Lecture Title:
BRAIN STEM AND CEREBELLUM

(CNS Block, Radiology)

Lecture Objectives..

Students at the end of the lecture will be able to:

- Identify radiological anatomy of brain stem and cerebellum.
- Compares CT and MRI imaging of brain stem and cerebellum.
- Recognize the imaging findings in common diseases involving brain stem and cerebellum.

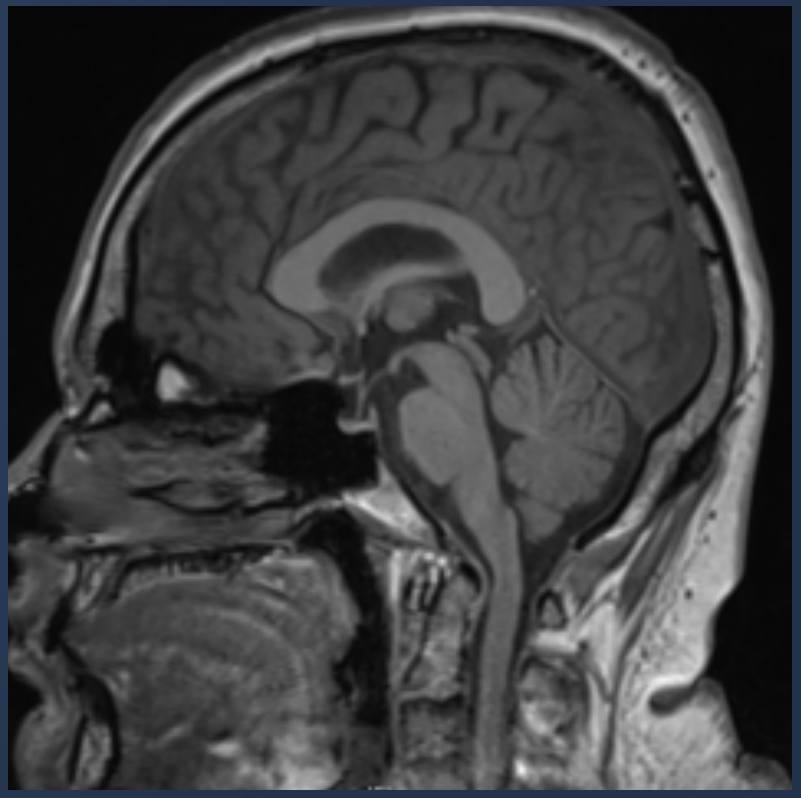
Brain Divisions..

- There are three major divisions of the brain:

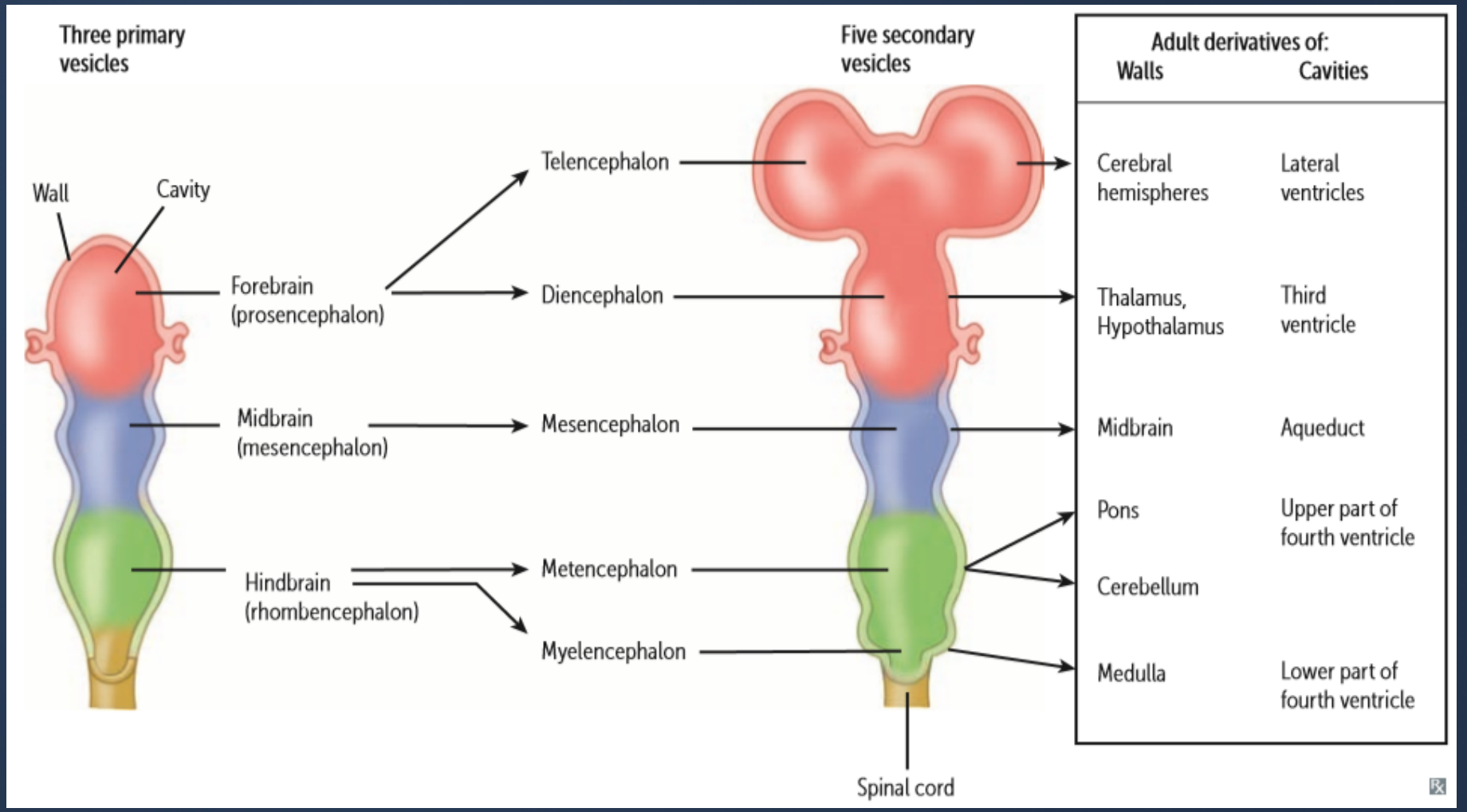
I Prosencephalon **Forebrain**
- Diencephalon **thalamus, hypothalamus**
- Telencephalon **cerebrum**

II Mesencephalon – **Midbrain**

III Rhombencephalon - **Hindbrain**
- Metencephalon **pons and cerebellum**
- Myelencephalon **medulla oblongata**

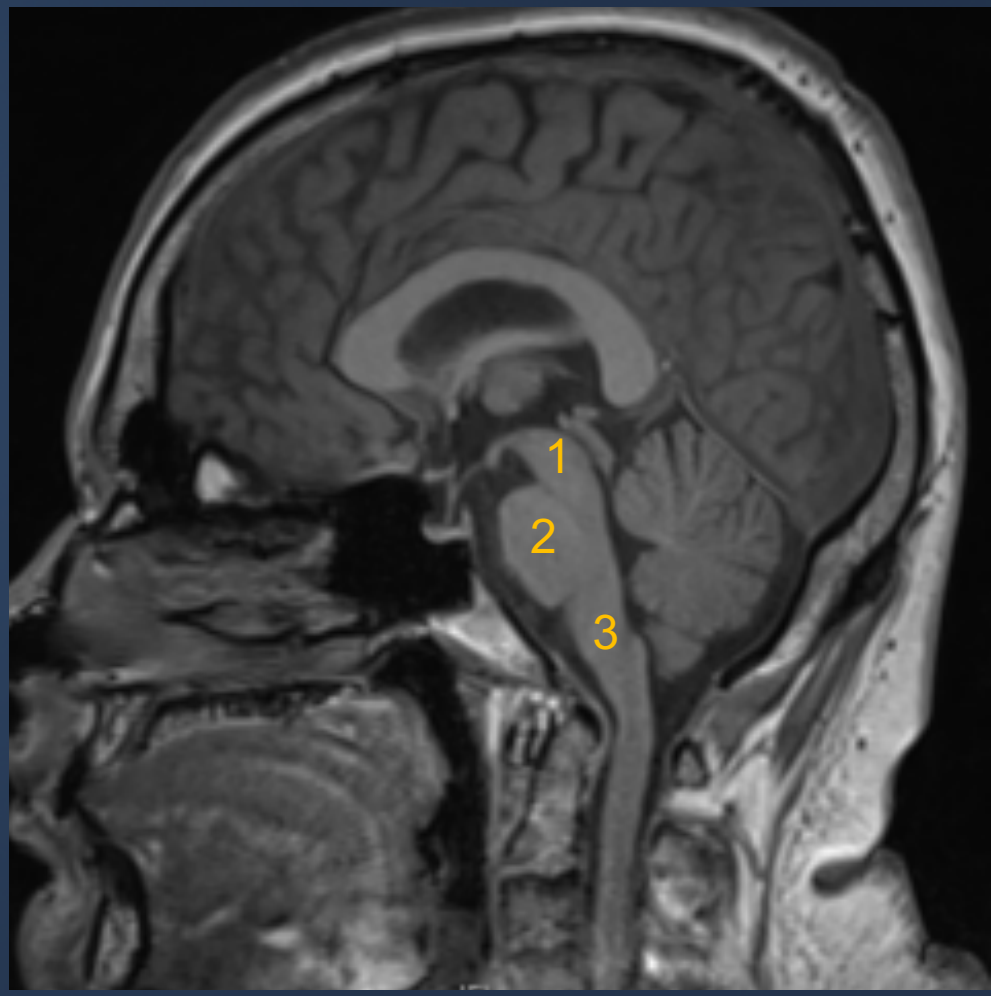


Brain Divisions..



Brain Stem..

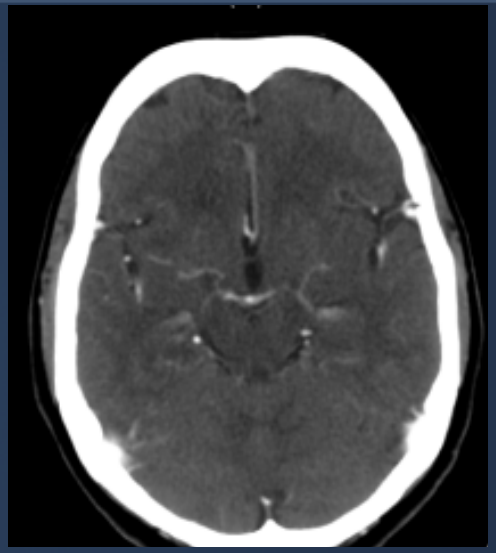
- Three parts from superior to inferior:
  - 1 midbrain
  - 2 pons
  - 3 medulla oblongata
- Connects cerebral hemisphere with spinal cord



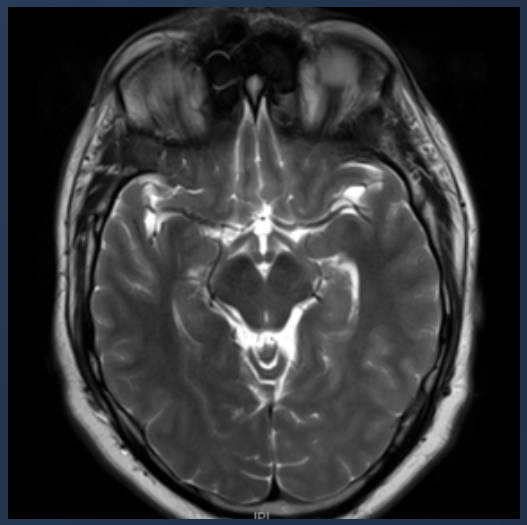
Midbrain..

Radiological Features:

- At the level of circle of willis
- Anteriorly two cerebral peduncles separated by interpeduncular fossa
- Posteriorly four rounded prominences (superior and inferior colliculi)



CT+

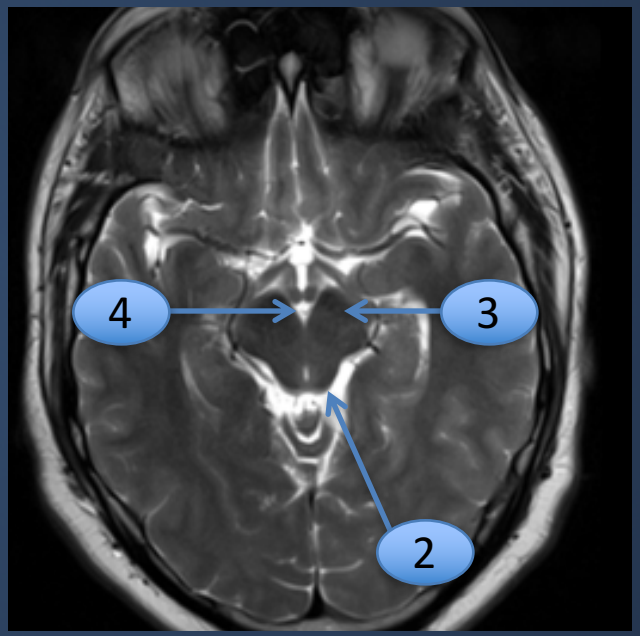


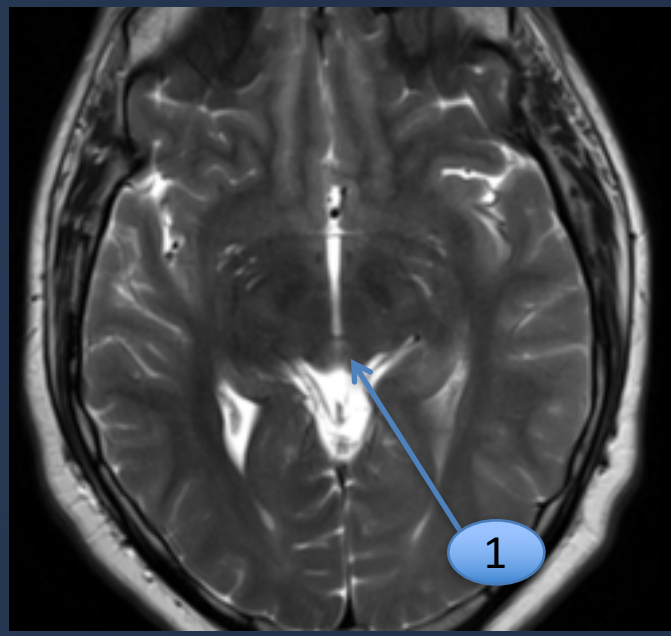
MRI
T2WI

Midbrain..

MRI Sagittal T1WI

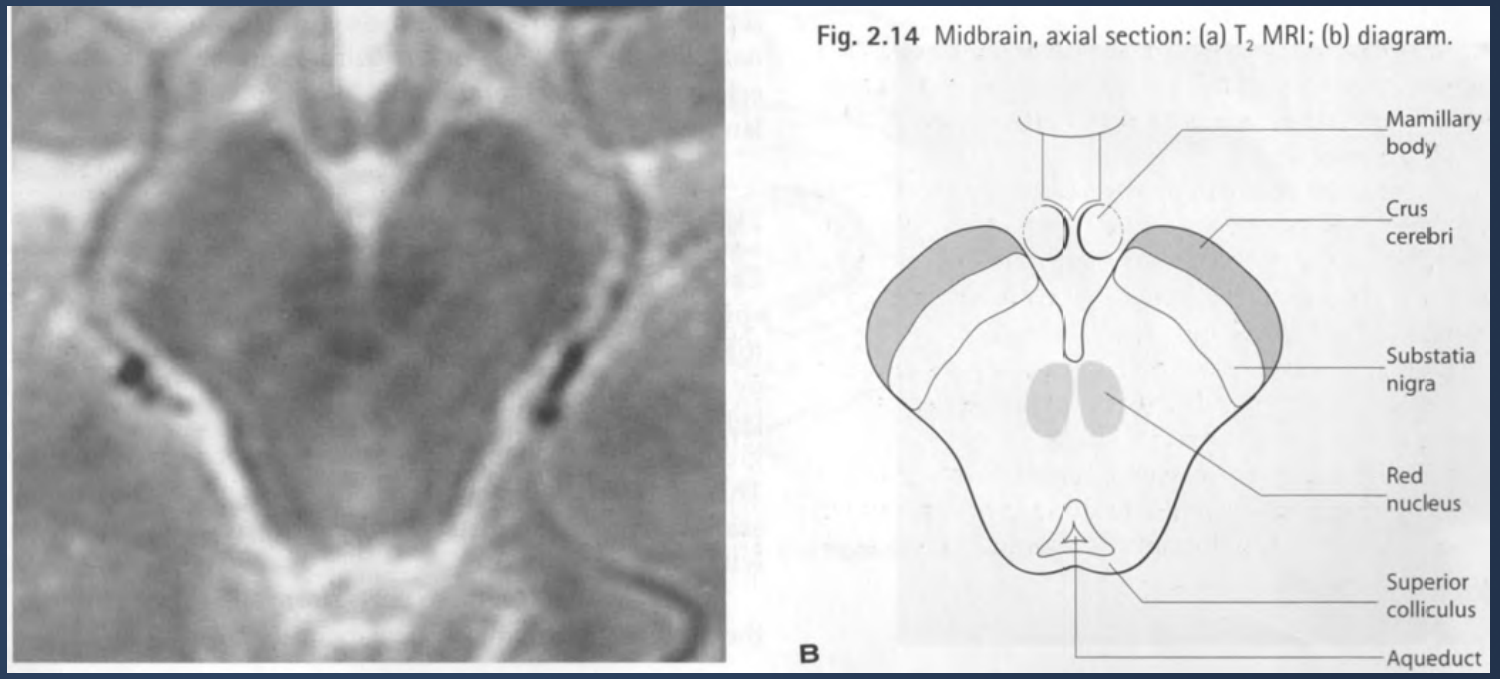
MRI axial T2WI





1 superior colliculus
2 inferior colliculus
3 cerebral peduncle
4 interpeduncular cistern

Midbrain..



Internal features:
substantia nigra separates crus cerebri ventrally from tegmentum posteriorly. Red nuclei are dorsal to substantia nigra at the level of superior colliculi

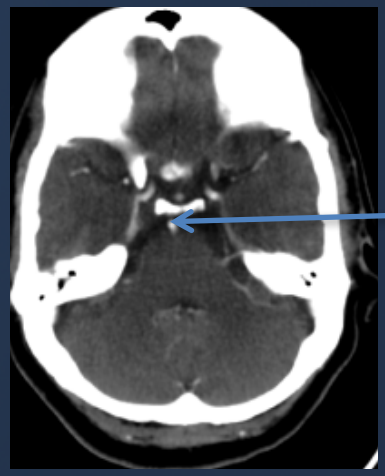
Pons..

Radiological Features:

- The bulbous anterior part consists mainly of fibres continuous on each side with middle cerebellar peduncle
- Basilar artery lies in groove anteriorly
- Posterior surface of the pons forms the upper part of the floor of the 4th ventricle.
- Bony anterior relation:
  clivus centrally and petrous temporal bones laterally

CT+

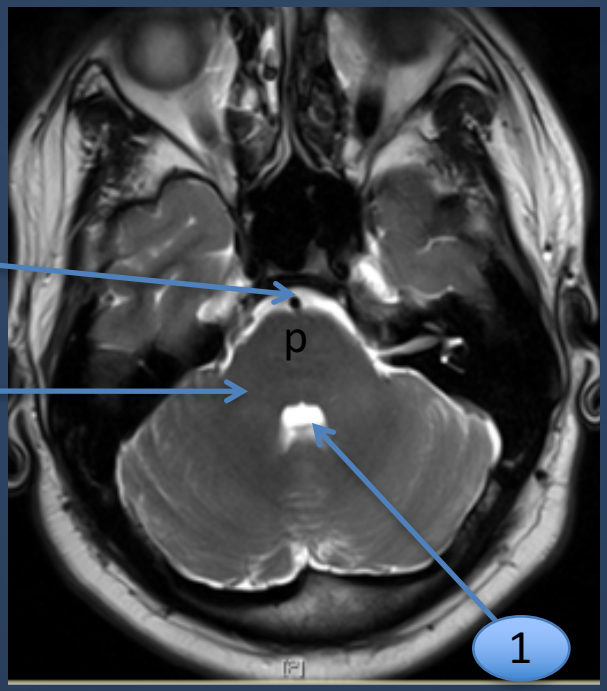
Petrous bone



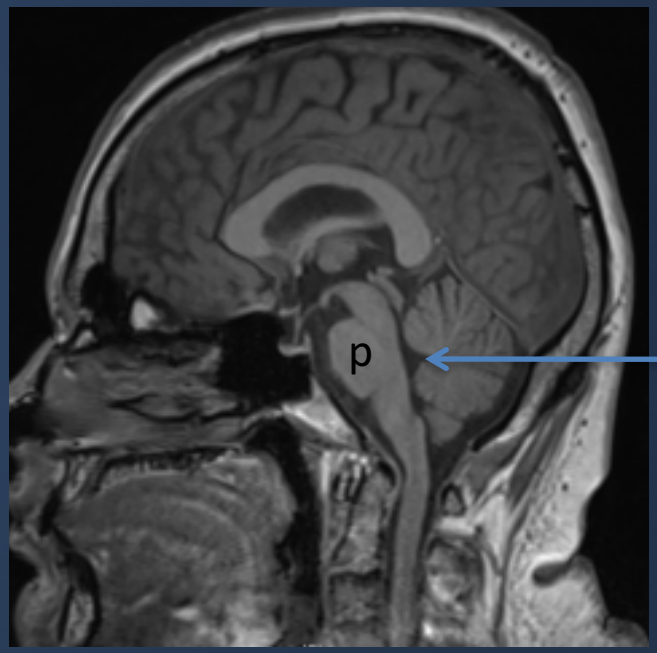
Basilar artery

Pons..

MRI axial T2WI



MRI Sagittal T1WI



P pons

1 4th ventricle

2 basilar artery

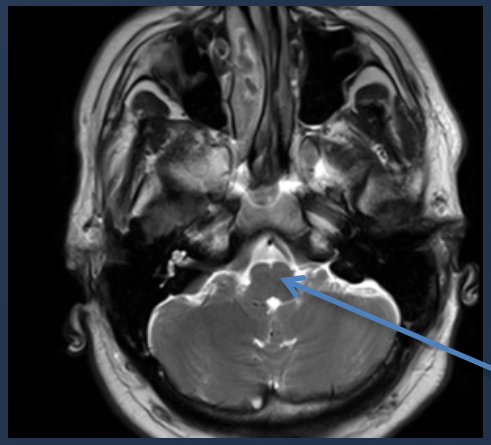
3 middle cerebellar peduncle

Medulla oblongata..

Radiological Features:

- MRI imaging of the medulla gives superior images to CT due to lack of bony artifact
- The ventral median fissure is seen anteriorly with the pyramid laterally
- The 4th ventricle is seen posteriorly

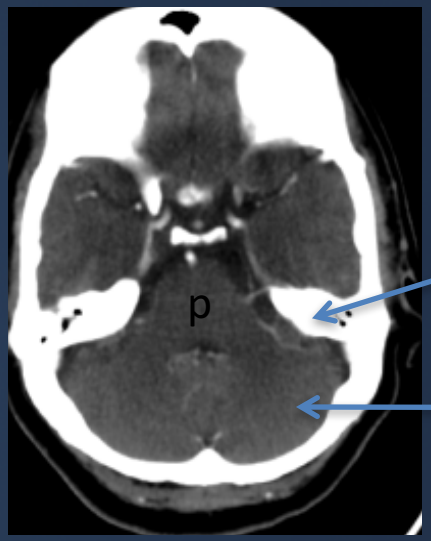
CT+



Cerebellum..

Radiological Features:

- On axial Ct & MRI the cerebellum is separated from the pons by the 4th ventricle and connected to the pons on each side by middle cerebellar peduncle, it is bounded anteriorly by petrous temporal bone

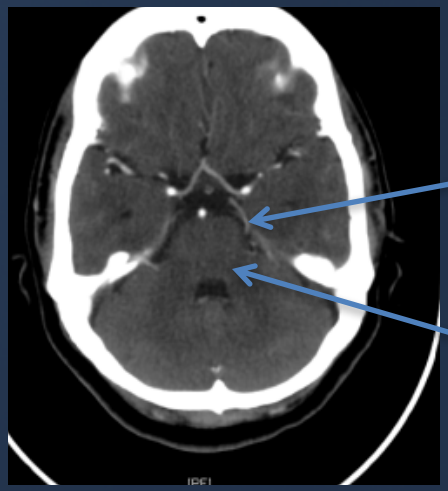


CT+

Petrous bone

cerebellum

- On higher slices it is separated from temporal and occipital lobes anterolaterally by tentorial margins, tentorium can be seen on contrast enhanced studies owing to the contained superior petrosal sinus



tentorium

Middle cerebellar peduncle

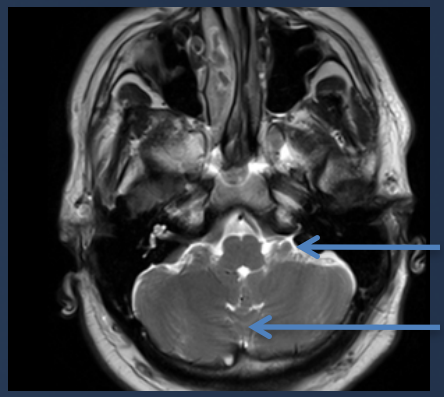
Cerebellum..

Radiological Features:

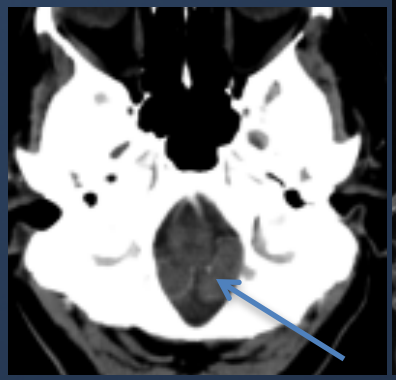
- Cerebellum is connected to the brainstem by three pairs of cerebellum peduncles:
  Superior.....connected to the midbrain
  Middle.....connected to the pons
  inferior.....connected to medulla oblongata

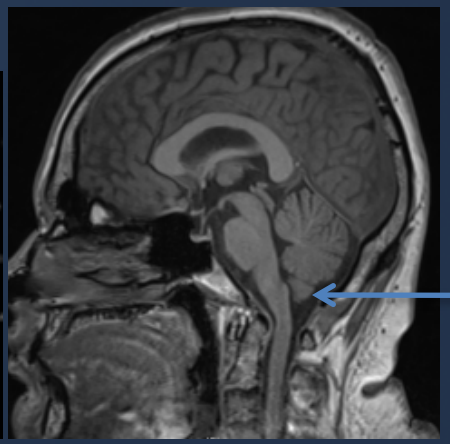
- Two cerebellar hemisphere with midline vermis
- Flocculus is a small ventral portion of the hemisphere
- Tosils are the most anterior inferior part of the hemispheres that lie close to the midline

MRI axial T2WI



axial CT



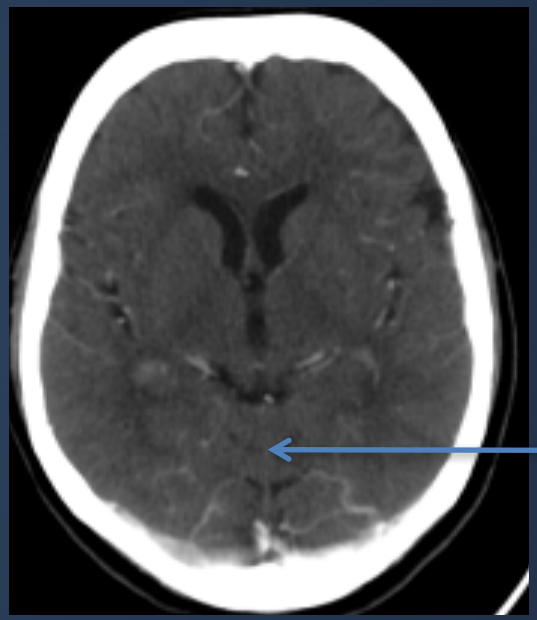


MRI sagittal T1WI

Cerebellum..

Radiological Features:

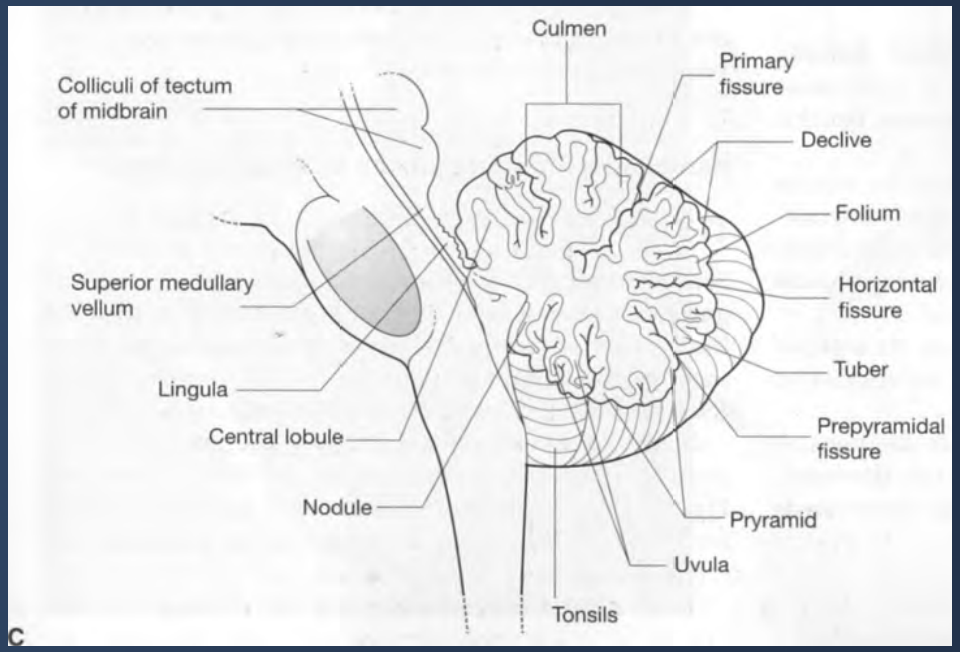
- The superior vermis can be seen between occipital lobes on section through the thalamus.



Cerebellum..

Fig. 2.16 Midline sagittal T_2 MRI to show vermis of cerebellum.

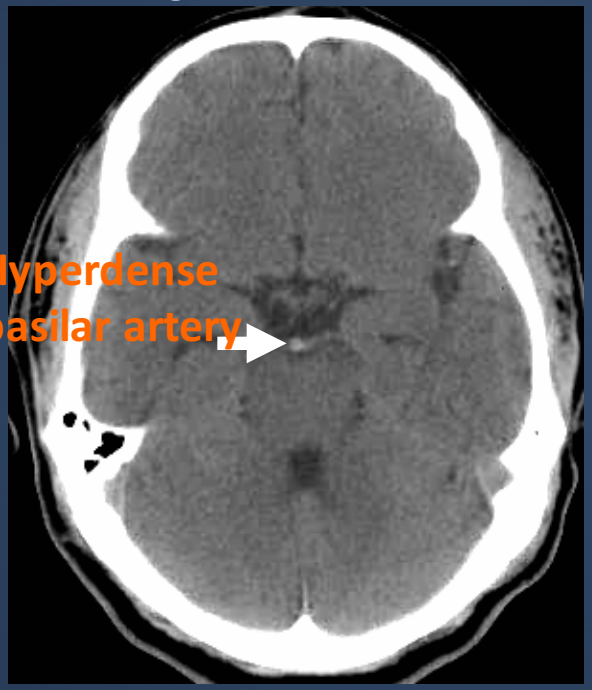
1. Lingula on superior medullary velum
2. Primary fissure
3. Horizontal fissure
4. Prepyramidal fissure
5. Foramen of Magendi



Cerebellar Vermis

Common diseases of brainstem & cerebellum..

CT

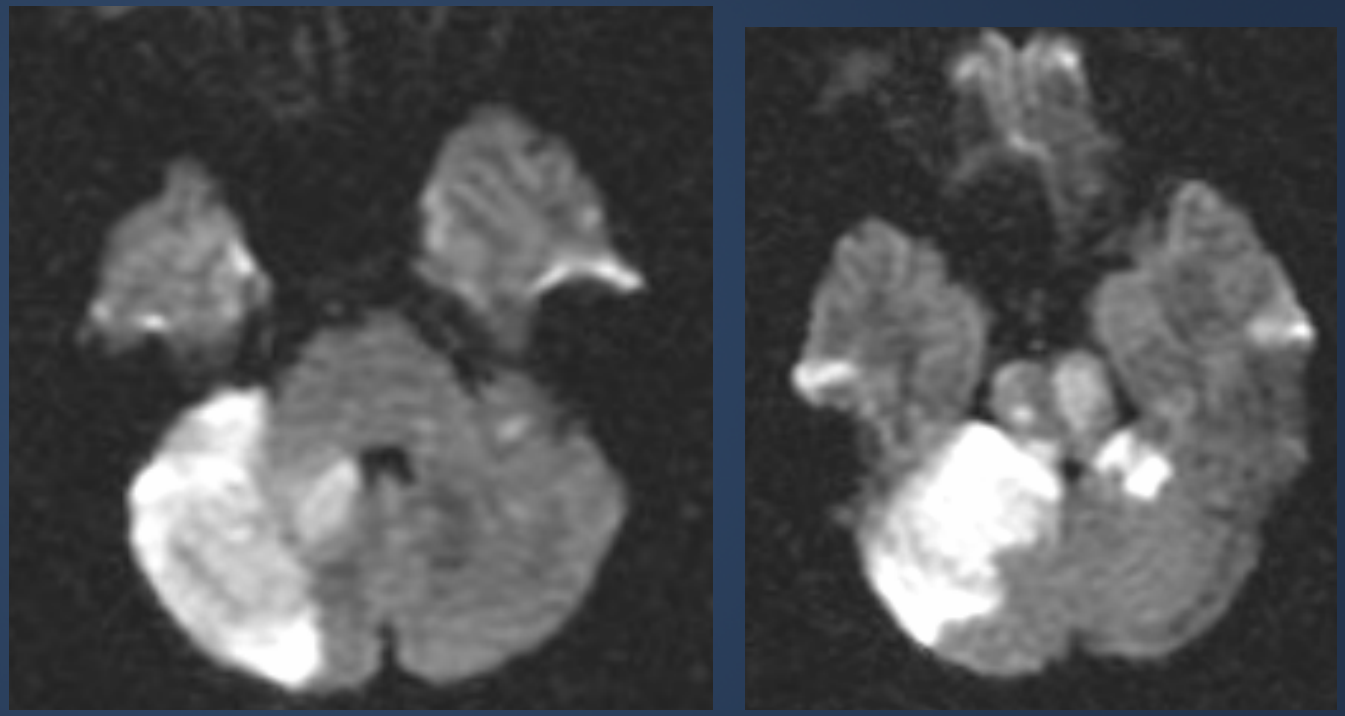


MRI axial FLAIR

MRI axial T2WI

Acute infarction due to basilar artery thrombosis

Common diseases of brainstem & cerebellum..

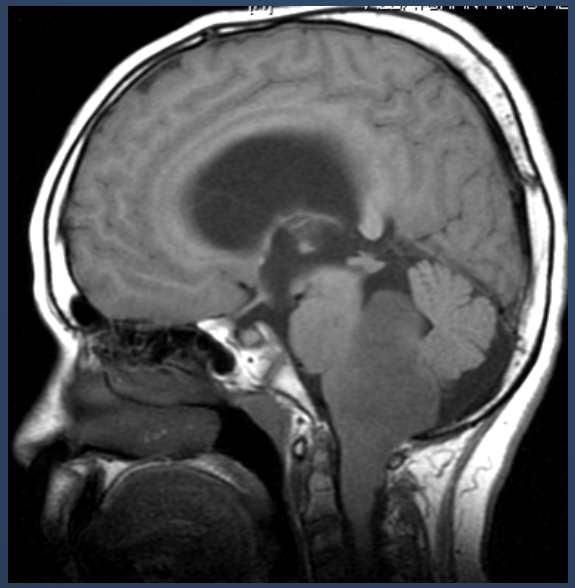


Diffusion sequence

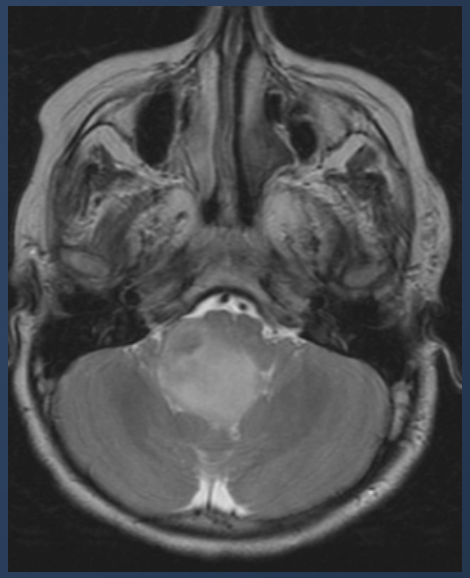
Acute infarction due to basilar artery thrombosis

Common diseases of brainstem & cerebellum..

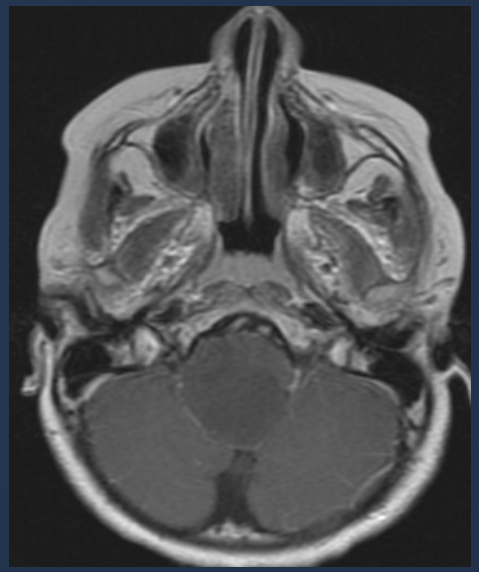
Sag MRI T1WI



axial MRI T2WI



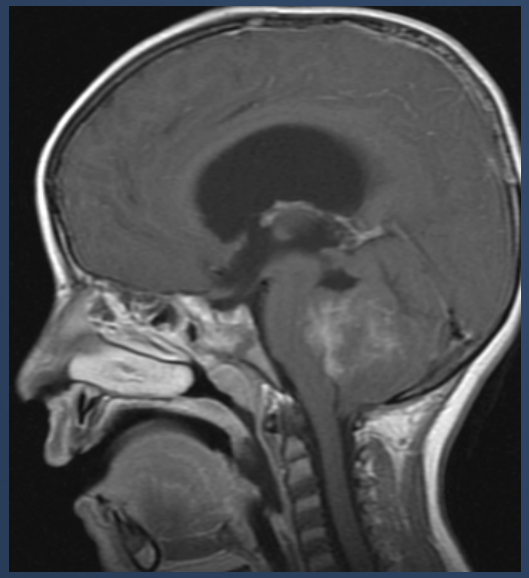
axial MRI T1WI contrast



Brain stem glioma

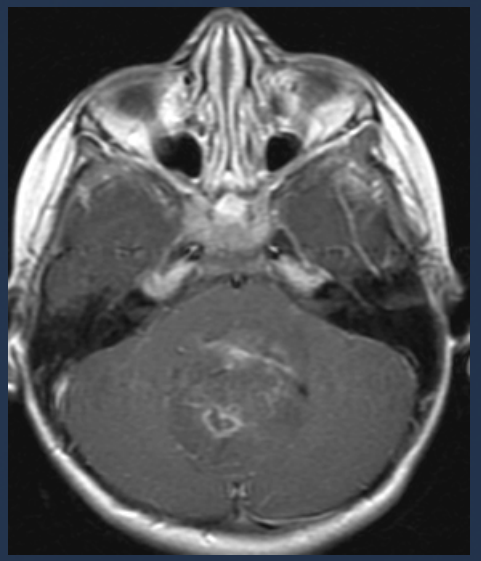
Common diseases of brainstem & cerebellum..

Sag MRI T1WI contrast



axial MRI T2WI

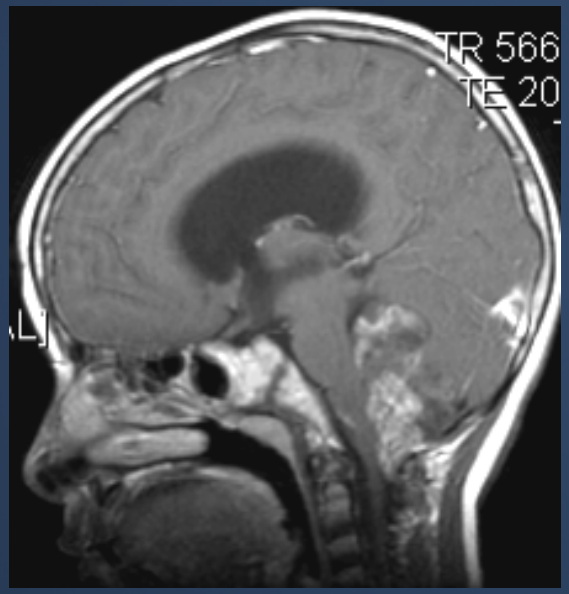
axial MRI T1WI contrast



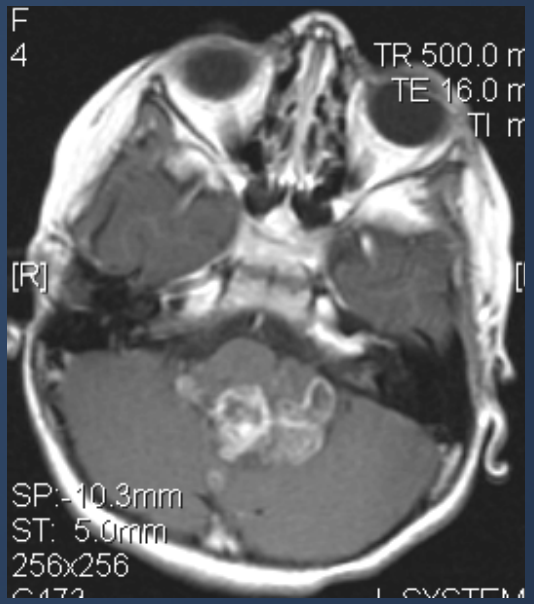
Medulloblastoma

Common diseases of brainstem & cerebellum..

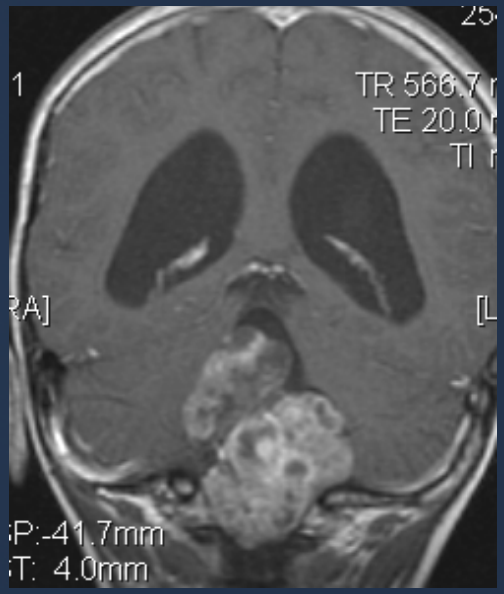
Sag MRI T1WI contrast



axial MRI T1WI contrast



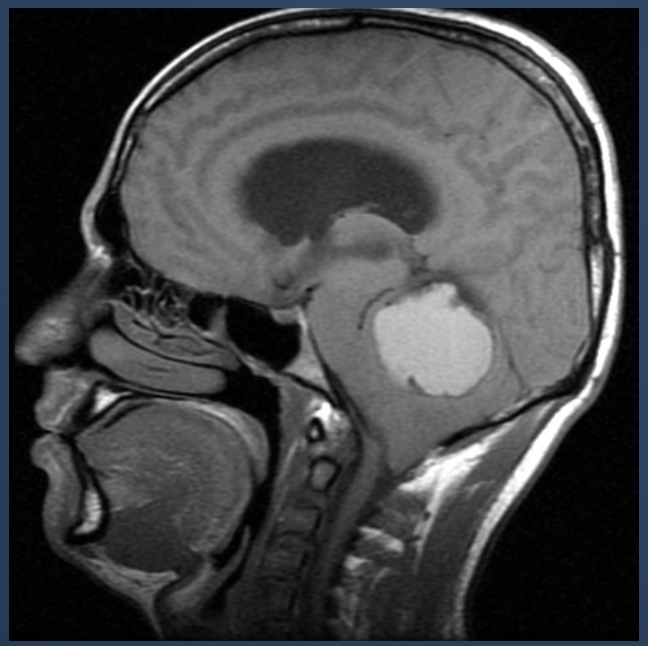
Coronal MRI T1WI contrast



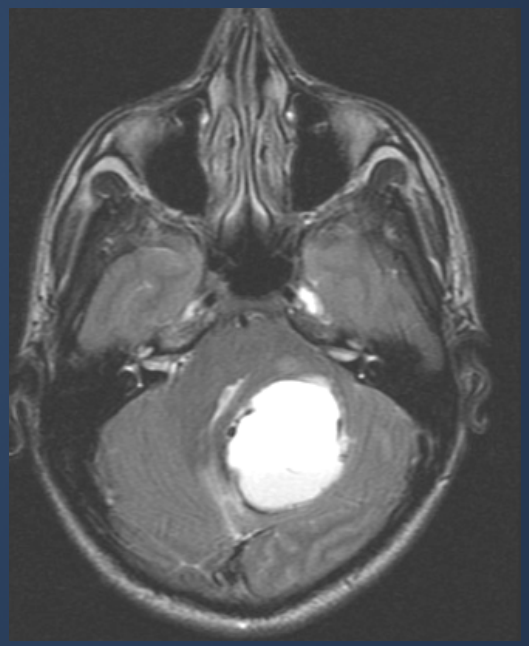
Ependymoma

Common diseases of brainstem & cerebellum..

Sag MRI T1WI



axial MRI T2WI

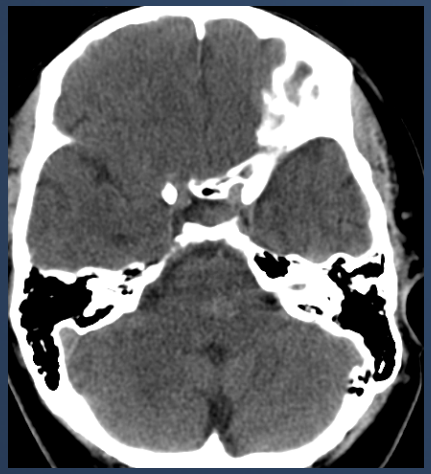


Coronal MRI T1WI contrast

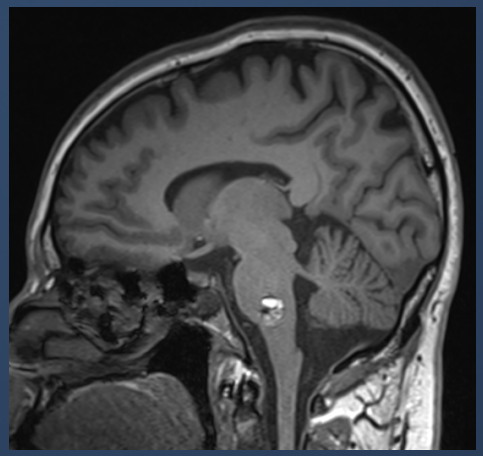
Hemangioblastoma

Common diseases of brainstem & cerebellum..

CT

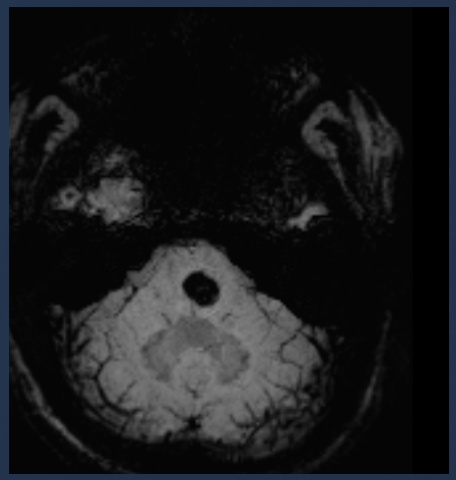


Sag MRI T1WI



axial MRI T2WI

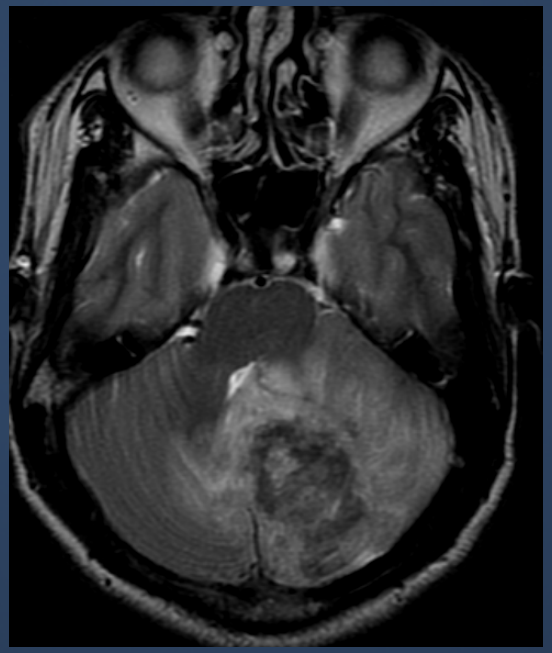
axial MRI SWI



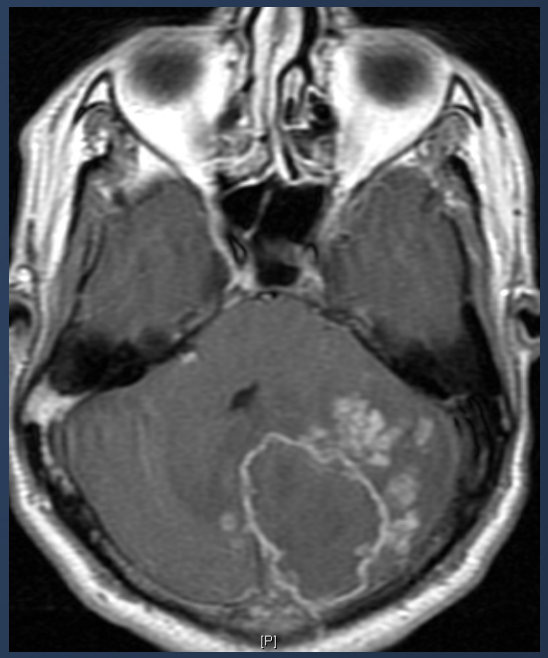
Cavernous angioma

Common diseases of brainstem & cerebellum..

axial MRI T2WI



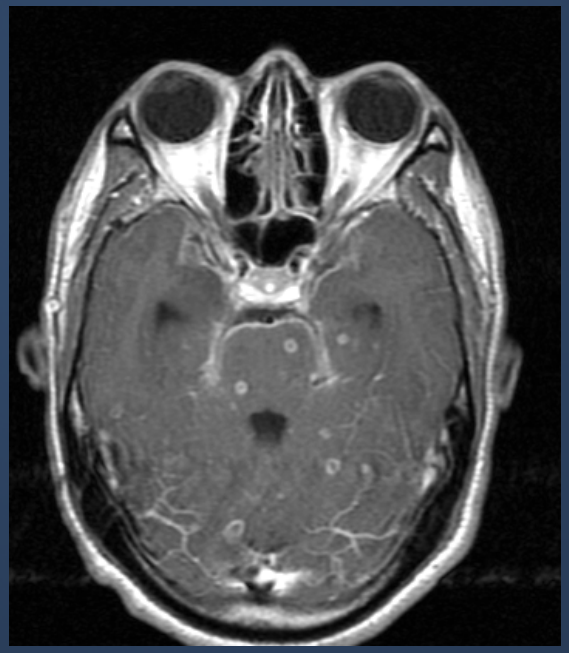
axial MRI T1 contrast

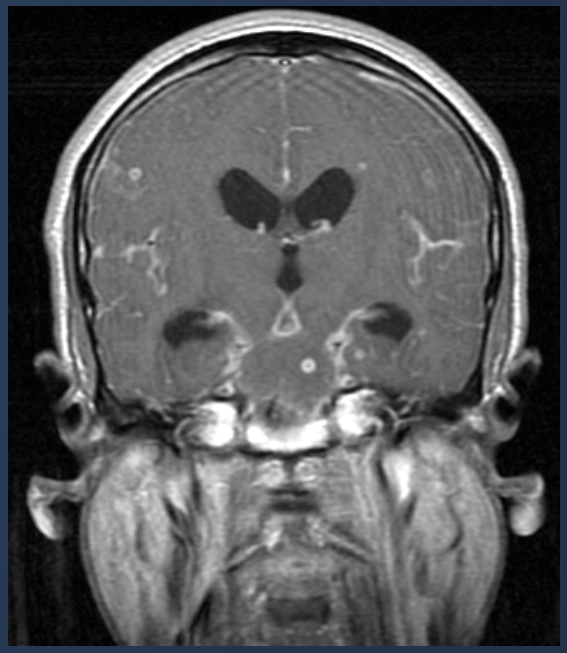


Cerebellar tuberculosis

Common diseases of brainstem & cerebellum..

axial MRI T1 contrast

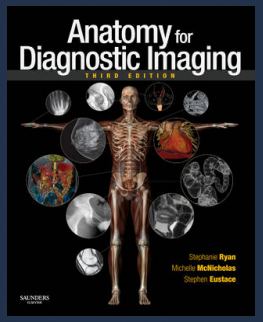




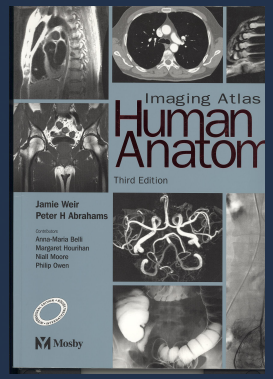
TB meningitis with multiple tuberculomas

Reference book and the relevant page numbers..

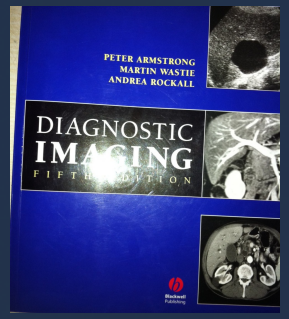
- Stephanie Ryan, "**Anatomy for Diagnostic imaging**", 2nd Edition, Pages 61-66



- Jamie Weir, Peter Abraham, "**Imaging Atlas of Human Anatomy**" 3rd Edition, Pages 34-41



- Peter Armstrong, "**diagnostic imaging** ", 5th Edition, Pages (396-404)



Thank You ☺

(CNS Block, Radiology)