

Essentials of Neuroradiology

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Glioma



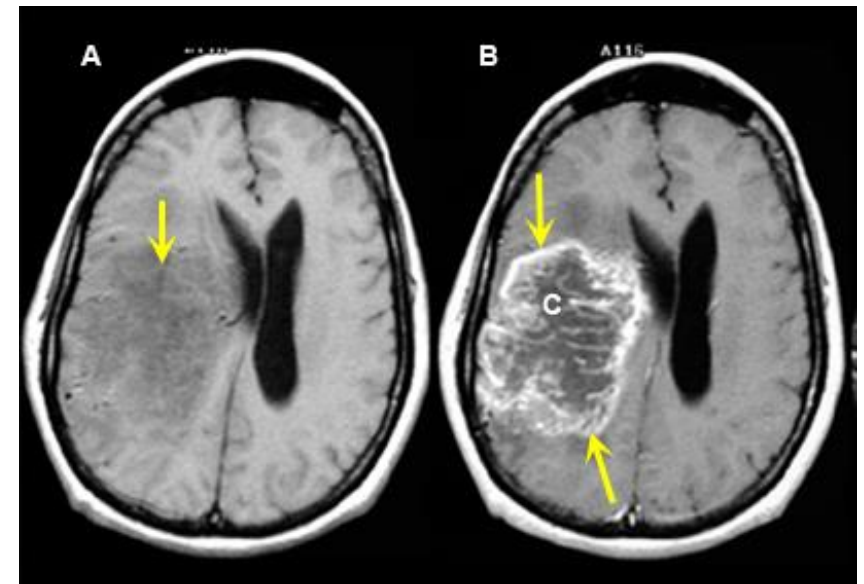
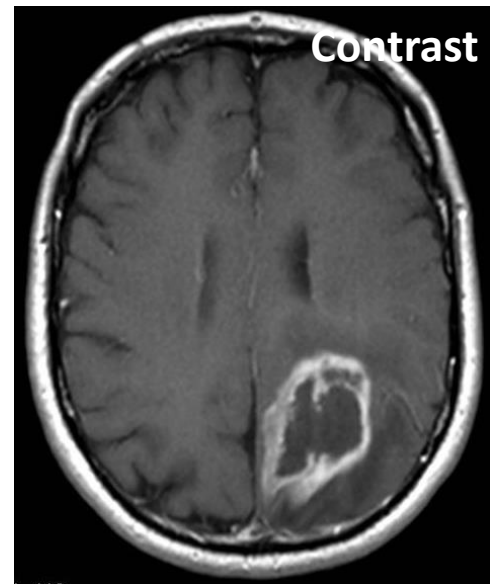
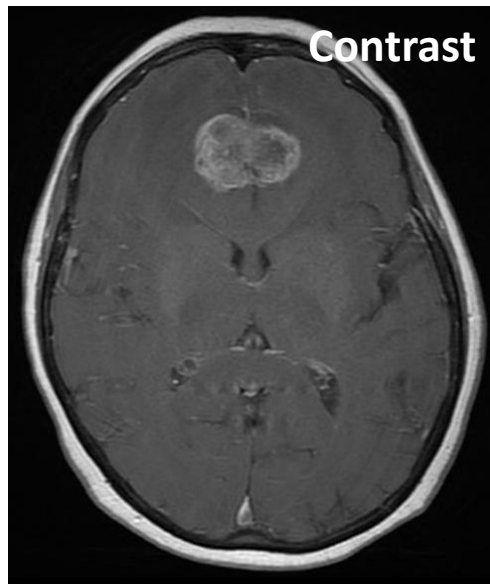
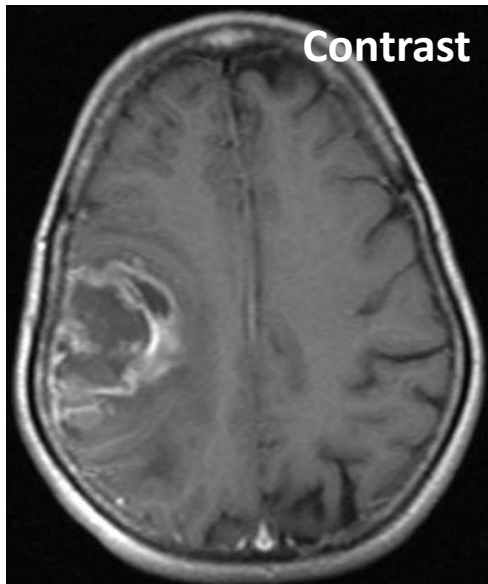
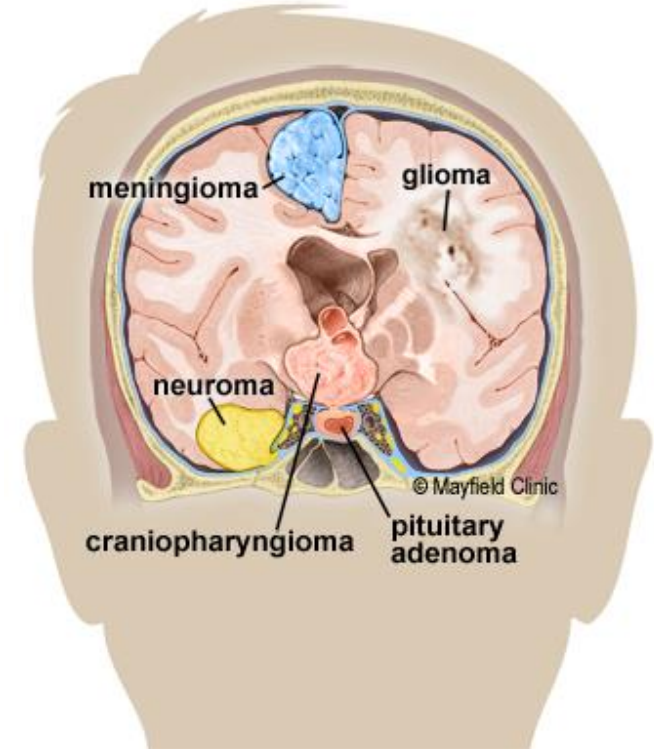
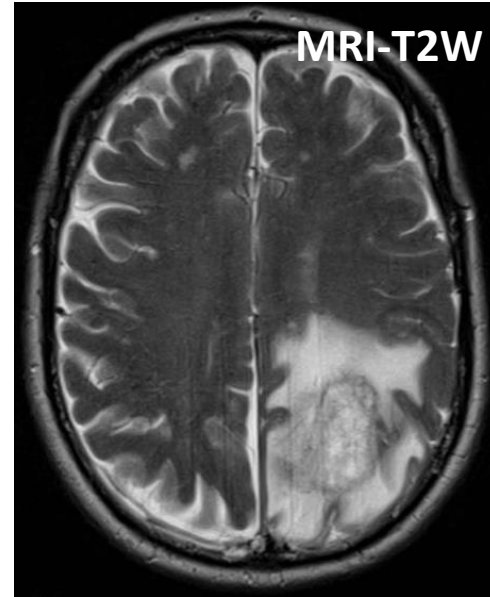
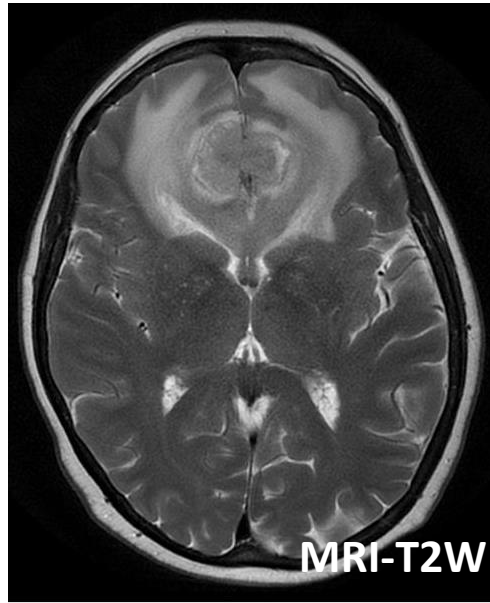
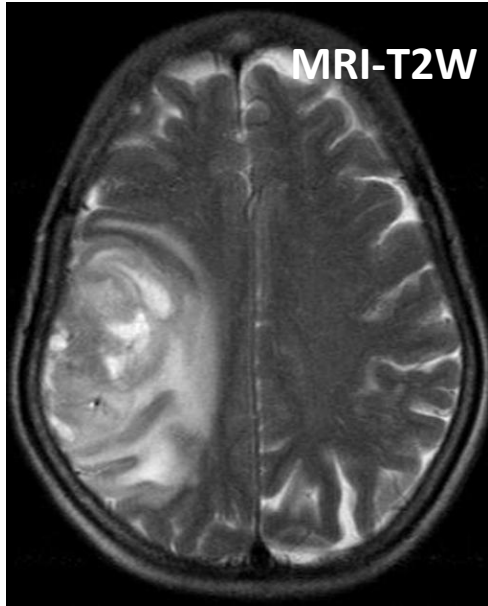
- **Commonest** primary intra cranial tumours.
- Can cause severe neurological defects due to **pressure effect** to brain parenchyma in confined space.
- Major sub types
 - Astrocytoma- arise from Astrocytes
 - Oligodendroglioma-arise from Oligodendrocytes
 - Ependymoma-arise from Ependymal cells.

Glioma - Radiological features



- Skull X Ray - may occasionally show calcification.
- CT and MRI - Surrounding oedema , mass effect and significant enhancement with intravenous contrast.
- MRI is the investigation of choice, but CT is still widely used.
- Low - grade gliomas –better prognosis
- High - grade gliomas –carry a worse prognosis

Glioma - Radiological features

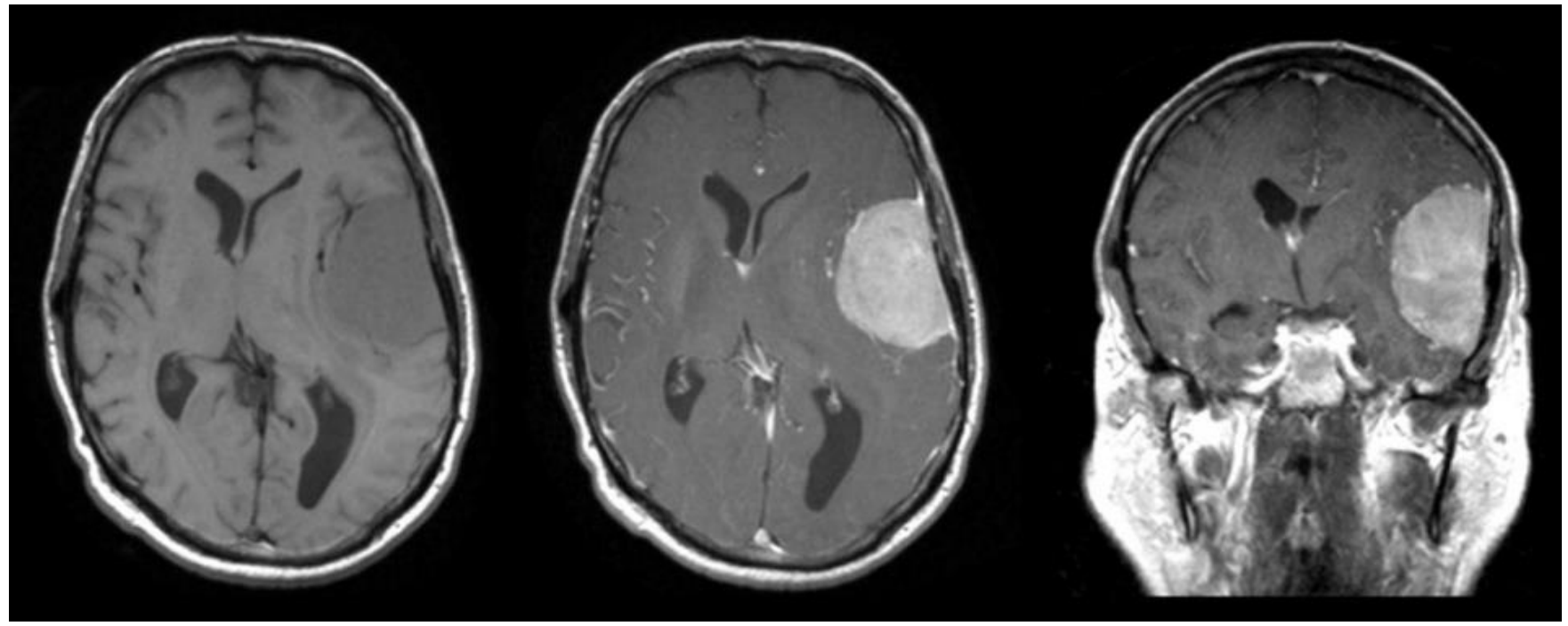
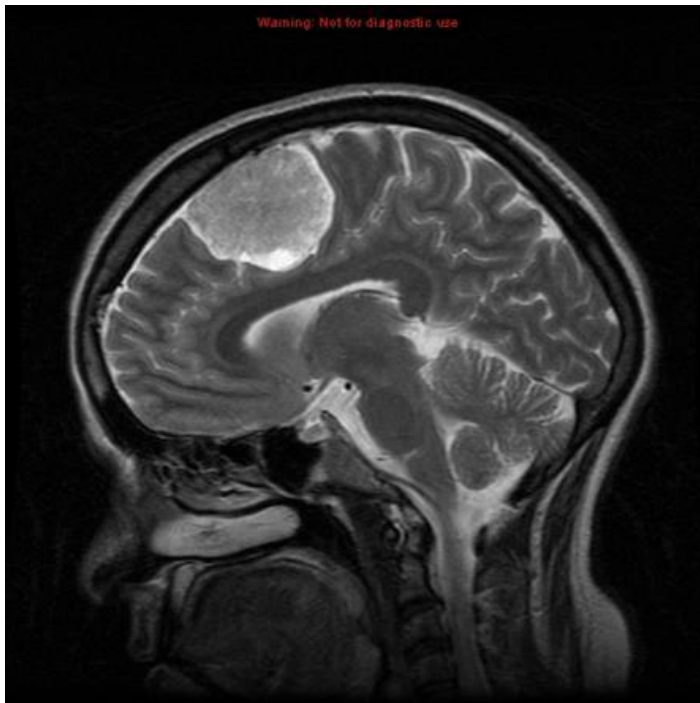
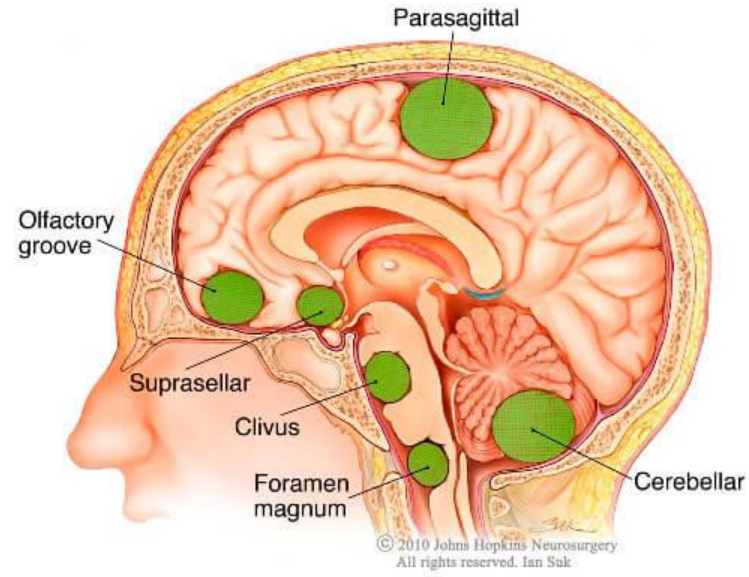
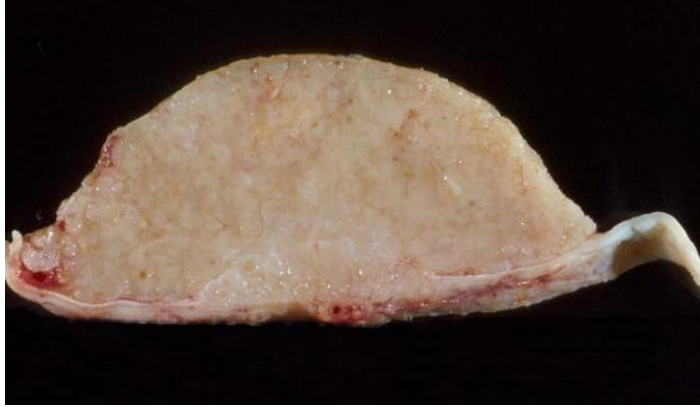


Meningioma



- Meningiomas are tumours that arise **from meninges**.
- They represent **15 – 20%** of primary brain tumours
- Often discovered **incidentally** when CT or MRI is done
- **Benign, well - defined lesions**, arising from any part of the meningeal covering of the brain.
- Frequent sites are the **falx, parasagittal region and sphenoid wing**.
- They usually **grow slowly**,
- CT and MRI show well - defined lesions **enhancing strongly and diffusely after intravenous contrast**.

Meningioma



Cerebral metastases



- Metastases are some of the commonest malignant cerebral lesions,
- involve any part of the brain
- May be single or multiple.
- Multiple lesions are almost certainly metastases.
- Secondary to the brain are commonly from bronchial, breast and GIT neoplasms.

Metastases- Radiological features

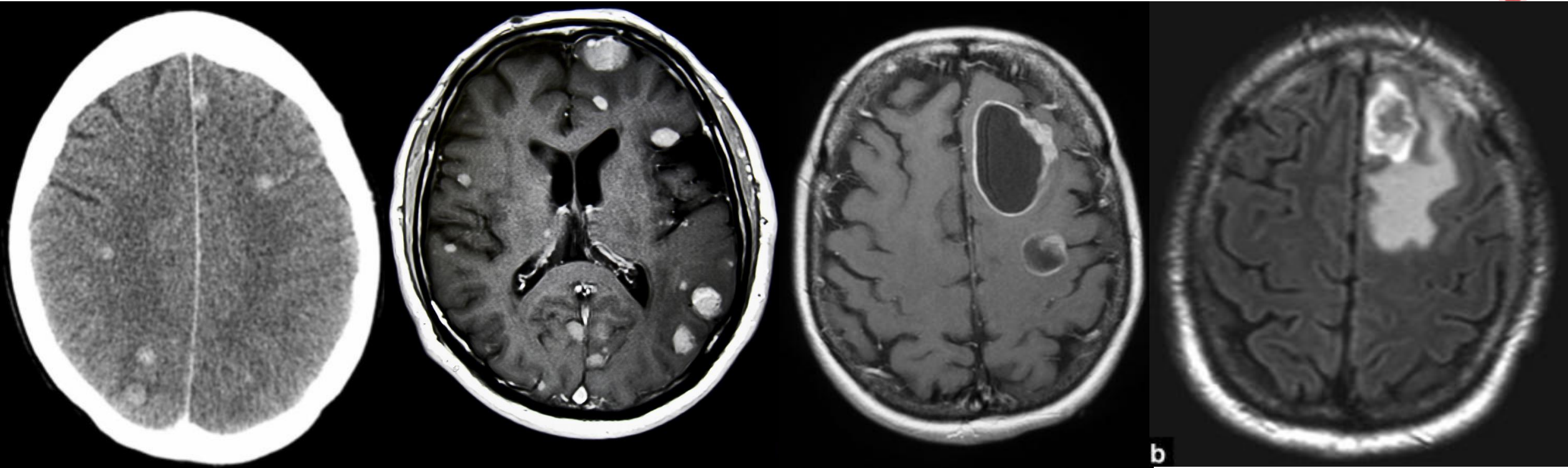


- Metastases can be haemorrhagic, cystic or calcified and they may cavitate.
- Surrounding brain oedema is always present.
- After intravenous contrast, CT/MRI almost always shows enhancement
- Whole lesion or around the periphery.

Treatment :

- Palliative: dexamethasone reduces oedema and relieves headache;
Radiotherapy.
- Surgical resection occasionally for a solitary metastasis.

Metastases- Radiological features



Posterior fossa tumours



“BEAM”

B: [Brainstem glioma](#)

E: [Ependymoma](#)

A: [Astrocytoma \(pilocytic\)](#) (85%)

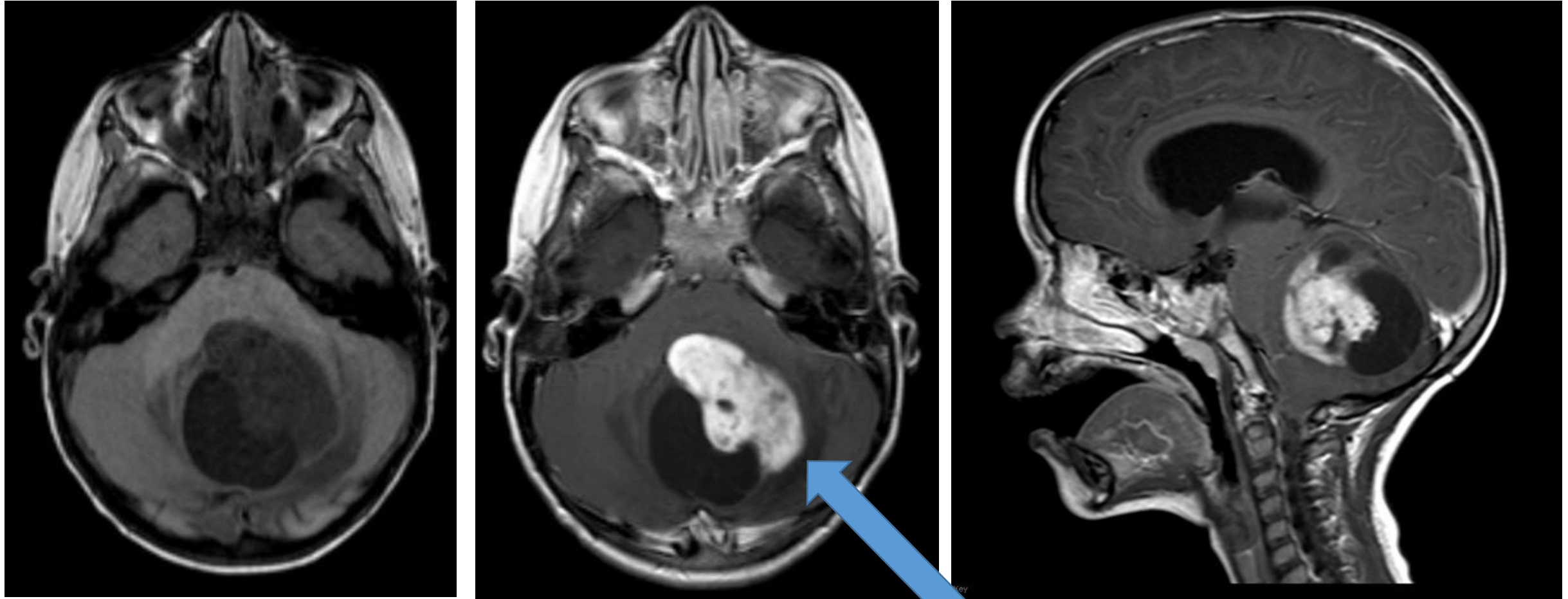
M: [Medulloblastoma](#)

Posterior fossa tumours



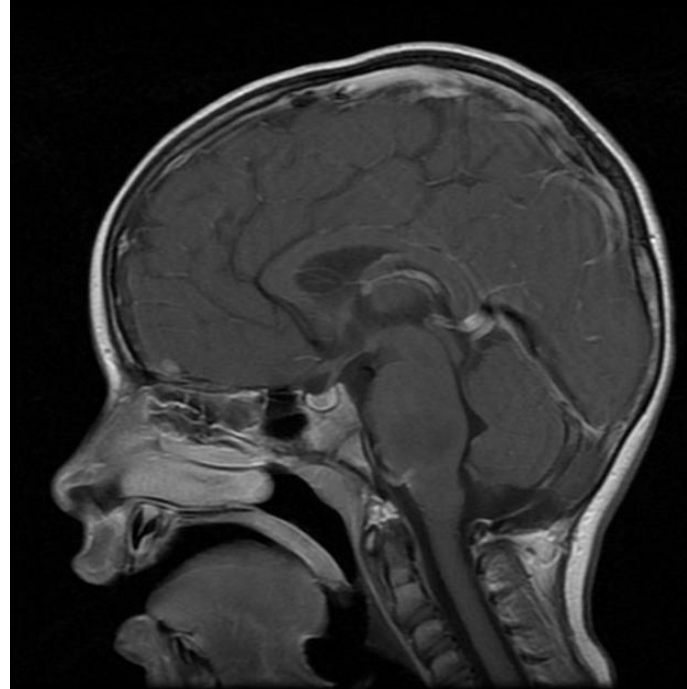
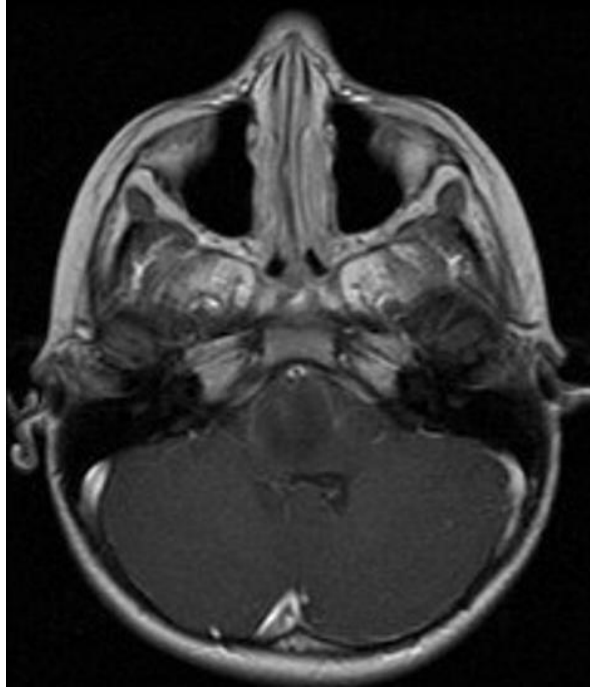
- Posterior fossa consists – Cerebellum, pons and medulla oblongata.
- Up to 75% brain tumors in children - occur in posterior fossa
- Commonest posterior fossa tumour in adults –**metastasis** Eg: Lung/breast
- Commonest posterior fossa tumour in children- **Pilocystic astrocytoma**
- They may present with
 - Ataxia
 - Headache
 - Vomiting
 - Nystagmus
 - Cranial nerve dysfunction

Pilocystic astrocytoma - MRI



Large posterior fossa cystic lesion with contrast enhancing mural nodule

Brainstem Glioma- MRI



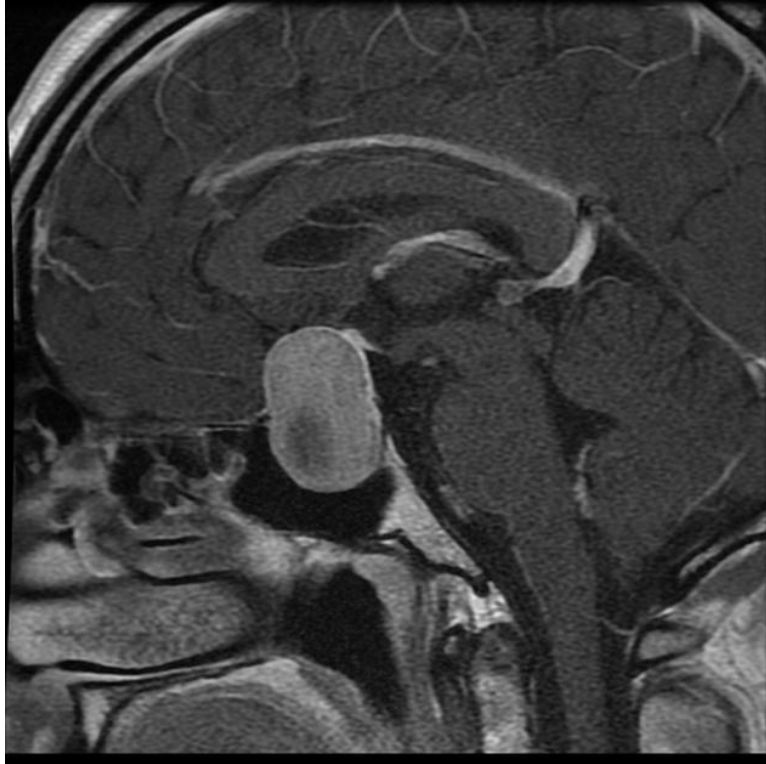
- Commonest variety is pontine glioma
- Very minimal contrast enhancement

Pituitary tumours

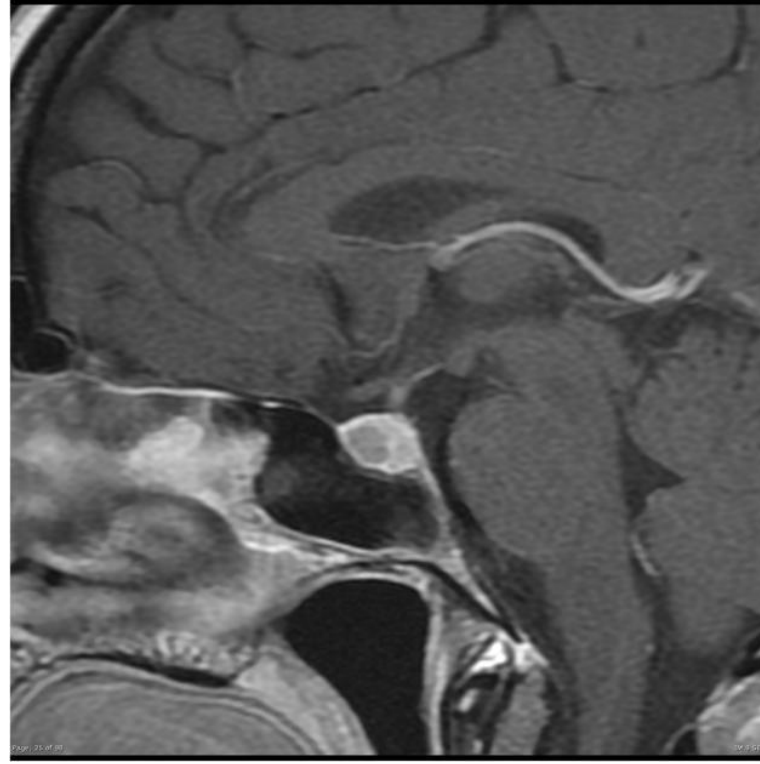


- Pituitary adenomas are usually benign
- Microadenoma < 1 cm in diameter, or macroadenomas > 1 cm.
- Prolactinoma is the most common pituitary tumour.
- Tumours are slow growing and penetrate and compress adjacent structures.
- Presenting features depend on
 - Type of hormone secreting
 - Compressive features

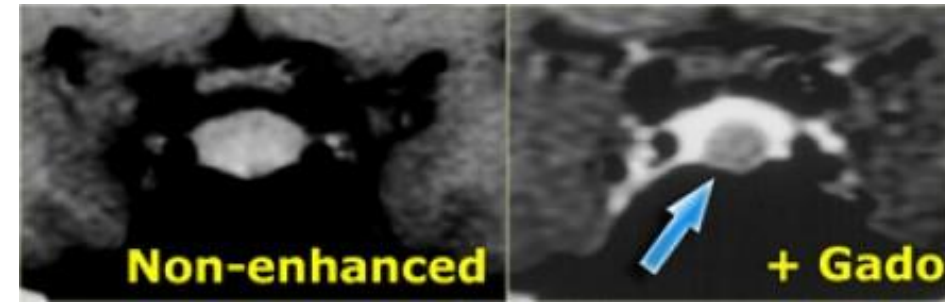
Pituitary tumours



Macroadenoma



Microadenoma



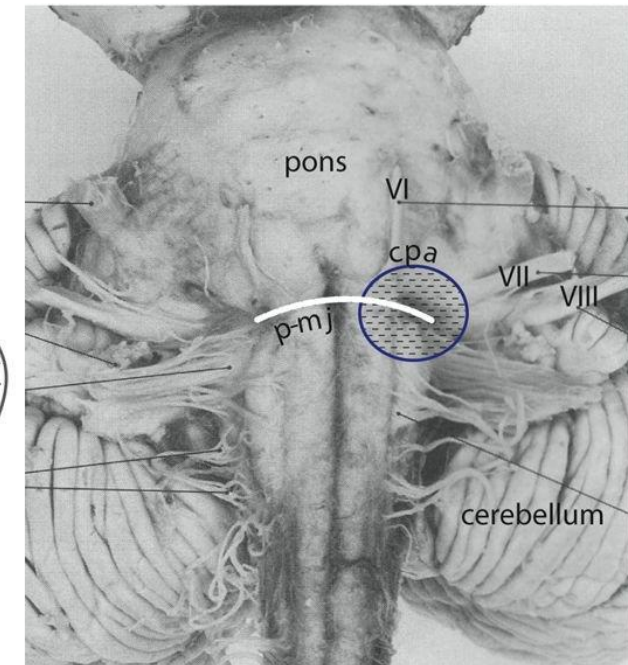
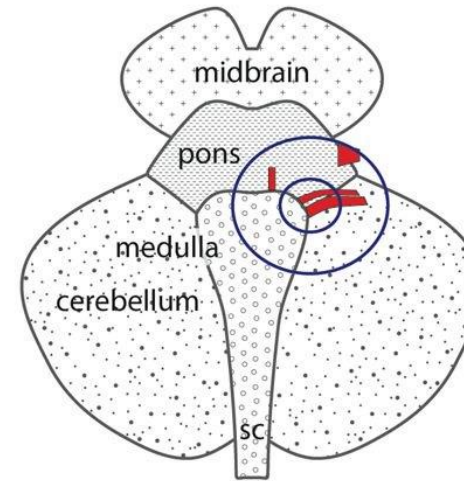
Cerebellopontine angle masses



- C-P angle wedge-shaped cisternal space within the posterior fossa
- Bounded by the petrous temporal bone laterally, the cerebellum and pons medially.



Cerebellopontine angle



Cerebellopontine angle masses



Various types of masses arise in this angle.

“SAME”

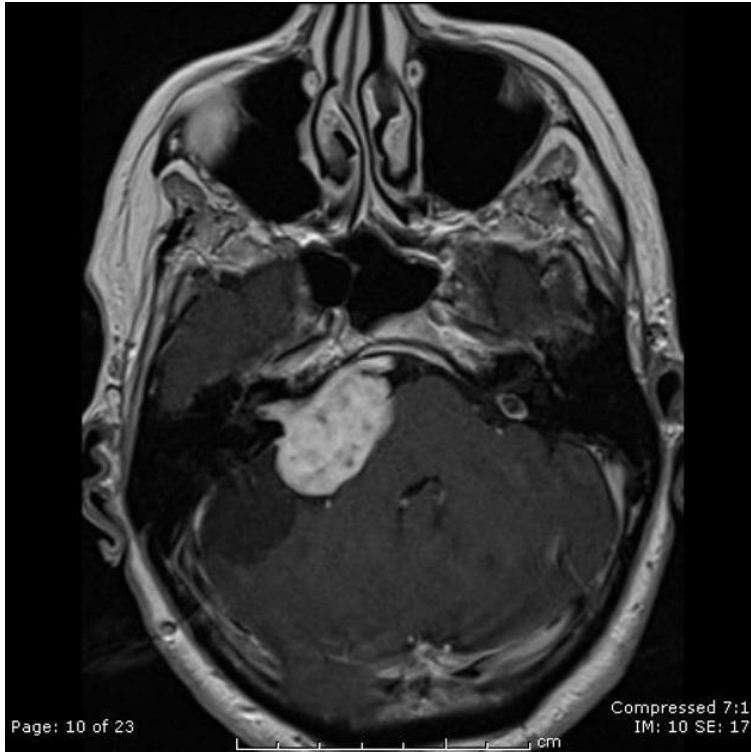
- S – Schwannoma (80%)
- A - Aneurysm/Arachnoid cyst
- M - Meningioma /Metastasis
- E - Epidermoid/Ependymoma

Acoustic neuroma

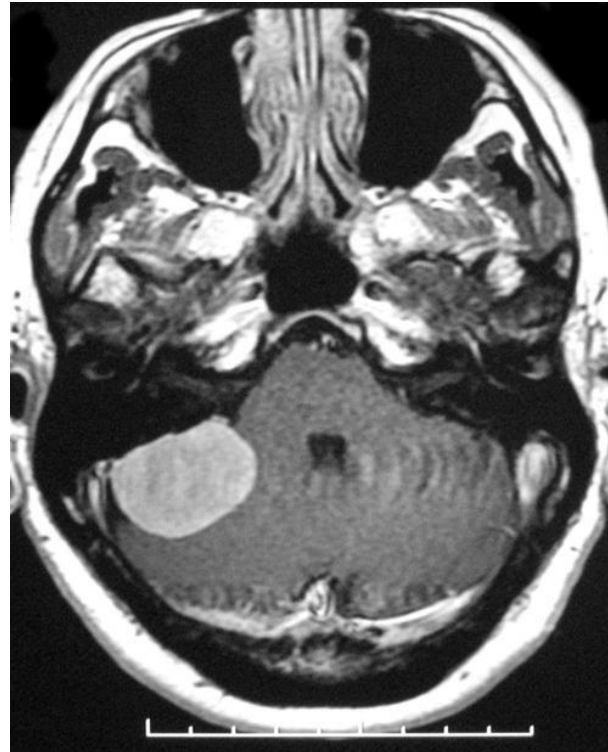


- Presentation
 - Ipsilateral sensorineural hearing loss, balance disturbance, altered gait, tinnitus, vertigo, nausea, vomiting.
- Benign primary intracranial tumour from the myelin cells of the 8th nerve (vestibulo - cochlear).
- MRI is the investigation of choice. CT may show winding of internal auditory canal
- Grows into the internal auditory canal and extends into the posterior fossa.

Cerebellopontine angle masses



Acoustic neuroma



Meningioma



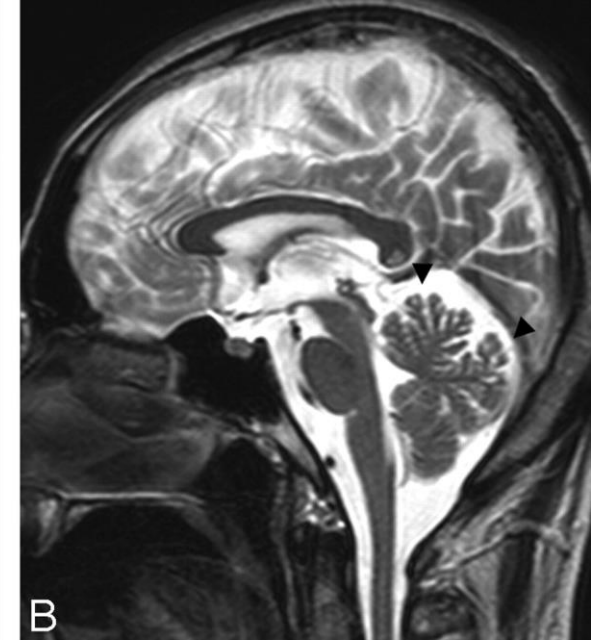
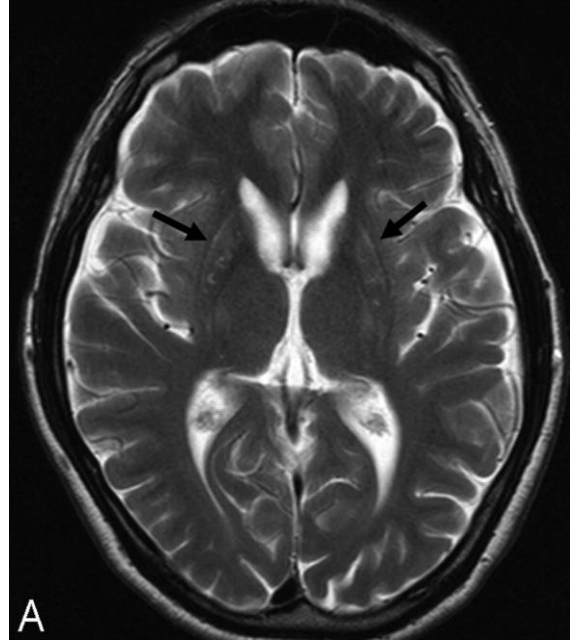
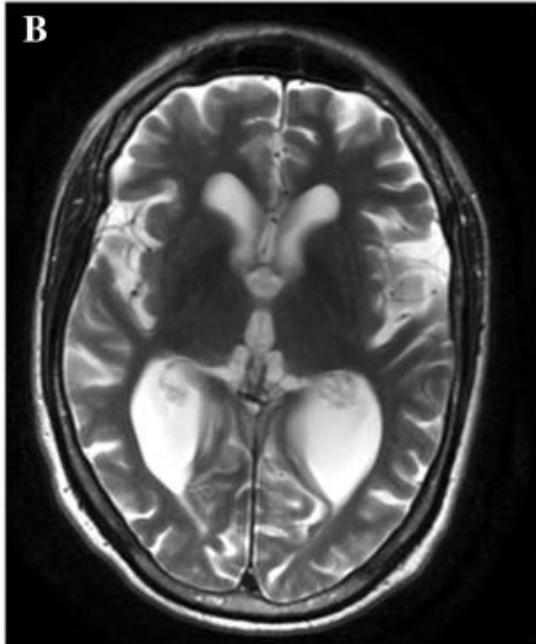
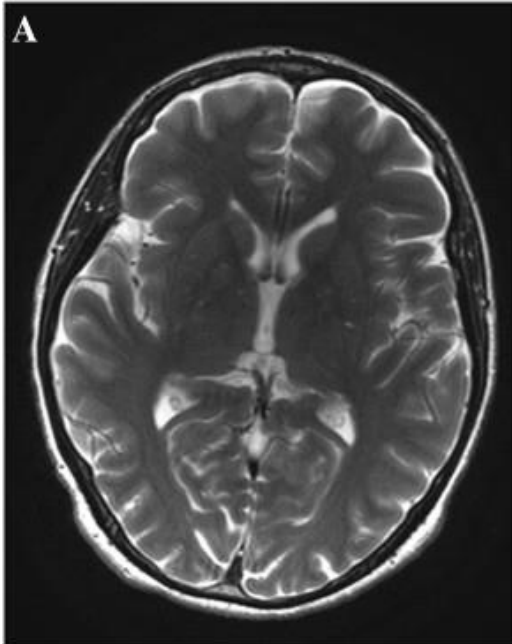
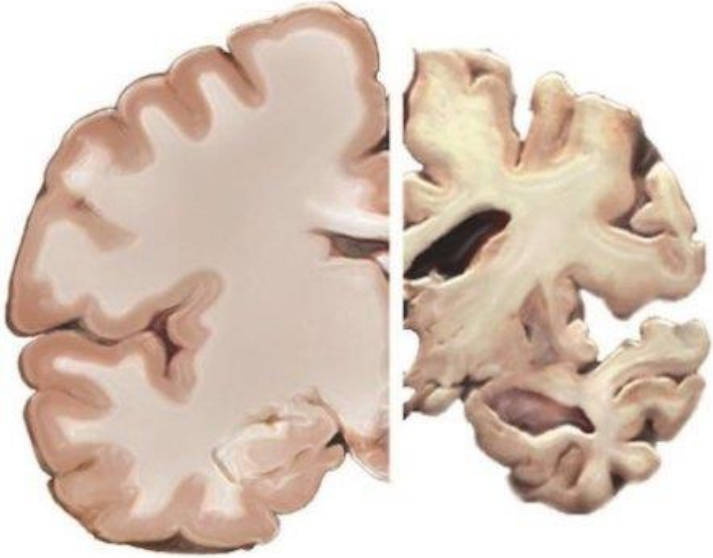
Arachnoid cyst

Cerebral atrophy- Radiological features



- Irreversible loss of brain substance results in enlargement of the CSF spaces ventricles, basal cisterns, cerebral and cerebellar sulci.
- Ventricular dilatation may also be noted in hydrocephalus.
- However, in hydrocephalus, the ventricles dilate with relatively normal sulci, whereas in atrophy there is usually both ventricular and sulcal enlargement seen.

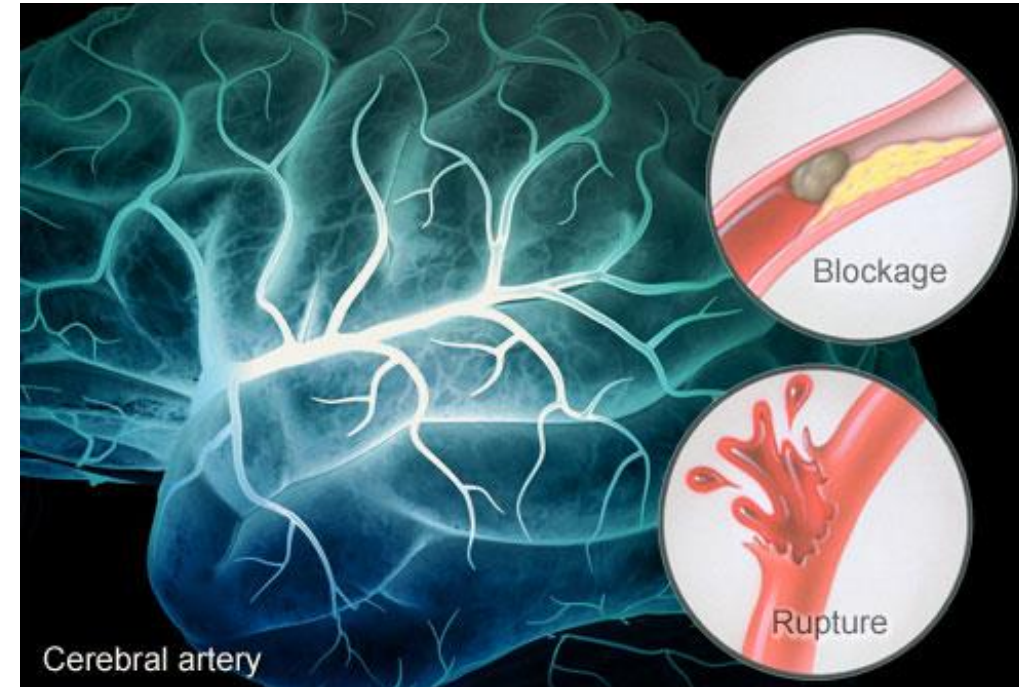
Cerebral atrophy- Radiological features



Stroke



- Stroke is a clinical diagnosis that refers to a **sudden onset focal neurological deficit** due to vascular origin.
- It is divided into two broad categories
 - **Ischemic stroke (80%)**
 - **Hemorrhagic stroke (15%)**
- Hemorrhage may be due to hypertension or other secondary causes such as vascular malformations.



Cerebral infarct (Ischemic Stroke)



- Infarction of the brain results from absent cerebral circulation from thrombosis or an embolic event.
- Clinically presents as a stroke.
- Predisposing factors include a **family history, hypertension, diabetes** and the many causes of **atherosclerotic disease or emboli**.
- Symptoms and signs vary depending on the **site and size of infarction**.
- **Transient ischaemic attack (TIA)** produces a focal neurological deficit in which complete recovery of function occurs **within 24 hours**.
- A stroke is one in which the neurological deficit persists.

CT in Stroke



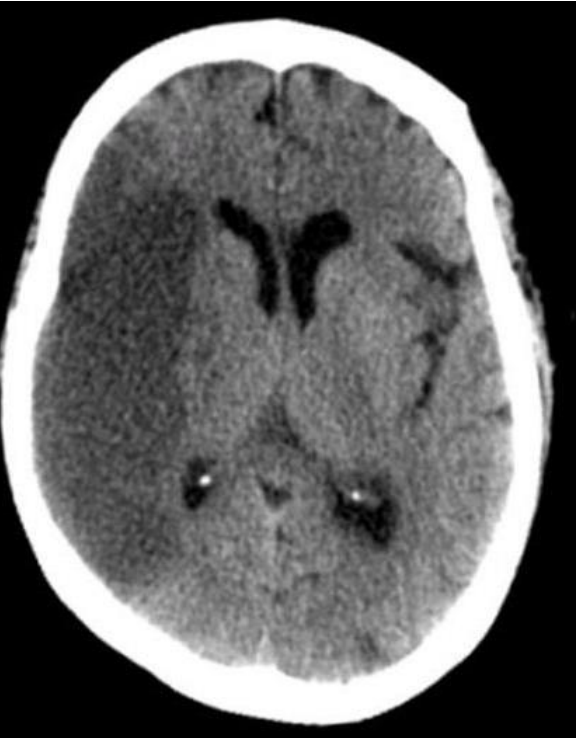
CT - advantage –

- Widely available
- Gold standard for hemorrhage.

(Hemorrhage on MR images can be confusing.)

- On CT **60% of infarcts** are seen within **3-6 hrs** and virtually all are seen in 24 hours.
- Early infarcts and lacunar infarcts may be missed

CT in Stroke



Infarction



Hemorrhage

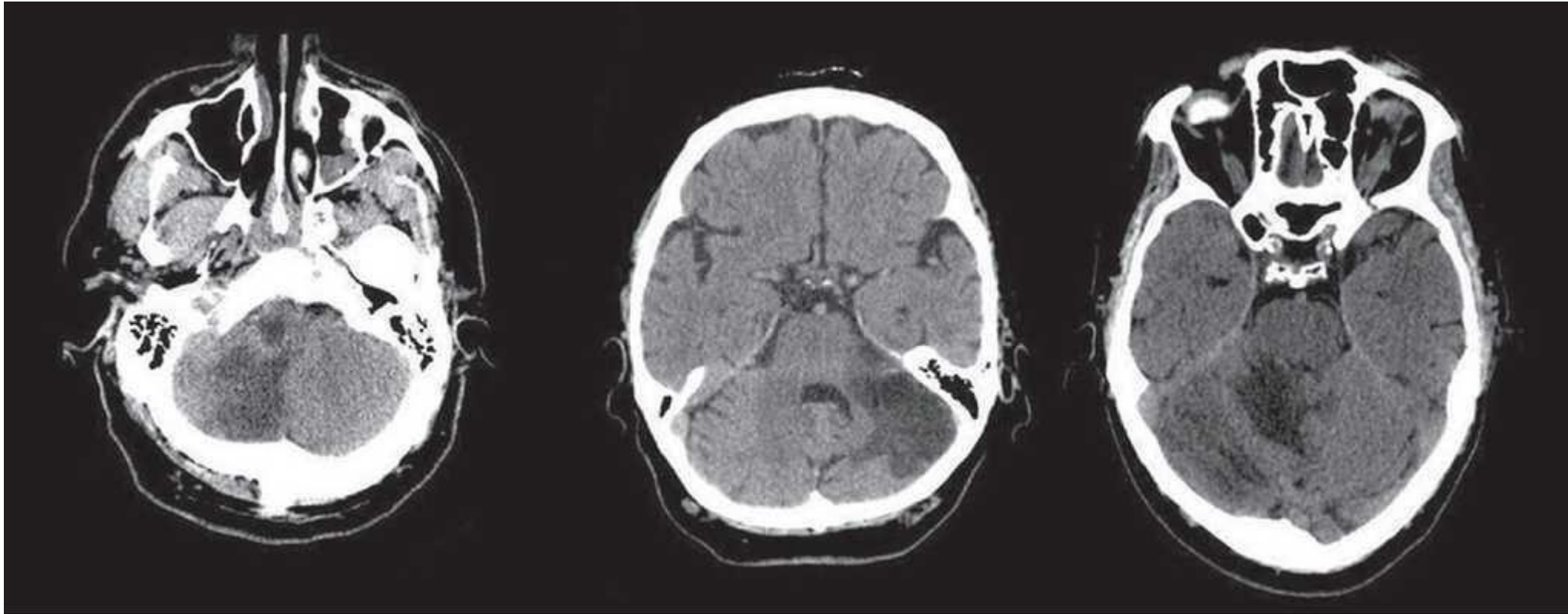


Early infarction



Hemorrhagic infarction

CT in infarcts



PICA

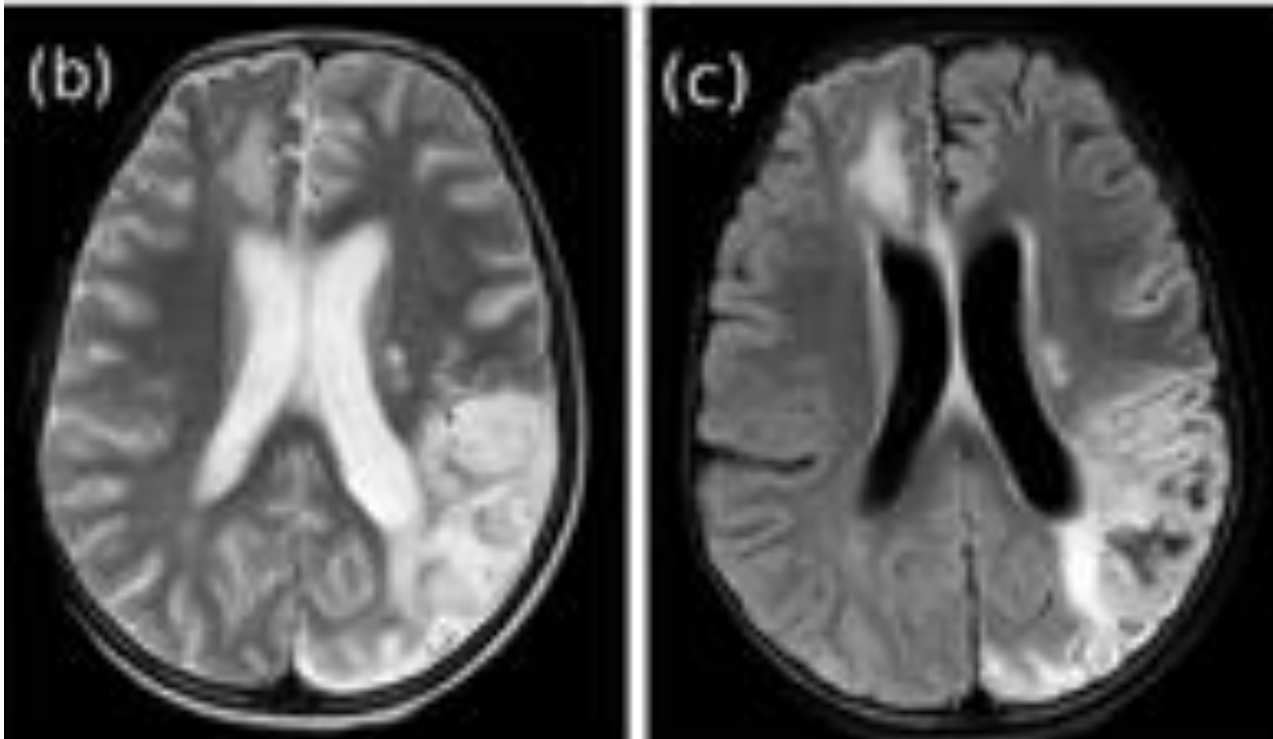
AICA

SCA

MRI in infarcts



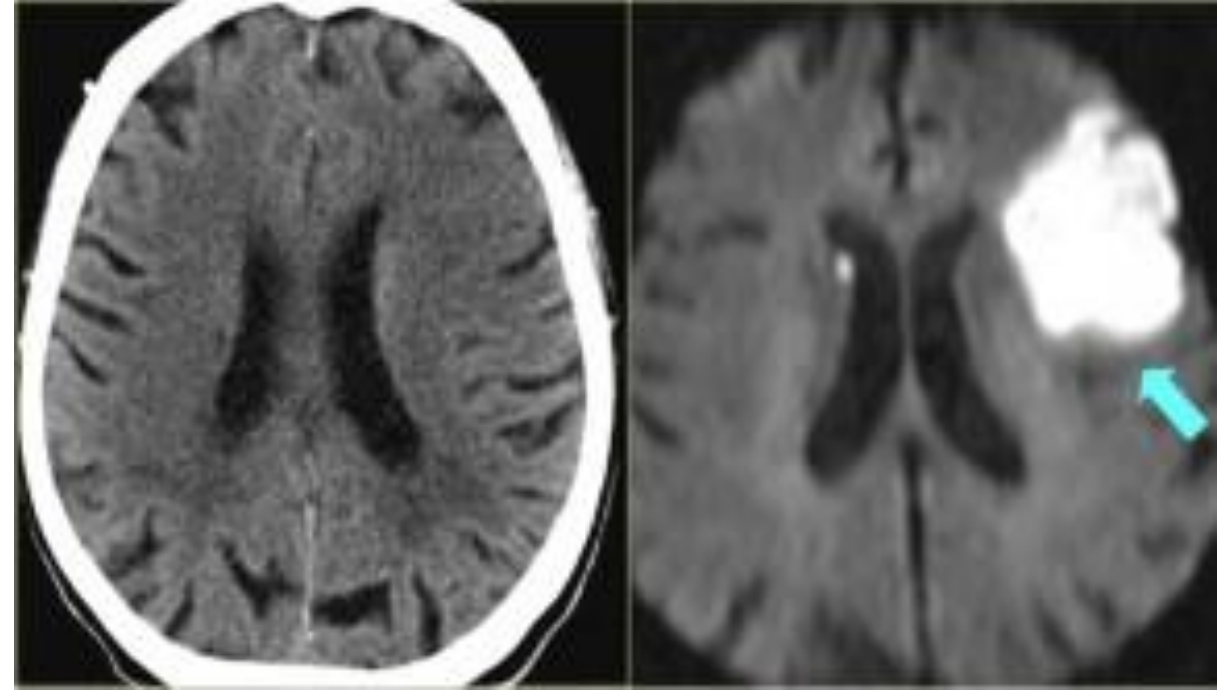
- On T2W and FLAIR sequences -infarction is seen as high signal - Hyperintense (White).
- These sequences detect 80% of infarctions before 24 hours.



Diffusion Weighted Imaging (DWI)



- DWI is the most sensitive sequence for stroke imaging.
- High intensity on DWI indicates – an infarction
- **Sensitive in very early infarctions**



CT –Early infarction

DWI–Early infarction

Haemorrhage



- **Intra-axial haemorrhage**

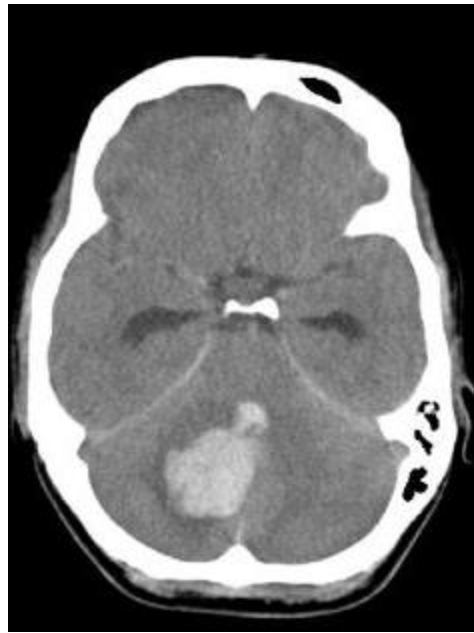
- intracerebral haemorrhage
- basal ganglia haemorrhage
- lobar haemorrhage
- pontine haemorrhage
- cerebellar haemorrhage

- **Extra-axial haemorrhage**

- extradural haemorrhage (EDH)
- subdural haemorrhage (SDH)
- subarachnoid haemorrhage (SAH)
- intraventricular haemorrhage (IVH)

- CT scan is almost always the first imaging modality used to assess suspected intracranial hemorrhage.
- Fortunately acute blood is markedly hyperdense (White) compared to brain parenchyma.
- Therefore nicely visualized

CT-Intracerebral haemorrhage (ICH)

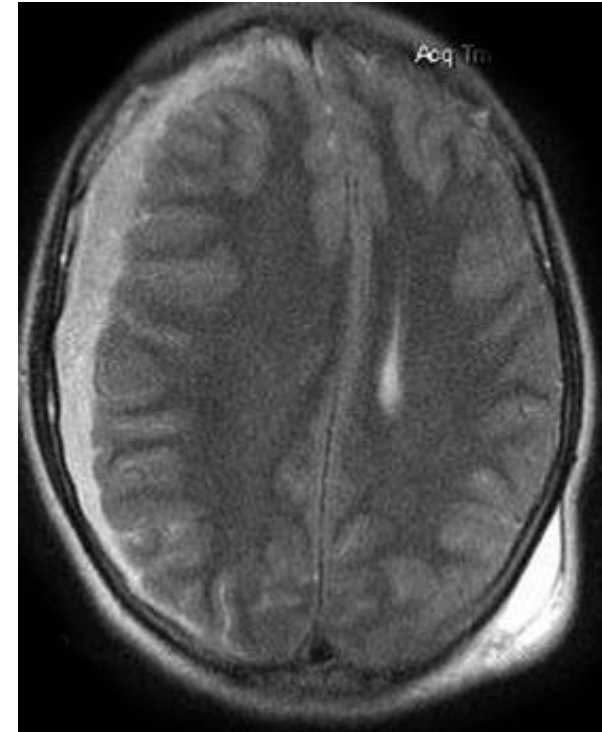


CT-Extra-axial haemorrhage -SDH



- Subdural hemorrhage (SDH) is a collection of blood accumulating in the subdural space
- Potential space between the dura and arachnoid
- SDH can happen in any age group, is mainly due to head trauma
- CT scans are usually sufficient to make the diagnosis.
- SDH due to stretching and tearing of bridging cortical veins.

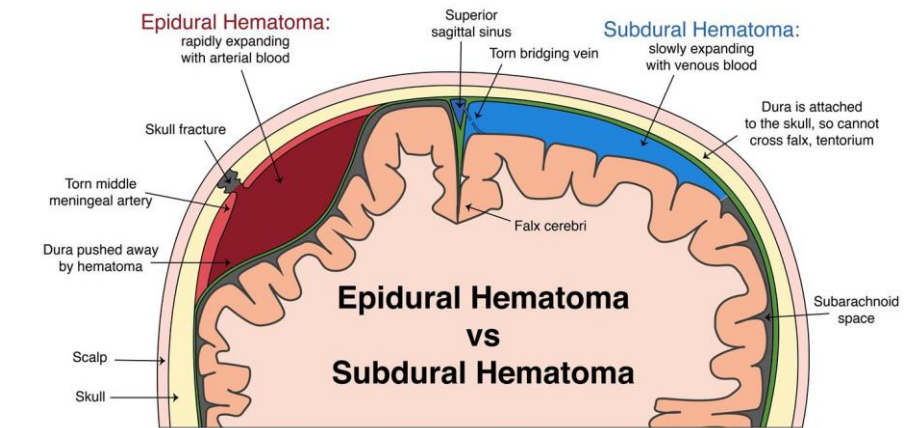
Subdural hemorrhage (SDH)



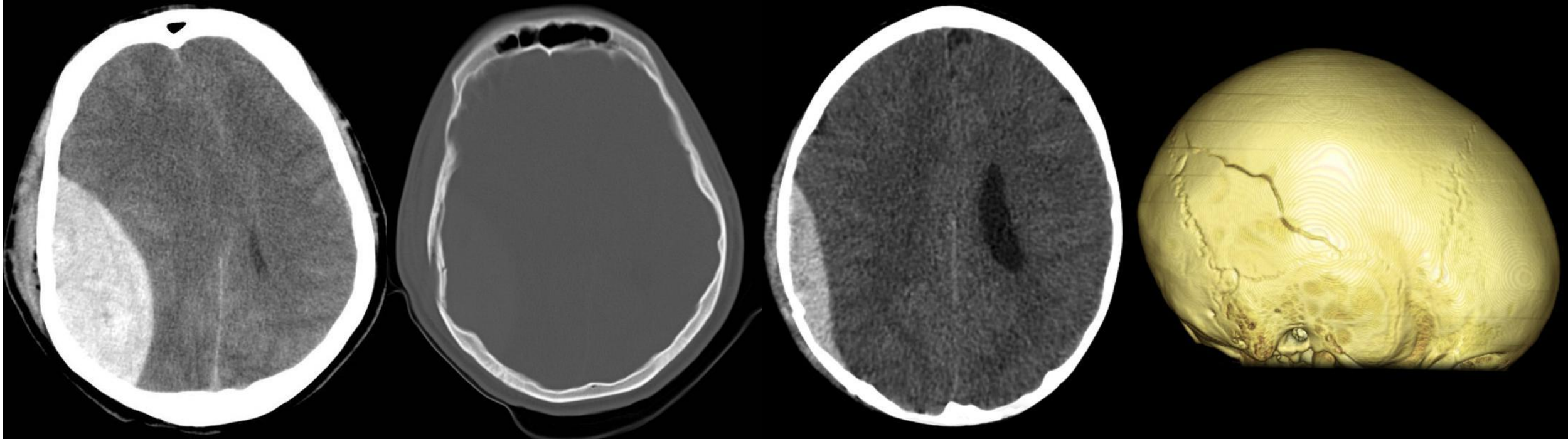
Extradural hemorrhage (EDH)



- Collection of blood between the inner surface of the skull and outer layer of the dura
- Associated with head trauma and frequently associated skull fracture.
- The source of bleeding is usually arterial, most commonly from a torn middle meningeal artery.(MMA)
- Typically bi-convex (or lentiform) in shape



Extradural hemorrhage (EDH)

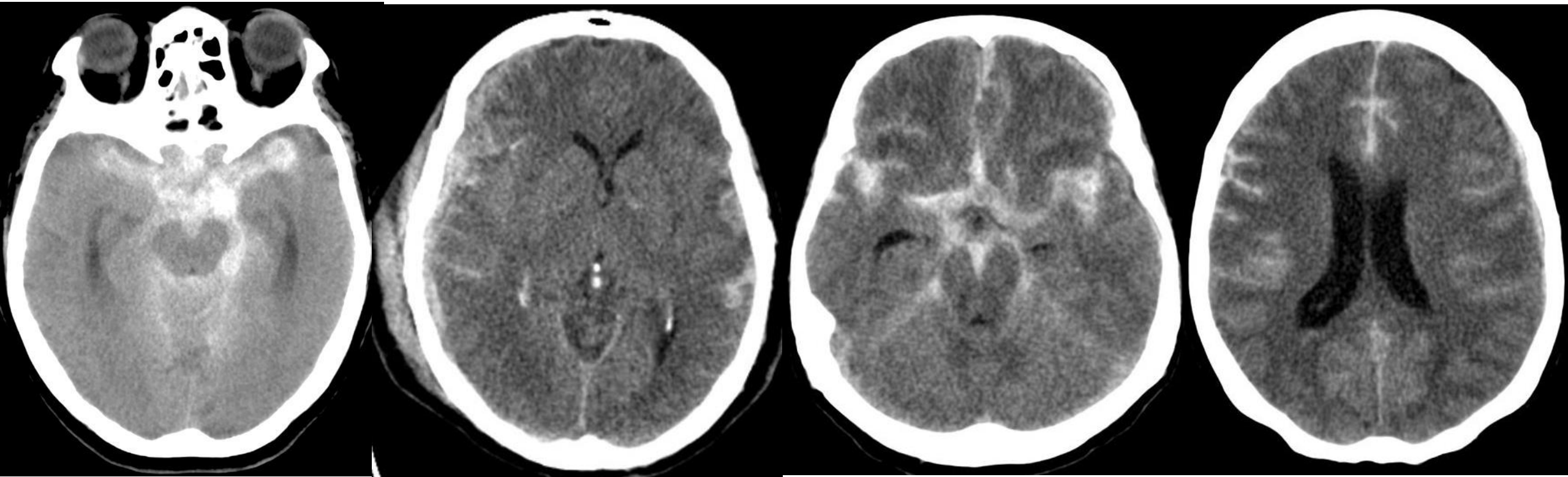


Subarachnoid hemorrhage (SAH)

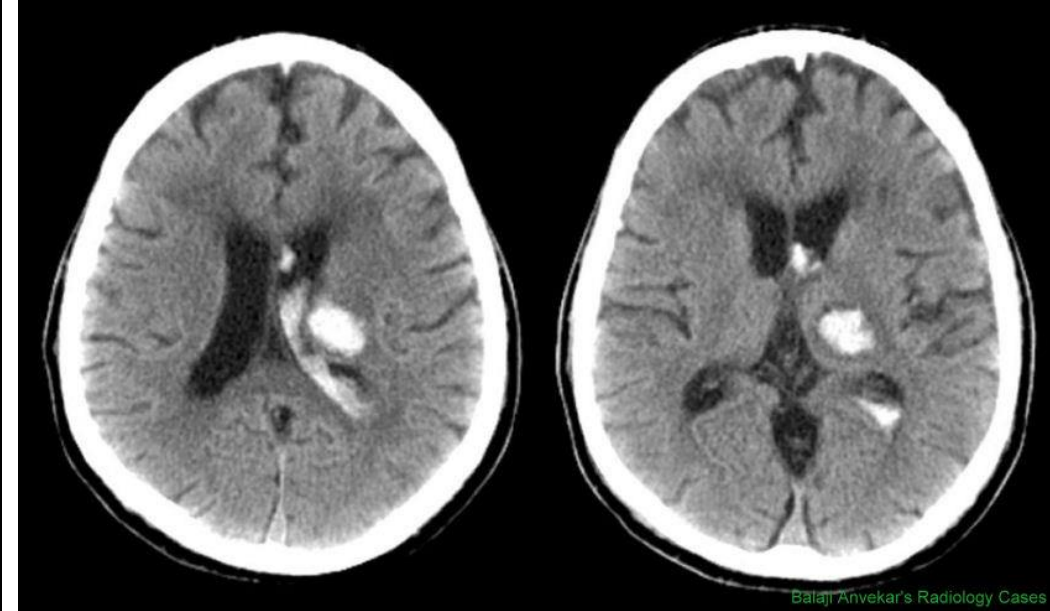


- Presence of blood within the subarachnoid space
- Thunderclap headache described as a sudden-onset headache that is the worst headache of their life.
- It is often associated with photophobia and meningism

Subarachnoid hemorrhage (SAH)



Intraventricular hemorrhage (IVH)



- MRI is more sensitive than CT to very small amounts of blood, especially in the posterior fossa.
- Remember not to confuse with choroid plexus calcifications in CT

Case Studies