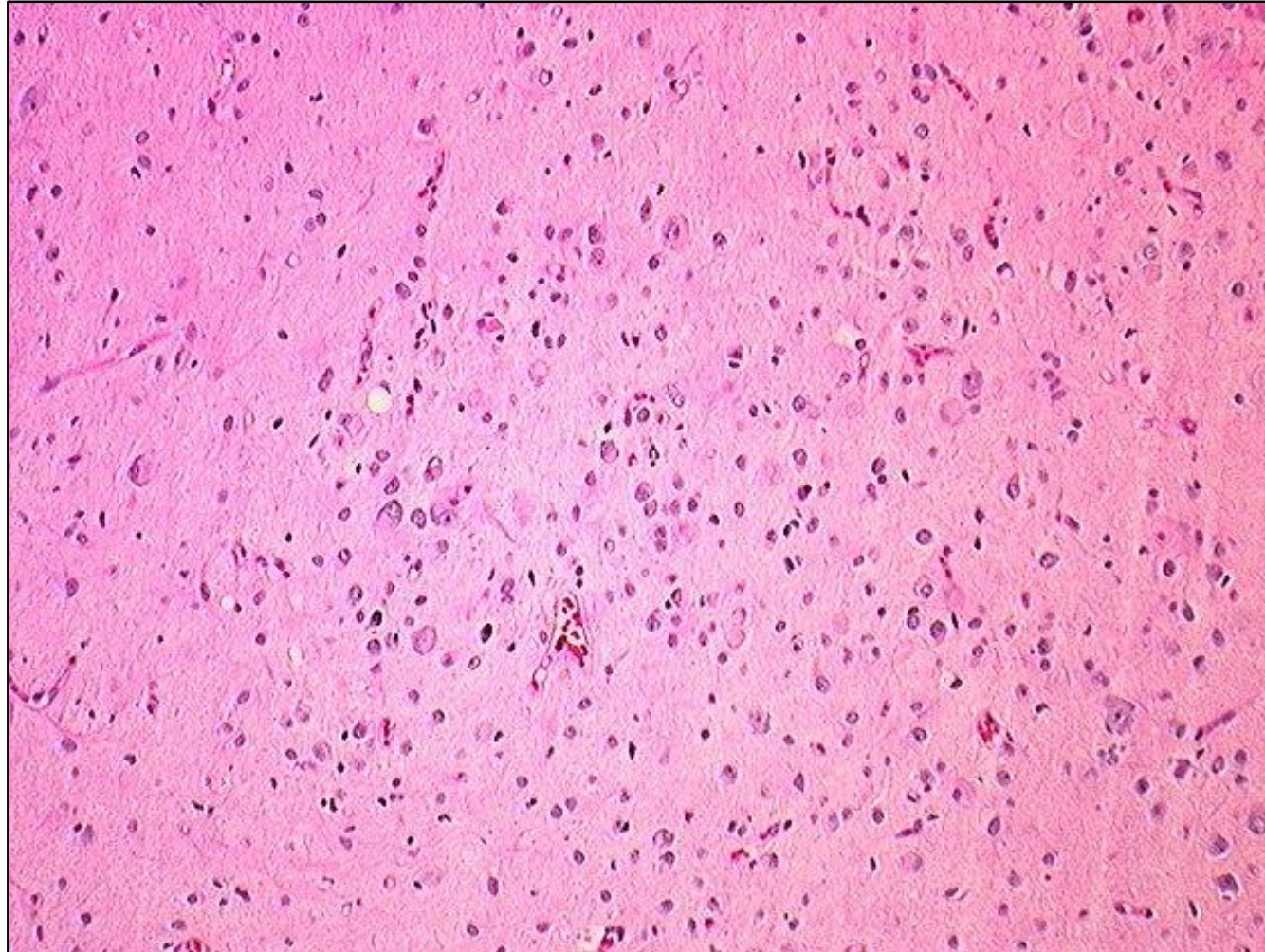


CNS Cells

- ***Two cell types:***
 - **Neuron:**
 - Conducts nerve impulses
 - Cannot be replaced if destroyed
 - **Neuroglial cells:**
 - Support, nourish, and protect the neurons
 - Include astrocytes, oligodendrocytes, ependymal cells and microcytes

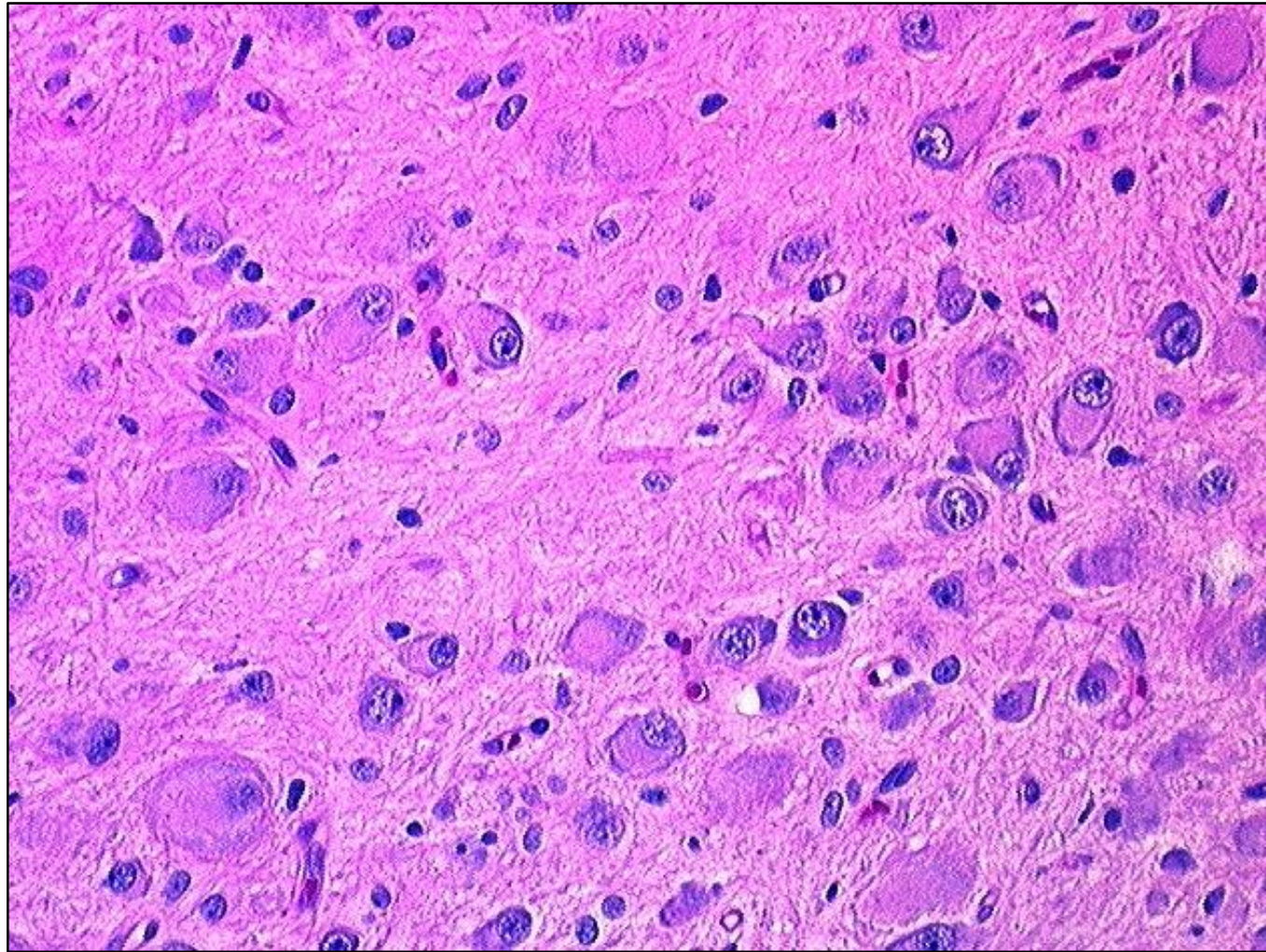


Histology of Brain tissue - LPF



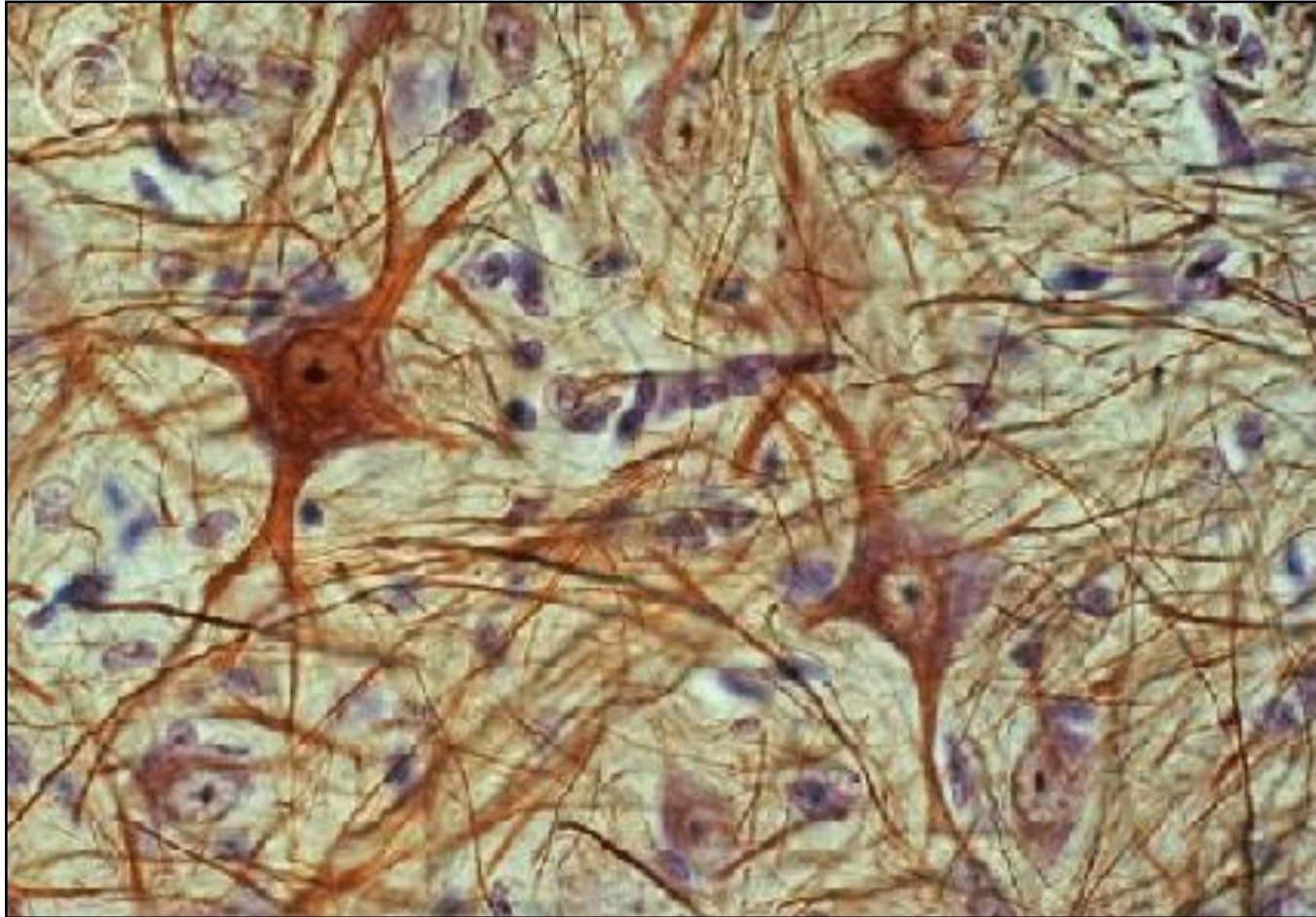
H&E stained sections reveal that at low power (40x) there is no obvious increase in cellularity and that the tissue resembles normal brain parenchyma

Histology of Brain tissue - HPF



The great variety in the size and shape of the neurons is better appreciated at higher magnification (200x)

Histology of Brain tissue - HPF



Light micrograph of a section cut through human nervous tissue showing nerve cells in gray matter of the brain. Nerve cells are seen as cell bodies (brown) with round central nucleus.

Gross and microscopic findings of selected CNS diseases

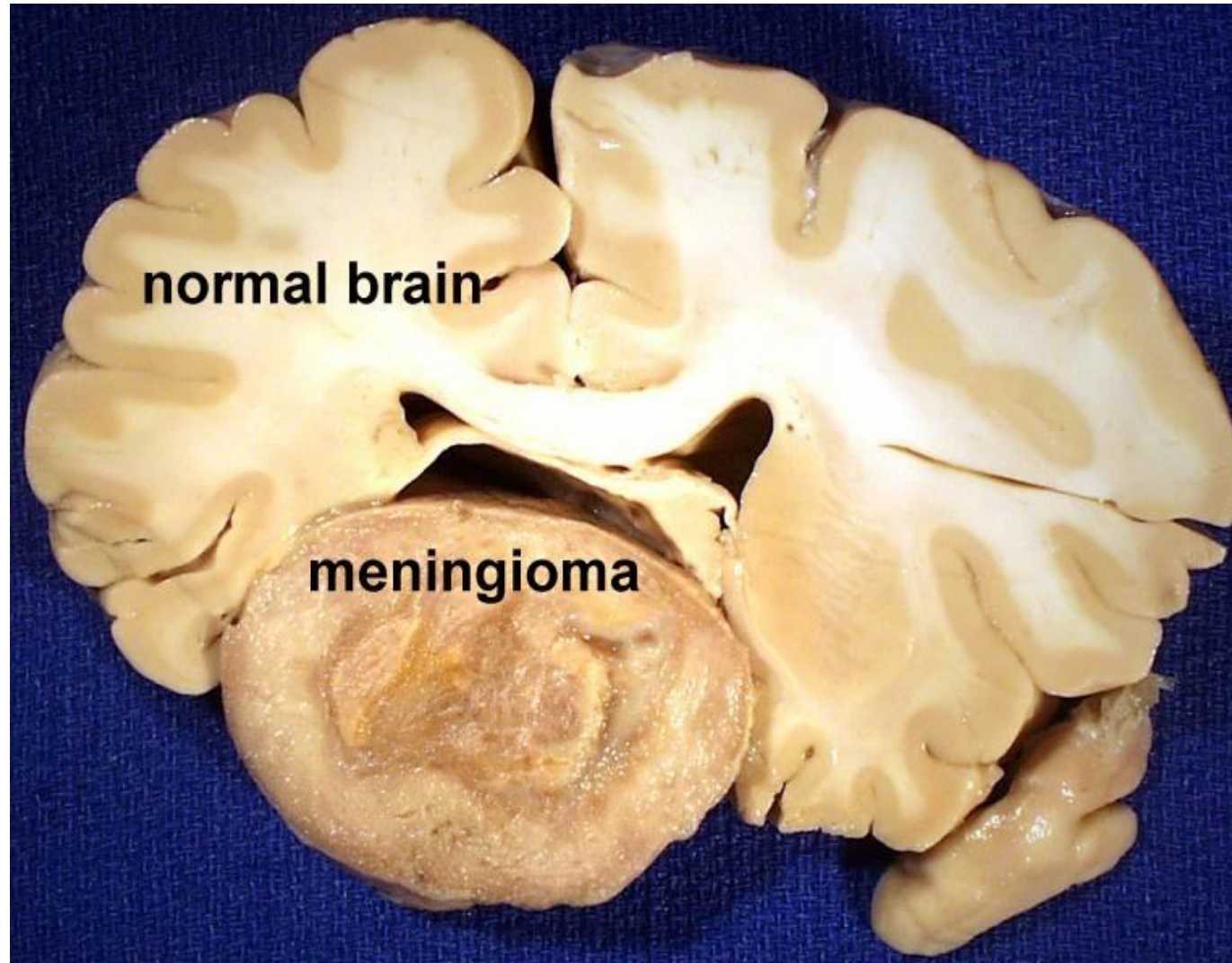
Meningioma

CASE 1:

A 43- year 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 the surrounding brain tissue.

- What is your provisional diagnosis?***

Meningioma vs Normal Brain

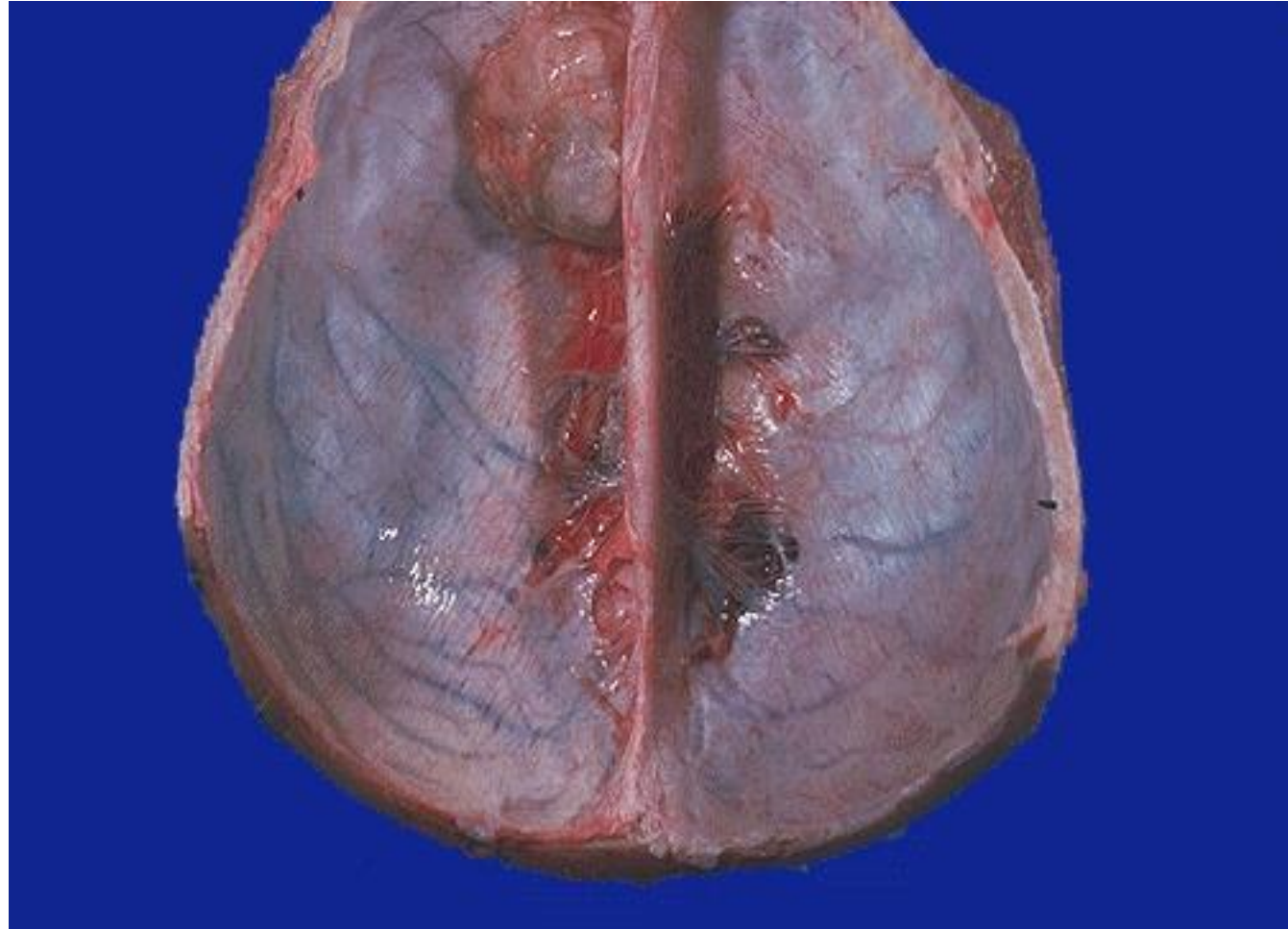


Meningioma – Gross



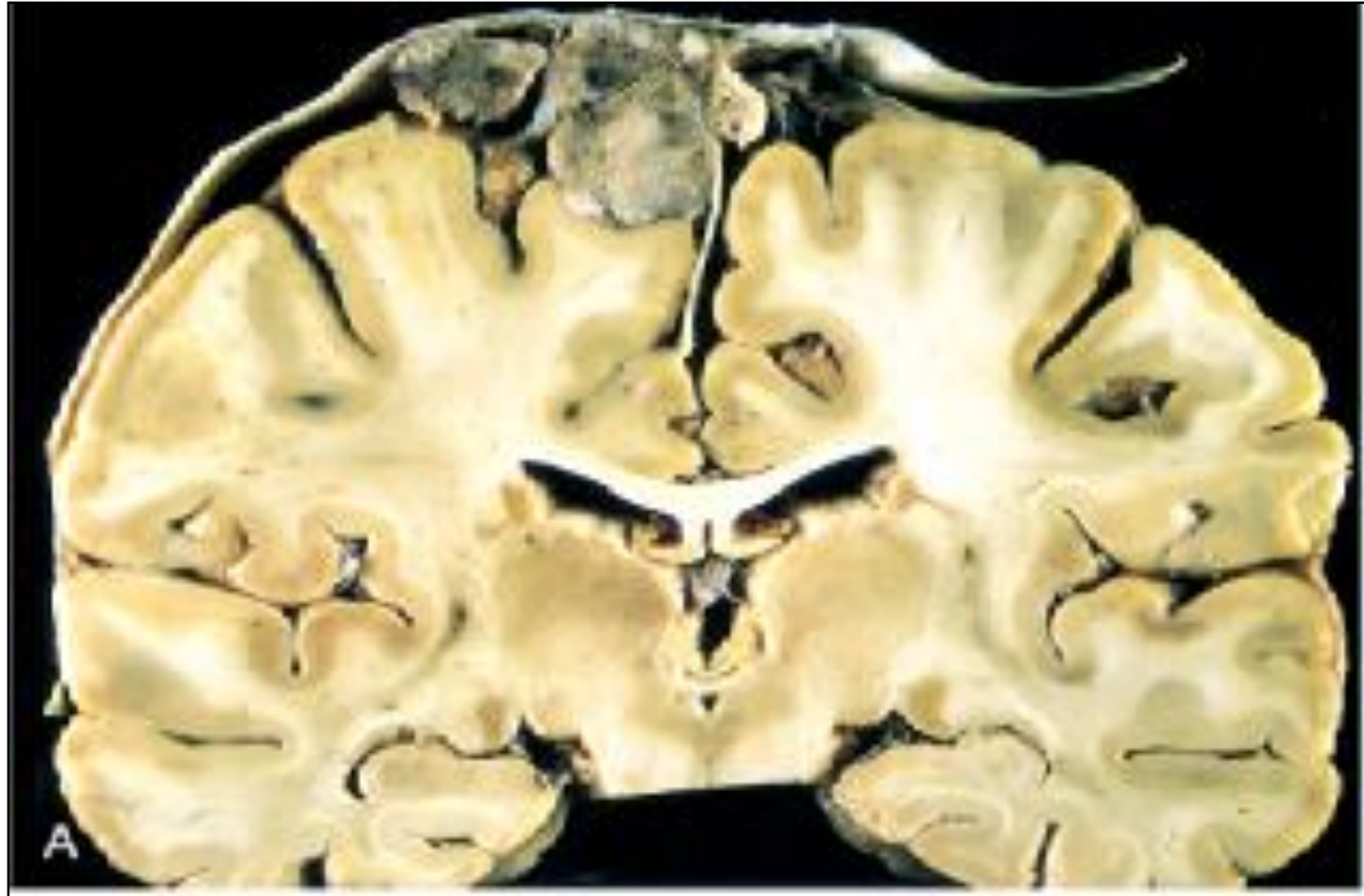
Note how this meningioma beneath the dura has compressed the underlying cerebral hemisphere. Rarely, meningiomas can be more aggressive and invade

Meningioma – Gross



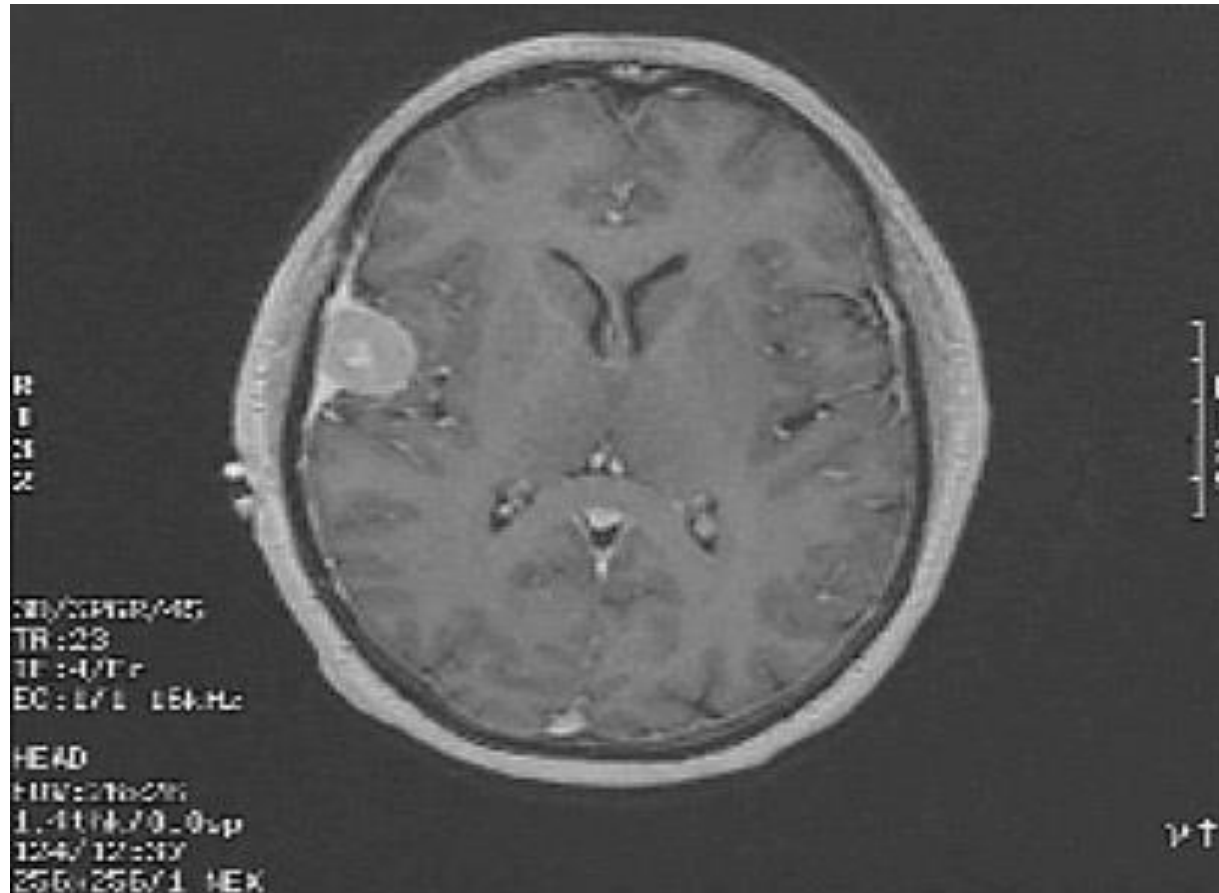
Here is another benign meningioma beneath the dura. These neoplasms are slow growing, but may reach a large size before symptoms lead to detection.

Parasagittal Meningioma - Gross



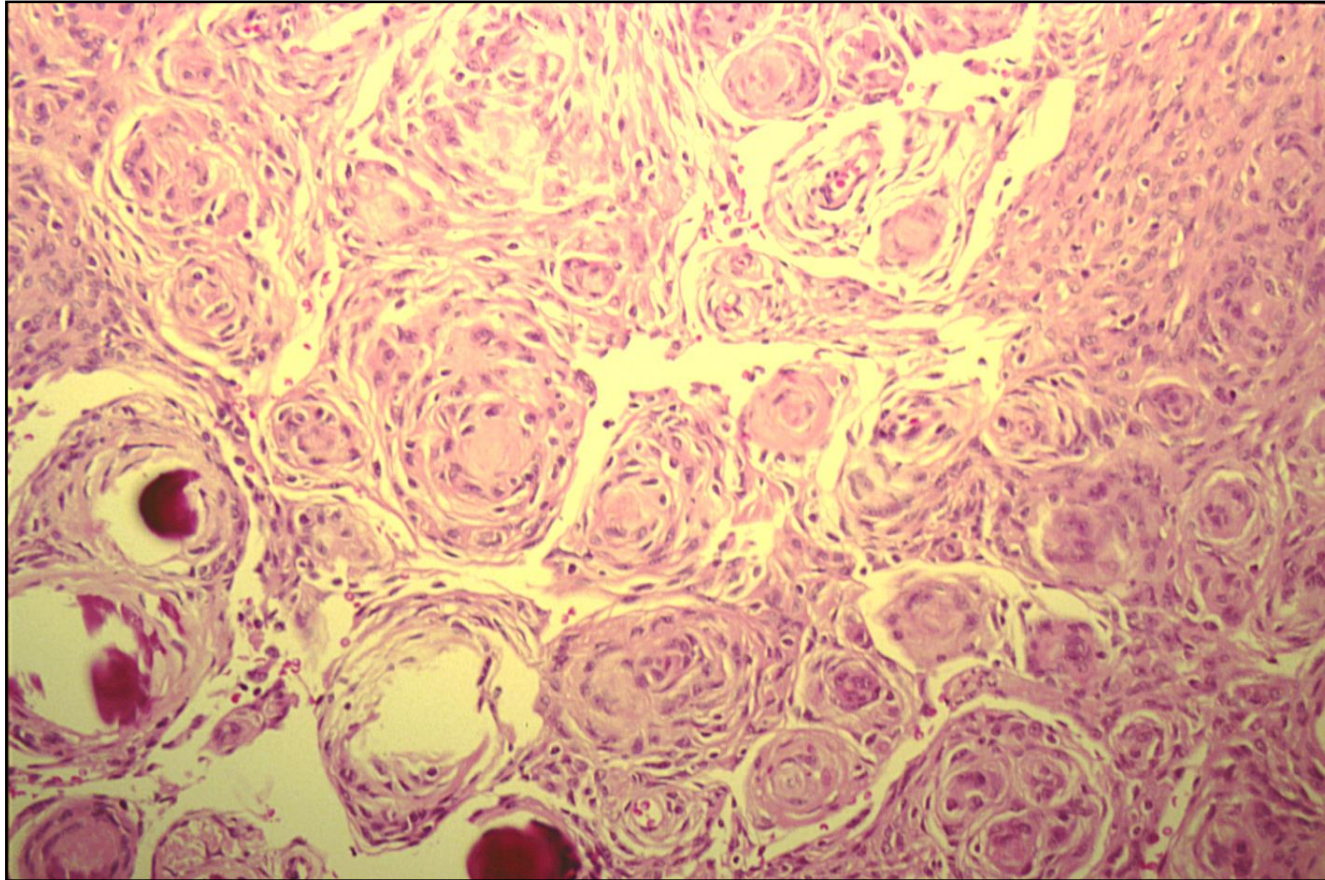
Parasagittal multilobular meningioma attached to the dura with compression of underlying brain.

Meningioma – MRI view



This is an MRI scan demonstrating a discreet mass along the lateral convexity and extending from a dural base impinging upon the cerebral hemisphere. This is consistent with a meningioma

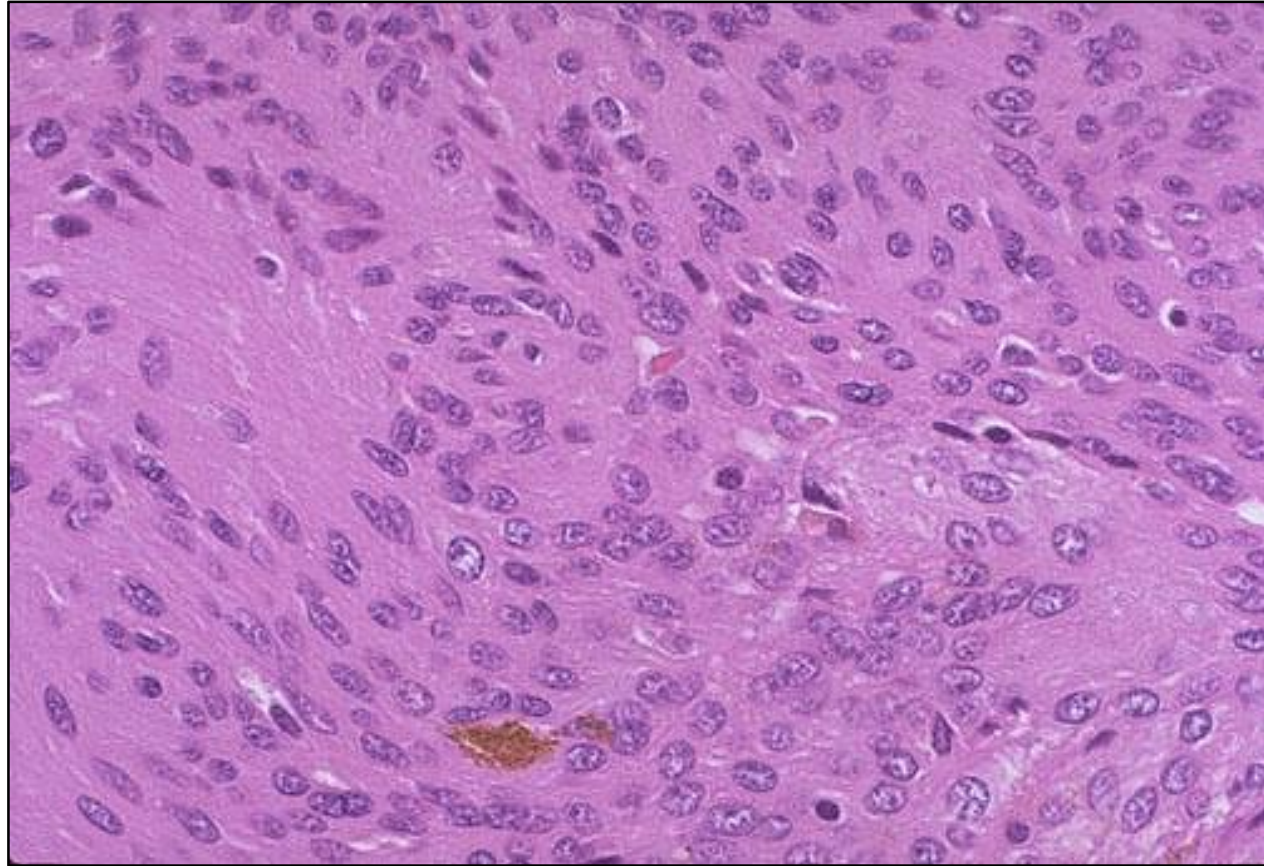
Meningioma - Microscopic view - LPF



Whorls of fibrocellular tissue. Cells are oval, spindle shape or elongated and lack mitosis.

Psammoma bodies (spherical calcified particles) are also seen within the tumour

Meningioma – Microscopic view - HPF



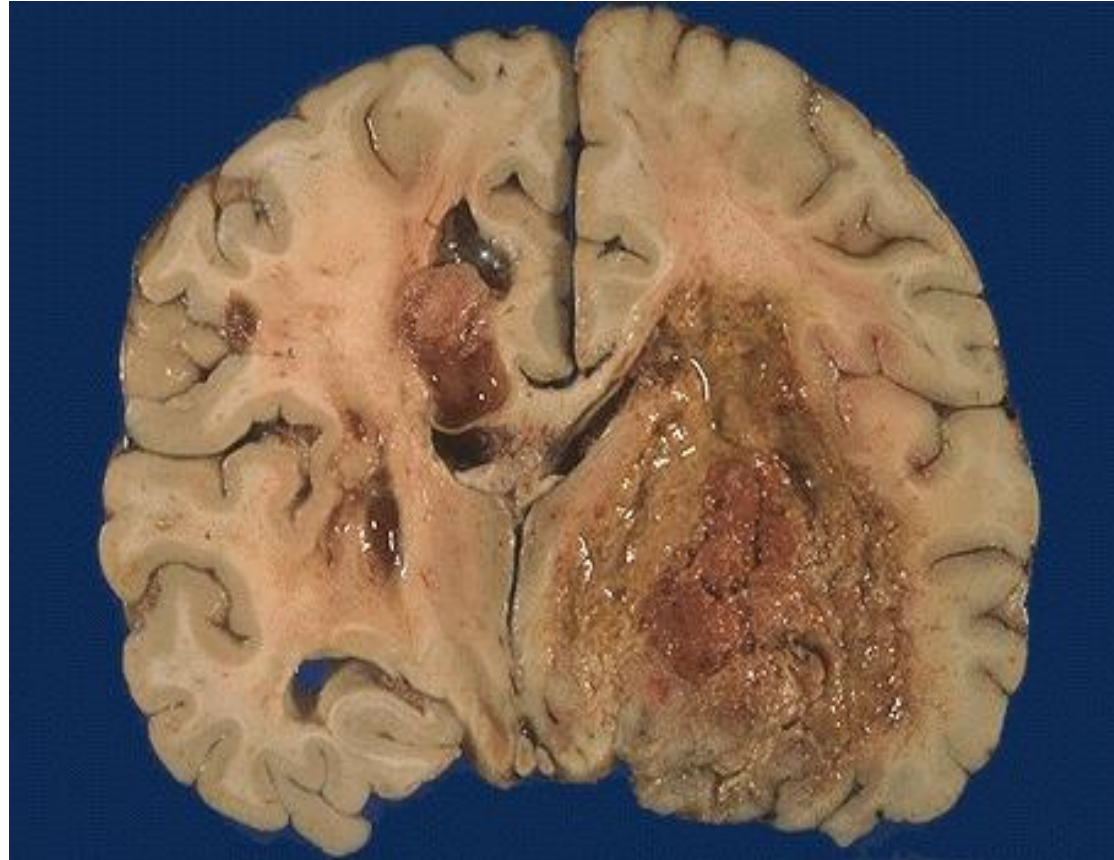
***At high magnification, this meningioma has plump pink cells.
A small amount of brown granular hemosiderin is present.
Meningiomas may also have psammoma bodies.***

Glioblastoma Multiforme

CASE 2:

- ***A 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.***
- ***What is your provisional diagnosis ?***

Glioblastoma Multiforme - Gross



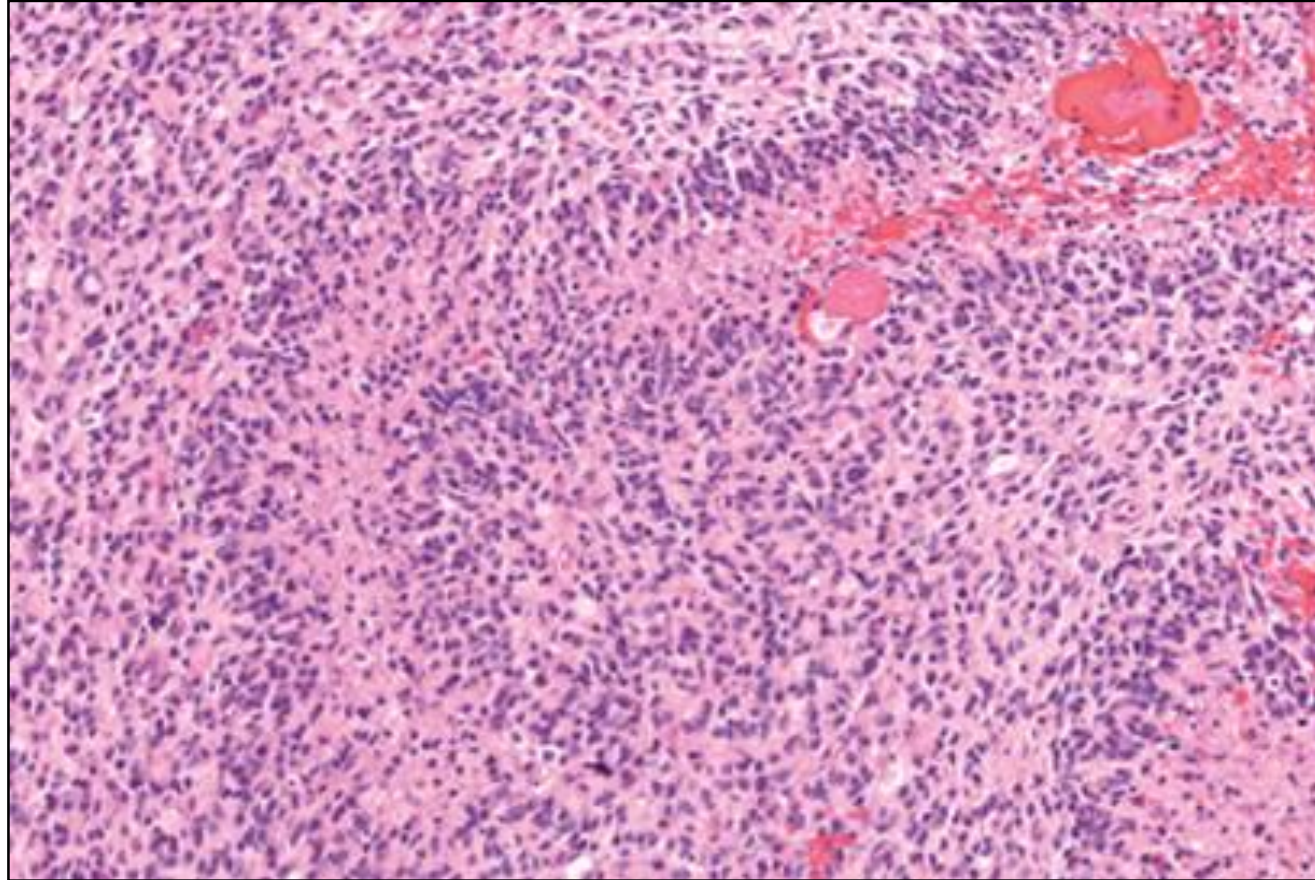
***This is the worst possible form of Glioma—
a Glioblastoma multiforme (GBM). These neoplasms are quite
vascular with prominent areas of necrosis and hemorrhage. Note
how this one has crossed the midline to the opposite hemisphere***

Glioblastoma Multiforme – CT scan



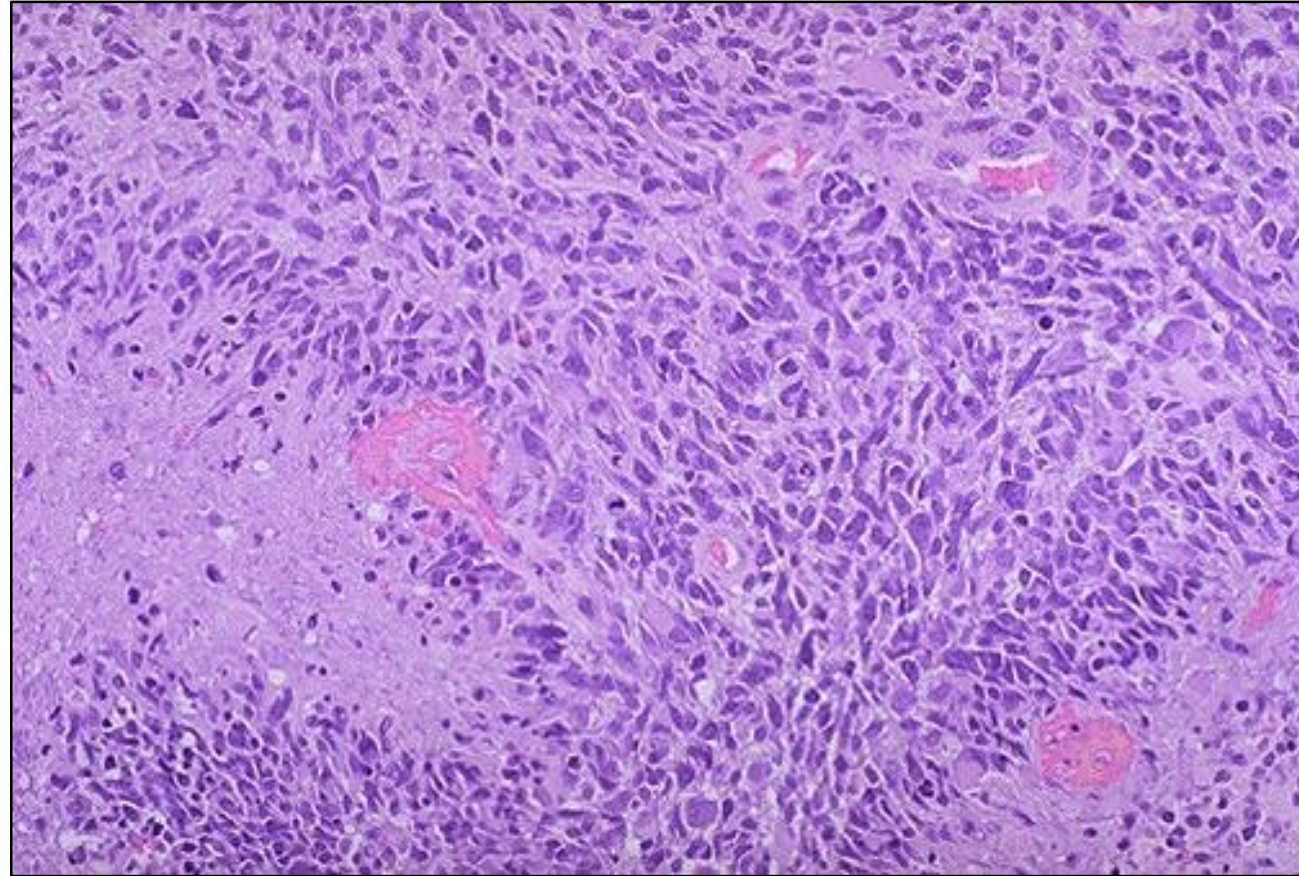
Computed tomographic (CT) scan of a large tumor in the cerebral hemisphere showing signal enhancement with contrast material and pronounced peritumoral edema.

Glioblastoma Multiforme – LPF Microscopy



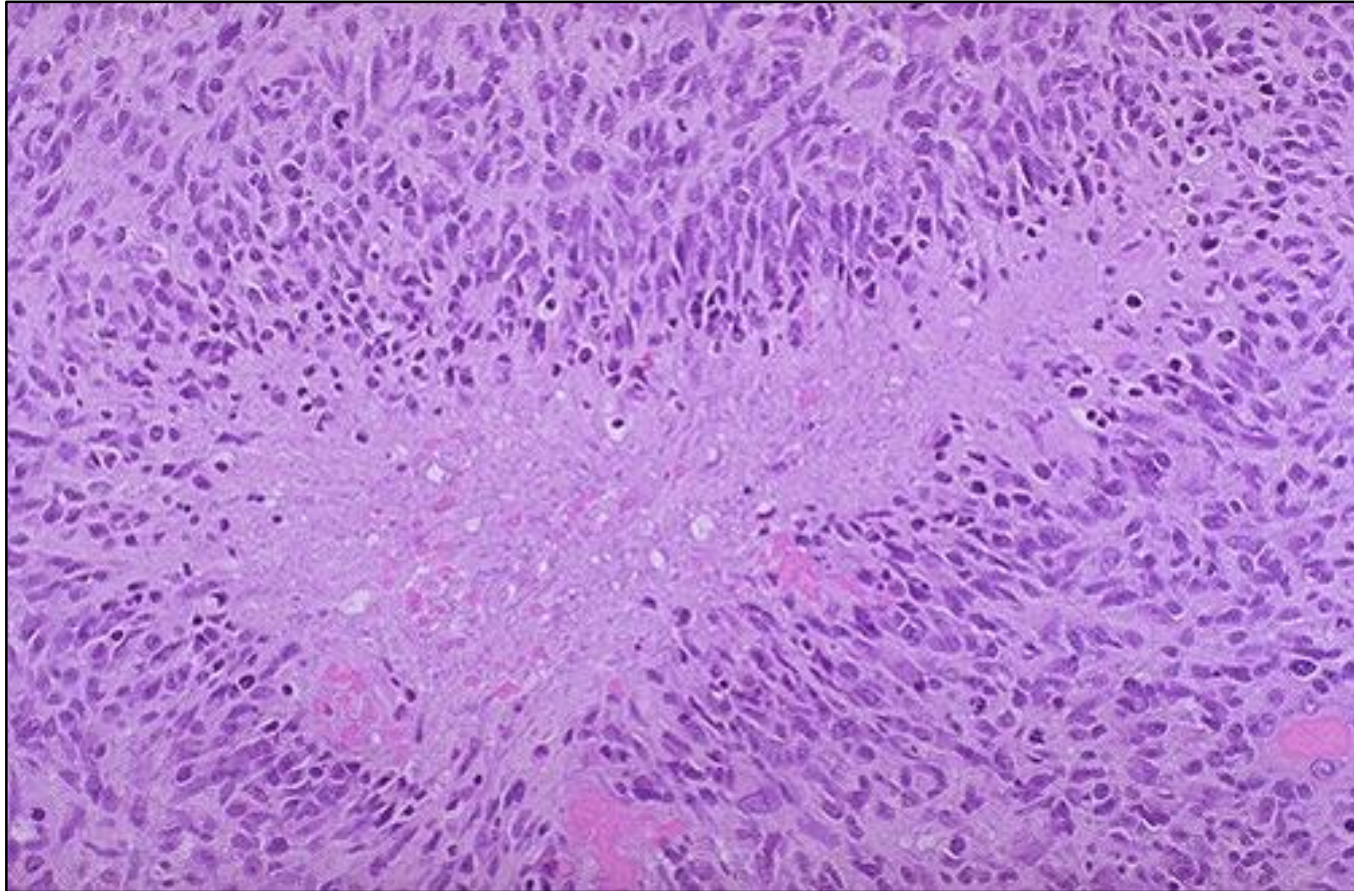
Glioblastoma. Foci of necrosis with pseudopalisading of malignant nuclei and endothelial cell proliferation.

Glioblastoma Multiforme – HPF Microscopy



This glioblastoma multiforme (GBM) demonstrates marked cellularity with marked hyperchromatism and pleomorphism. Note the prominent vascularity as well as the area of necrosis at the left with neoplastic cells palisading around it.

Glioblastoma Multiforme – HPF Microscopy



Here is another example of pseudopalisading necrosis of neoplastic cells in a glioblastoma multiforme (GBM). The cells of a GBM can infiltrate widely, particularly along white matter tracts, and even through the CSF.

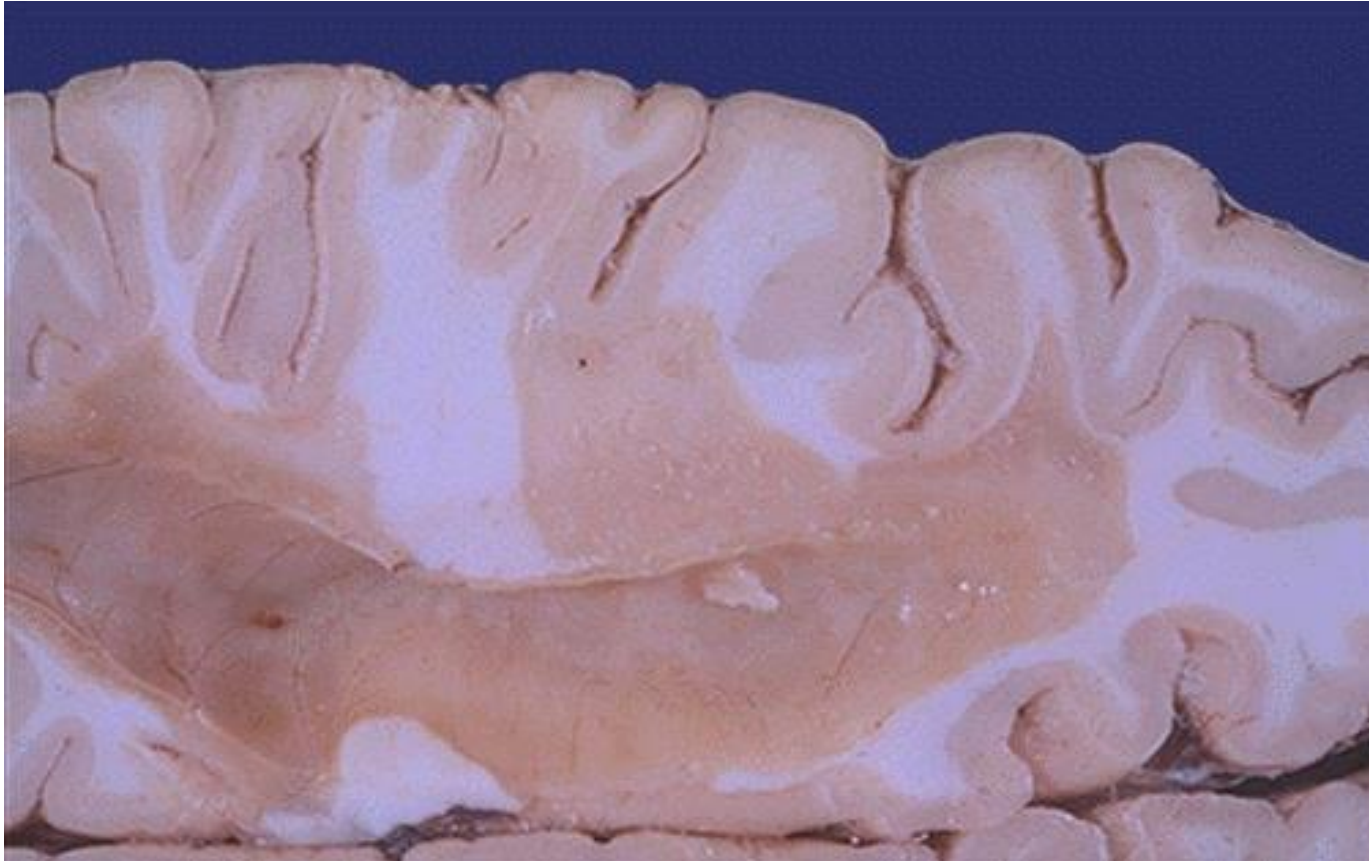
Multiple Sclerosis

CASE 3 :

- ***A 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.***

What is your provisional diagnosis?

Multiple Sclerosis – Gross



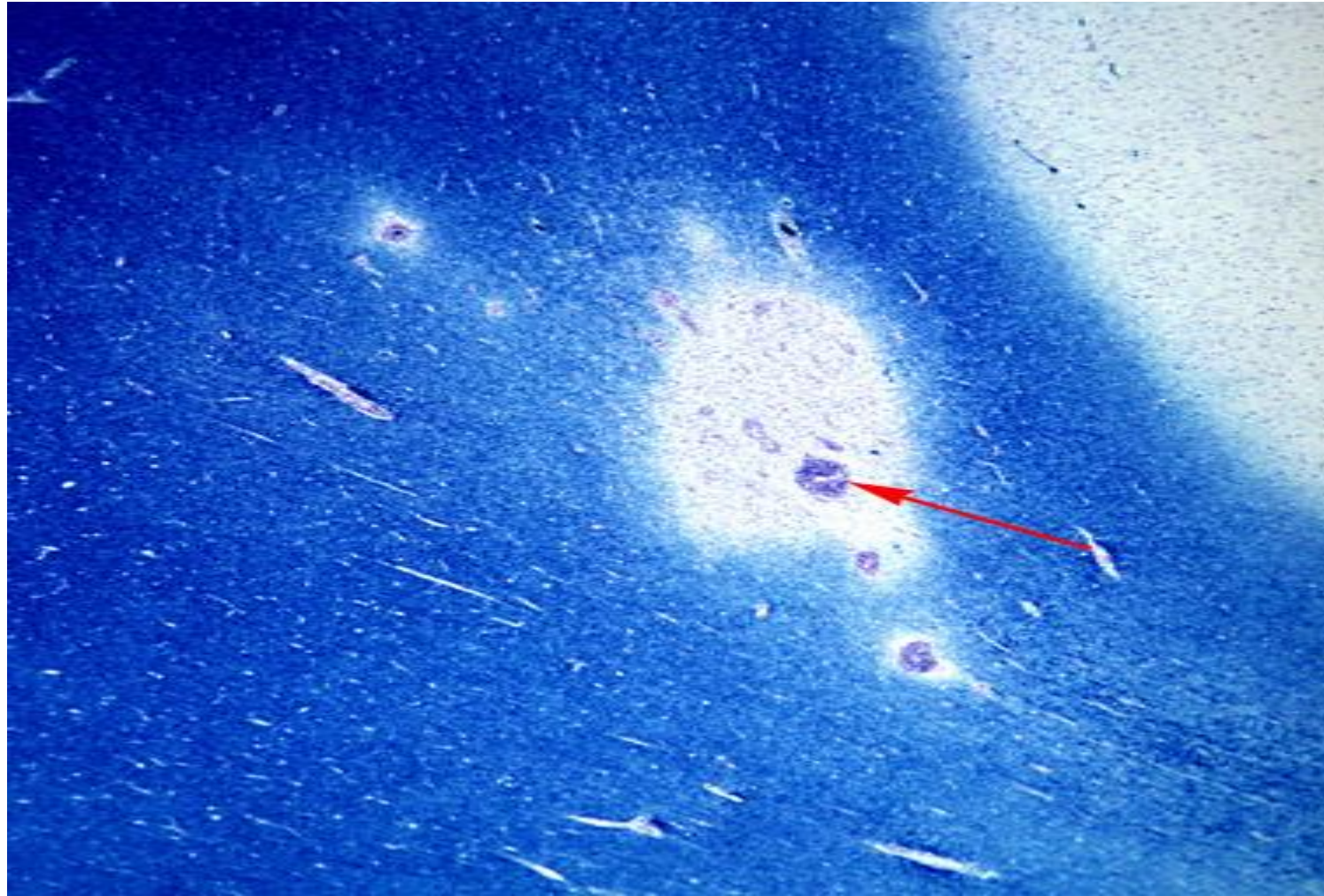
A large "plaque" of demyelination in the white matter. The plaque has a grey-tan appearance. Such plaques are typical for multiple sclerosis (MS). These plaques lead to the clinical appearance of transient or progressive loss of neurological function. The disease is multifocal and the lesions appear over time.

Multiple Sclerosis – Gross



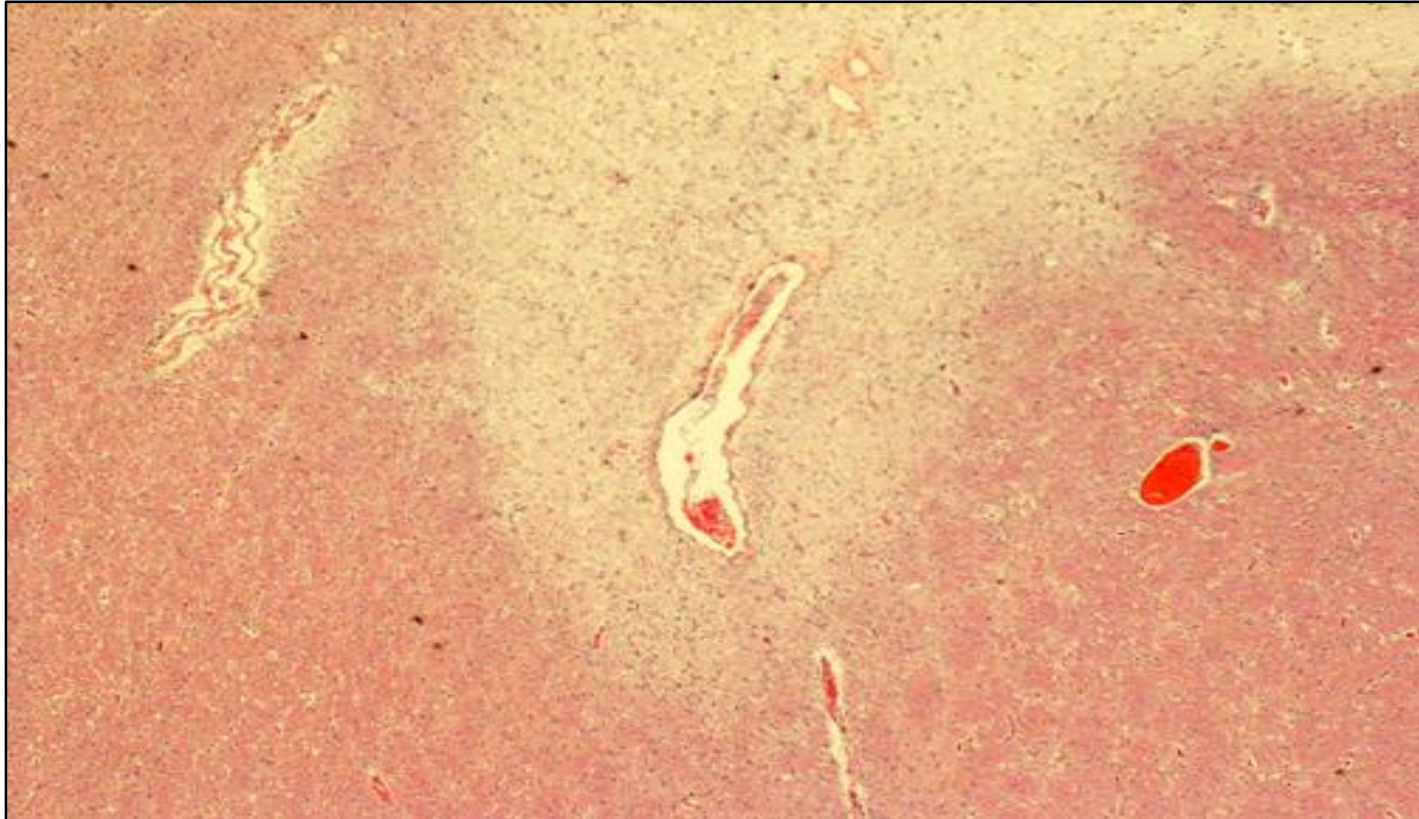
Here is a demyelinated plaque in a patient with multiple sclerosis (MS). The lesions can be seen with MRI scans, but the appearance in the CSF of increased protein from IgG that demonstrates oligoclonal bands on electrophoresis is very consistent with this diagnosis.

Multiple Sclerosis – Microscopic view



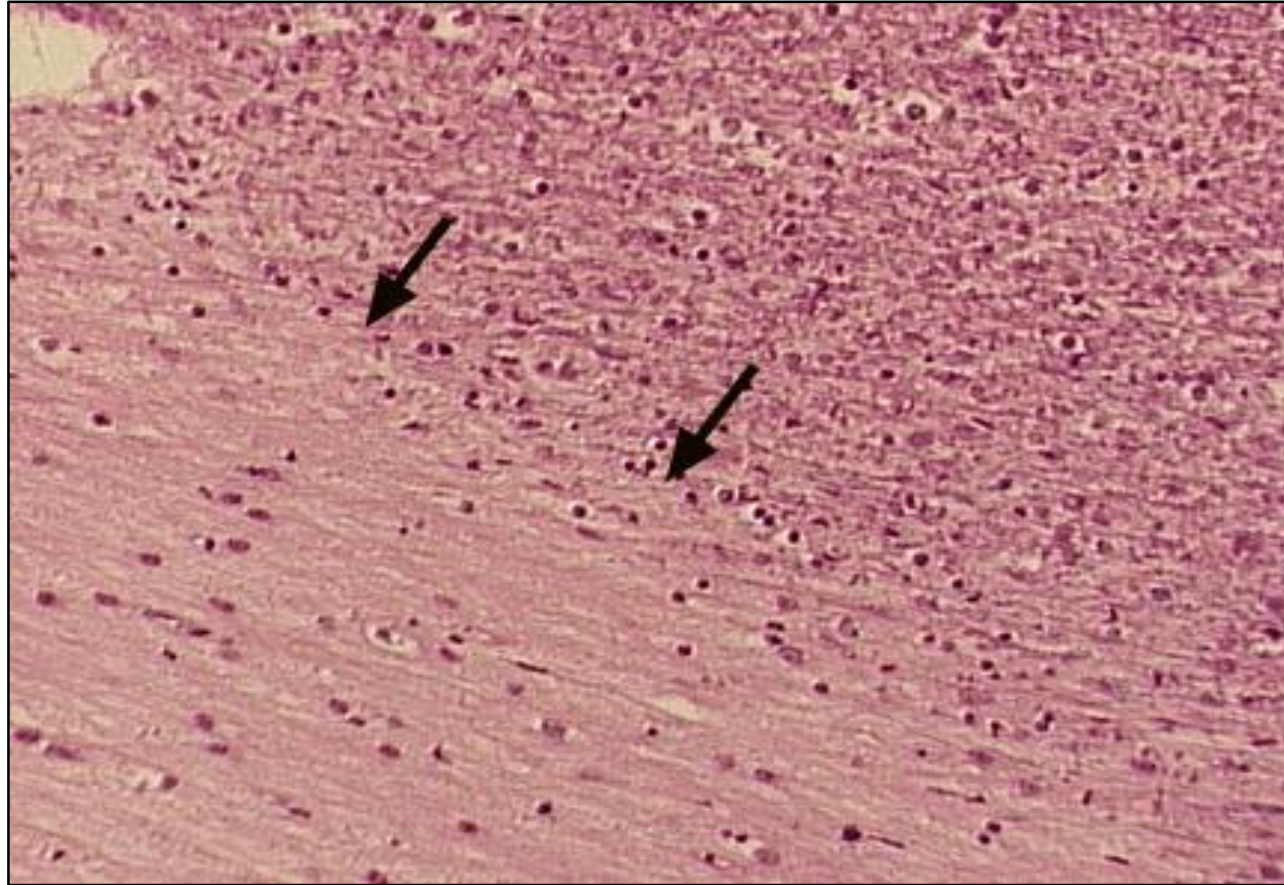
This is a myelin stain (luxol fast blue/PAS) of an early lesion. The lesion is centered around a small vein (arrow) which is surrounded by inflammatory cells.

Multiple Sclerosis – Microscopic view



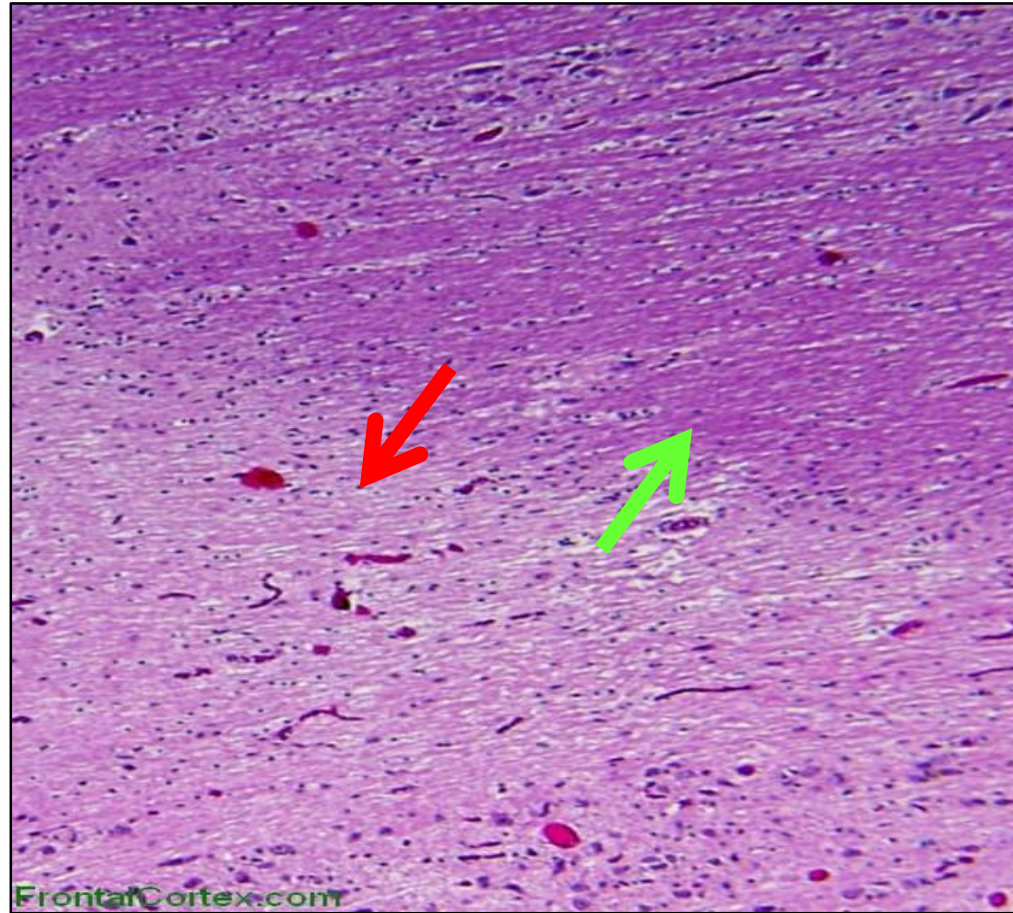
This is an H&E stained sections from a patient with long-standing MS. This lesion is centered on a vein. In this older lesion, however, there is very little inflammation around the vein. You can see the loss of myelin even without a special stain: it is lighter pink than the normal white matter surrounding it.

Multiple Sclerosis – Microscopic view



A high power photomicrograph of the MS plaque showing the pallor of the plaque almost devoid of myelin. There is a decrease in oligodendroglial nuclei and an increase of astrocyte nuclei characteristic of an older MS plaque.

Multiple Sclerosis – Microscopic view



Inactive demyelinated plaque from a brain with MS. There is no active demyelination going on in this plaque. In this image, we see the border between the plaque – pale (red arrow) and normal neuropil – darker (green arrow). Pale plaque indicates a lack of myelin.

***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).***

- **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.

Schwannom a

CASE 4:

- ***A 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 .***

What is your provisional diagnosis ?

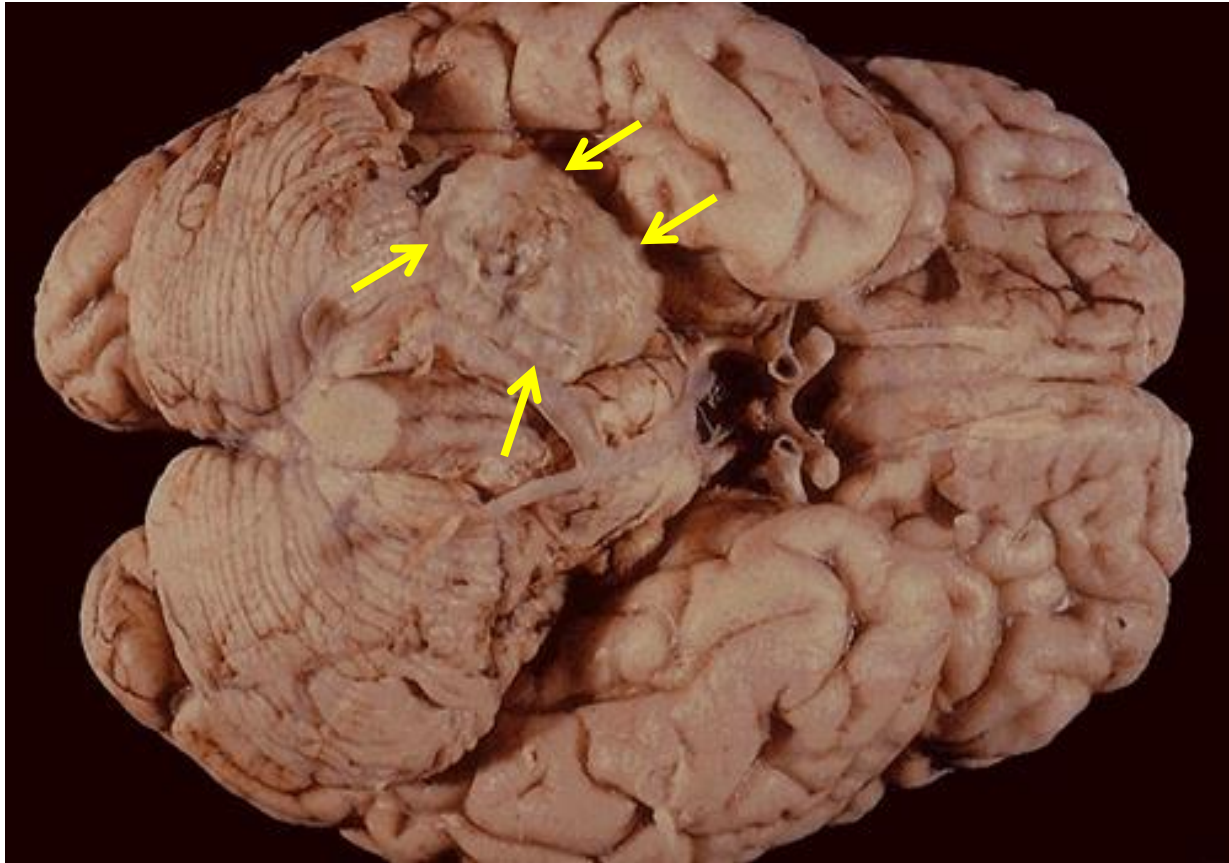
Schwannoma – Gross



Schwannoma : A nerve sheath tumor that seen most frequently on the eighth nerve (acoustic neuromas), in which case, they occupy the cerebello- pontine angle (arrows).

Acoustic tumors can be removed, but usually not without damaging the eighth nerve and sometimes the facial nerve and brain stem.

Schwannoma – Gross



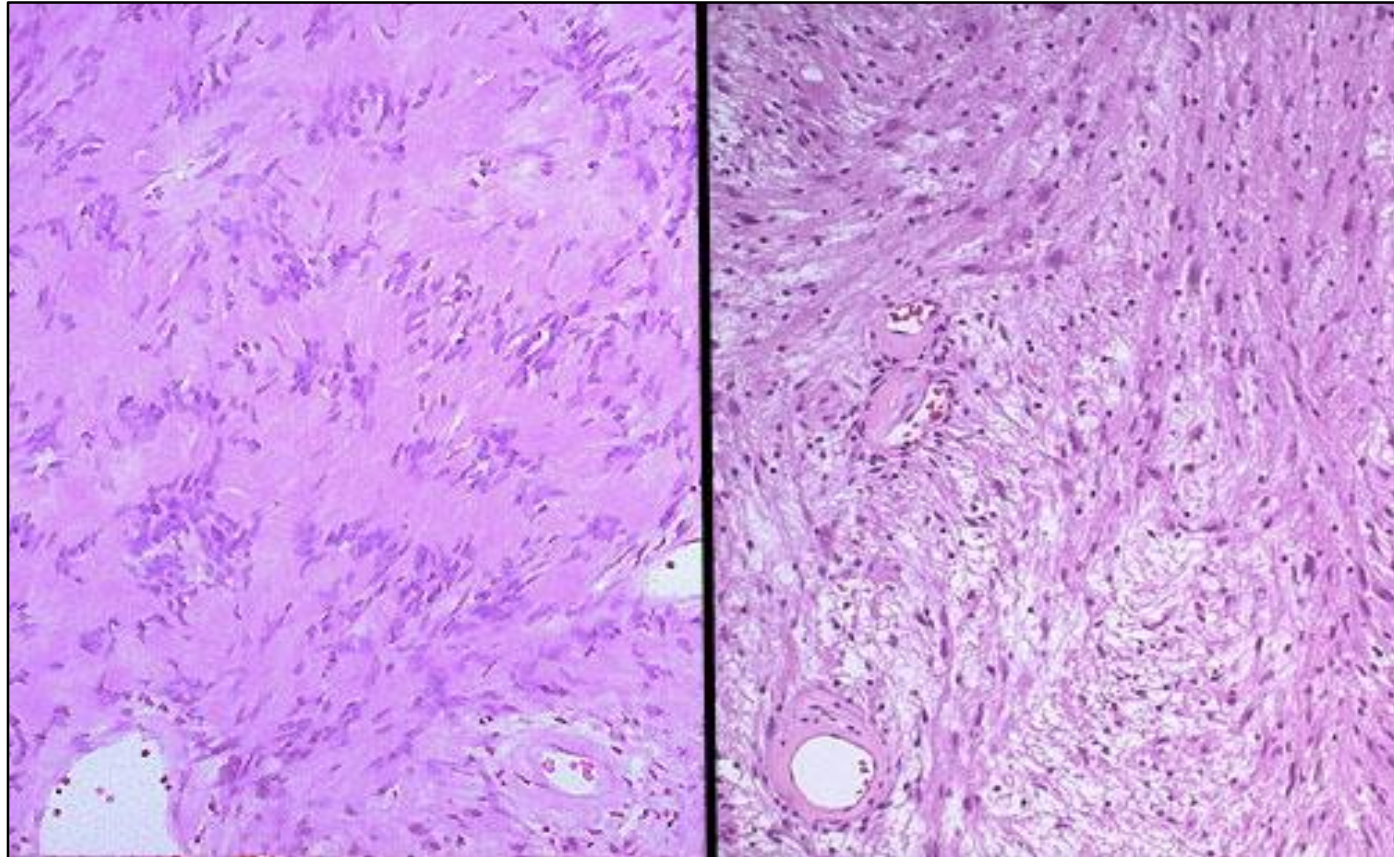
Acoustic Schwannoma: The mass lesion here is arising in the acoustic (eighth cranial) nerve at the cerebellopontine angle. Patients may present with hearing loss. These benign neoplasms can be removed.

Schwannoma – Cut Section



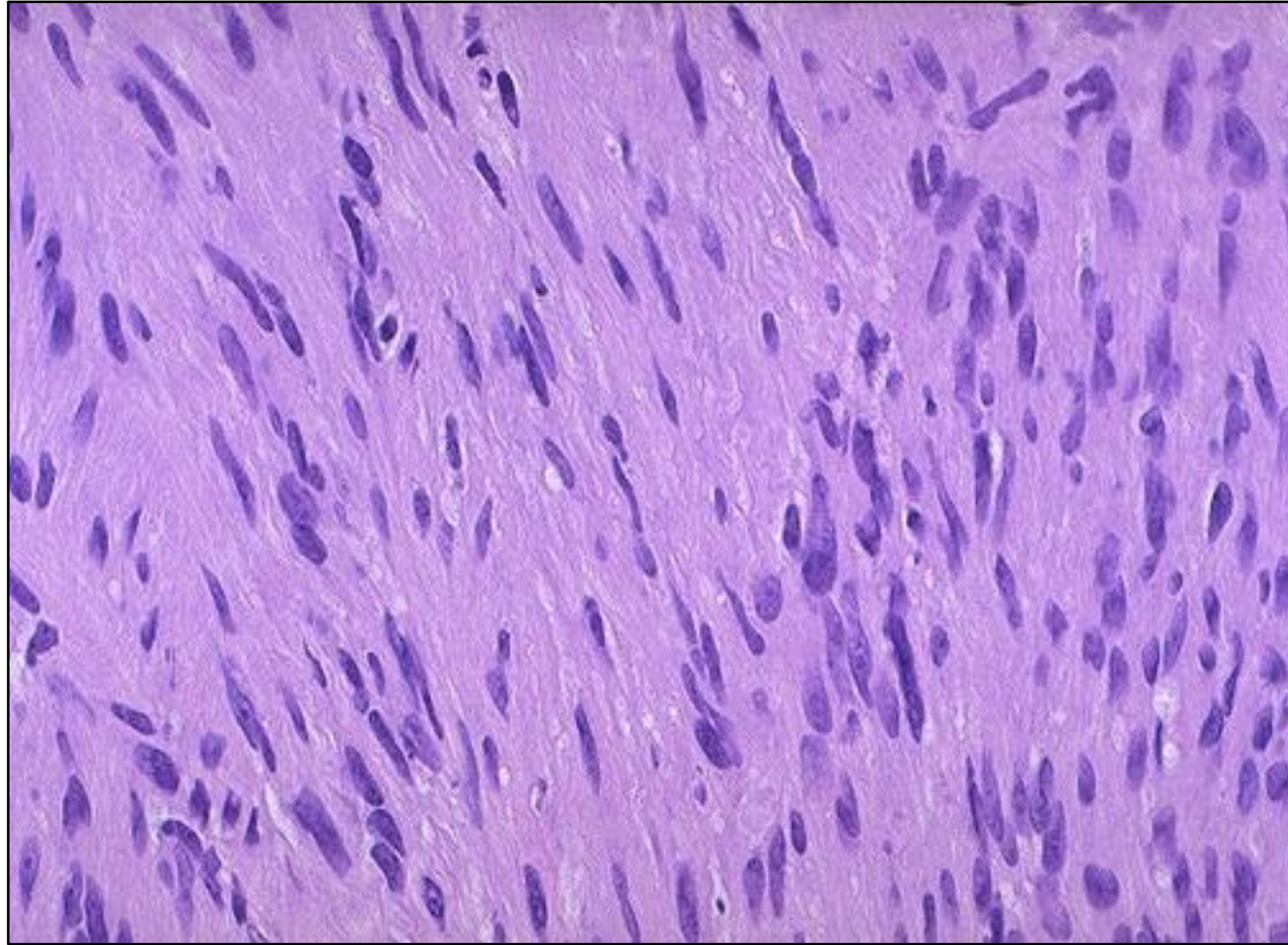
The cut surface of a schwannoma is similar to that of many mesenchymal neoplasms, with a "fish flesh" soft tan appearance.

Schwannoma – LPF Microscopy



These are the classic microscopic appearances of a schwannoma, which is benign. Note the more cellular "Antoni A" pattern on the left with palisading nuclei surrounding pink areas (Verocay bodies). On the right is the "Antoni B" pattern with a looser stroma, fewer cells, and myxoid change.

Schwannoma – HPF Microscopy



The schwannoma is seen here at higher magnification.