MED439
KING SAUD UNIVERSITY

Revised & Approved

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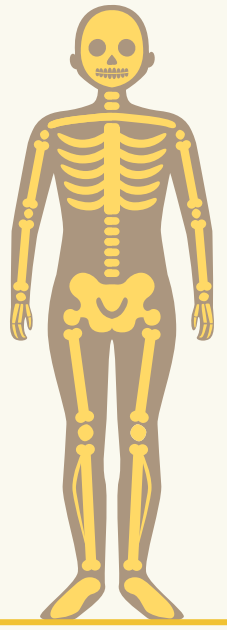
RADIOLOGY TEAM 439

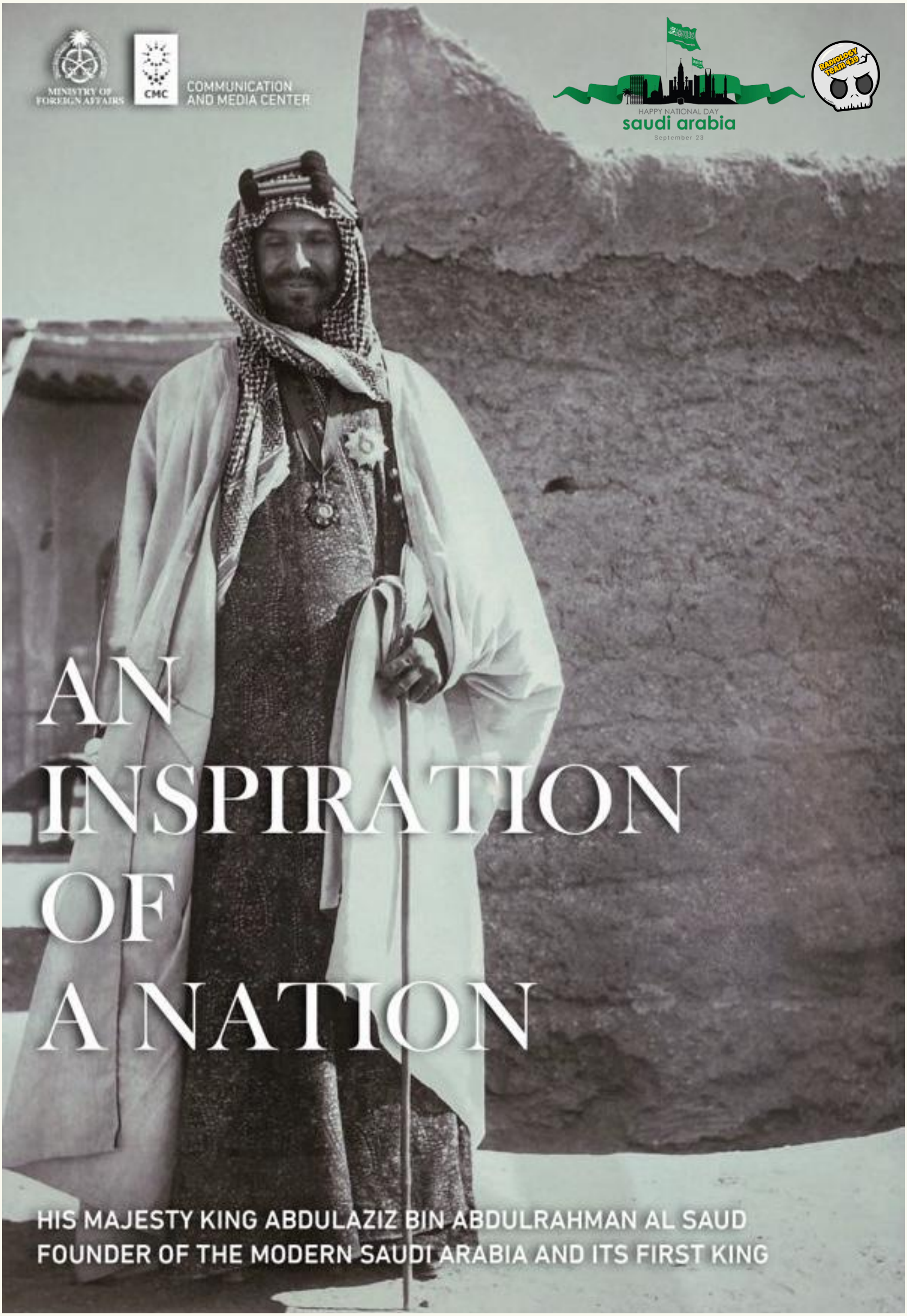
Brain Stem & Cerebellum

-CNS BLOCK-



Color index:

Black: Main text
Red: Important ★
Yellow: Drs notes
Gray: Extra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RADIOLOGY TEAM 439
AN INSPIRATION OF A NATION
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FOUNDER OF THE MODERN SAUDI ARABIA AND ITS FIRST KING

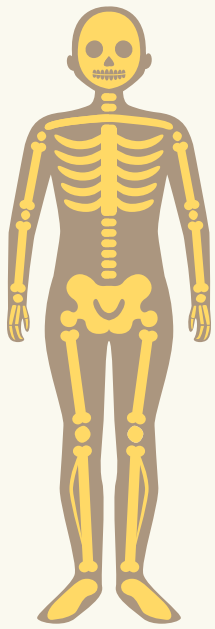
Objectives

By the end of this lecture you should know:

1. Identify radiological anatomy of brainstem and cerebellum.

2. Compares CT and MRI imaging of brain stem and cerebellum.

3. Recognize the imaging findings in common diseases involving brain stem and cerebellum.



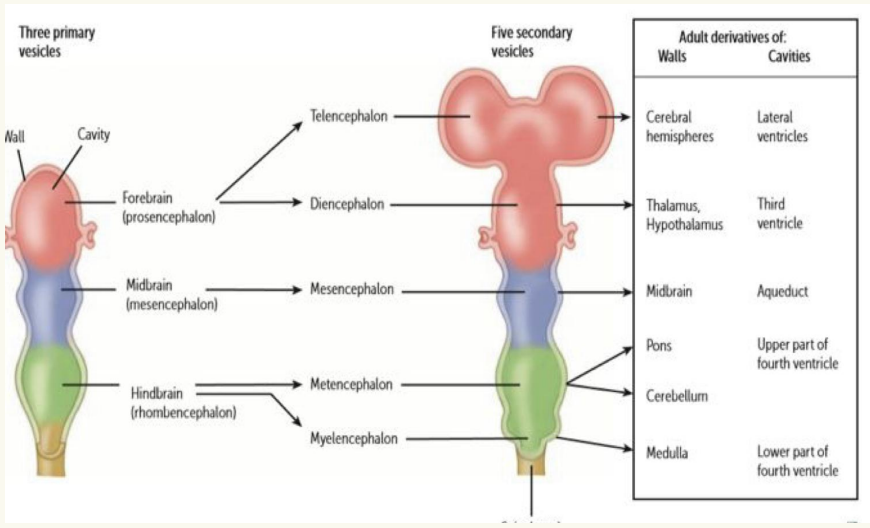
Introduction

Brain Divisions

I Prosencephalon Forebrain
- Diencephalon thalamus,hypothalamus
- Telencephalon cerebrum

II Mesencephalon-Midbrain

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



Brain stem

Midbrain | **Pons** | **Medulla oblongata**

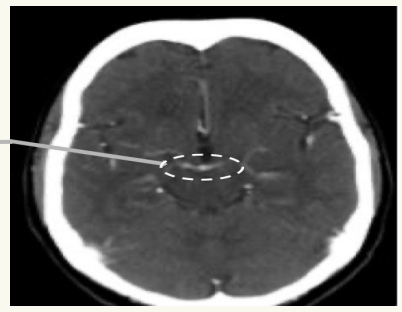
Connects cerebral hemisphere with spinal cord

- **Midbrain**

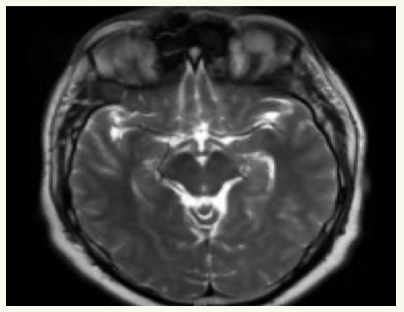
Radiological Features:

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

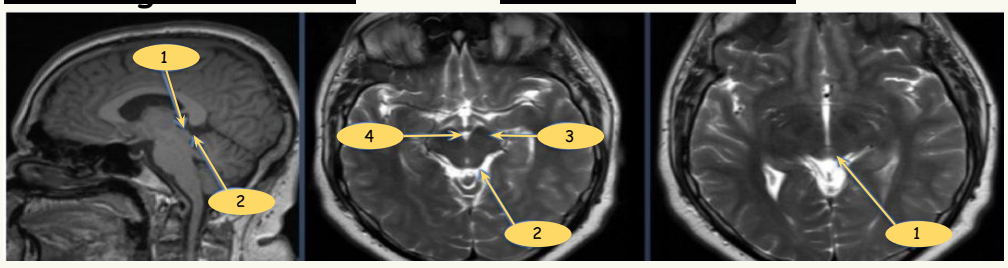
CT+



MRI T2WI

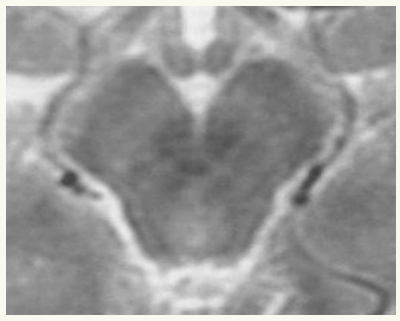


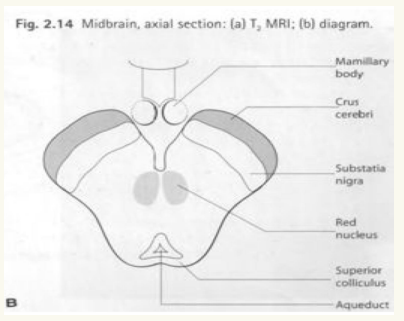
MRI Sagittal T1WI MRI Axial T2WI



1) Superior colliculus 2) Inferior colliculus
3) Cerebral peduncle 4) Interpeduncular cistern

1.T2 weighted image (More) , CSF is white





Internal features:

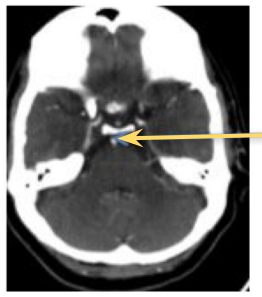
substantia nigra separates crus cerebri ventrally from tegmentum posteriorly.

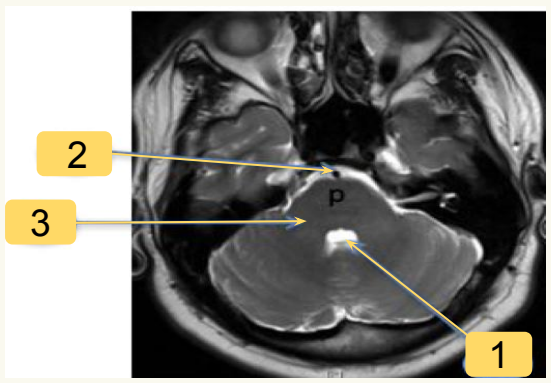
Red nuclei are dorsal to substantia nigra at the level of superior colliculi

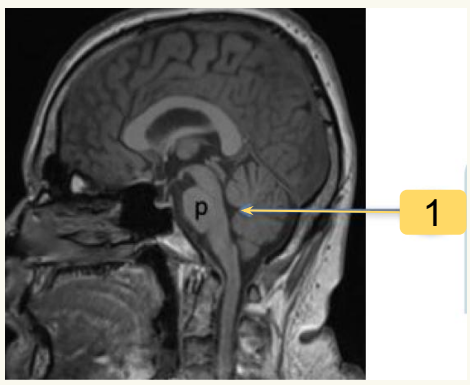
• Pons

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







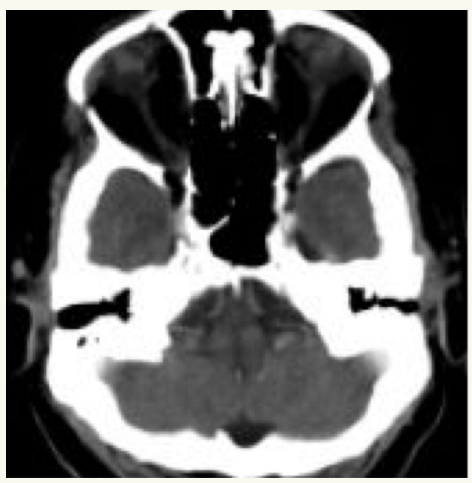
1. 4th ventricle
2. basilar artery
3. middle cerebellar peduncle

• Medulla oblongata

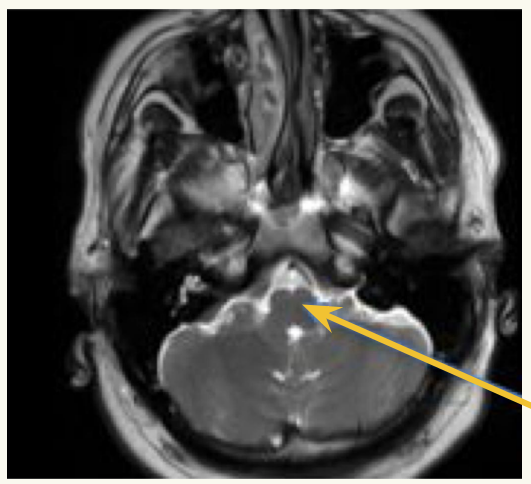
Radiological Features:

- ➢ 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+



No Basilar artery = Medulla oblongata



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

- 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

- Cerebellum is connected to the brainstem by three pairs of cerebellum peduncles:

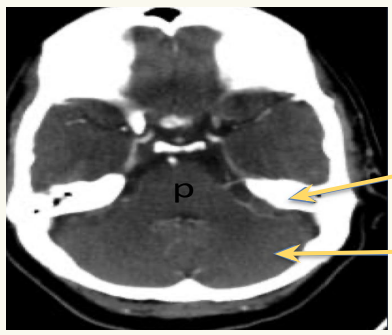
❖ Superior: connected to the midbrain
❖ Middle: connected to the pons
❖ inferior: connected to medulla oblongata

- Two cerebellar hemisphere with midline vermis

- Flocculus is a small ventral portion of the hemisphere

- Tonsils are the most anterior inferior part of the hemispheres that lie close to the midline

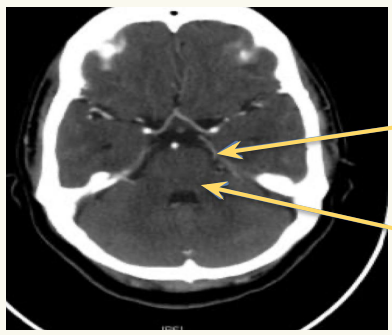
- The superior vermis can be seen between occipital lobes on section through the thalamus.



CT+

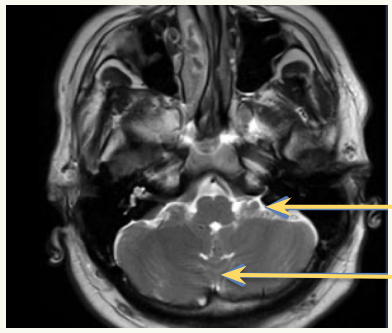
Petrous bone

Cerebellum



Tentorium

Middle cerebellar peduncle



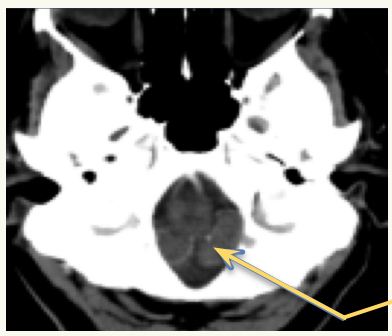
MRI axial T2WI

Flocculus

Vermis

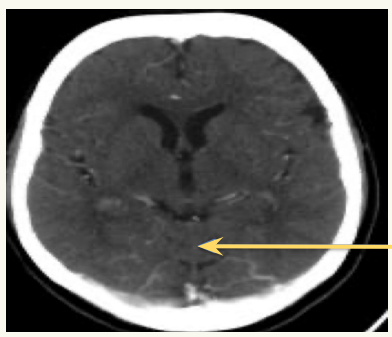
MRI sagittal T1WI

Tonsil



axial CT

Tonsil



CT+

Superior vermis

Cerebellum..

Cerebellar Vermis

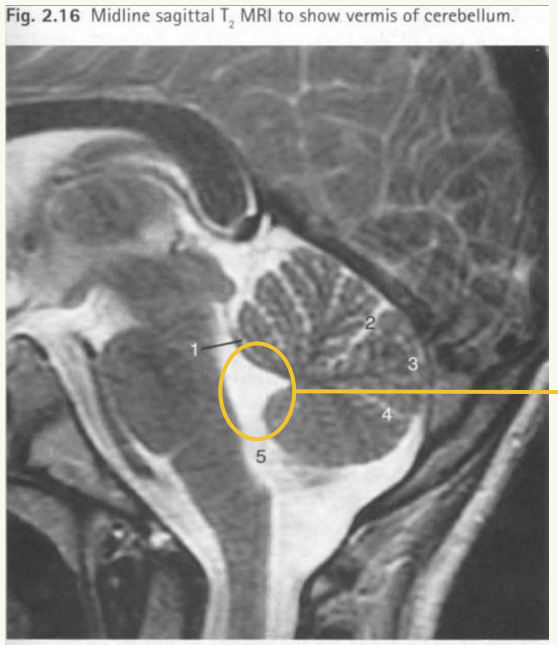
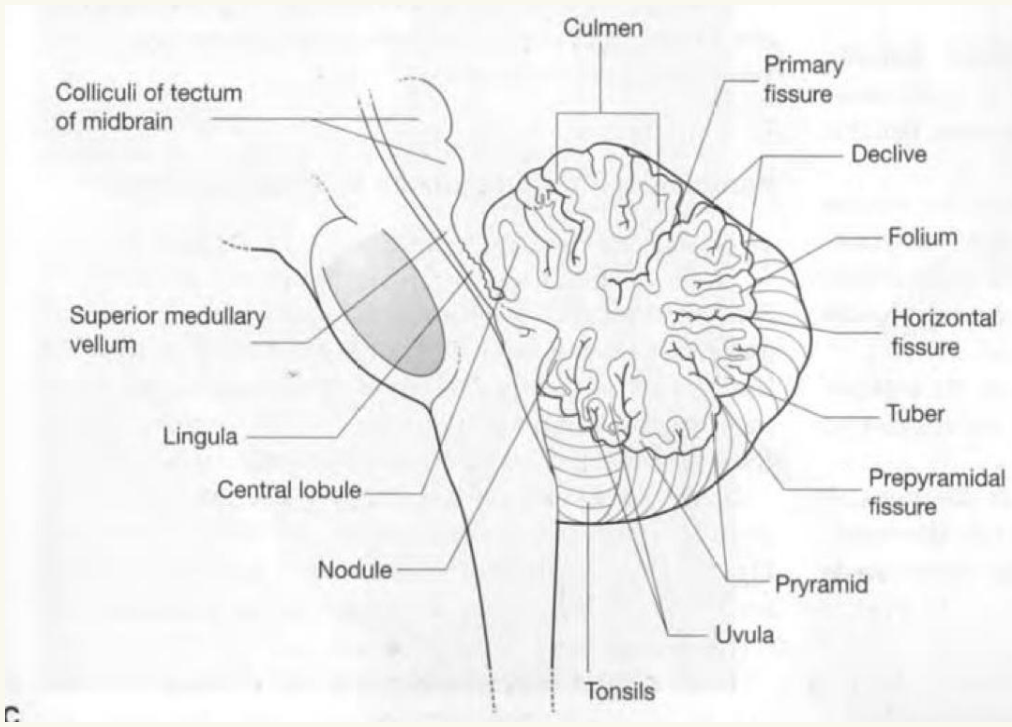


Fig. 2.16 Midline sagittal T_2 MRI to show vermis of cerebellum.

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

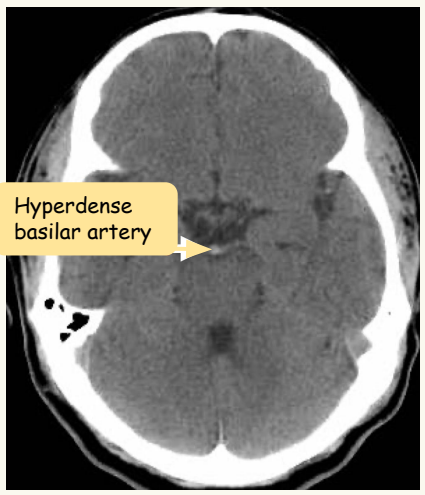
4th ventricle



Common diseases of brainstem & cerebellum

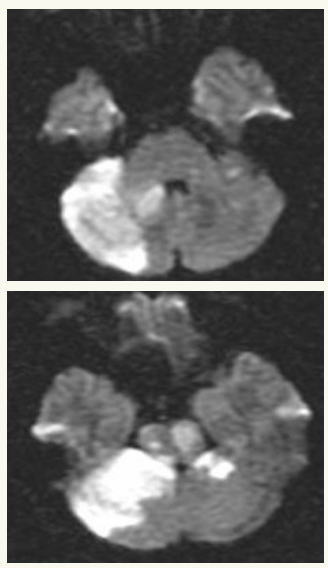
Acute infarction due to basilar artery thrombosis

CT



MRI axial FLAIR

MRI axial T2WI

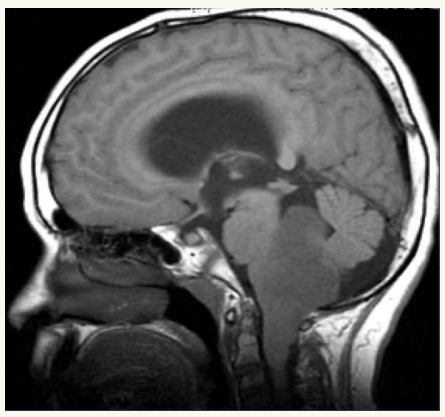


Diffusion sequence

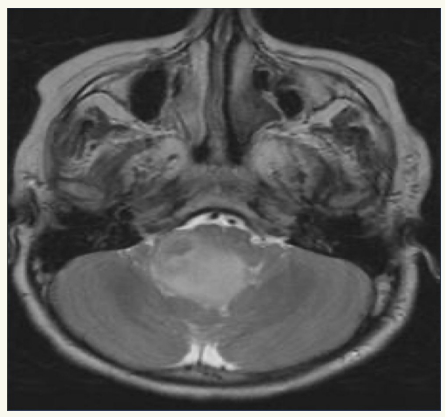
Common diseases of brainstem & cerebellum..

Brain stem glioma

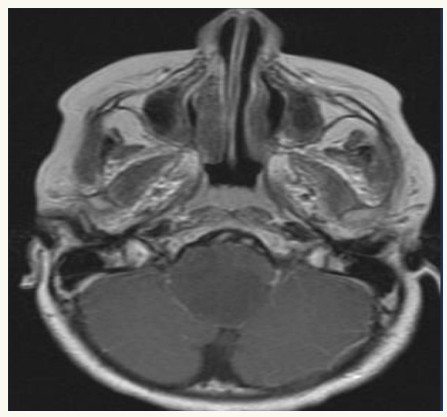
Sag MRI T1WI



axial MRI T2WI

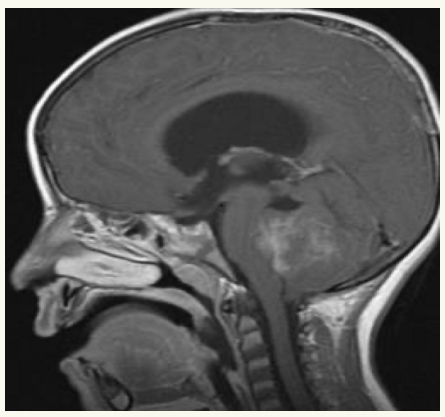


axial MRI T1WI contrast

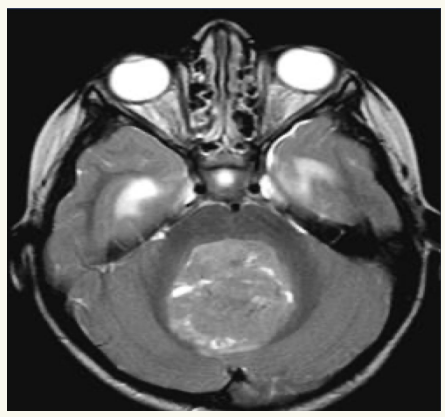


Medulloblastoma

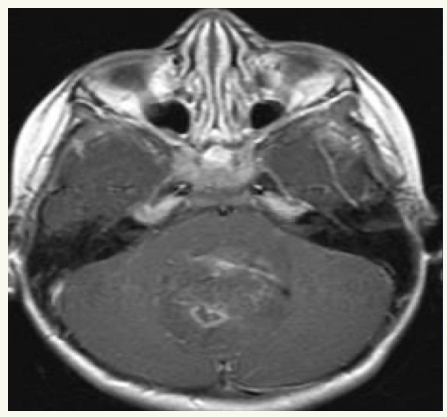
Sag MRI T1WI contrast



axial MRI T2WI

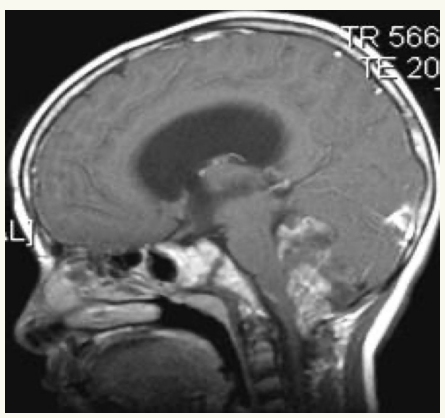


axial MRI T1WI contrast

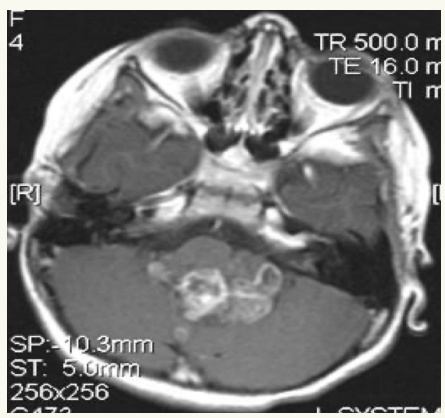


Ependymoma

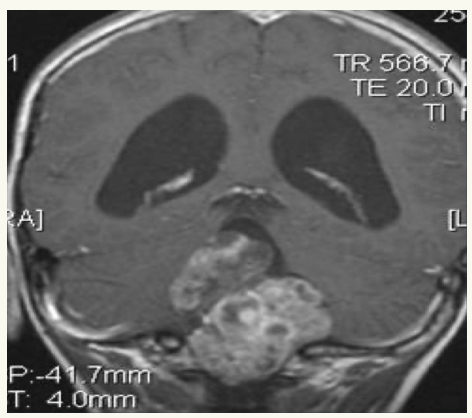
Sag MRI T1WI contrast



axial MRI T1WI contrast



Coronal MRI T1WI contrast

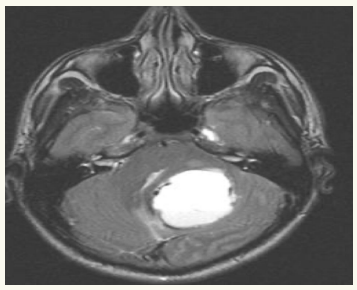


Common diseases of brainstem & cerebellum..

Hemangioblastoma

Sag MRI T1WI

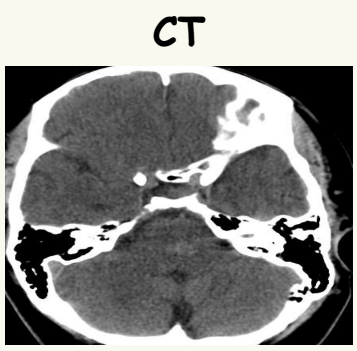
axial MRI T2WI



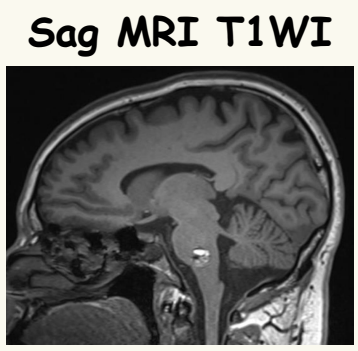
Coronal MRI T1WI contrast

Cavernous angioma

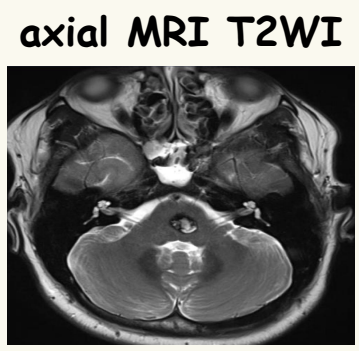
CT



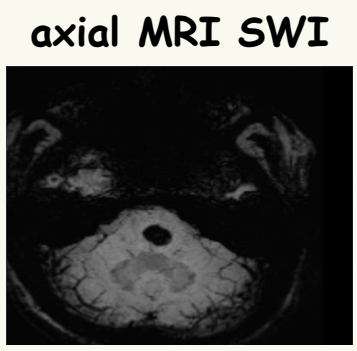
Sag MRI T1WI



axial MRI T2WI



axial MRI SWI

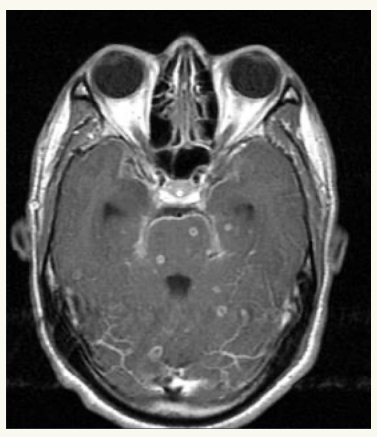


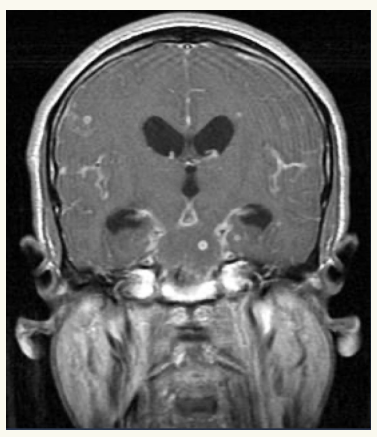
Cerebellar tuberculosis

axial MRI T2WI

axial MRI T1 contrast

TB meningitis with multiple tuberculomas





axial MRI T1 contrast

Helpful Drs notes

- How to differentiate between T1 and T2 (MRI)? "هذا اذا ممكن نسألكم الامتحان في T1 or T2"
  - ❖ In T1 CSF is dark
  - ❖ In T2 CSF is bright (Except Flair in which CSF is Dark)
  - ❖ Flair causes White matter to appear Gray and Gray matter to look white (Gray-white switch, CSF is dark)

- In CT the Bones are very bright (Unlike MRI where bones aren't clear)
- *Interpeduncular fossa* is important in imaging because in Subarachnoid hemorrhage (even if minimal) Blood will pool causing it to disappear in the scan

- Basilar stroke causes Locked-in syndrome (Complete paralysis except eyes)
- *Medulla oblongata* is not clearly seen in CT because the surrounding bones Block the Imaging Radiation
- Only the *Middle Cerebellar peduncle* is **normally** seen in radiology

- Stroke are two types:

  - ❖ Ischemic (most common)
  - ❖ Hemorrhagic
  - ❖ Clots are harder so they appear more bright on CT (Hyperdense Arteries indicate Ischemic stroke)
  - ❖ Hyperdense tissue in the brain parenchyma Indicates Hemorrhagic stroke (On CT)
  - ❖ On MRI Ischemic areas appear bright
  - ❖ Normal MRI has a 1-2hr delay before showing ischemia
  - ❖ Diffusion Sequence has only a 10min delay for ischemic injury

- Contrast is used to test Blood Brain Barrier (If contrast shows up on the scan then the BBB Is damaged
- Brain tumors are usually Bright on T2
- In *brainstem Glioma* Blockage of the central canal leads to hydrocephalous (enlargement of lateral ventricle on imaging)
- Contrast makes tumors appear bright on imaging
- *Cavernous angioma* shows "Popcorn" appearance on MRI
- MRI SWI (Susceptibility weighted imaging") shows blood products and calcium
- *Cerebellar Tuberculosis* is **Dark on T2** (considered an exception)

MCQs

1- Which of the part of the brain stem is at the level of circle of will?			
A) Pons	B) Midbrain	C) Medulla oblongata	D) Diencephalon
2- The red nuclei can be seen at the level of?			
A) Superior colliculi of Midbrain	B) Inferior colliculi of Midbrain	C) Rostral part of Medulla oblongata	D) Caudal part of Medulla oblongata
3- which of the following structures is Anterior to the pons?			
A) Floor of the 4th ventricle	B) Cerebellum	C) Medulla oblongata	D) Basilar artery
4- metencephalone give a rise to?			
A) pons	B) cerebellum	C) midbrain	D) A and B
5- what is the best radiological method to diagnose TB meningitis with multiple tuberculomas?			
A) axial MRI T1 contrast	B) axial MRI T2WI	C) CT	D) B & C

5. A
4. D
3. D
2. A
1. B

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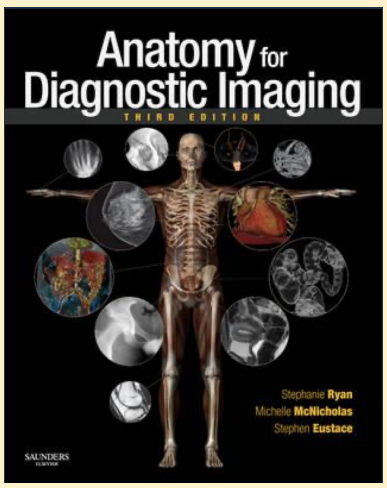

MED439
KING SAUD UNIVERSITY

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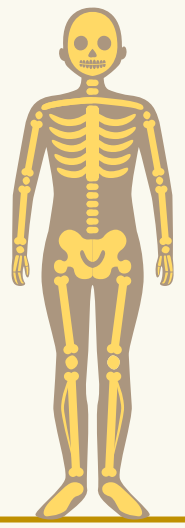

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