

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ





Day 2 - Program

BASICS of RADIOLOGY

For Medical Students & house officers

1 st Day – 18 May 2022					
Introduction To Imaging Modalities	10	11	Session 1	Dr. Ahmad Mokhtar	
Basics of GIT Imaging	11	12		Dr. AbdelRahman Foda	
Break	12	12.15			
Basics of Chest Imaging	12.15	1	Session 2	Dr. Ahmad Mokhtar	
Basics of UT Imaging	1	1.30		Dr. Ebtessam AbdelBarey	
Open Discussion	1.30	2.00		Dr. Ahmad Mokhtar	

2 nd Day – 19 May 2022					
Basics of Brain Imaging	10	11	Session 1	Dr. Ahmad Mokhtar	
Basics of MSK Imaging	11	12		Dr. Mohammed Ezzeddin	
Break	12	12.15			
Imaging of Poly traumatized Patient	12.15	1	Session 2	Dr. Ahmad Mokhtar	
Quiz Cases	1	1.30		Dr. Ahmad Mokhtar	
Open Discussion	1.30	2		Dr. A. Mokhtar - Dr. M. Ezzeddin	

Scientific coordinator

Dr. Ahmad Mokhtar Abodahab.

Head of Department

Prof. Mohammed Zaki

BASICS OF CT BRAIN

A patient is lying on a CT scanner bed, partially covered by a blue blanket. The patient's head is positioned inside the circular gantry of the scanner. The background is dark, and the lighting is focused on the patient and the scanner's opening.

By

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Lecturer of Rdiology – Sohag University



AHMAD MOKHTAR ABODAHAB – MD

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Radiology Department Faculty of Medicine – Sohag University

Certified Trainer – Supreme Council of Egyptian Universities

Consultant of Radiology - Sohag Police Clinics & Military Hospital

Lecturer at Virtual Medical Academy – KSA

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Consultant of Radiology - Sohag Police Clinics & Military Hospital



Brain Imaging Modalities

✓ CT

✓ MRI

✓ US : (Trans cranial - < 1.5 y)

CT

Computed Tomography



The image is a composite. The top half shows a patient lying in a CT scanner. The bottom left shows a portrait of Sir Godfrey Hounsfield, an older man with a mustache, wearing a suit and tie, standing next to a CT scanner. A small inset image shows a CT scan of a human torso. The text 'CT' is overlaid on the left side of the image.

CT

Invented By

• Dr. G. N.

Hounsfield in /

1971

Sir Godfrey Hounsfield
1919 - 2004

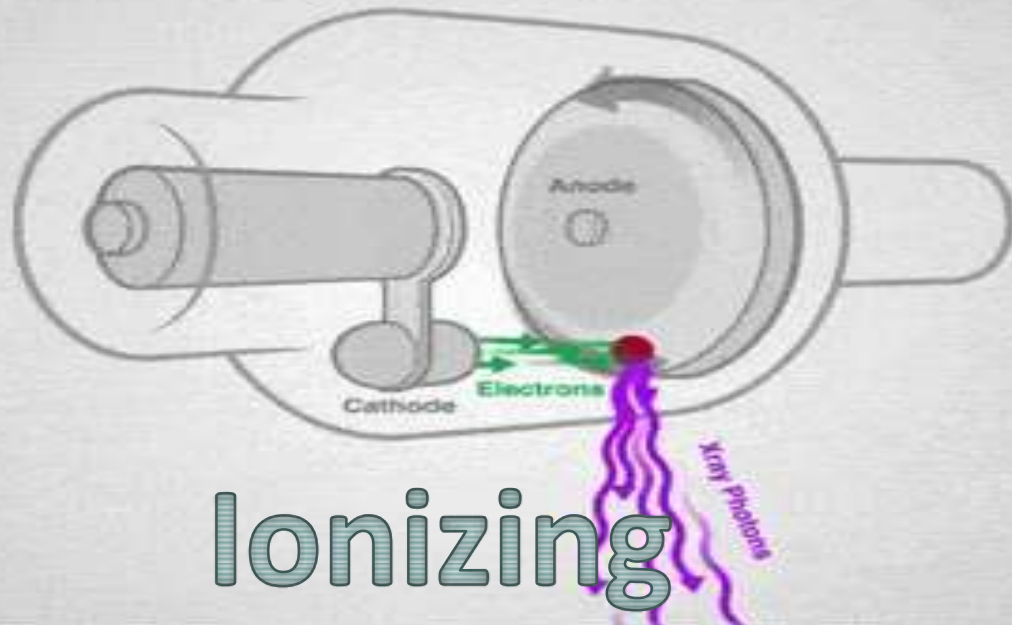
Won
Noble Prize

1979



CT Energy

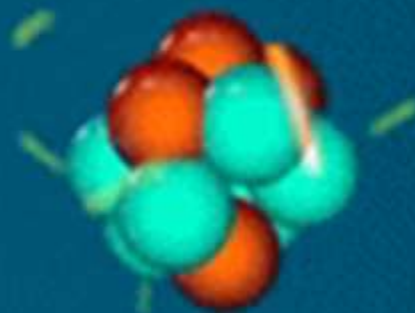
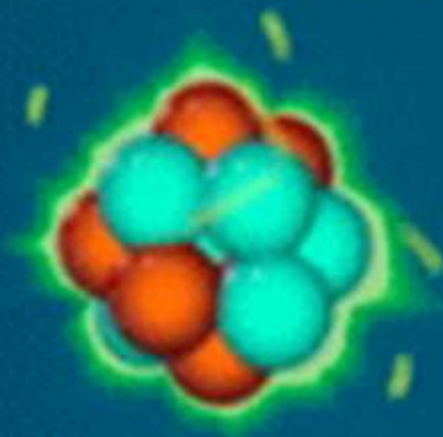
X ray



Ionizing
Radiation



Ionizing Radiation



A stylized illustration of a DNA double helix. The two strands are colored red and blue. The base pairs are represented by horizontal lines connecting the strands. One base pair is highlighted in green, indicating a mutation. The background is a soft, out-of-focus gradient of orange and red. The text "DNA MUTATION" is written in white capital letters at the bottom center.

DNA MUTATION

What is the 1st contraindication
of X-ray or CT?

PREGNANCY
...especially when Early

A.M.A.B.O.D.A.H.A.B





! CAUTION

X-RAY IN USE

**If you are pregnant or
unsure, notify staff
immediately.**



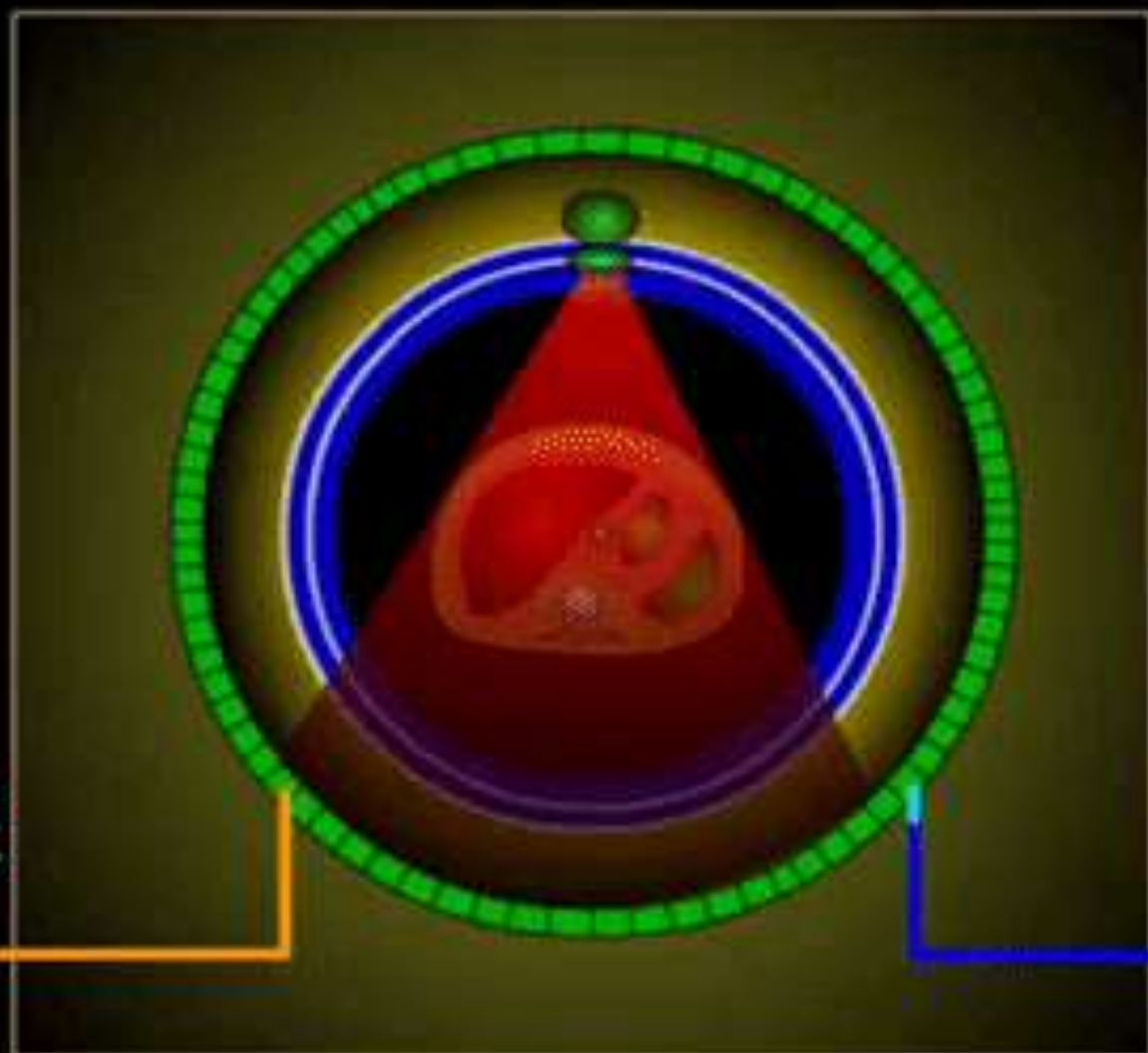








**POWER
SUPPLY**



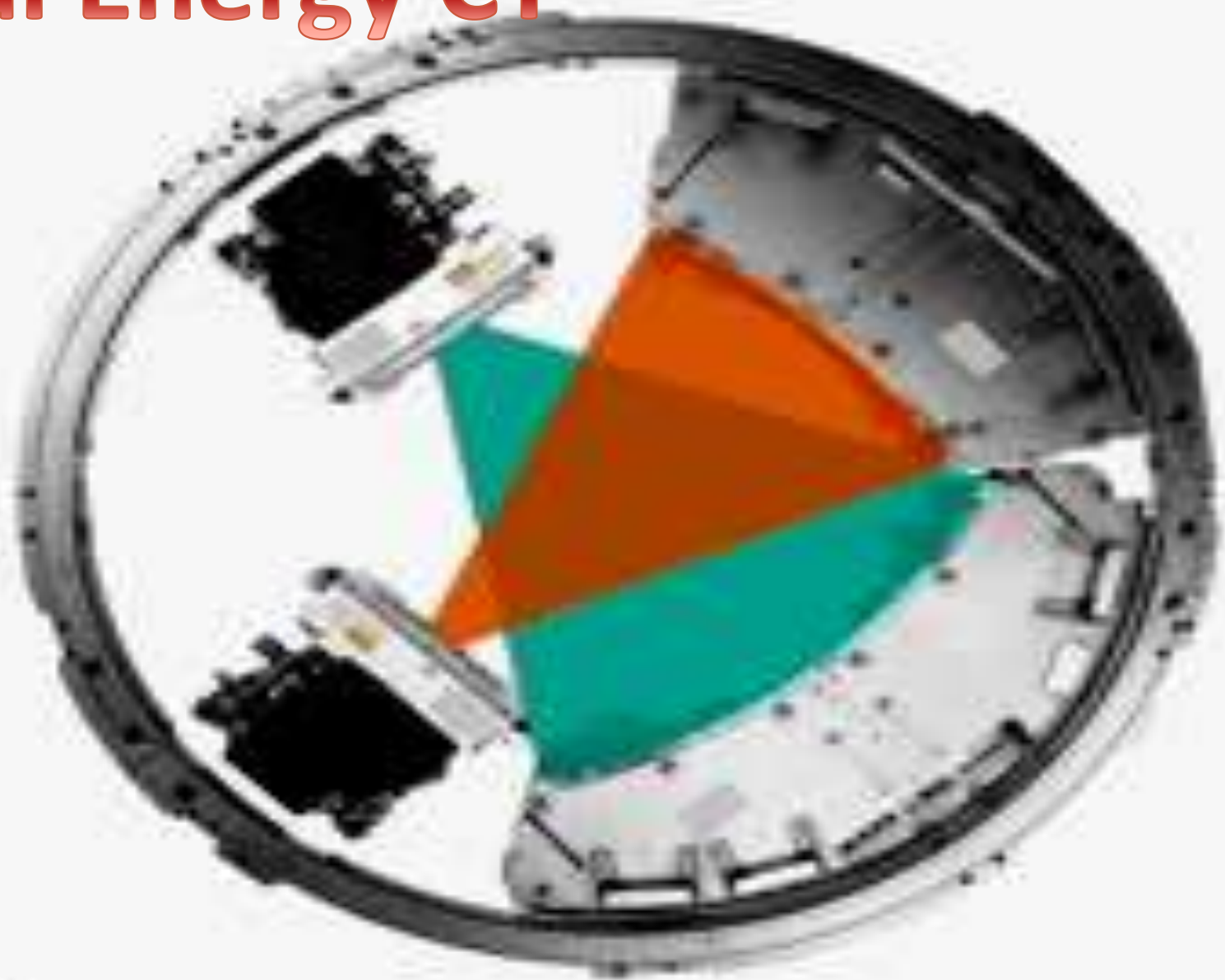
**OUTPUT
SIGNAL**

4th Generation

M. Mongkolsuk

11/04/2004

Dual Energy CT





PresenterMedia

Key Word

Density

• Iso

Hyper dense

Hyper

Dense

Hypo

Hypo dense

HOUNSFIELD UNIT

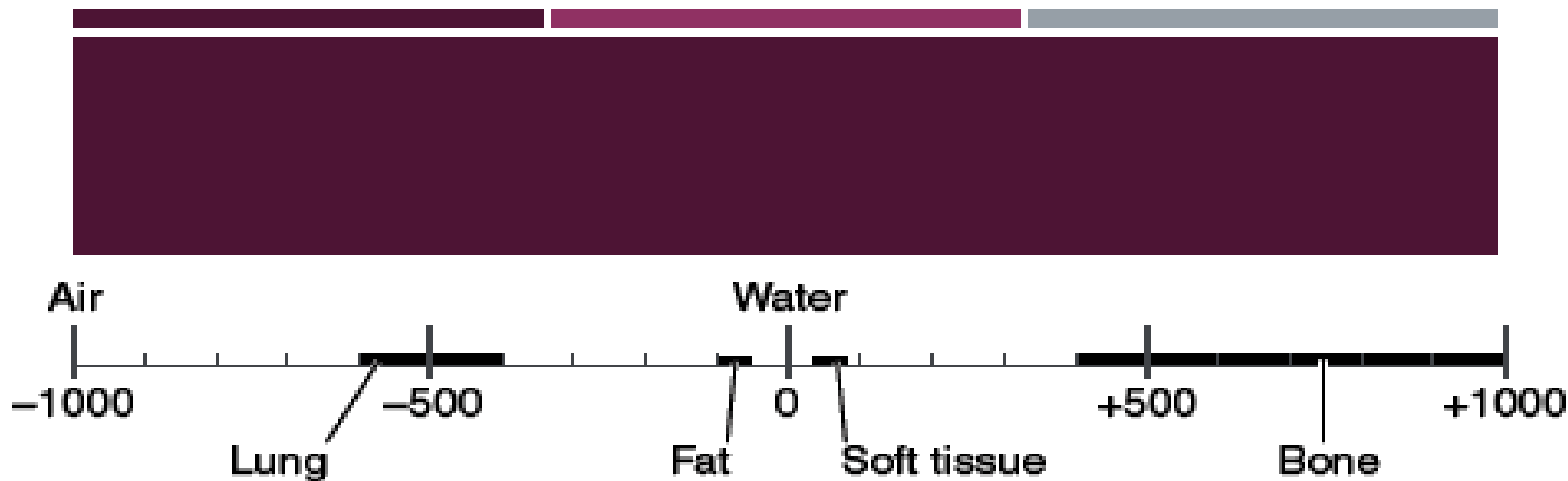
HU

The unit of measuring density of different objects imaged by CT.

■ Hyper dense 

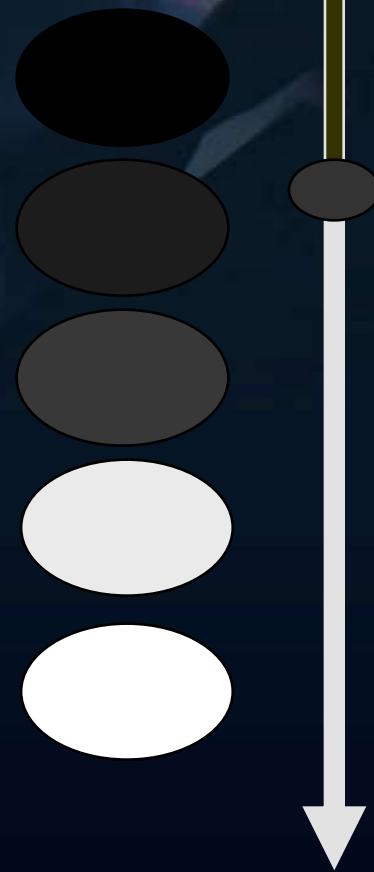
■ Iso dense 

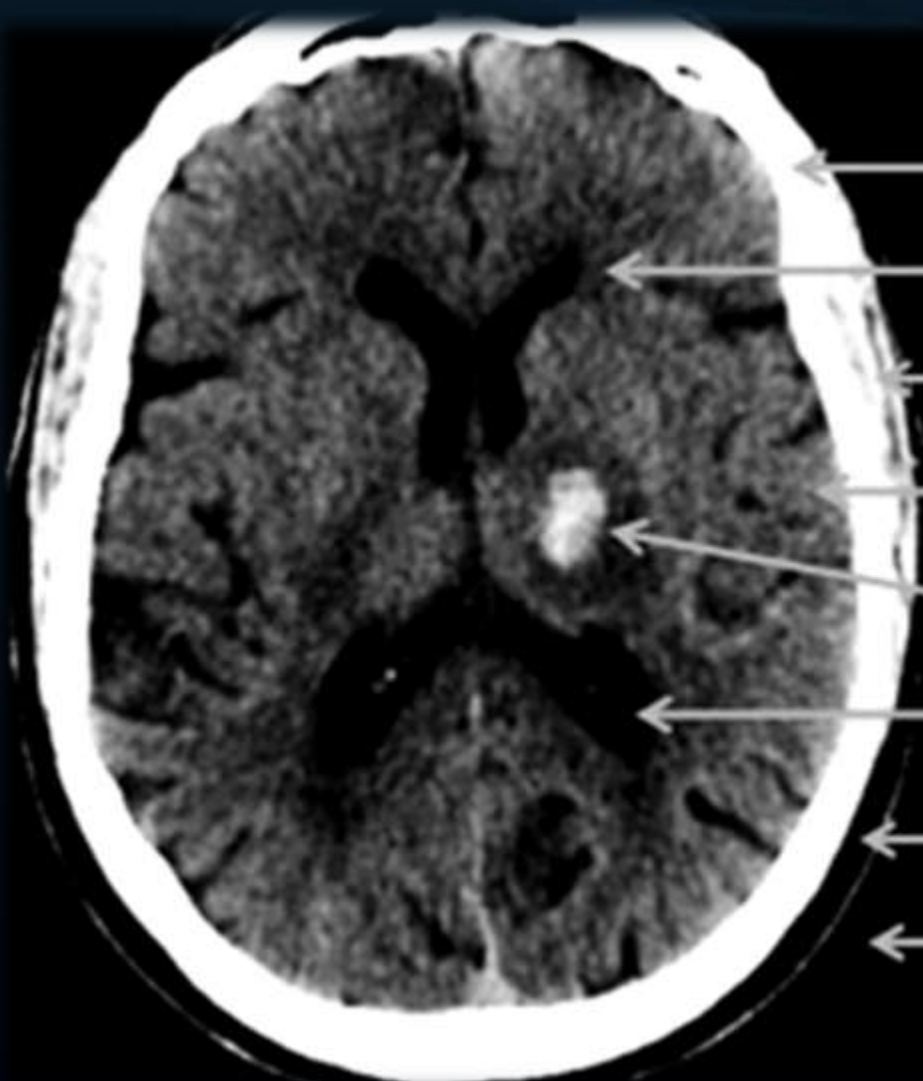
■ Hypo dense 



Bone	+400 → +1000
Soft tissue	+40 → +80
Water	0
Fat	-60 → -100
Lung	-400 → -600
Air	-1000

- ✓ Air -1000 HU
- ✓ Fat -10 : -300
- ✓ **Fluid 0 : 15**
- ✓ Recent blood 60 : 90
- ✓ Calcification more 100
- ✓ Metal > Hundreds



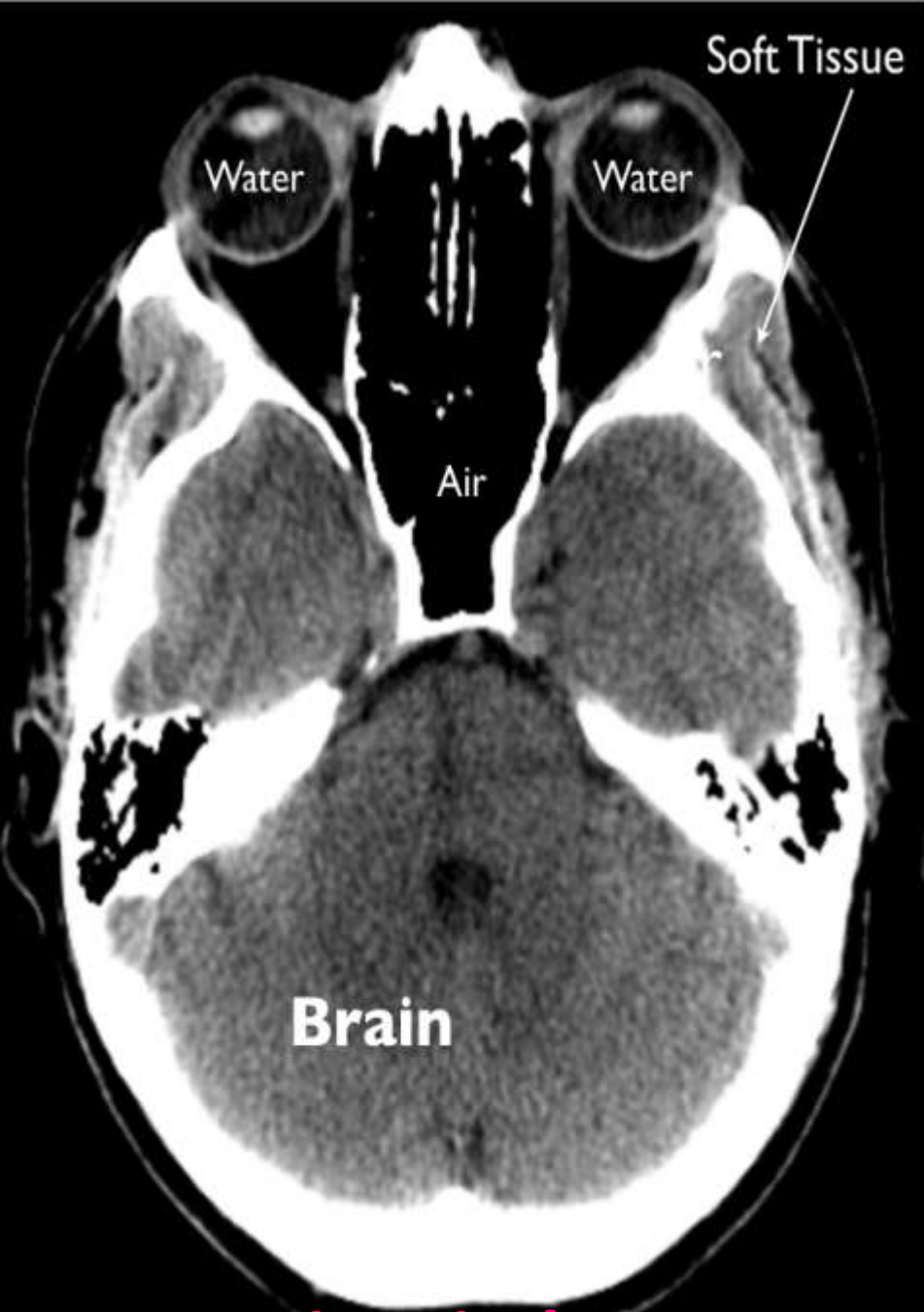


CT Number Ranges in Hounsfield Units (HU)

Bone	+1000
White matter	+20 to 30
Muscle	+20 to 40
Gray matter	+30 to 40
Hemorrhage	+65 to +95
CSF (water)	0
Fat	-30 to -70
Air	-1000

What is CT Window ?





Brain window

Vs



Bone window

A patient is lying on a table inside a CT scanner. A red laser line is projected across the patient's body. The patient is wearing a blue blanket and a white headrest. The background is dark and the lighting is focused on the patient.

3D CT Images



DFOV 25.0 cm
EDGE
250/1

Nb Views: 12

Rotation: 30.0 deg.

R
1
2
5

L
1
2
5

Nb VOI
kv 120
mA Mod.
Rot 0.70s/HE 5.6mm/rot
0.6mm 0.562:1/0.6sp
Tilt: 0.0
11:42:23 AM
W = 594 L = 41

I 189

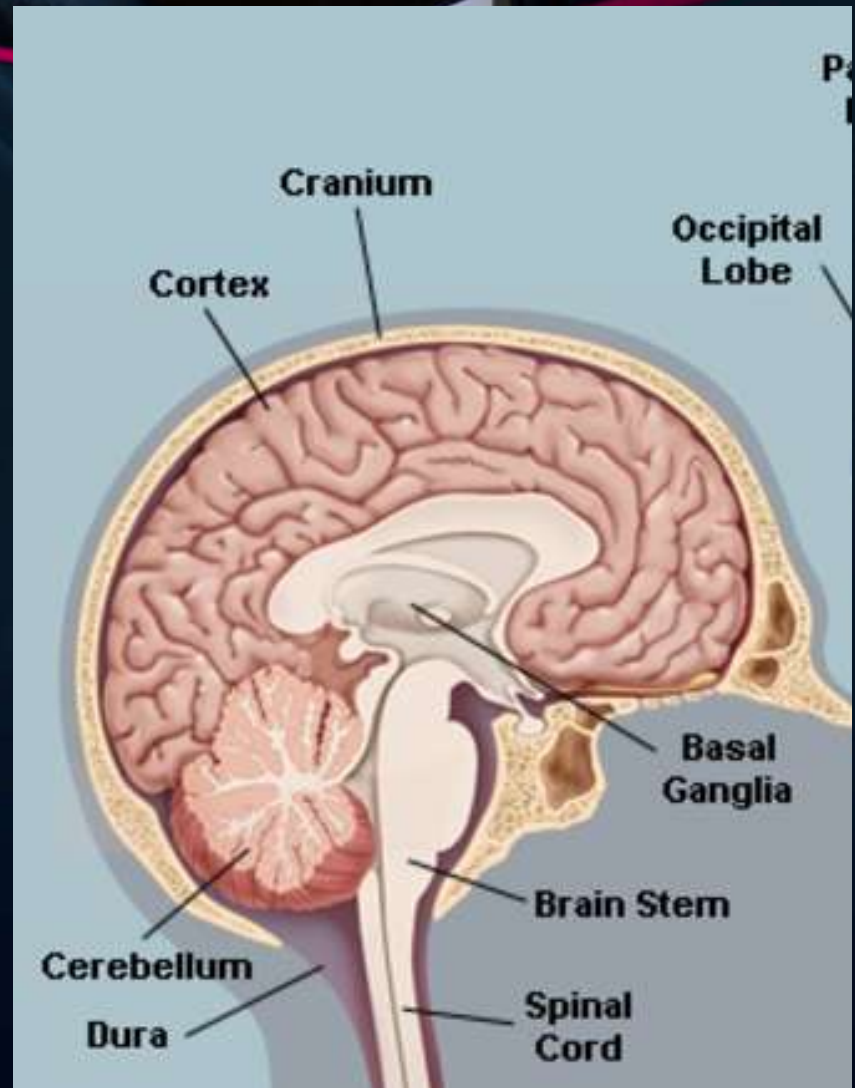


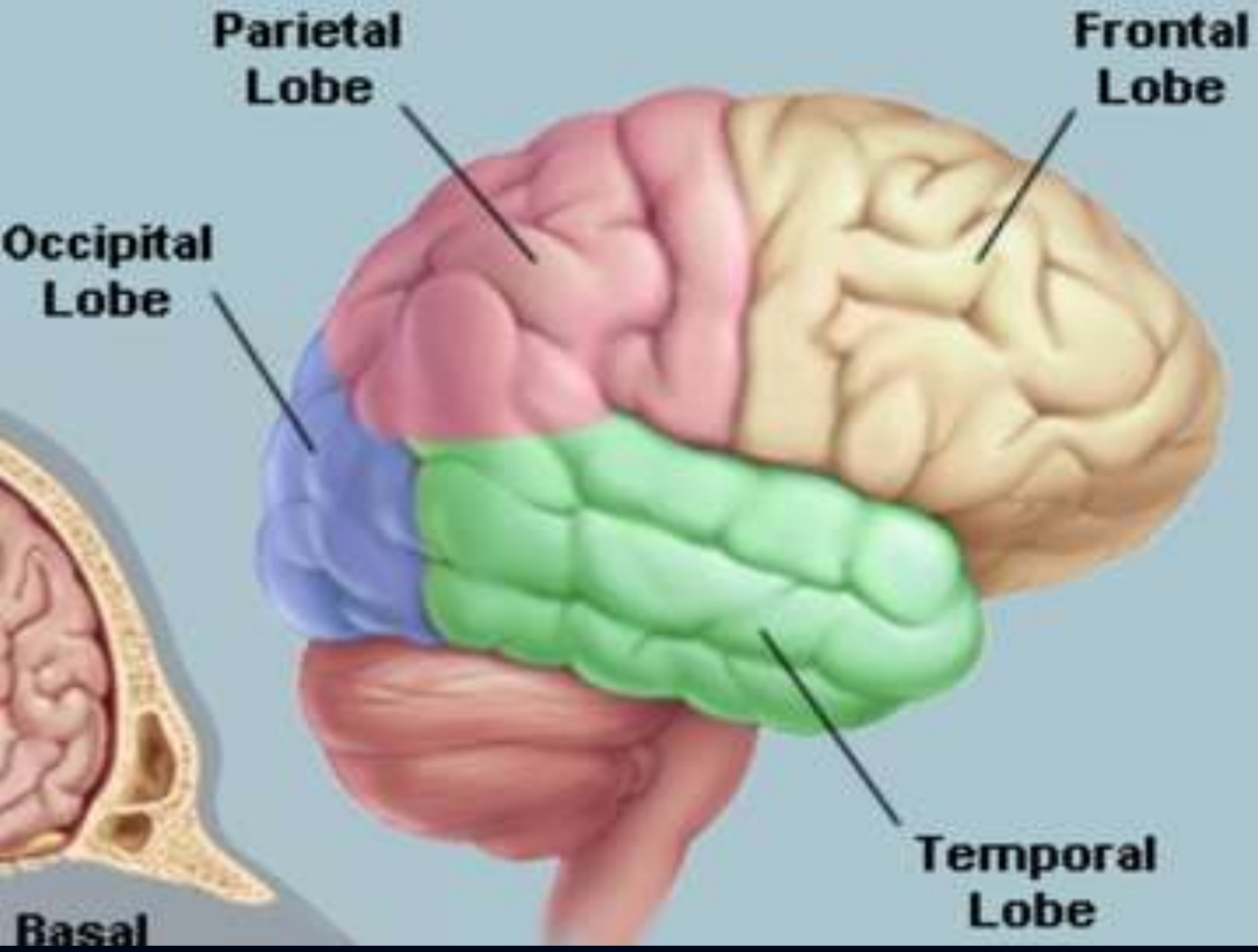
Normal Finding & Anatomy CT Brain



BRAIN CT ANATOMY

- Skull bones
- Hemispheres
- Ventricular system
- Brain stem
- Cerebellum





Any Radiological Image Always

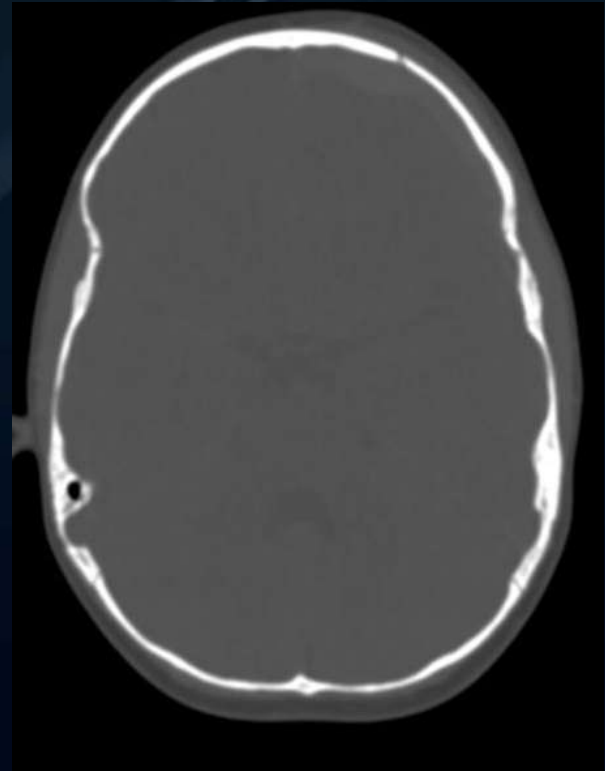
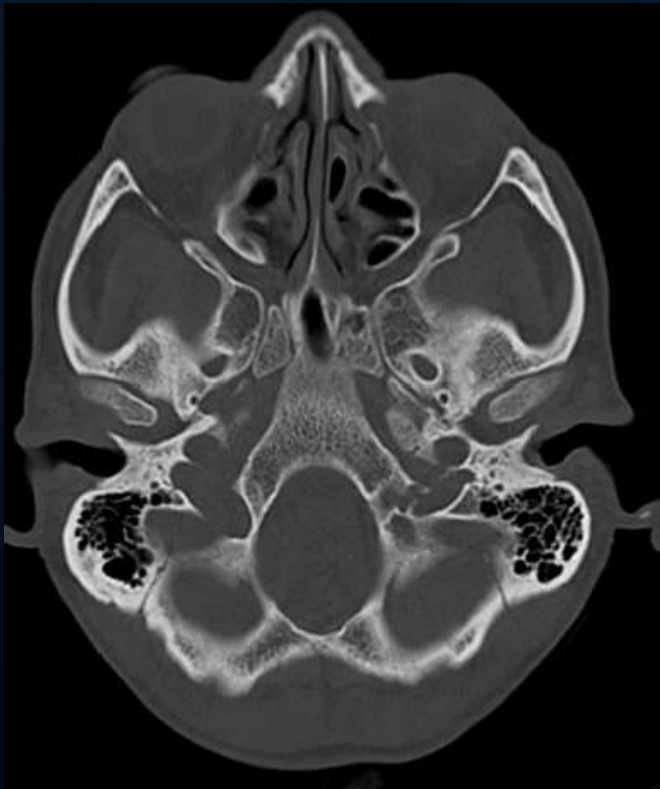
as if Patient facing us

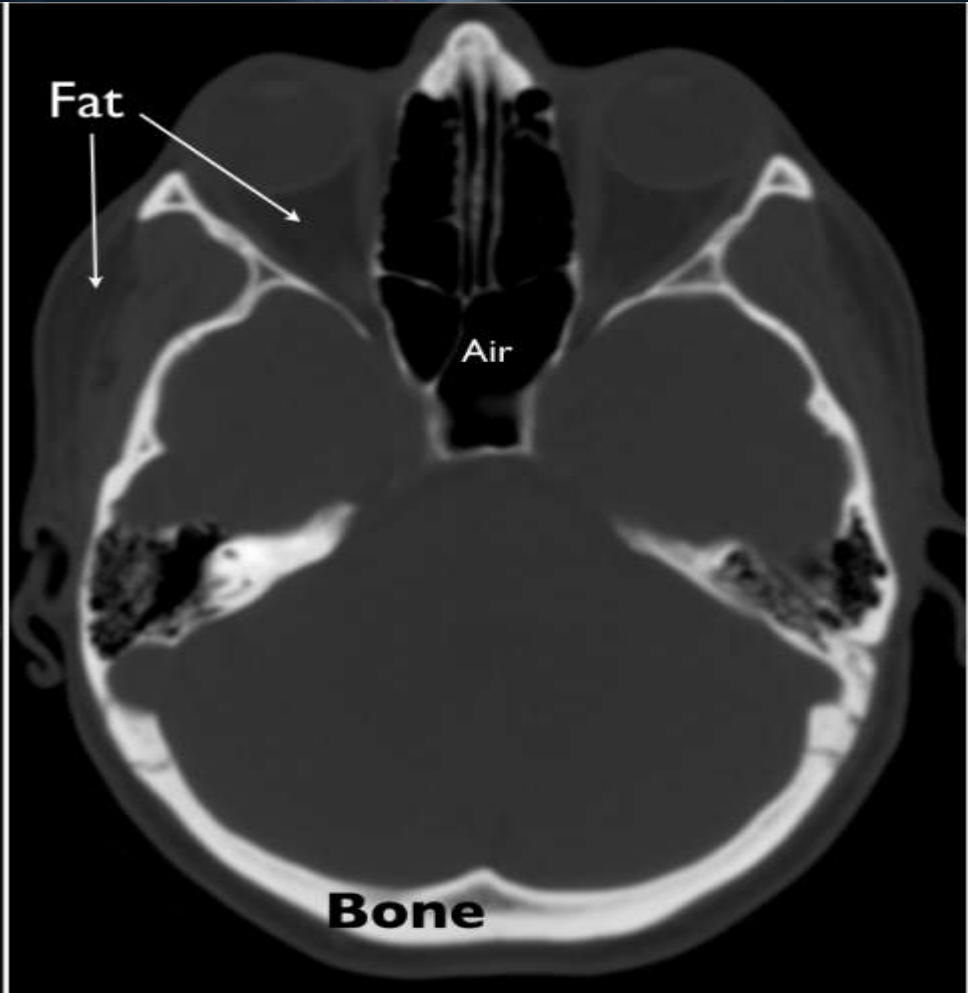
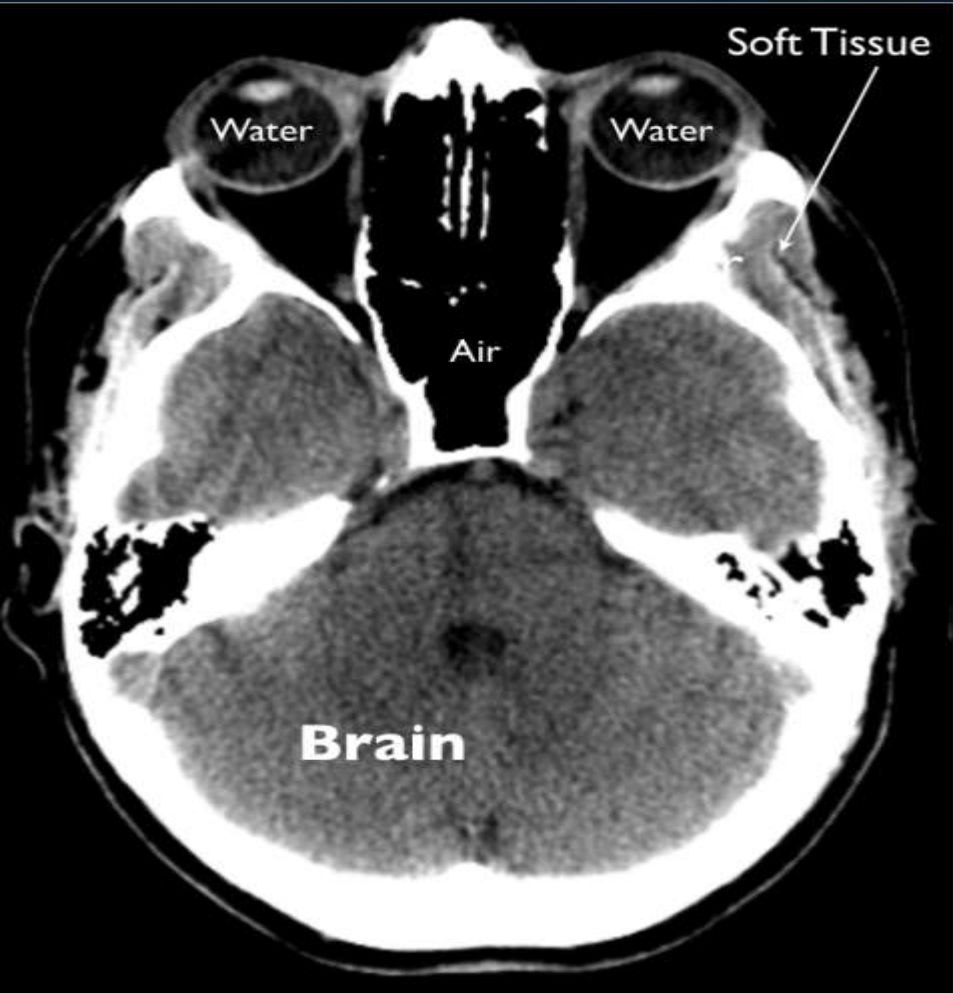
i.e. Lt side of the image , on our Rt side .



Skull bones

- Skull Base
- Cranial bones



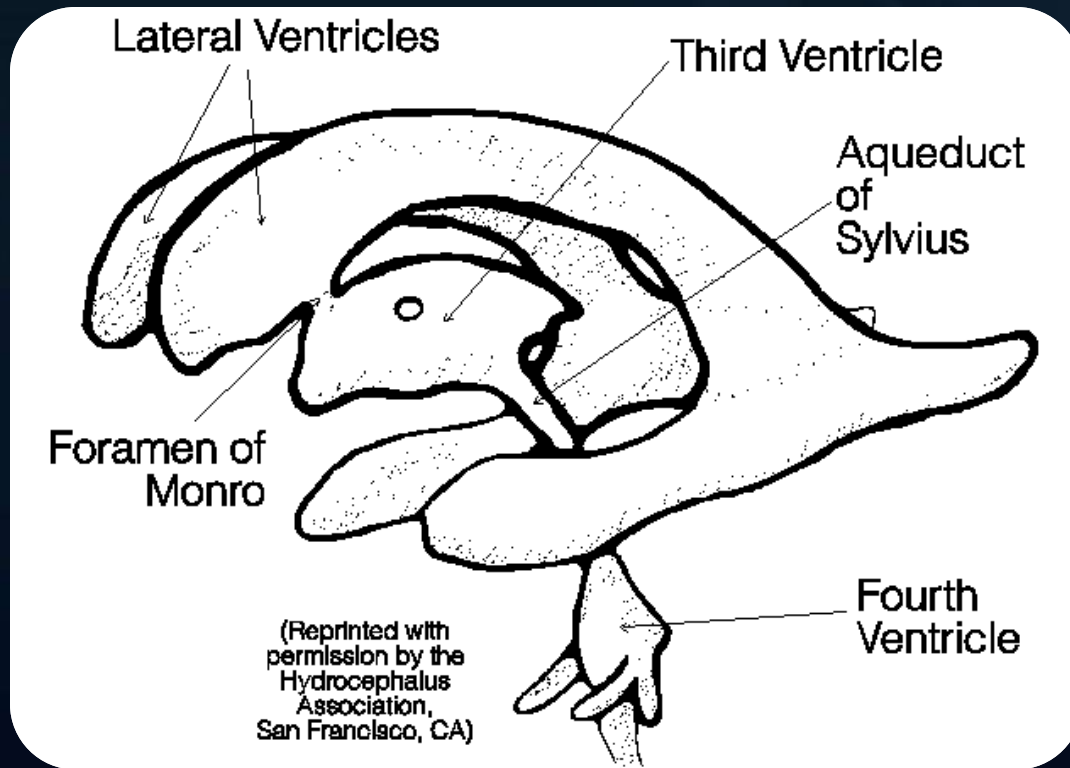


Hemispheres & Cerebellum

Frontal Lobe



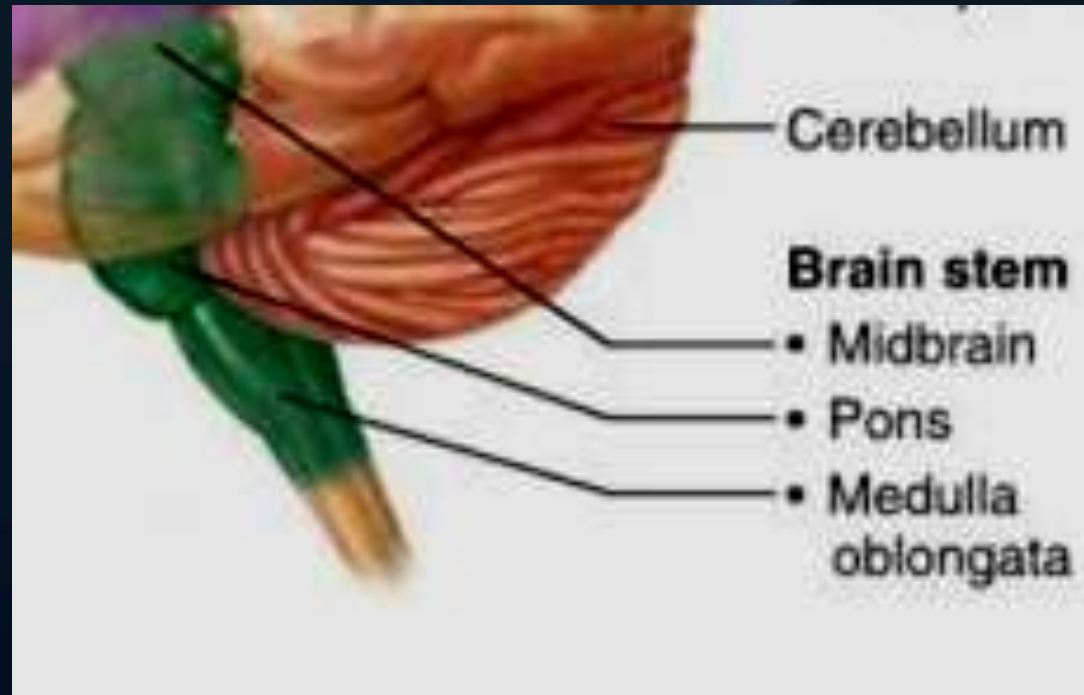
Ventricular system

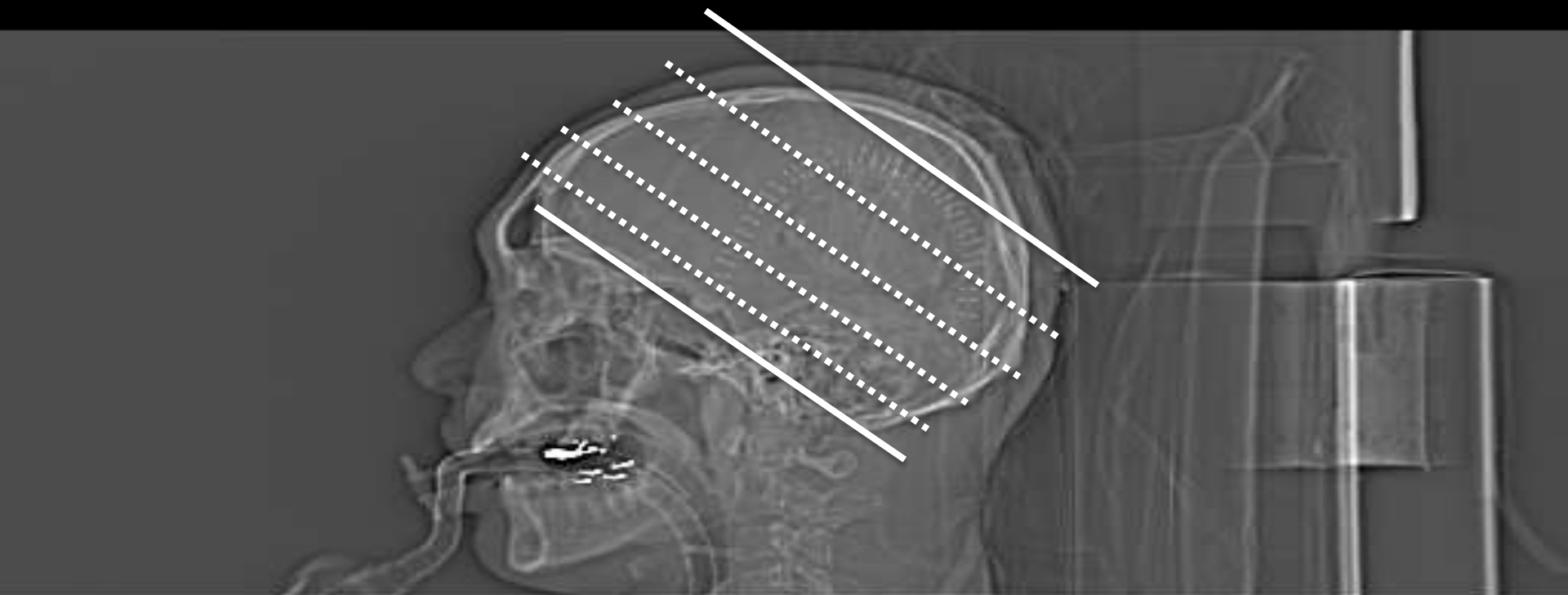


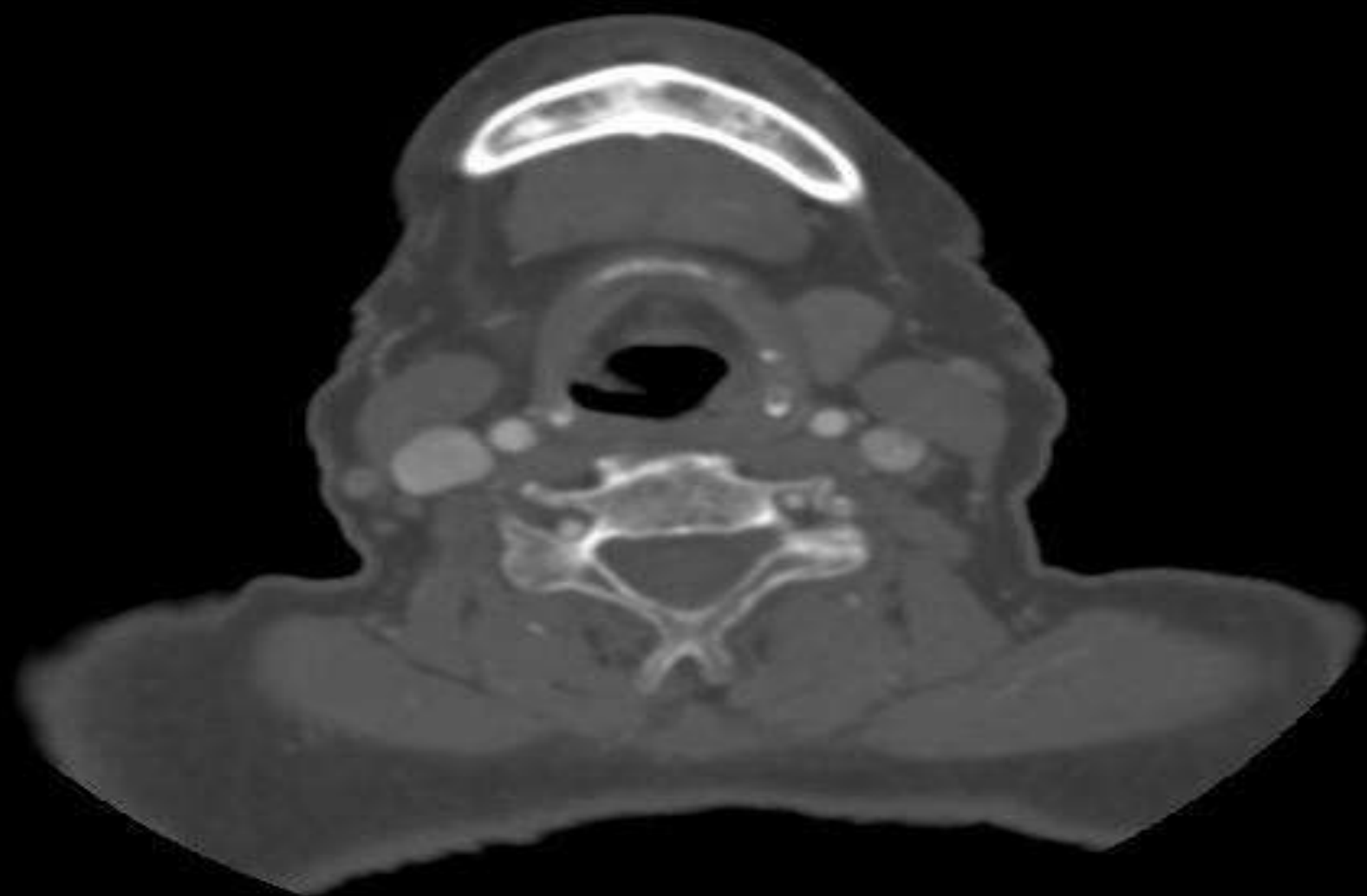


Crump Institute for Biological Imaging

4- Brainstem



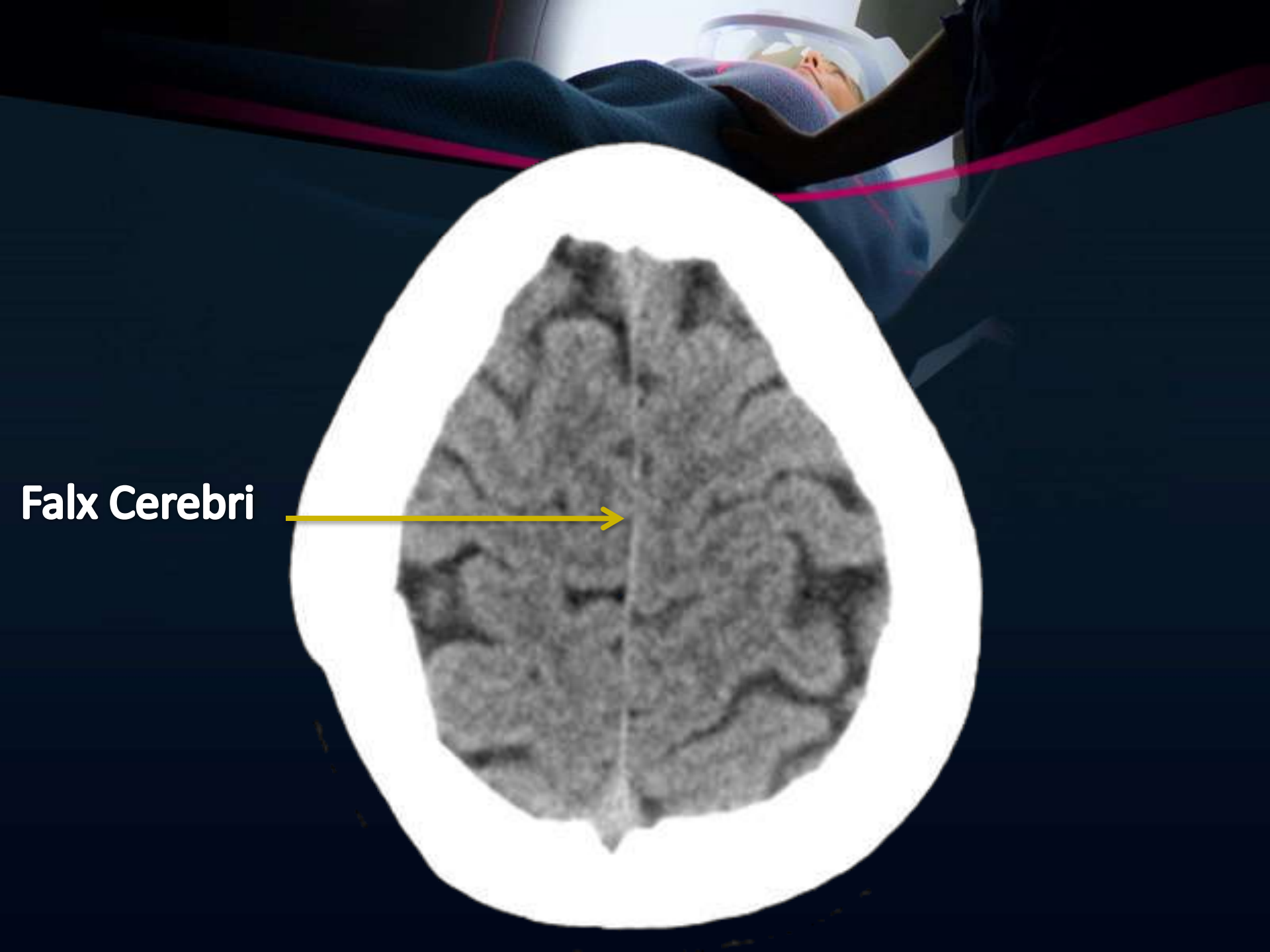
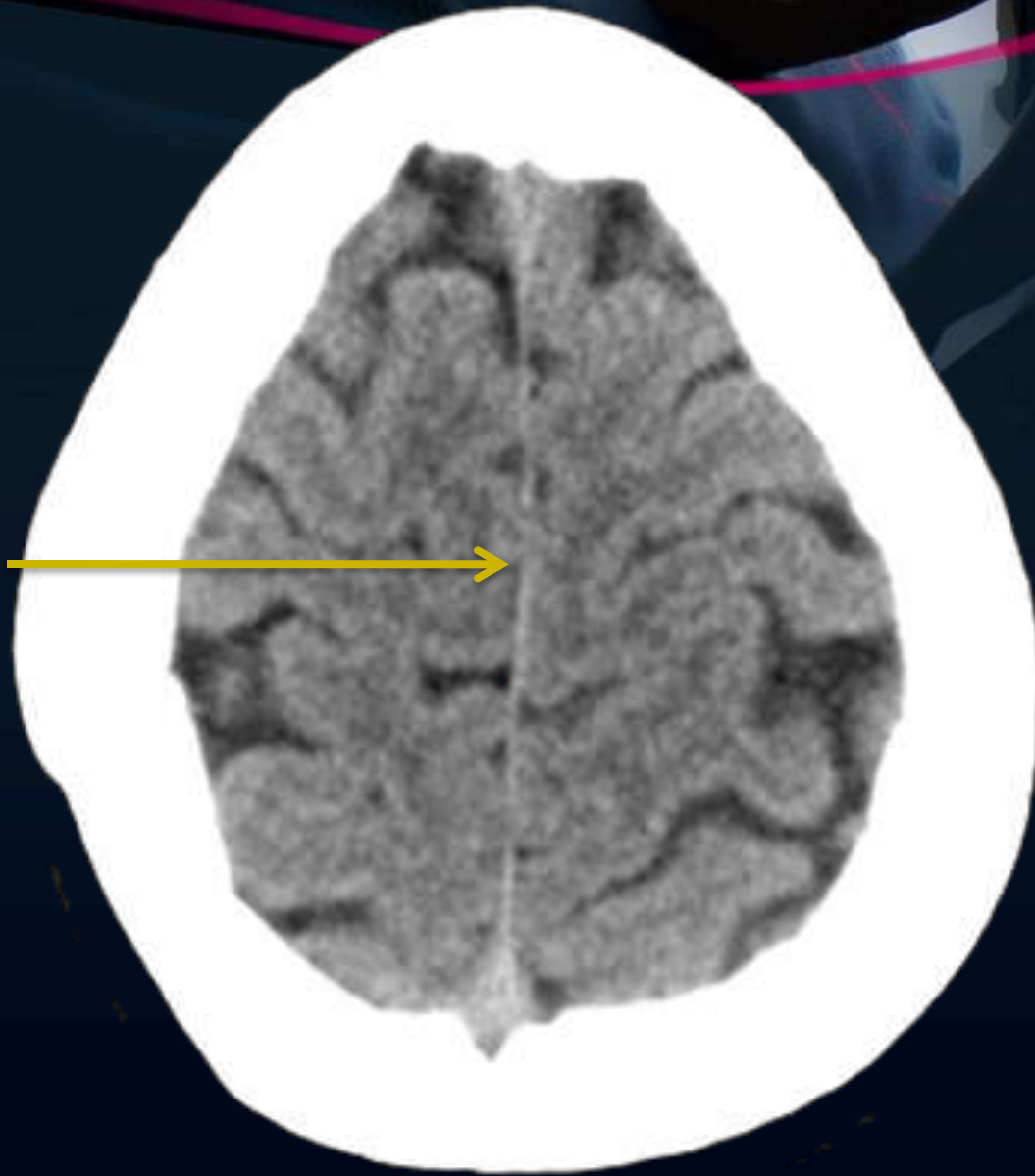


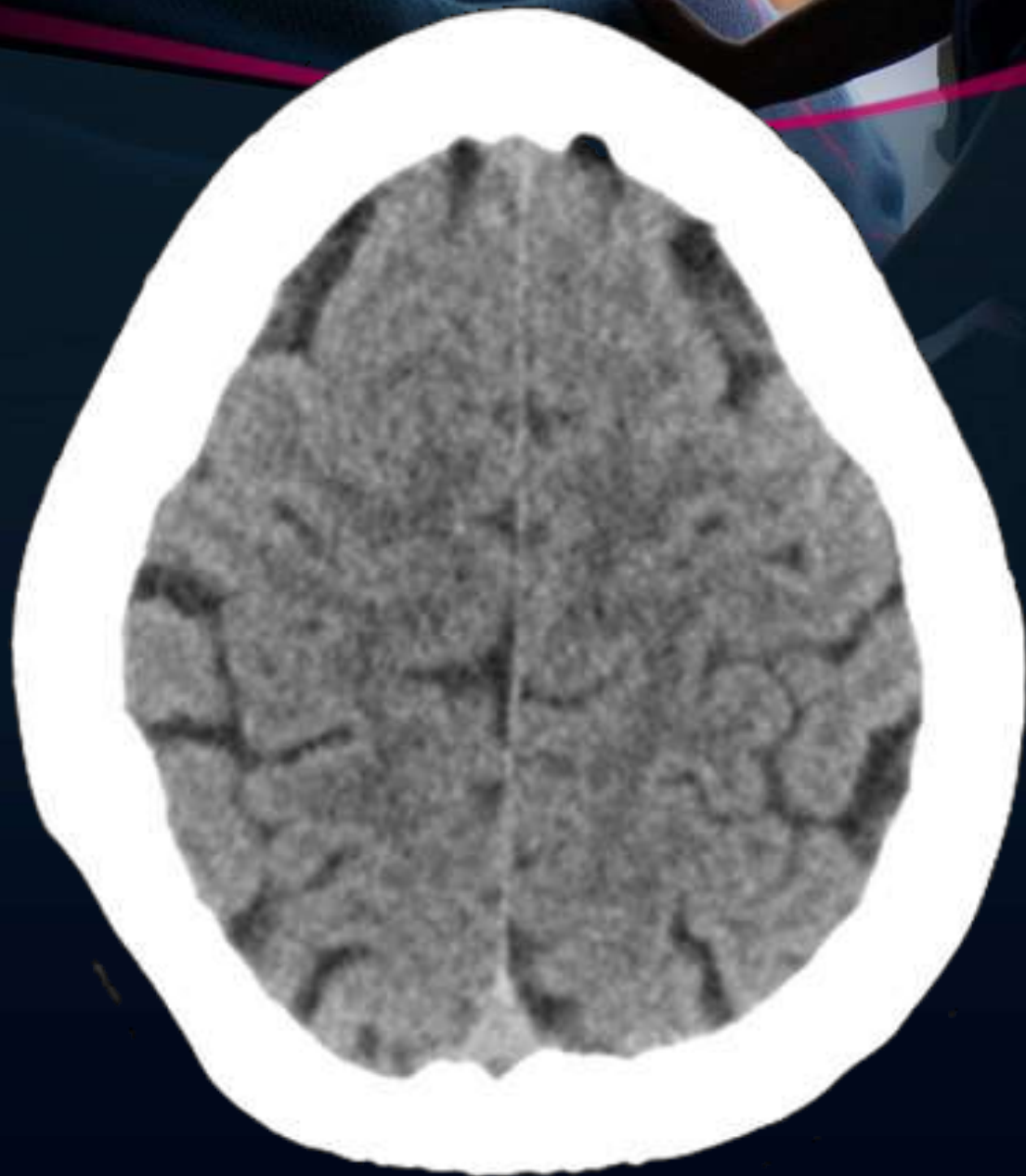


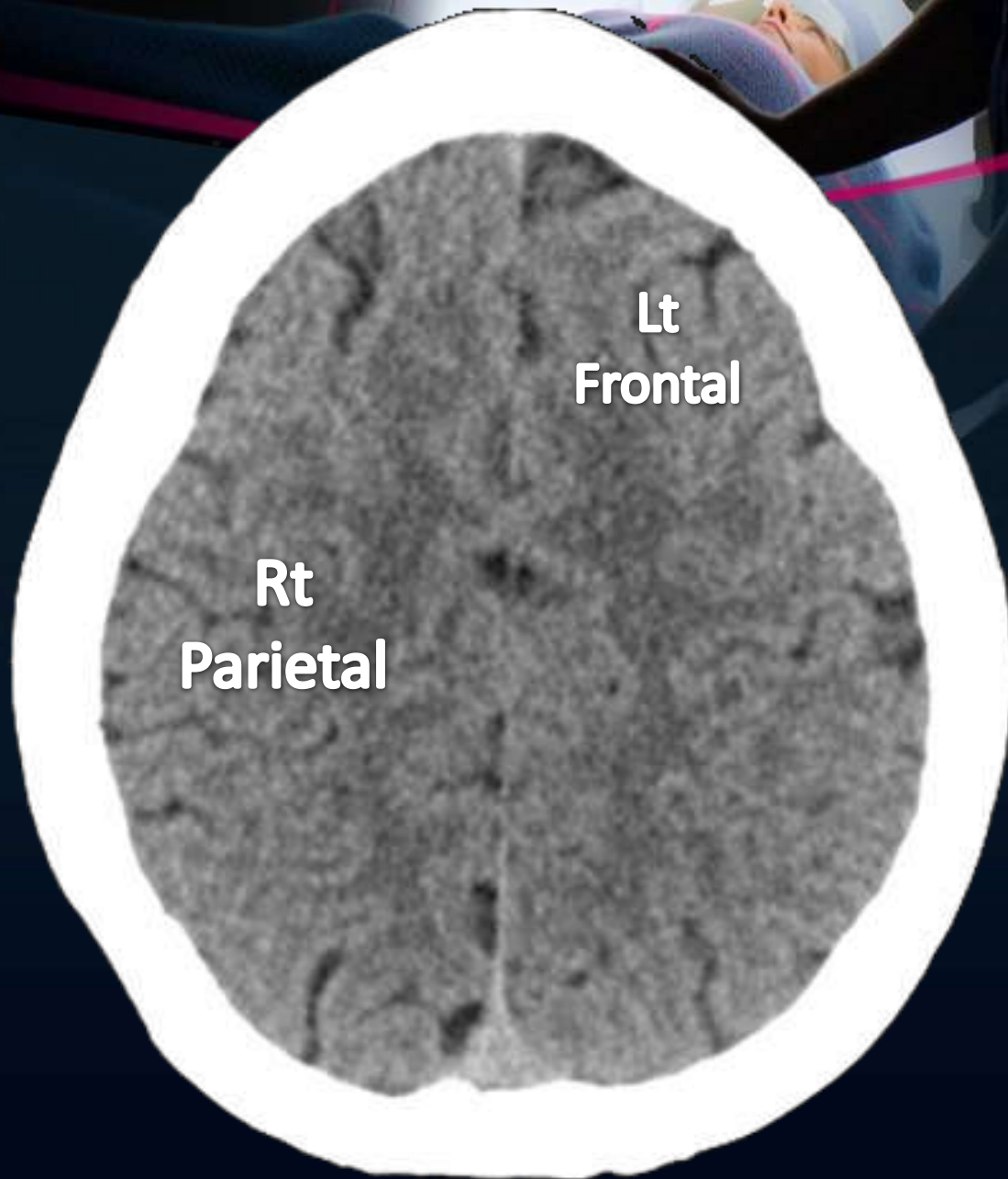
Parietal Lobe



Falx Cerebri



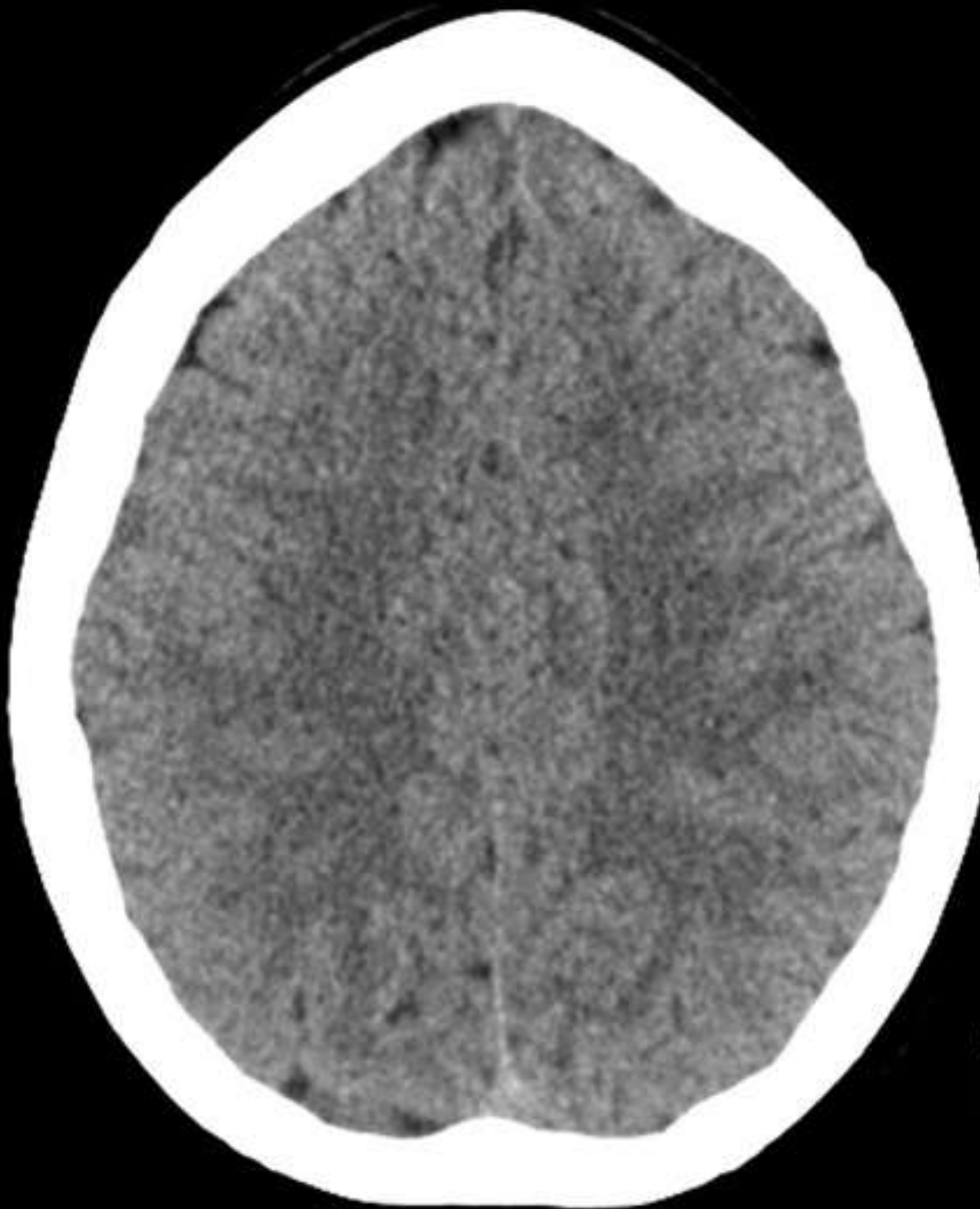


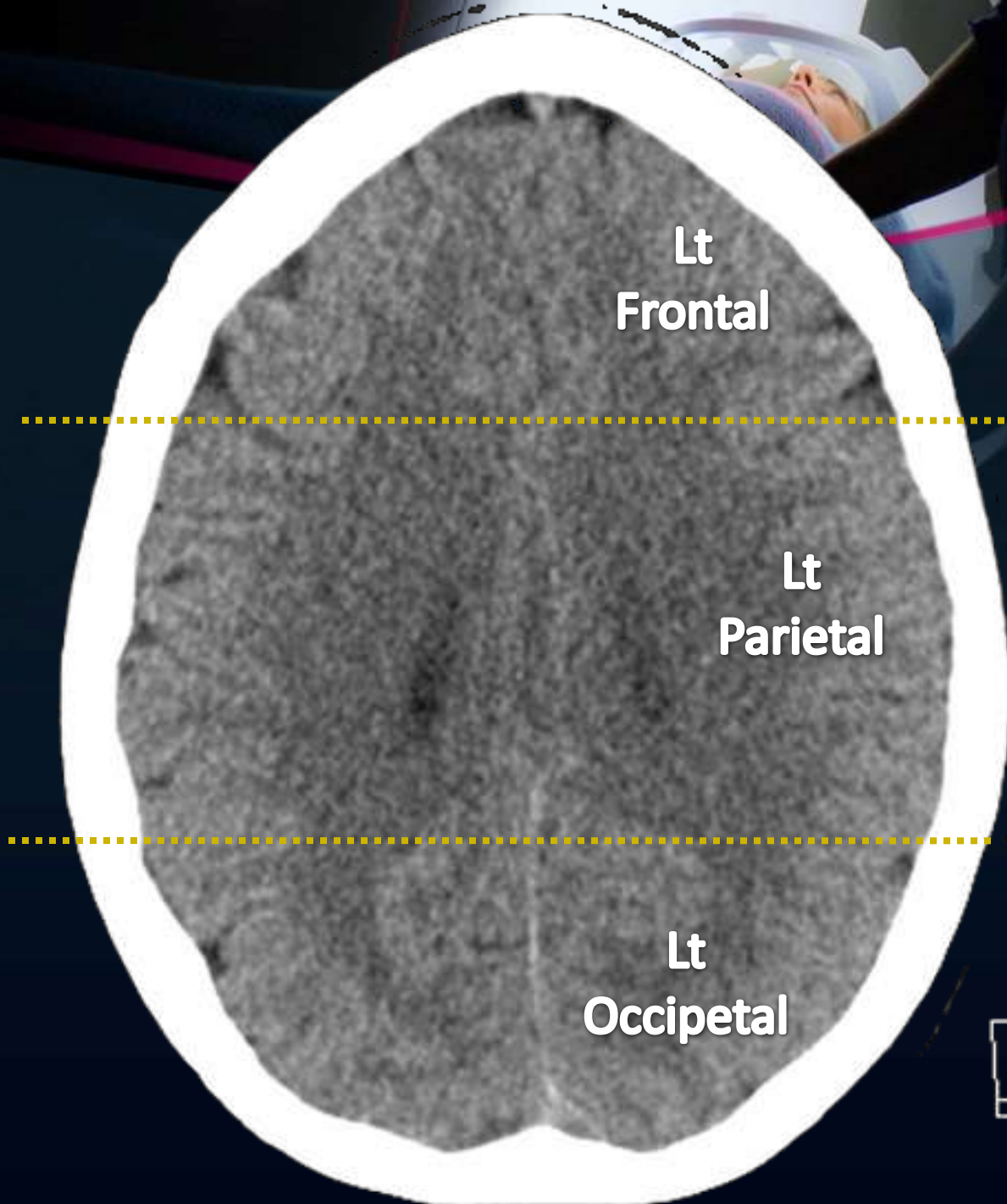


Lt
Frontal

Rt
Parietal







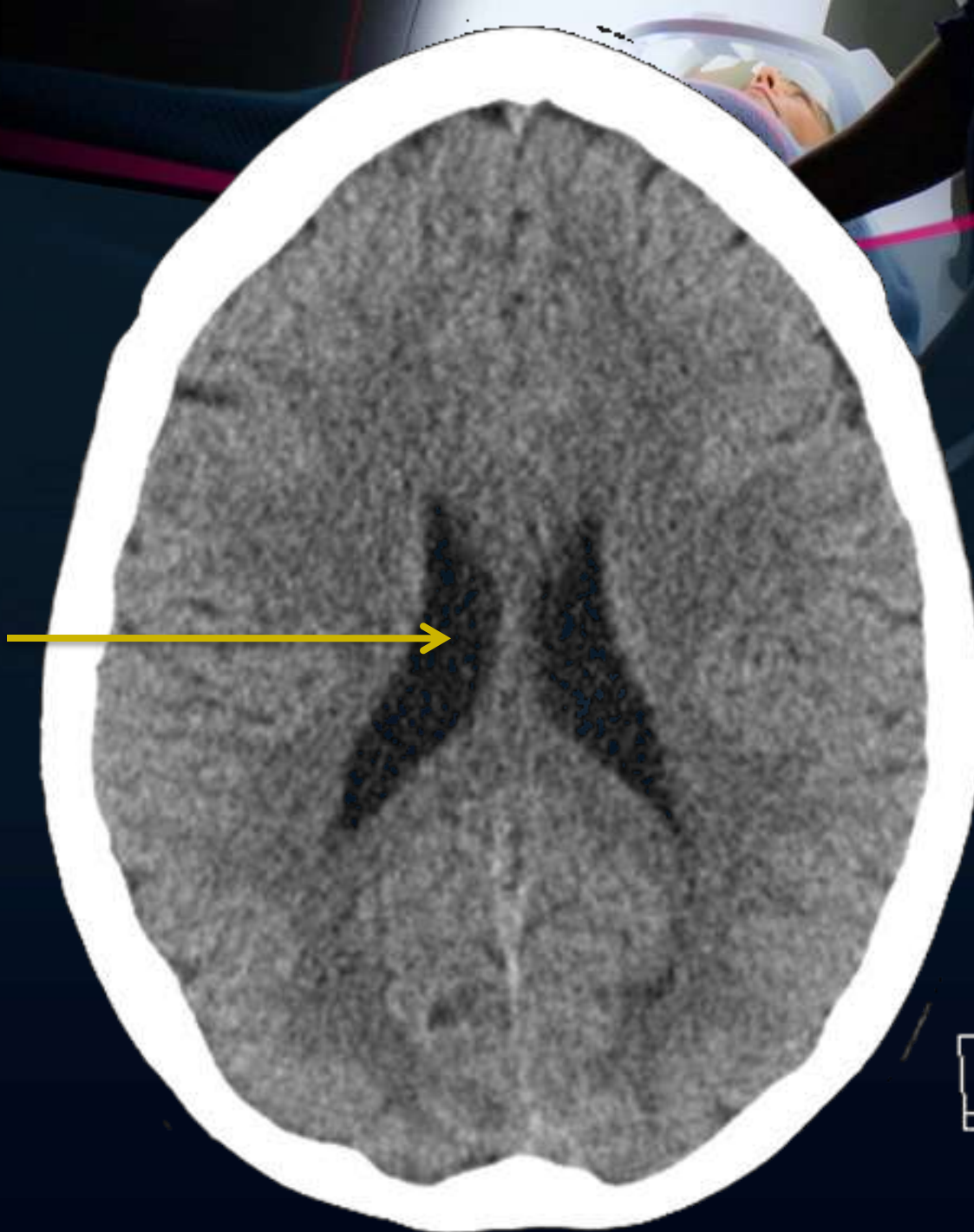
Lt
Frontal

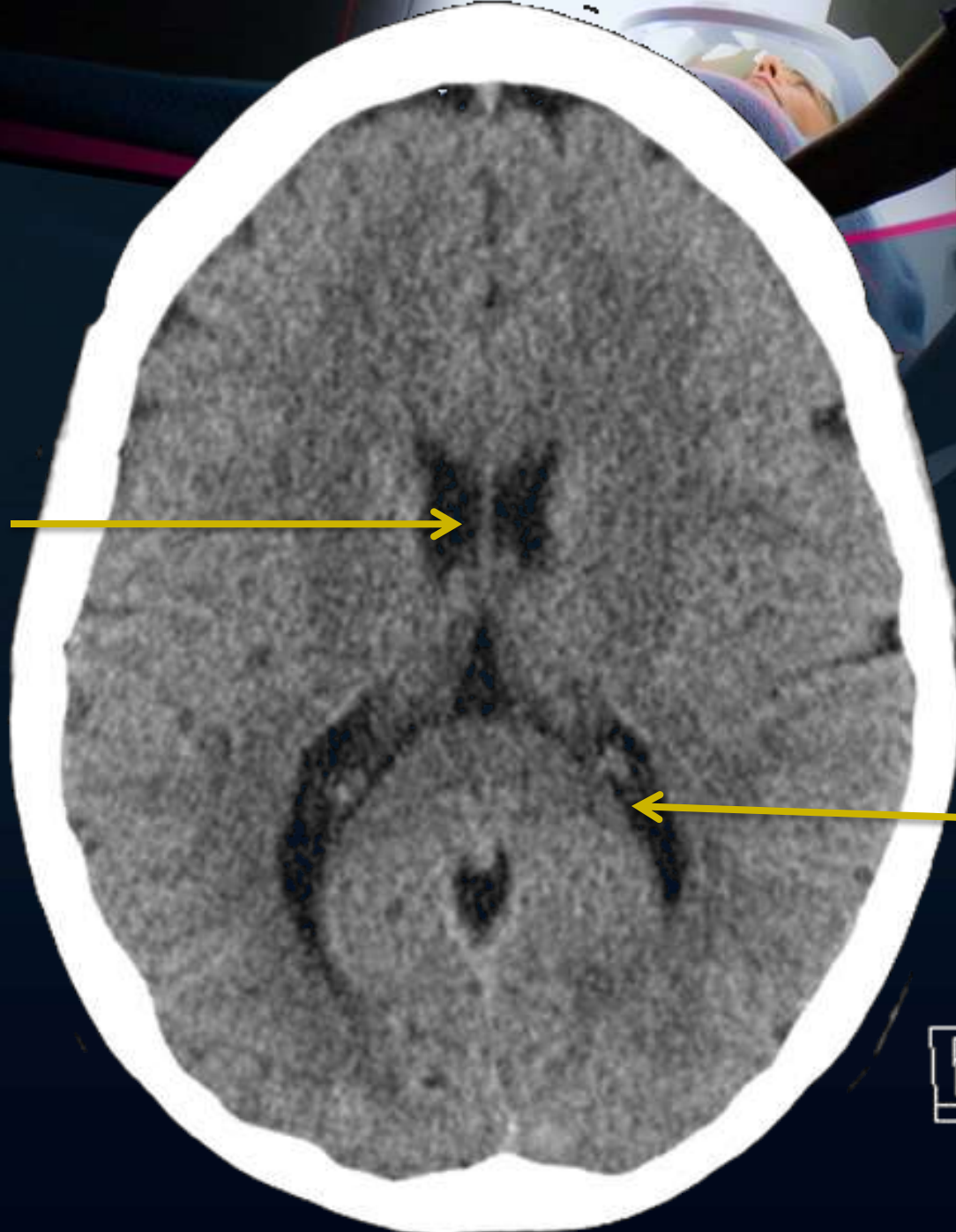
Lt
Parietal

Lt
Occipetal



Rt
Lateral
Ventricle
"Body"





Rt

"Ant horn"
Lateral
Ventricle

Lt

"Post horn"
Lateral
Ventricle



Ant Horn

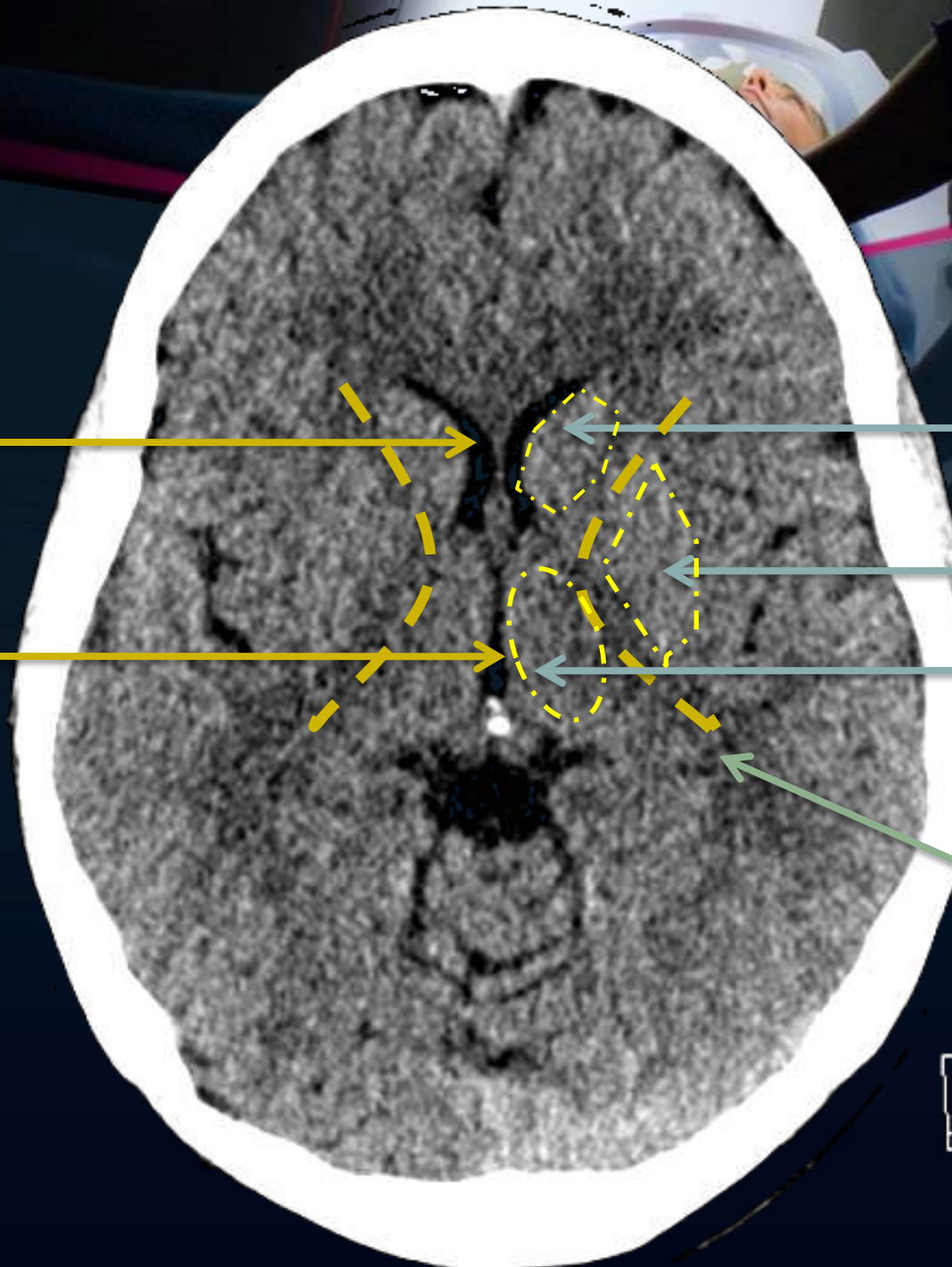
**3rd
Ventricle**

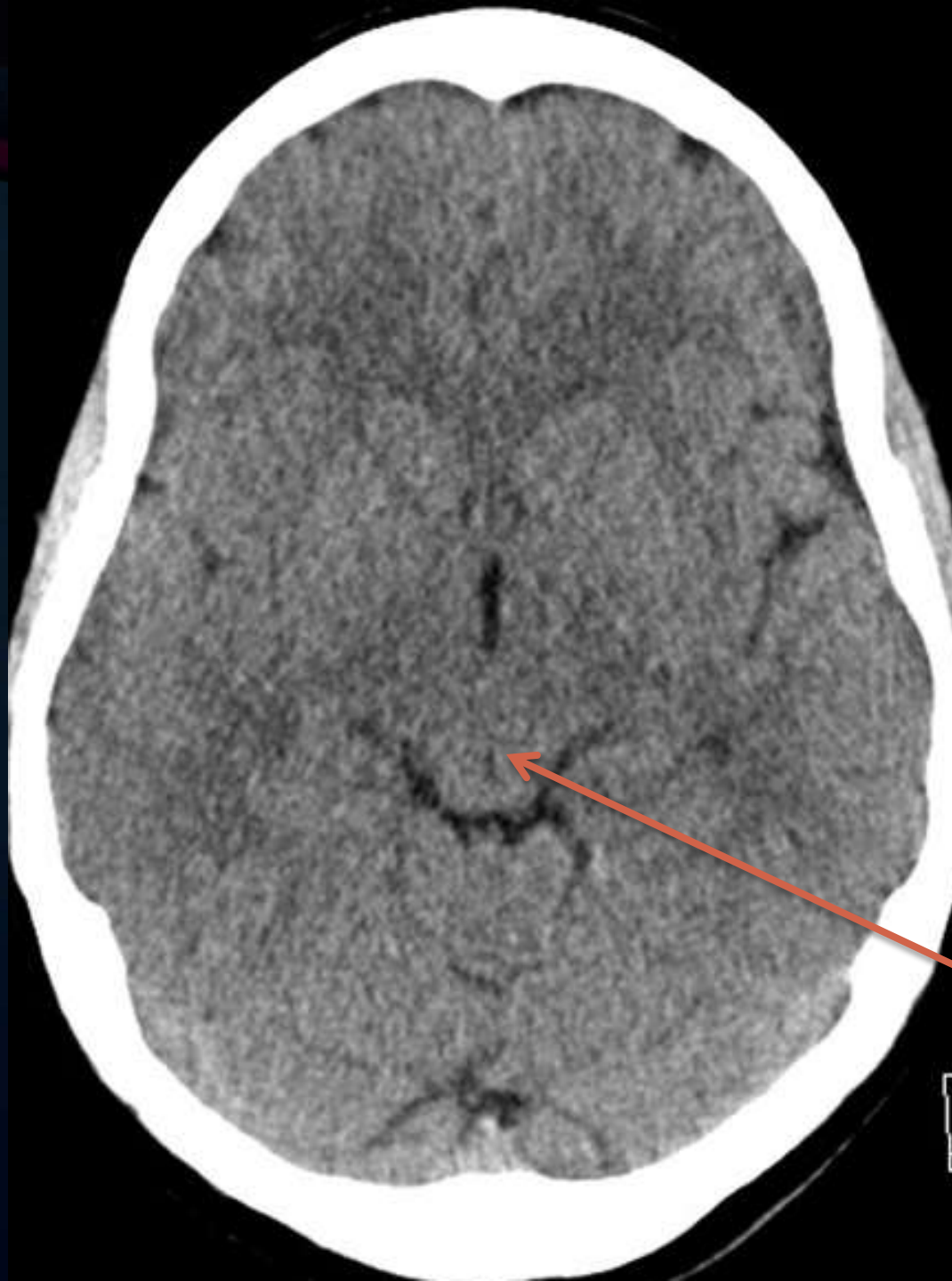
Quadrate n

Lentiform n

Thalamus

**Internal
Capsule**

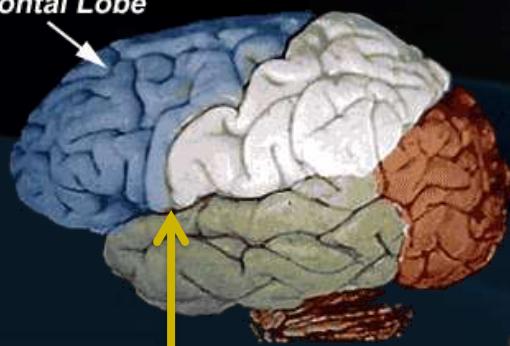




Midbrain



Frontal Lobe

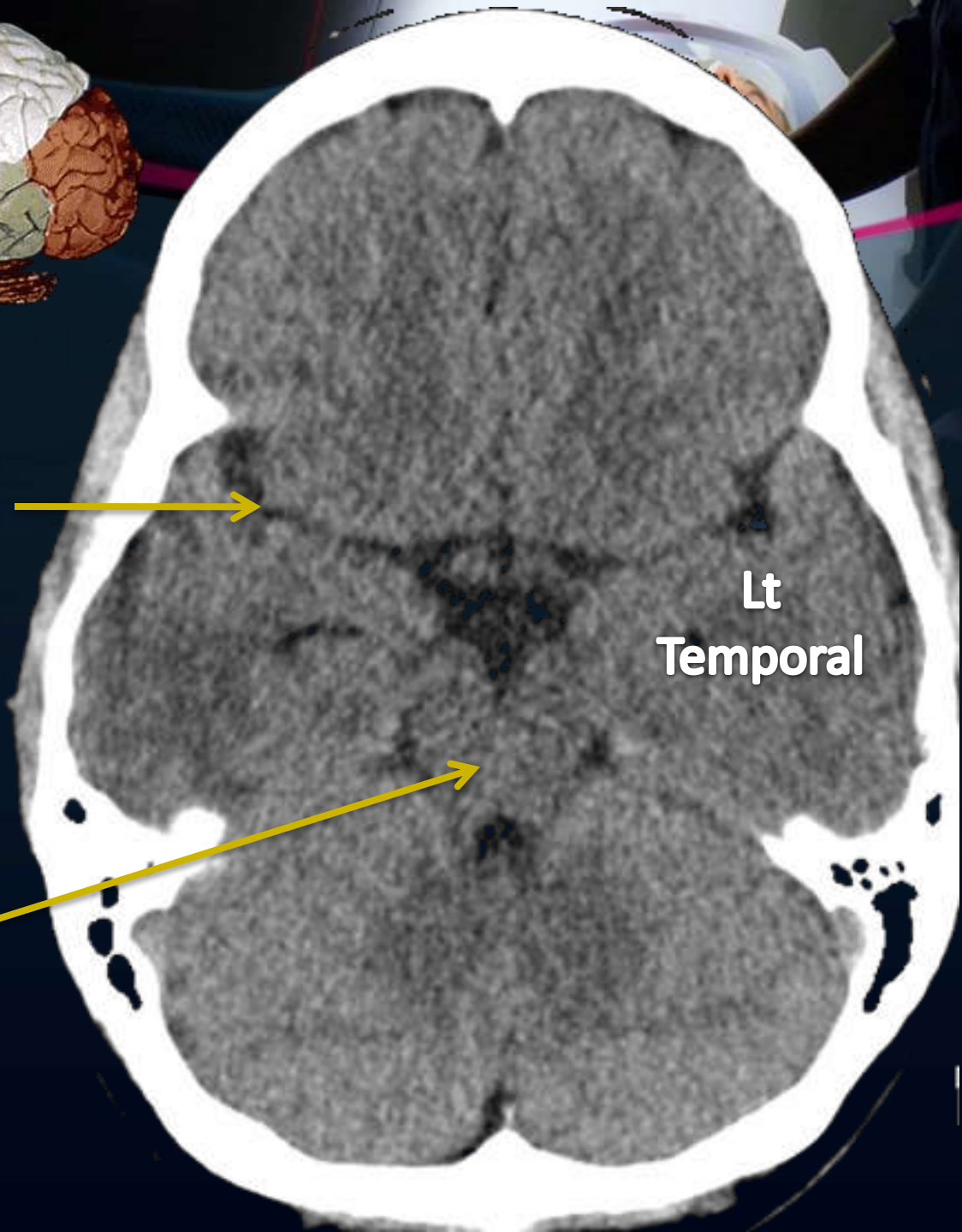
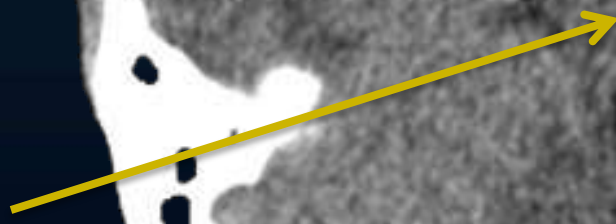


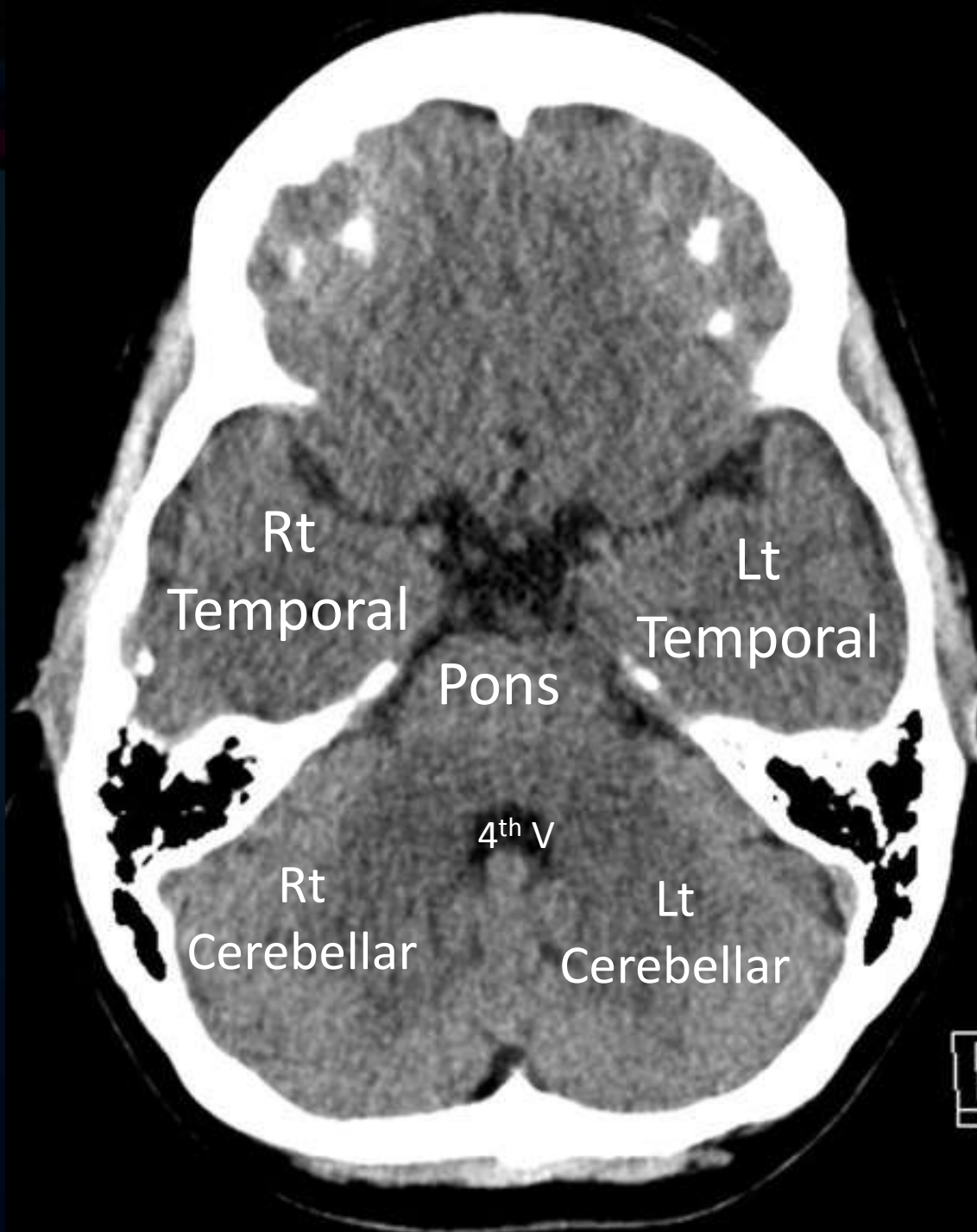
Sylvain
Fissure



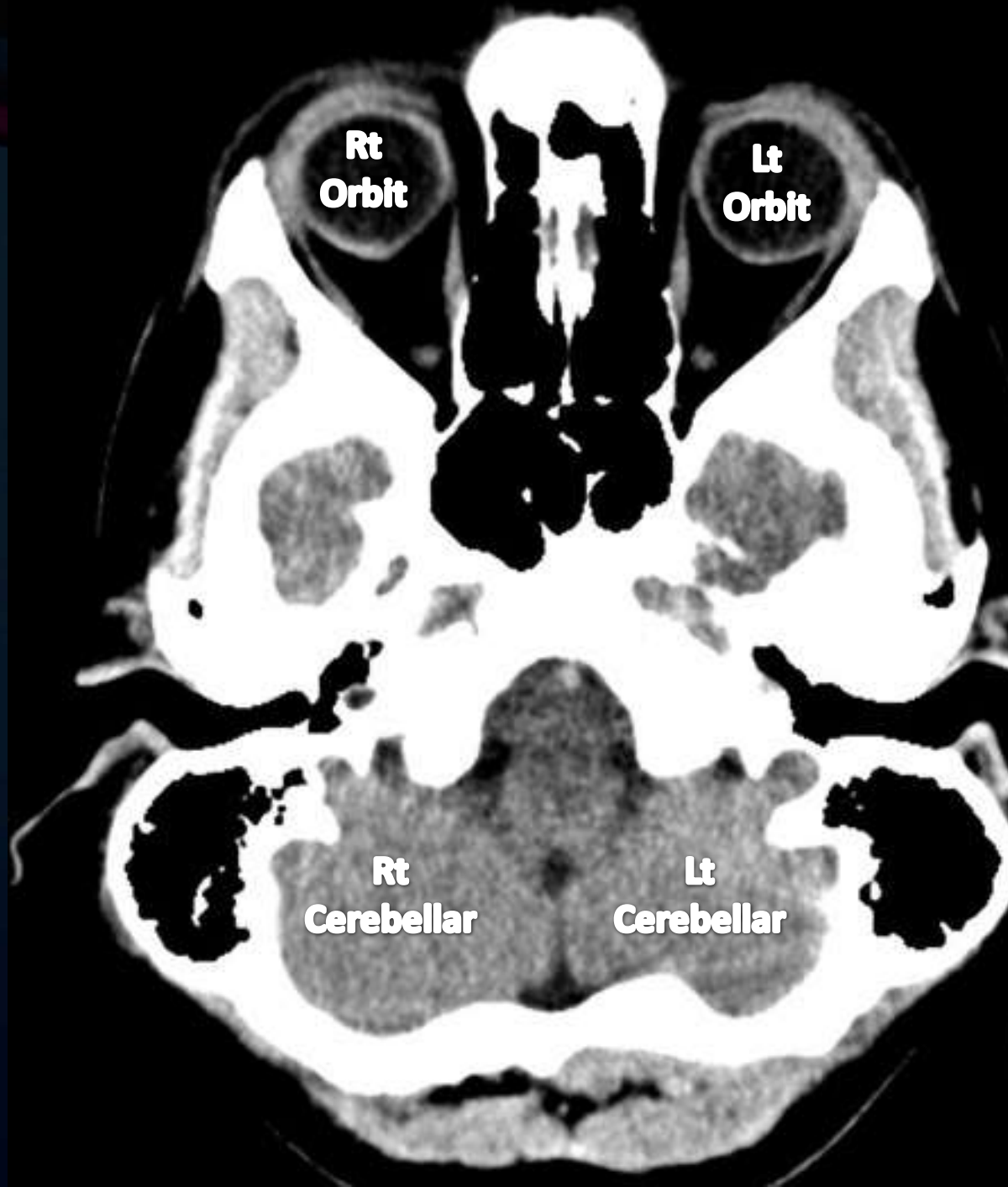
Lt
Temporal

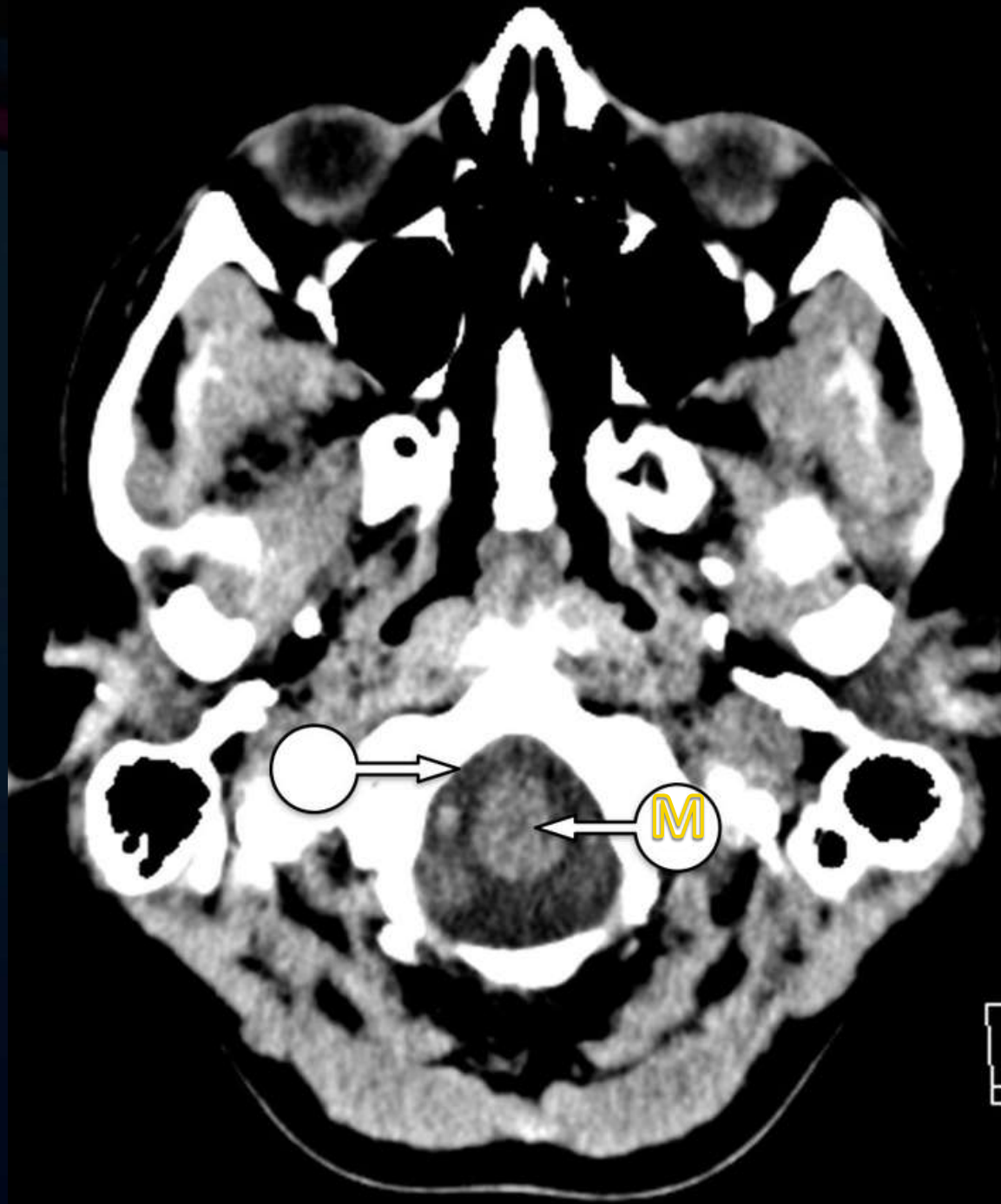
Midbrain





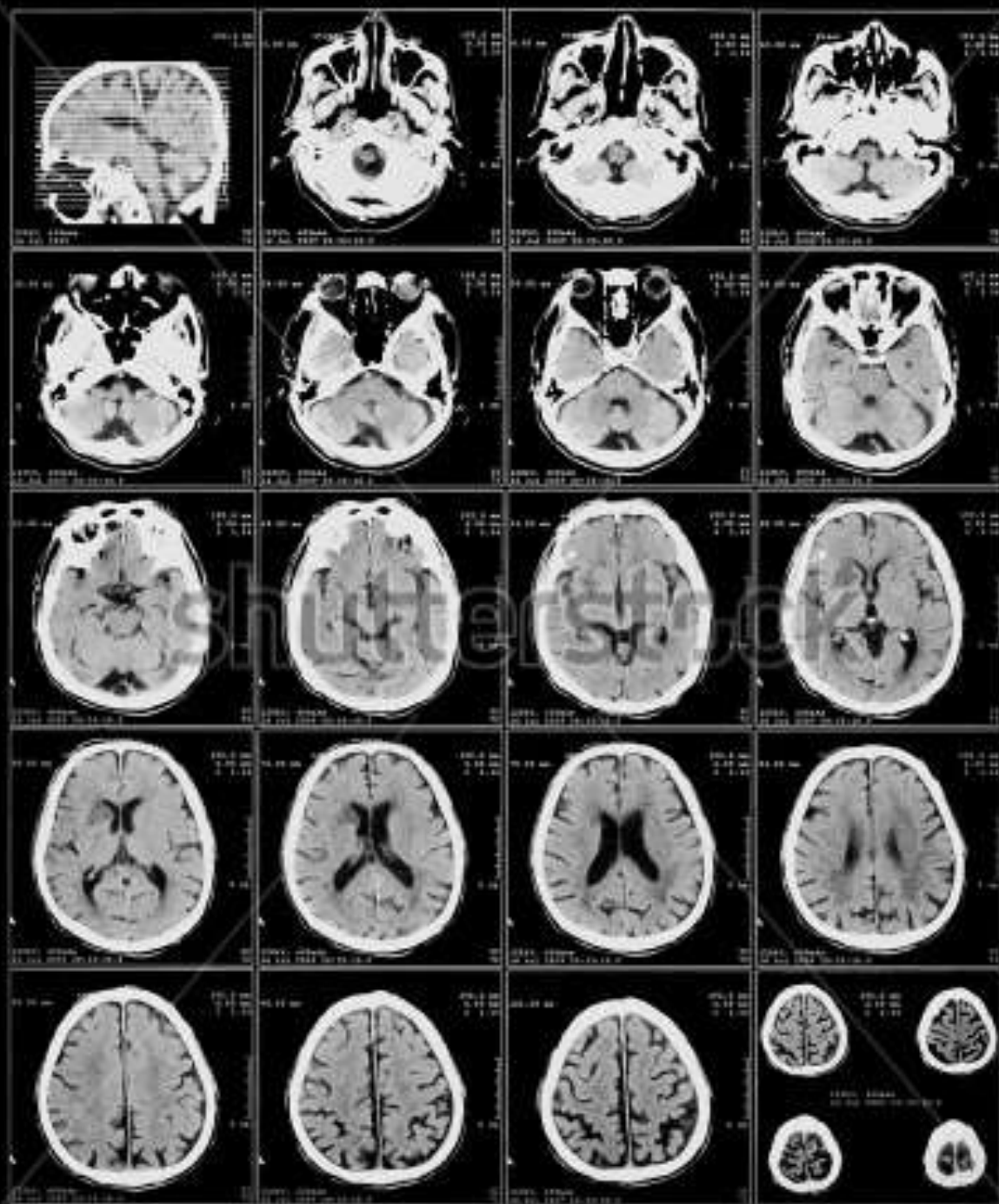






Common Finding & Emergency CT Brain







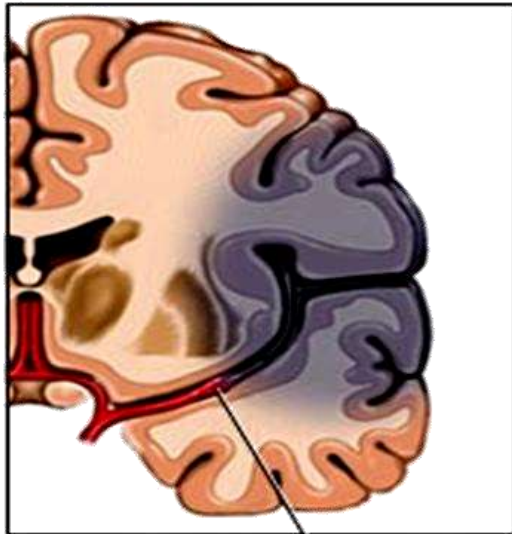
Main Finding of CT Brain :

- **Stroke** (Infarction –Hemorrhage) .
- **Trauma** (Hemorrhages – Fractures)
- **Hydrocephalus**
- **Tumors**
- **Others**

STROKE

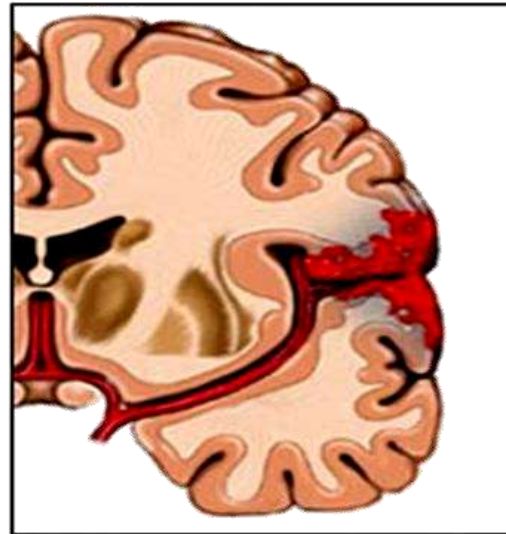
2 major types of Stroke

Ischemic stroke

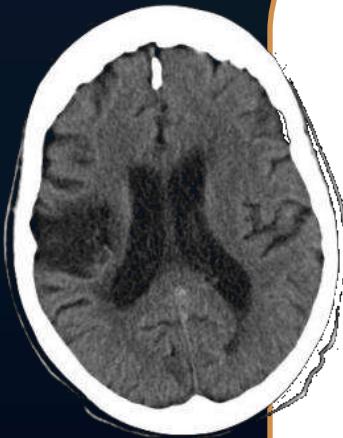


A clot blocks blood flow to an area of the brain

Hemorrhagic stroke



Bleeding occurs inside or around brain tissue



→ Infarction

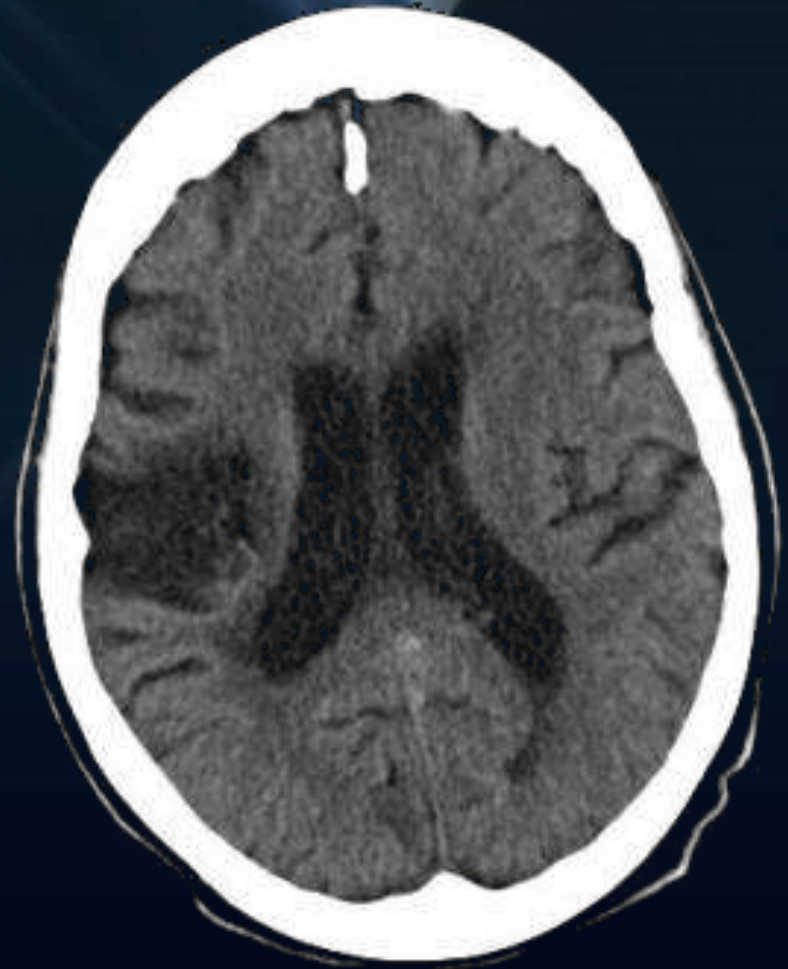
- **How to Diagnose :**

- Neurological deficit
related to site of infarction

- Hypo dense lesion

- **3 Stages :**

- Acute
- Subacute
- Chronic





DAYS



WEEKS



MONTHS

→ Hemorrhage

FRSH BLOOD DENSITY is HYPERDENSE

↳ **1-Intracranial**

↳ **2-Intra-ventricular**

↳ **3-Extradural**

↳ **4-Subdural**

↳ **5-Sub arachnoid**

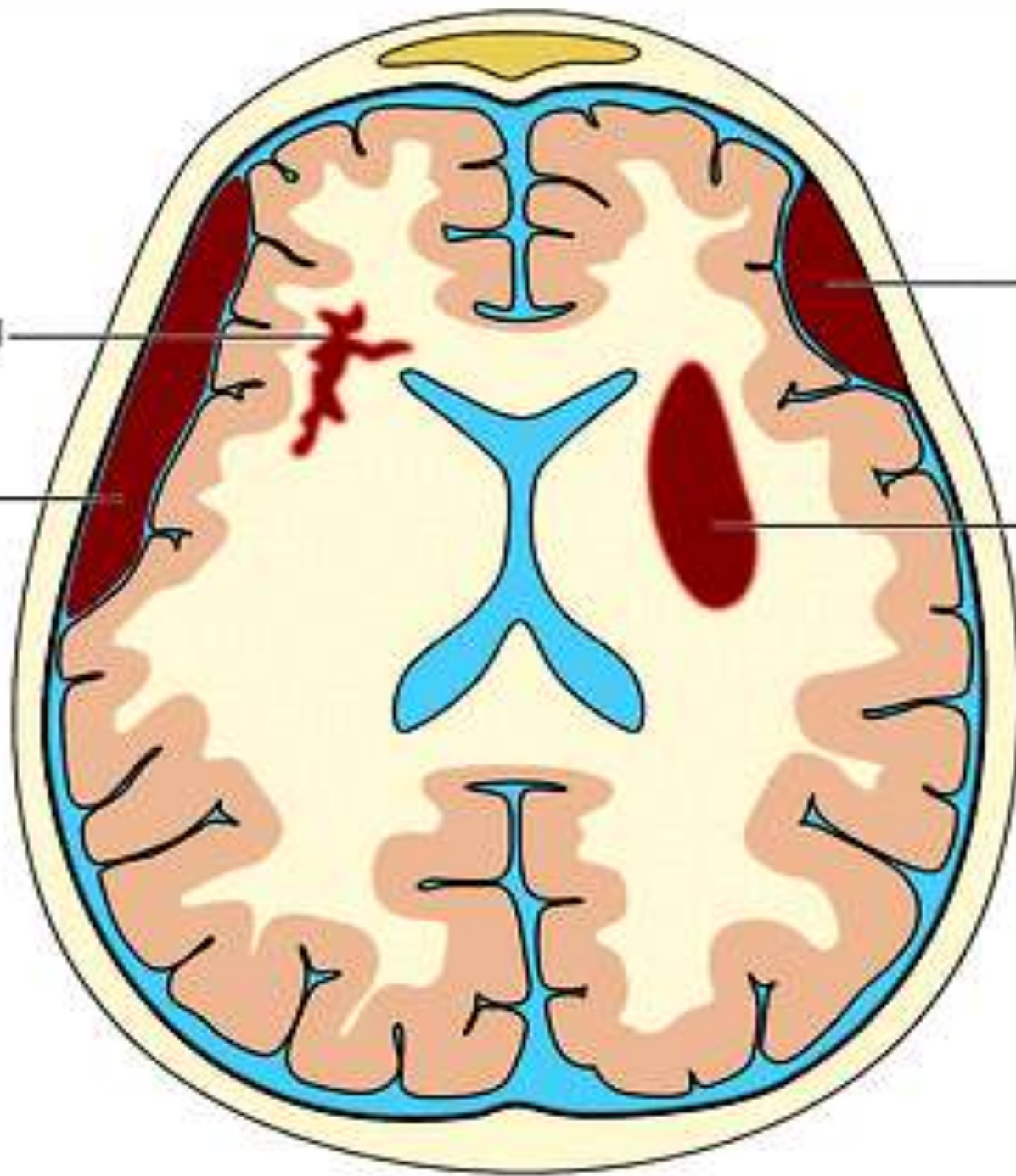


Subarachnoid
hemorrhage

Subdural
hemorrhage

Epidural
hemorrhage

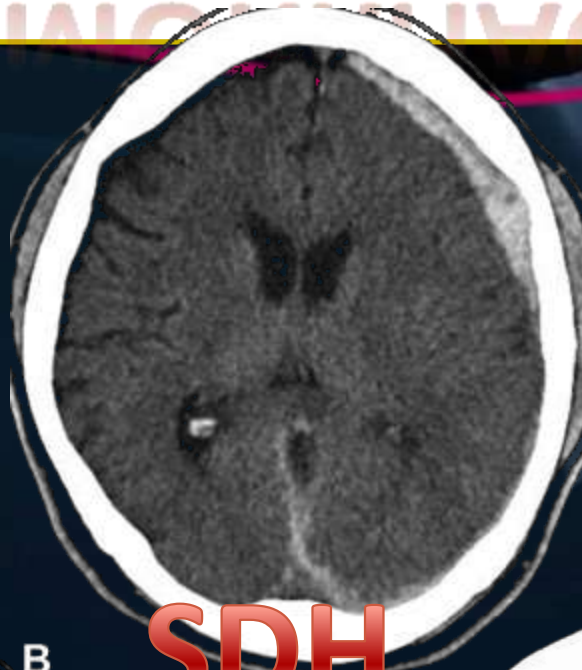
Intracerebral
hemorrhage



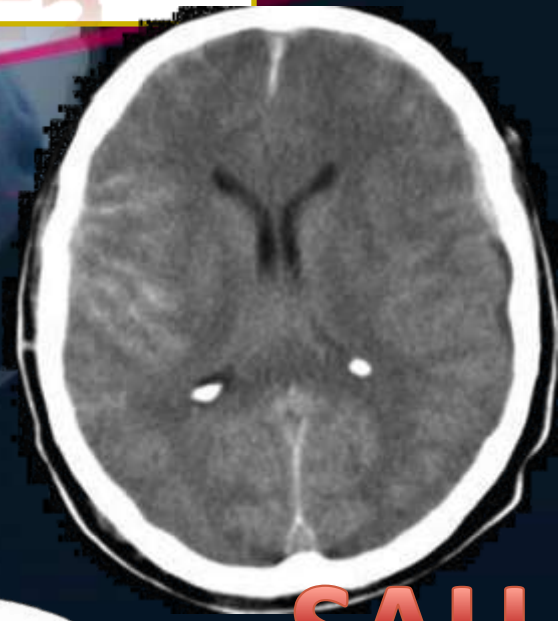
HEMORRHAGES



EDH



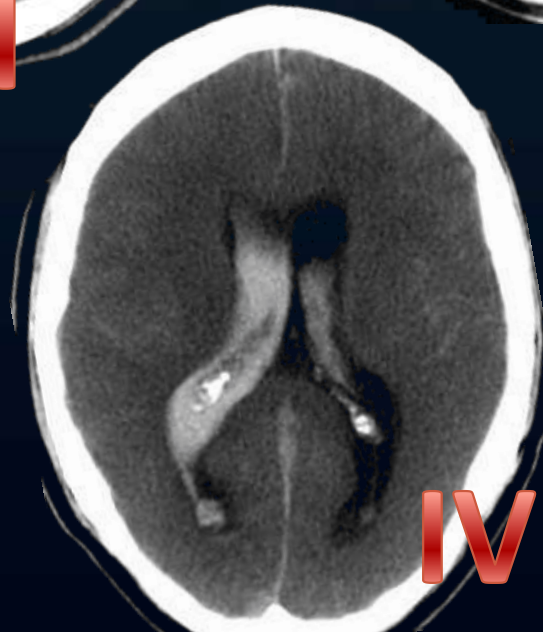
SDH



SAH



ICH



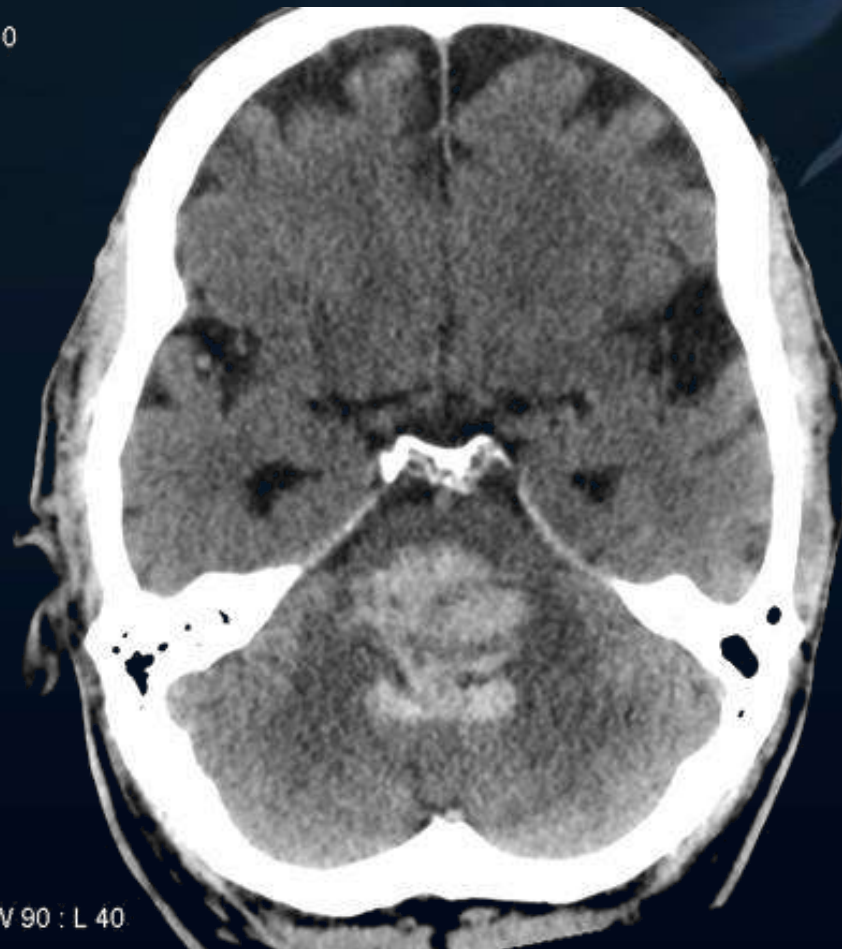
IVH

Cerebellar Hemorrhage

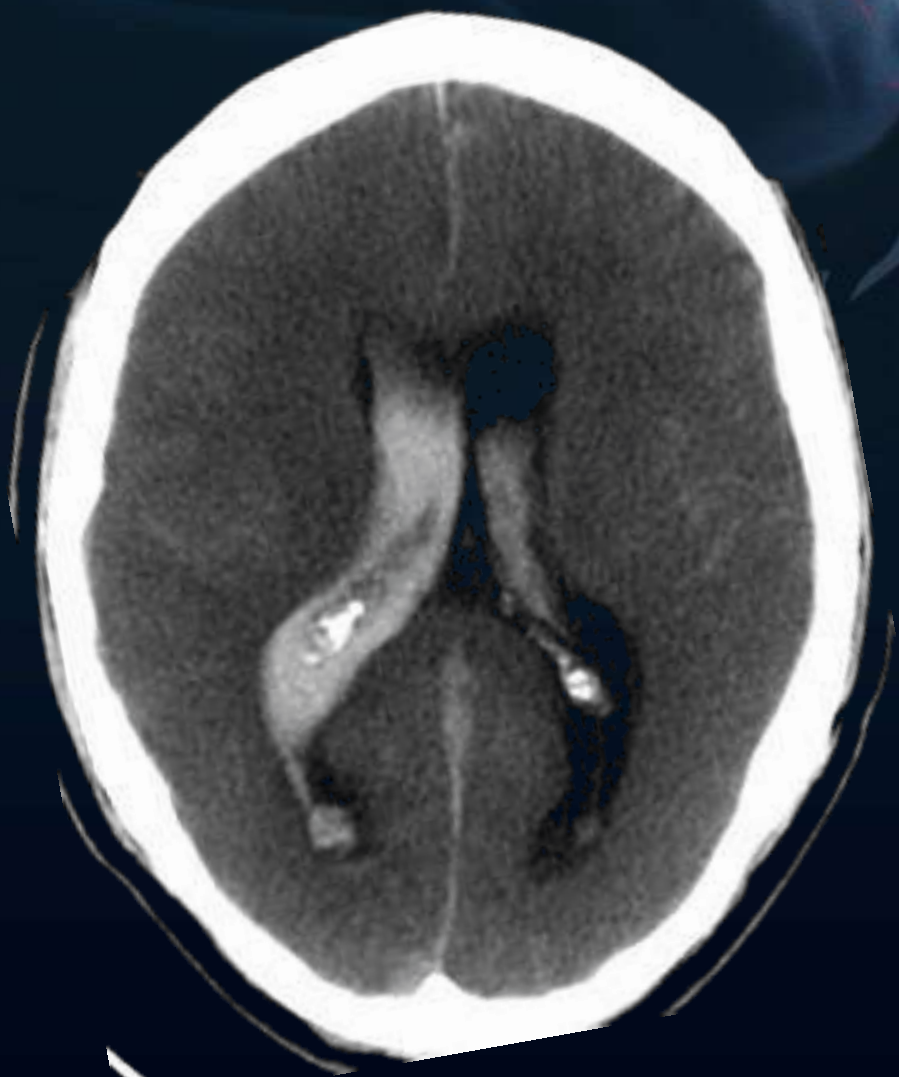


Brainstem Hemorrhage

10

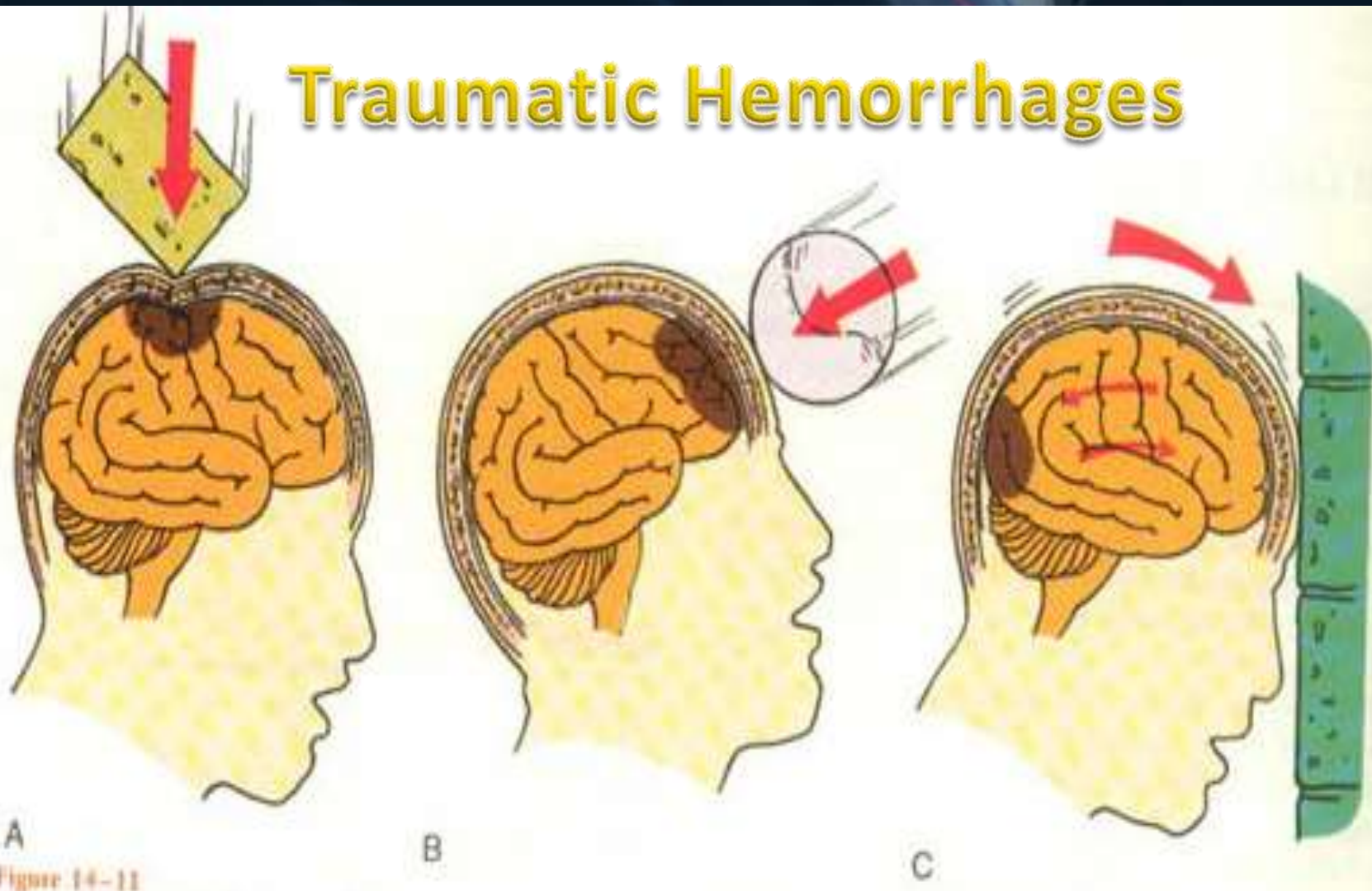


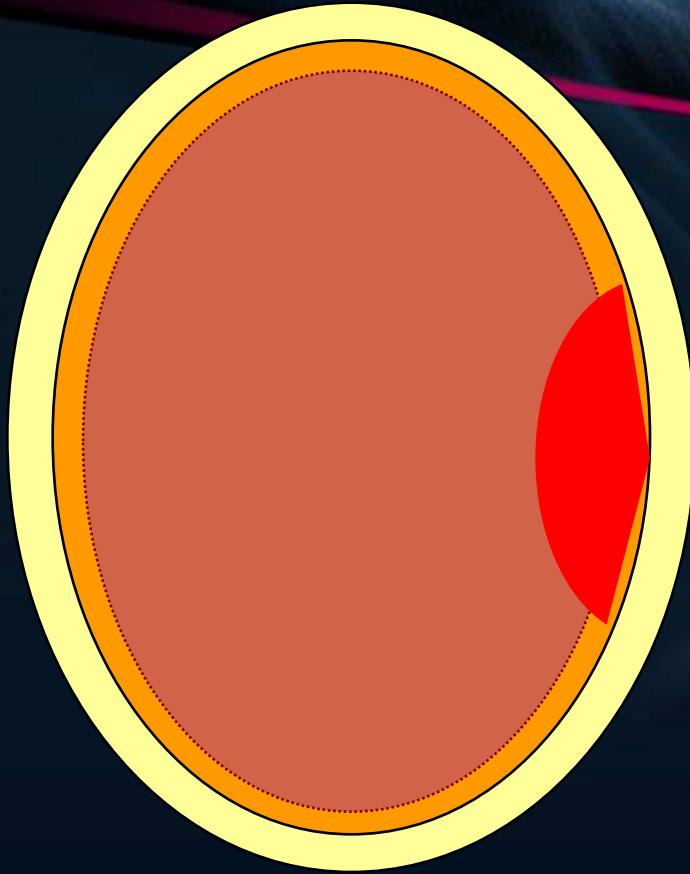
W 90 : L 40



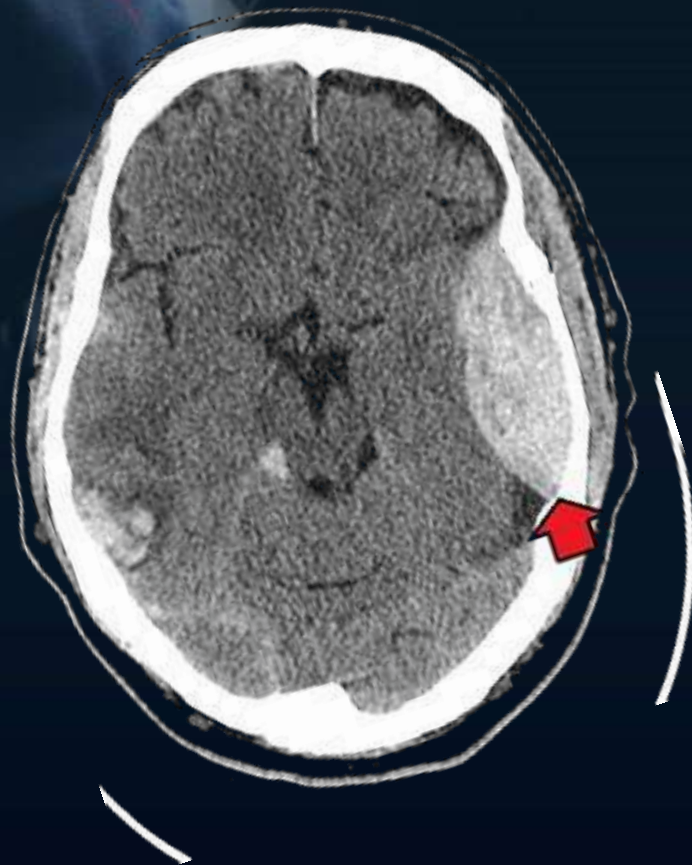
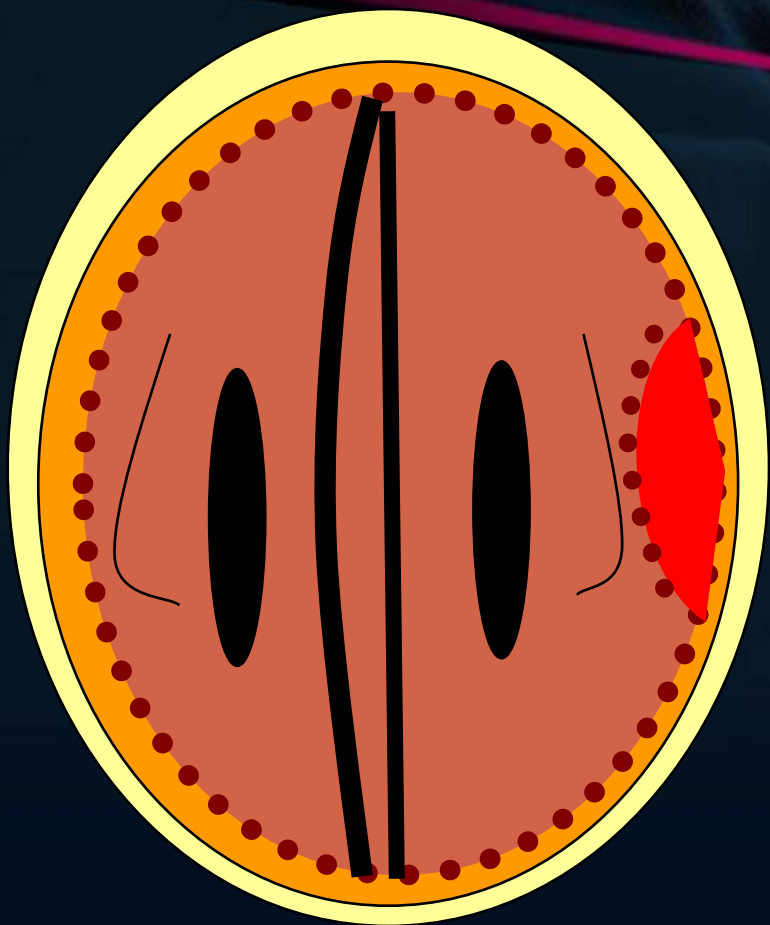


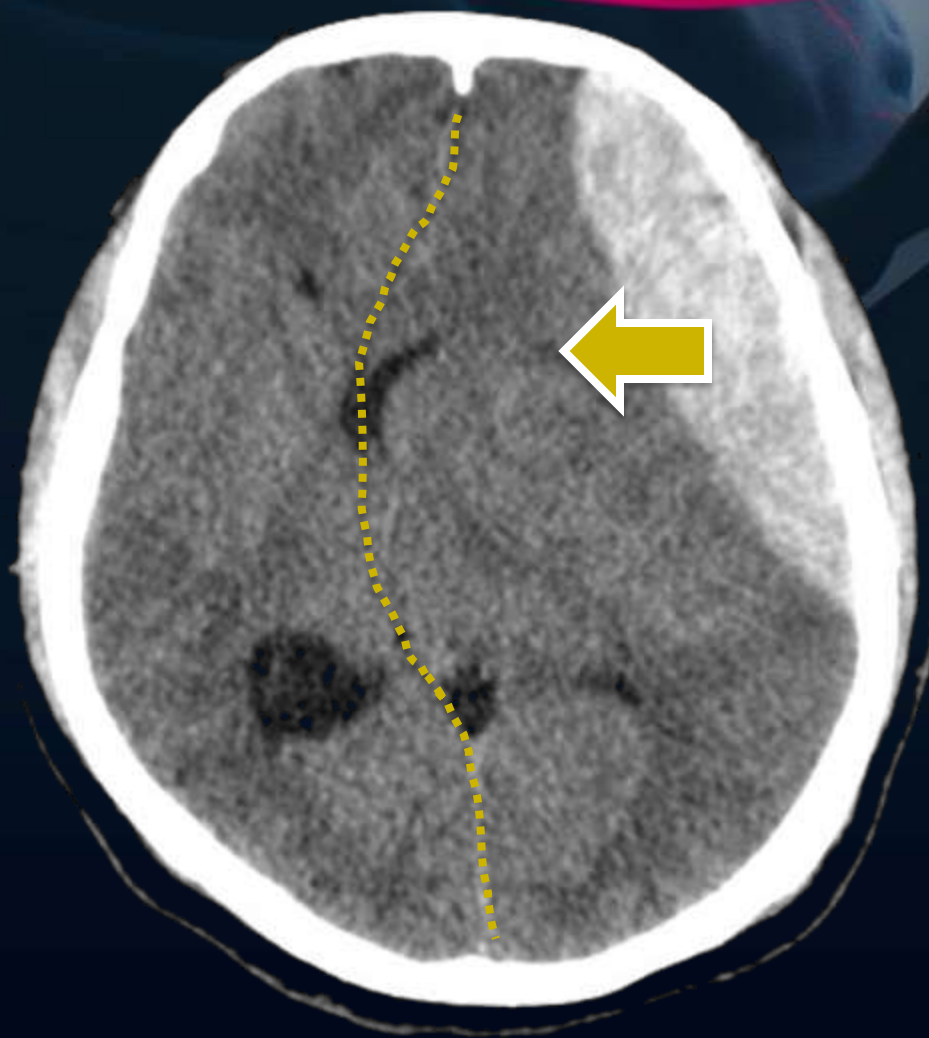
Traumatic Hemorrhages

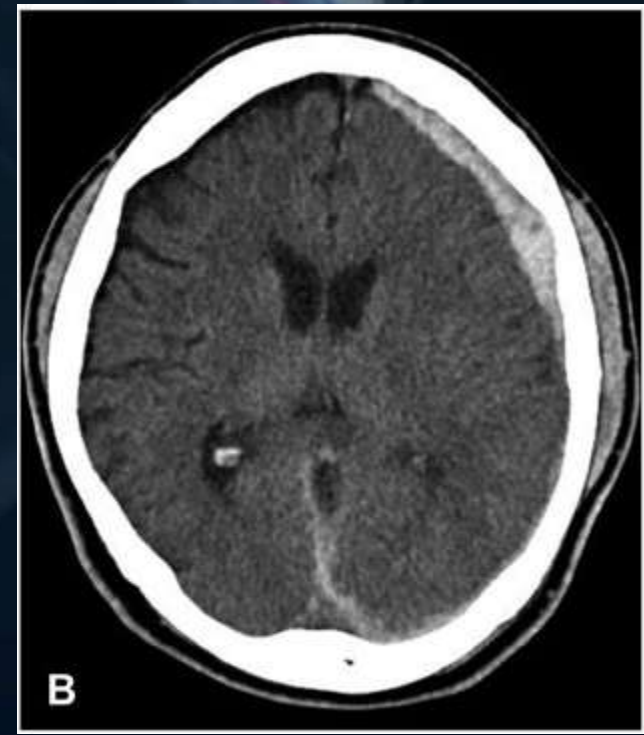
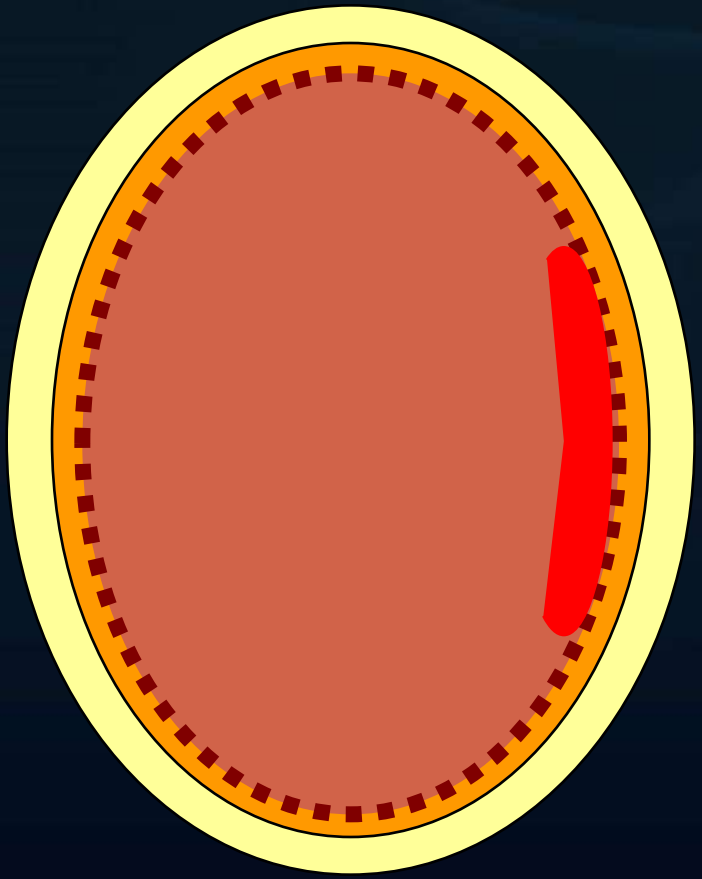




***Extra Dural
or
EpiDural***



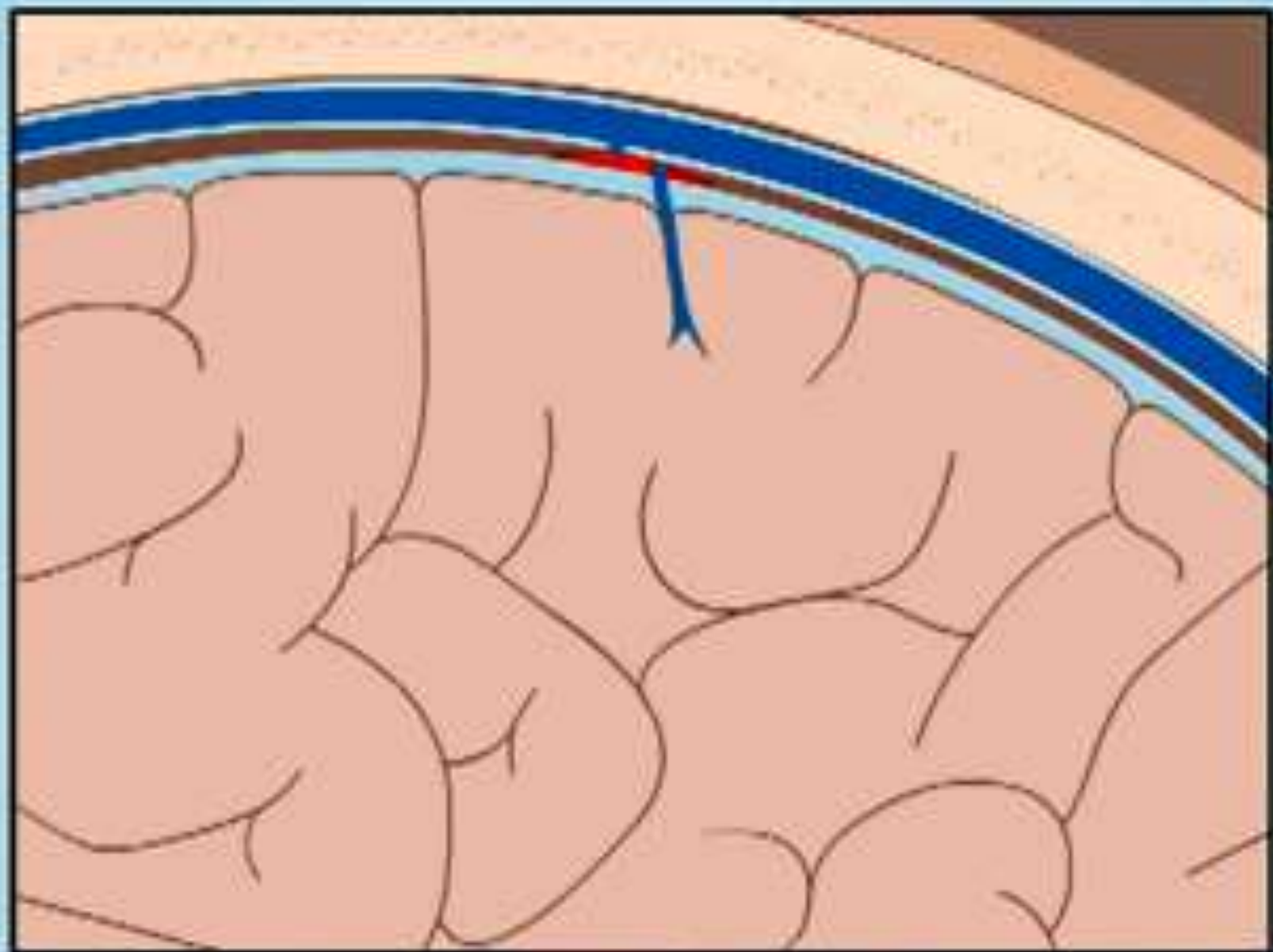




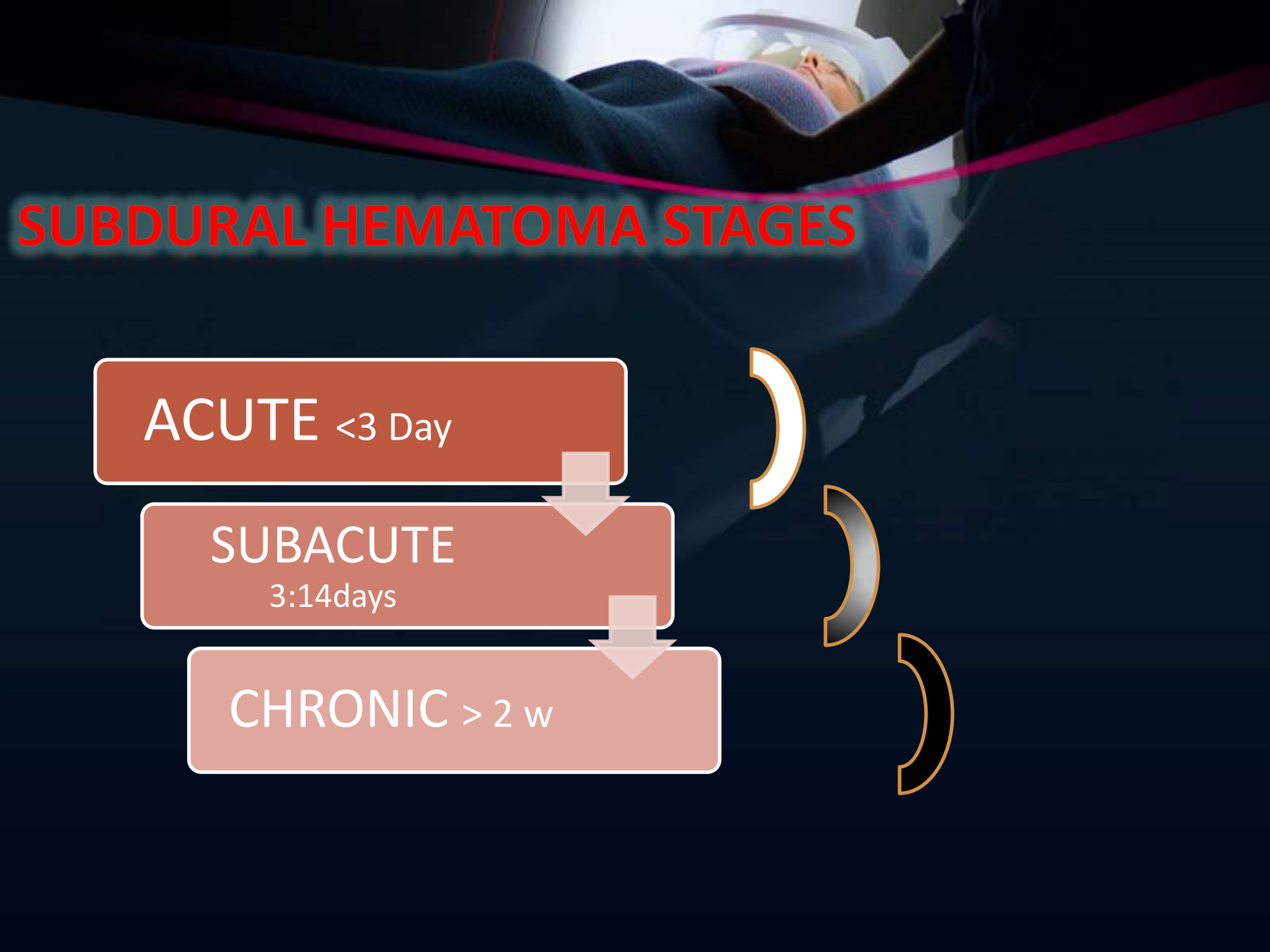
Sub Dural



Home



[Home](#)



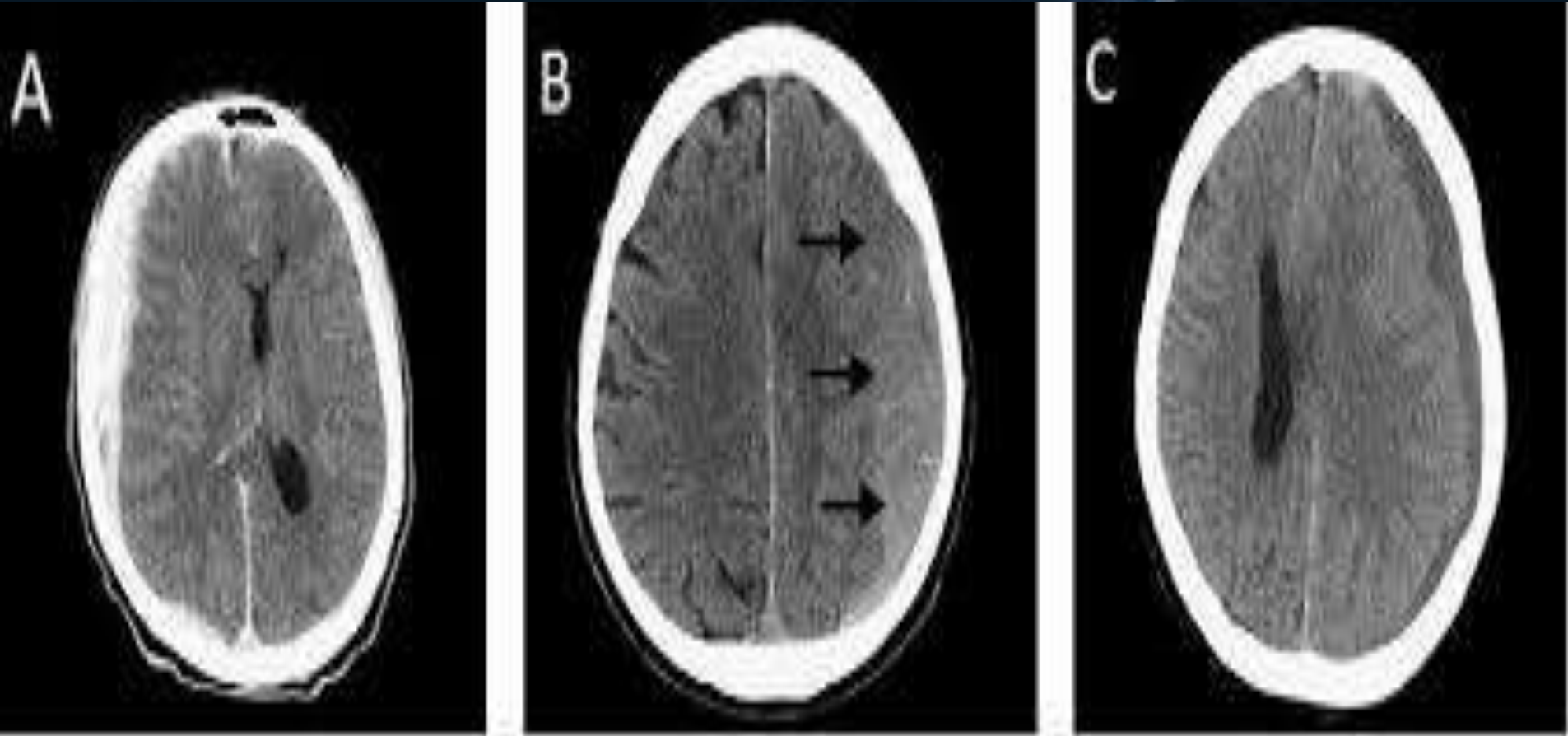
SUBDURAL HEMATOMA STAGES

ACUTE <3 Day

SUBACUTE
3:14days

CHRONIC > 2 w

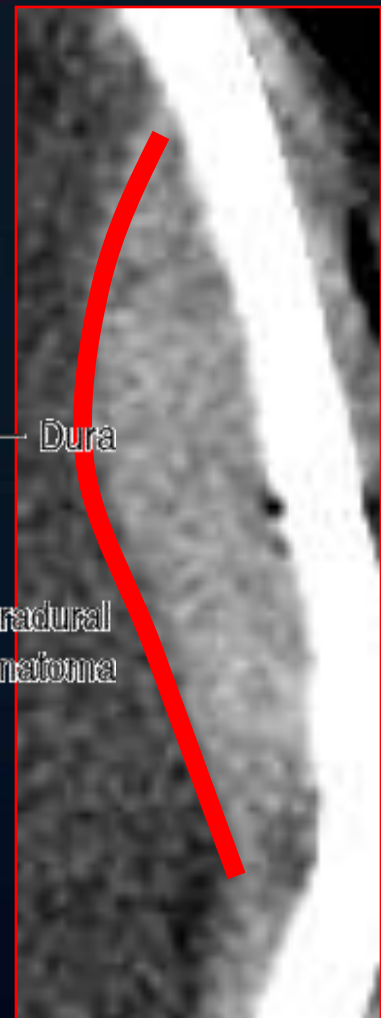
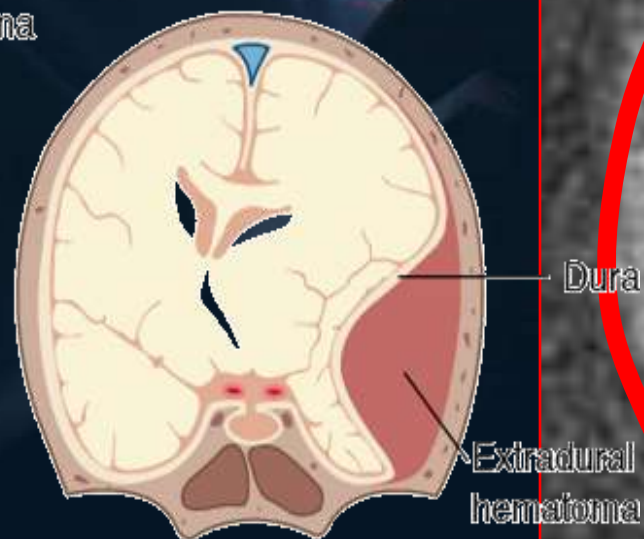
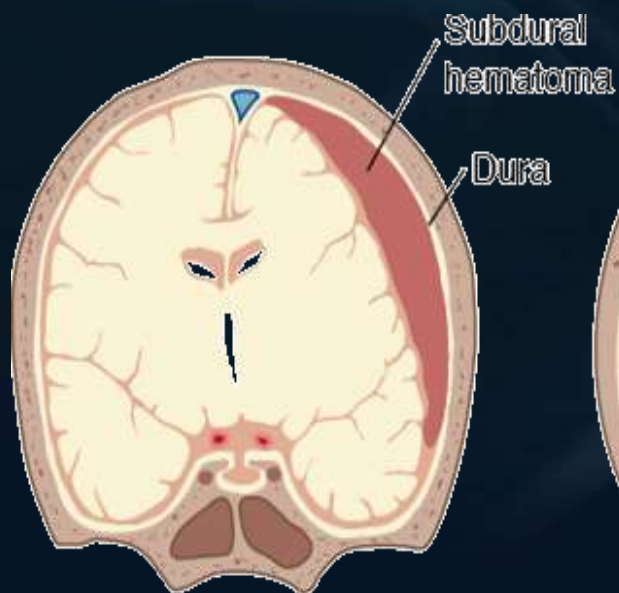
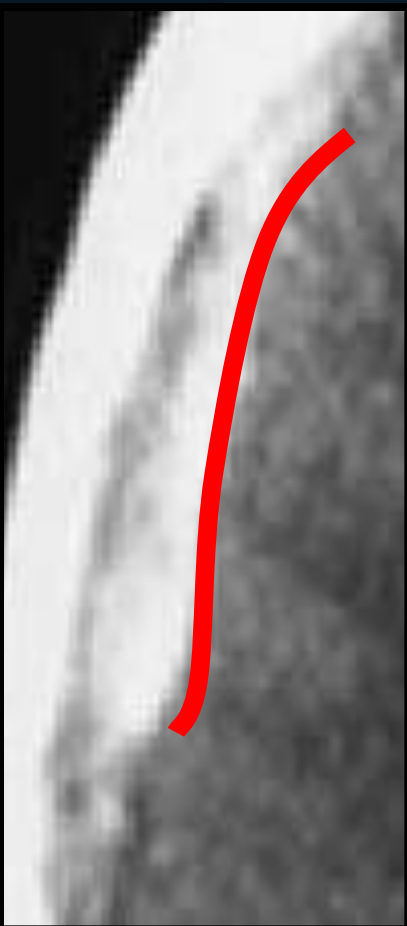




SUB

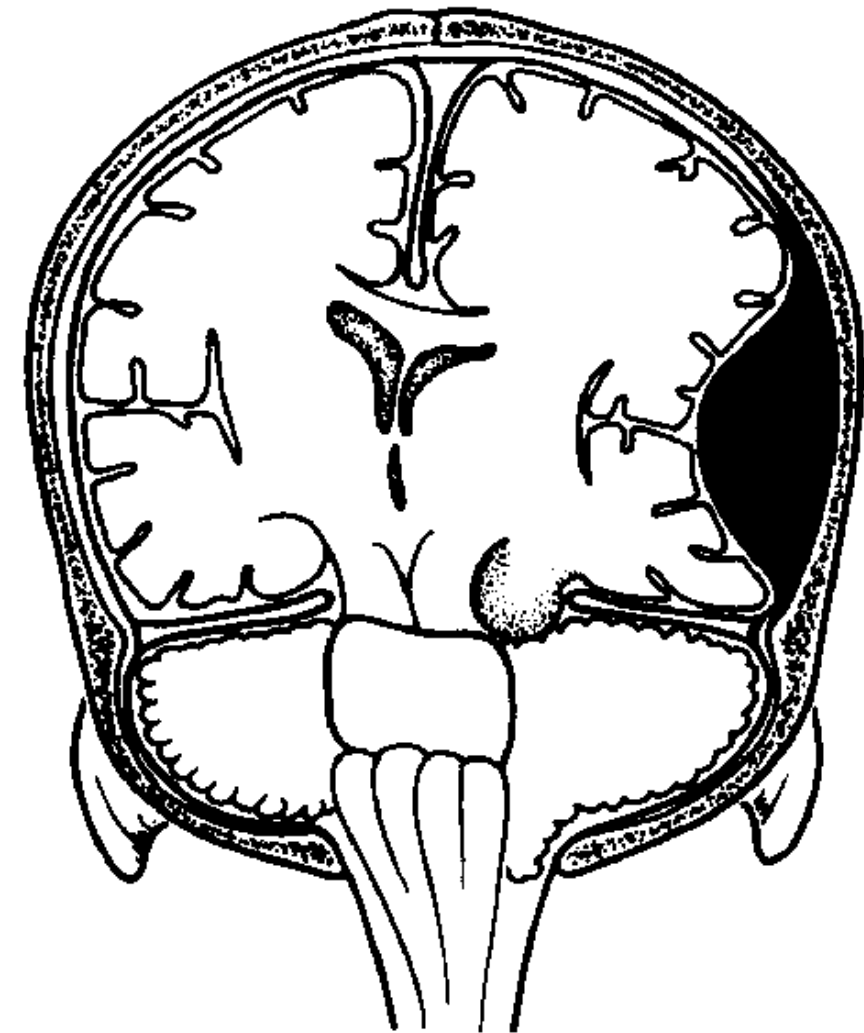
OR

EXTRA ?

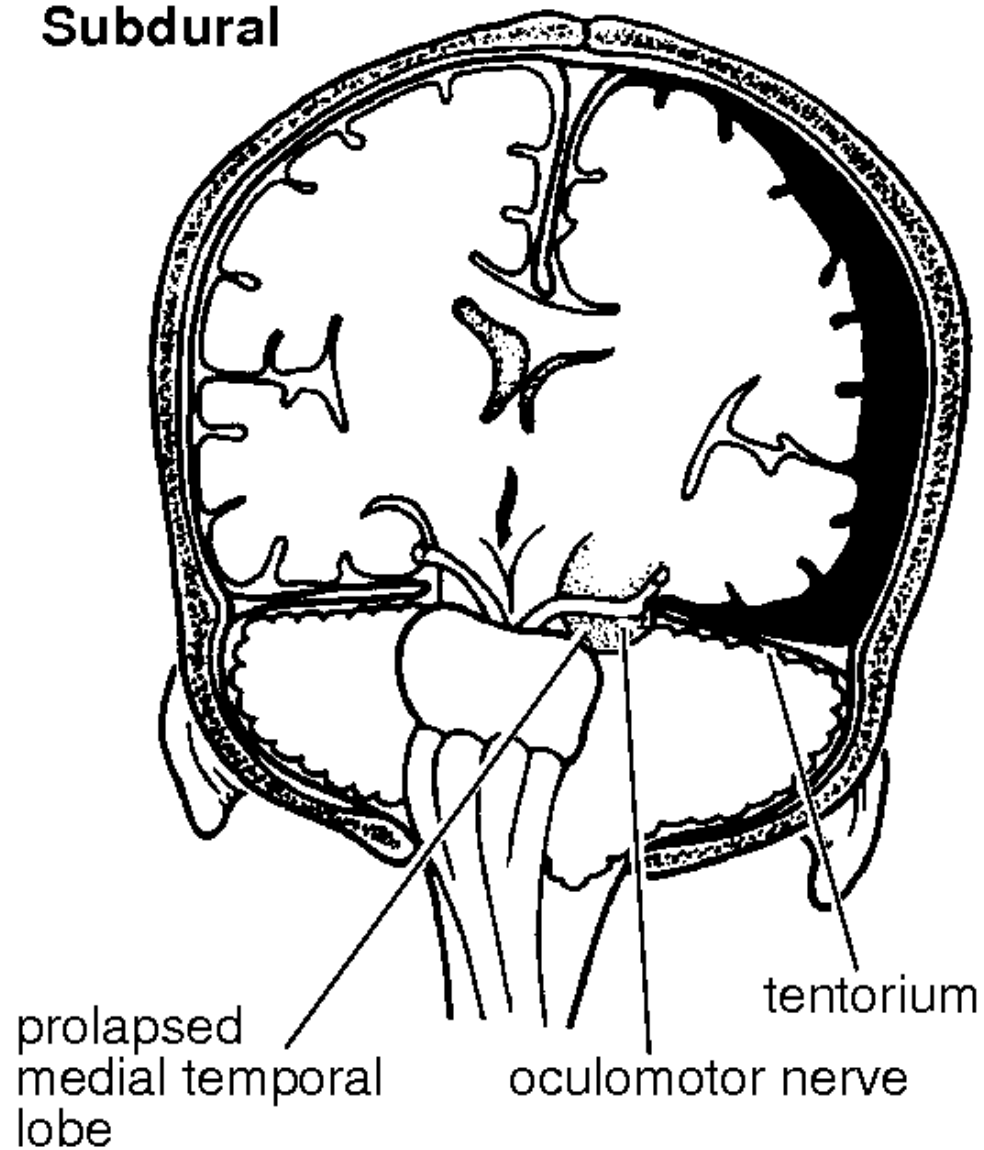


INTRACRANIAL HAEMORRHAGE

Extradural



Subdural



A patient is lying in a hospital bed, wearing a clear oxygen mask over their nose and mouth. A blue blanket is pulled up to their chest. Overlaid on the lower half of the image is a diagram of a brain cross-section. The diagram shows a yellow vertical line representing the midline. Two red curved arrows originate from the top of the brain, one pointing left and one pointing right, indicating the spread of fluid. Dashed orange lines follow the inner curve of the brain, representing the subdural space. The text 'Extradural H. Can Cross medline' is positioned to the right of the diagram, and 'Subdural H. Can Cross Suture' is positioned to the left.

**Extradural H.
Can Cross medline**

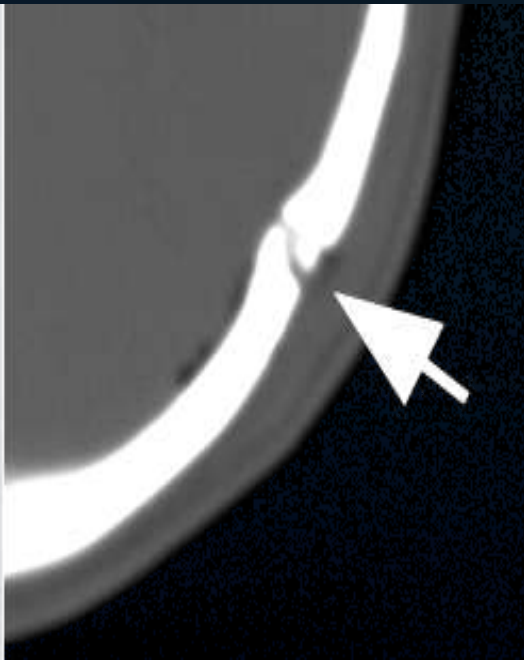
**Subdural H.
Can Cross Suture**



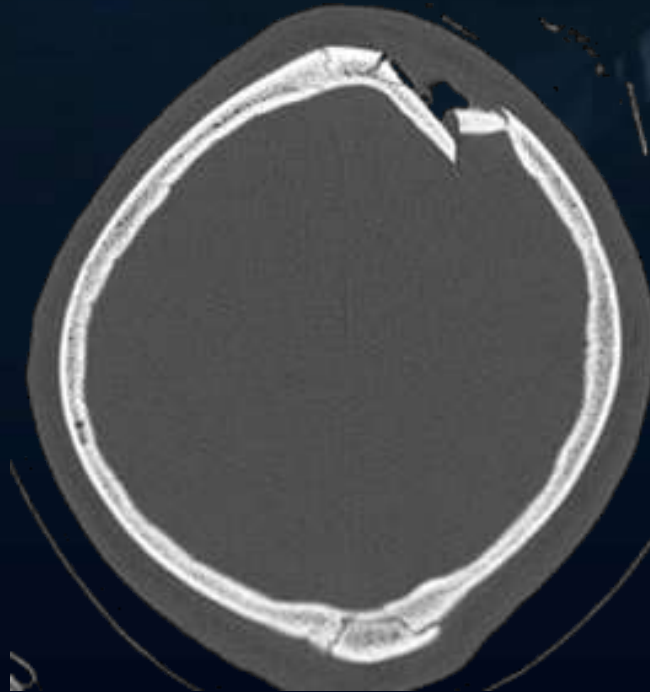
Subarachnoid Haemorrhage

Skull Fractures

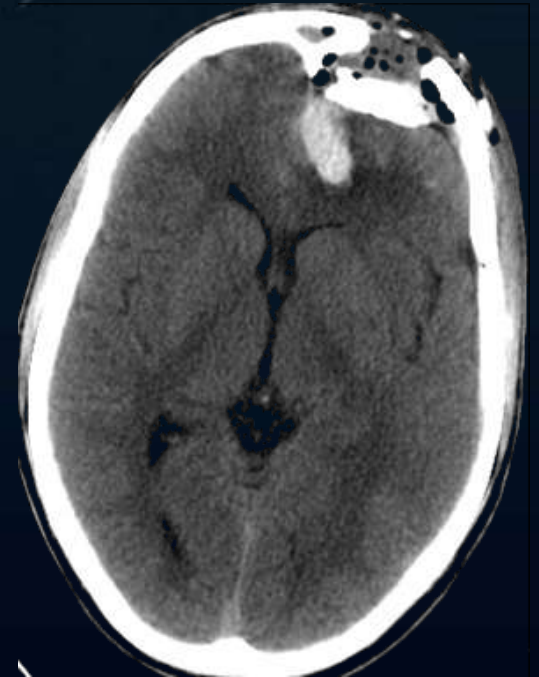
Fissure



Depressed

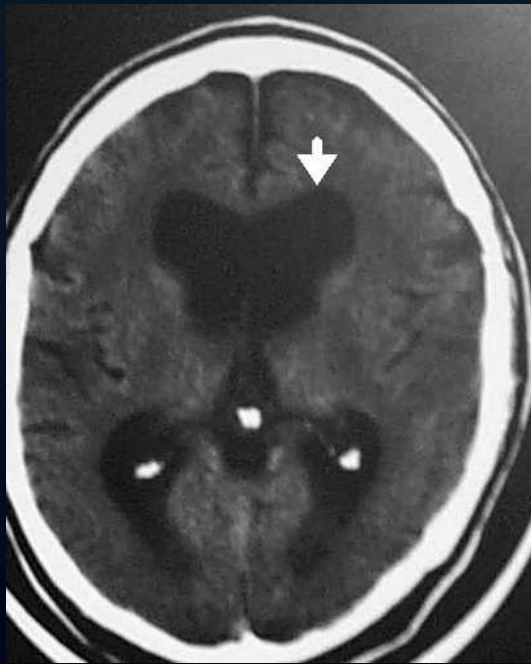


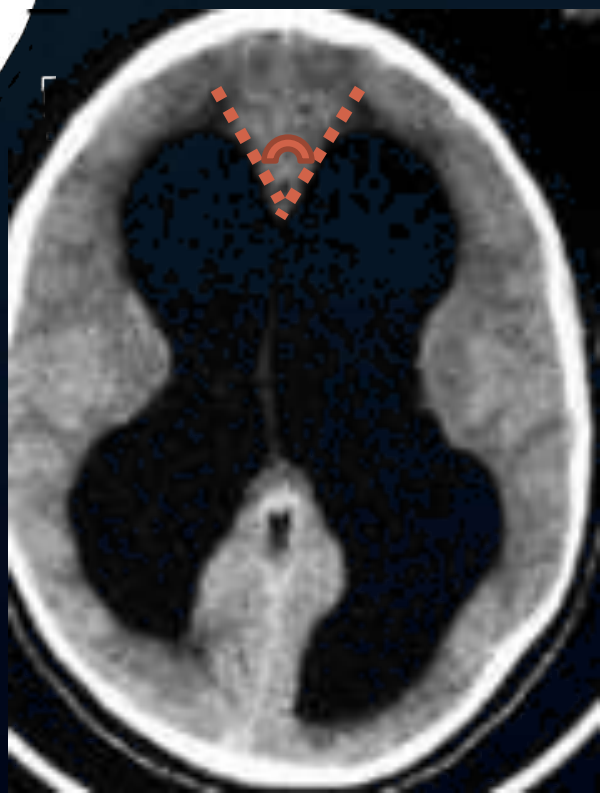
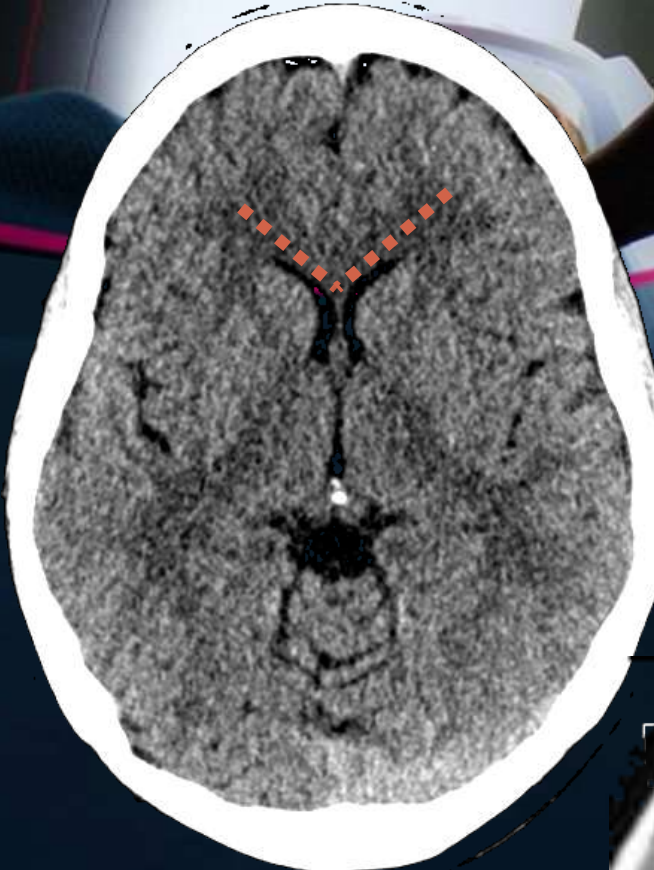
Comminuted



Hydrocephalus

- Increase intra-ventricular pressure
- **Communicating & Non communicating**

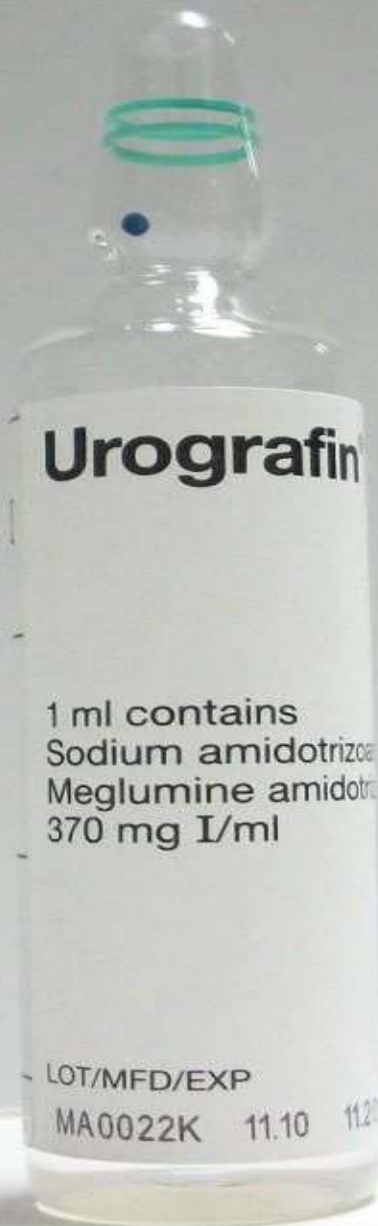




Basics of Enhanced CT



IODINE







Contraindications of Contrast Injection:

→ Absolute :

- Hypersensitivity

→ Relative :

- Thyrotoxicosis ← contains Iodine
- Renal Failure
- Diabetes Mellitus “treated by metformin”
- Multiple Myeloma

Patterns of contrast enhancing :



Non enhancing

ENHANCING



HOMO

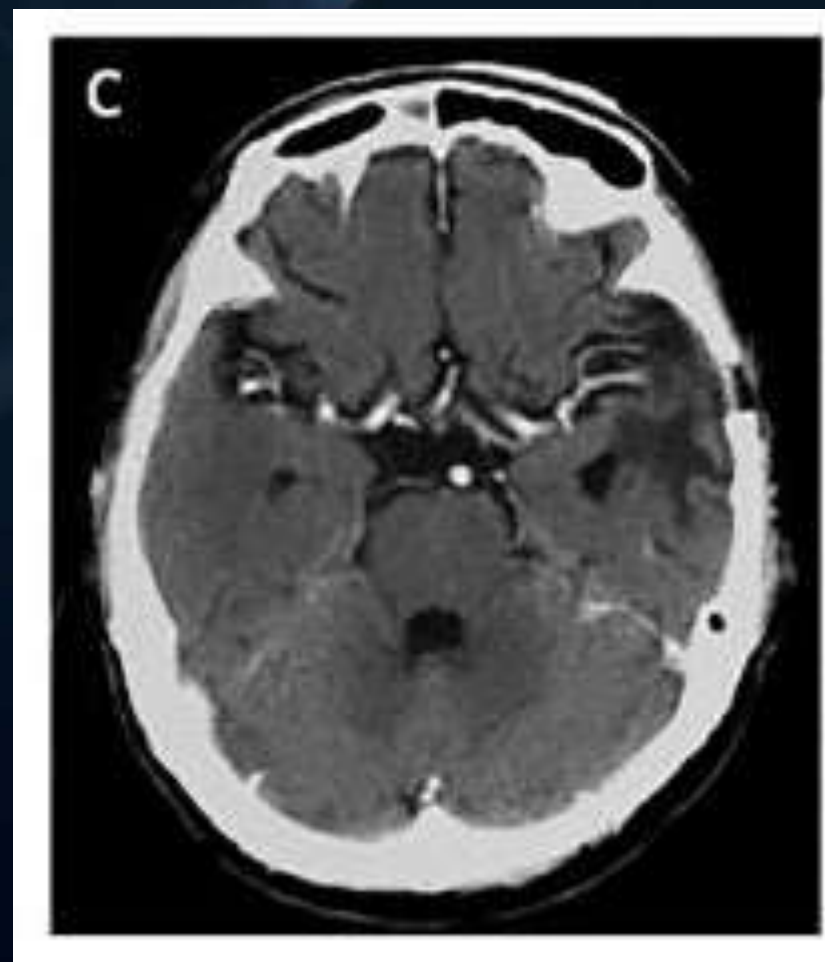
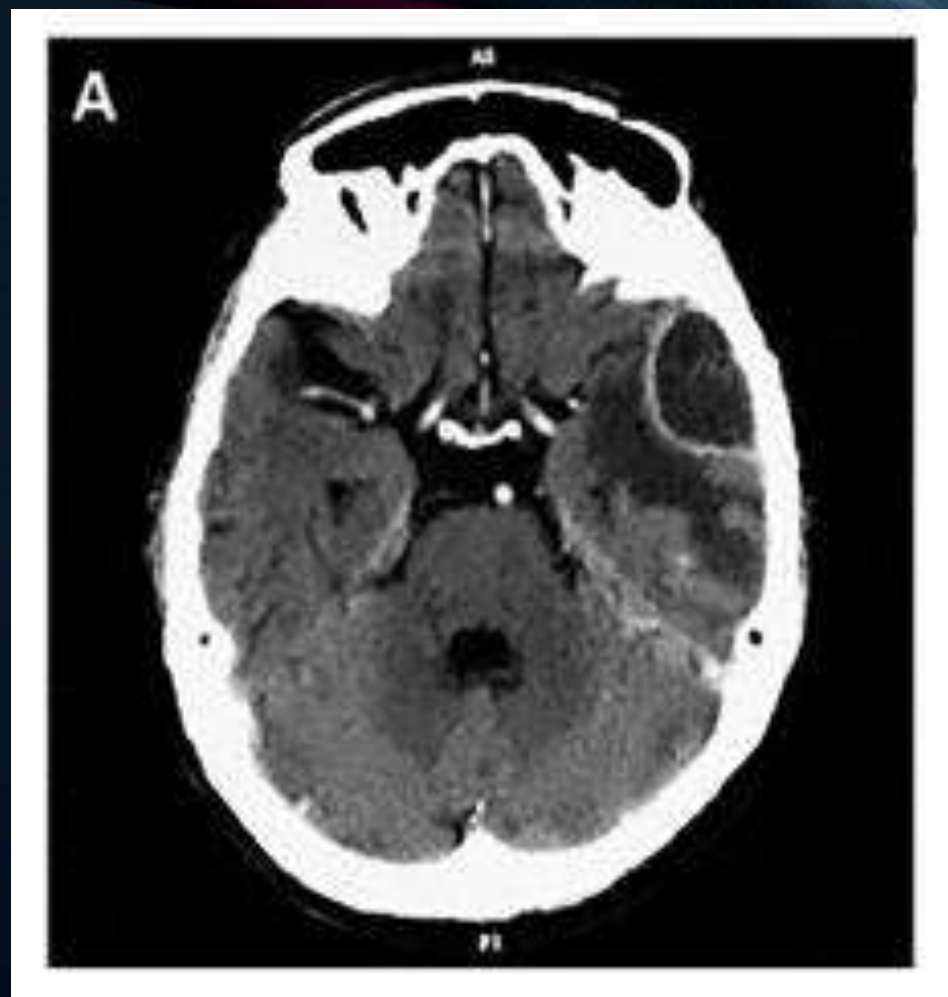
HETERO

Uniform

Non Uniform

MARGINAL





A patient is lying in a medical scanner, likely for an MRI. A bright, circular contrast-enhancing lesion is visible on the patient's head, which is positioned inside the scanner's gantry. The patient is wearing a blue hospital gown. The background is dark, typical of a medical imaging suite.

Patterns of contrast enhancing :

- **Homogenous** : eg. Meningioma
- **Heterogenous** : Gliomas
- **Marginal “Ring”** :
 - **Uniform** : Abscess
 - **Non Uniform** : Glioblastoma
-
-

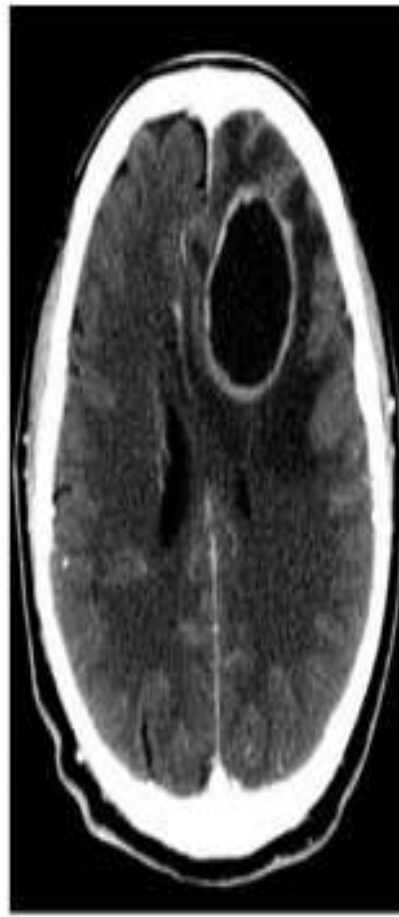
Glioma

Heterogeneous
Enhancement



Glioblastoma

Non Uniform
Ring Enhancement



Abscess

Uniform Ring
Enhancement

Meningioma

Homogeneous
Enhancement



SUMMARY







! CAUTION

X-RAY IN USE

**If you are pregnant or
unsure, notify staff
immediately.**

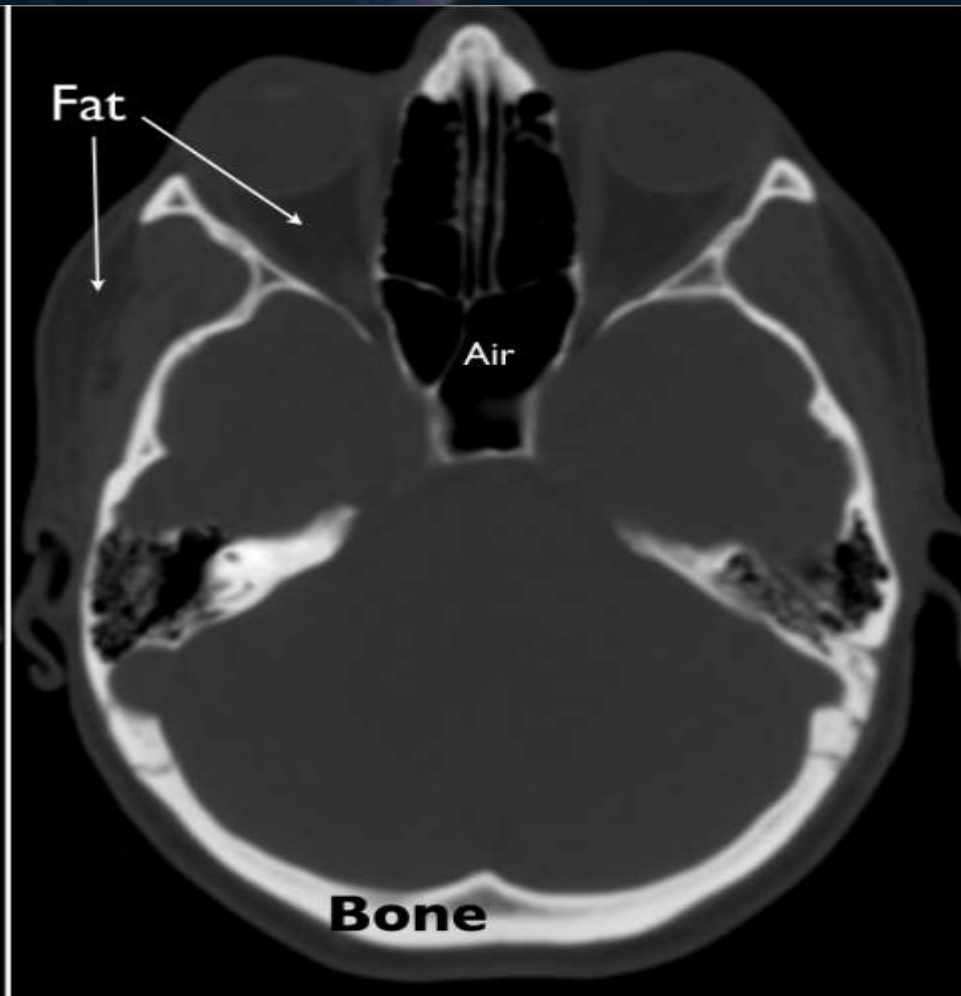
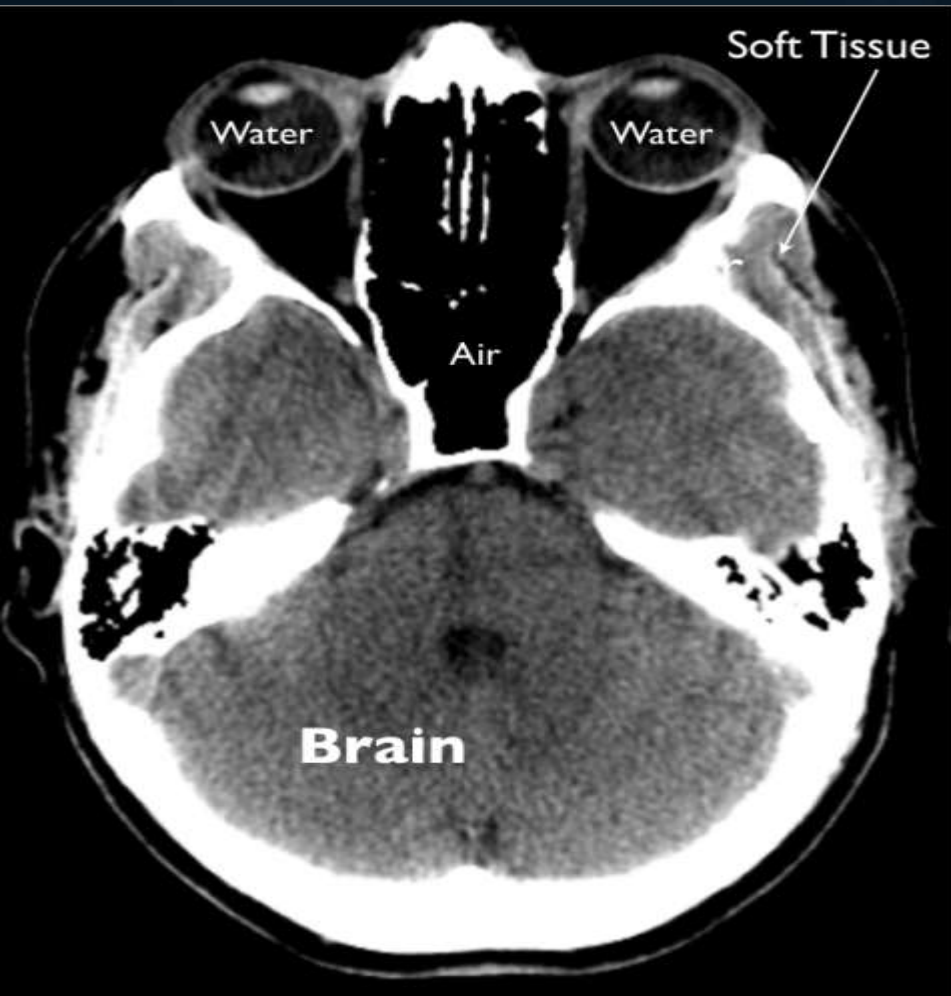




Brain window

Vs

Bone window



Any Radiological Image Always

as if Patient facing us

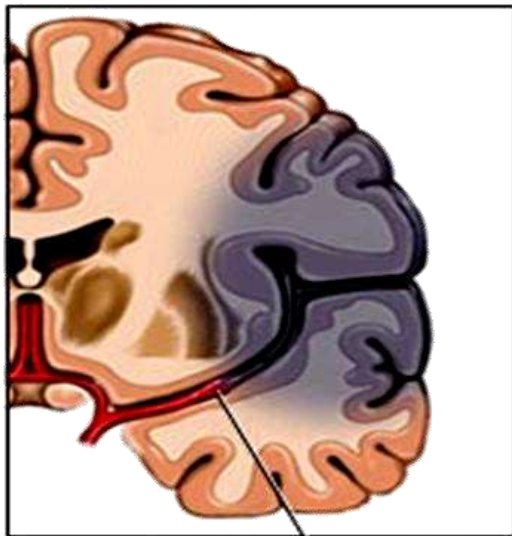
i.e. Lt side of the image , on our Rt side .



STROKE

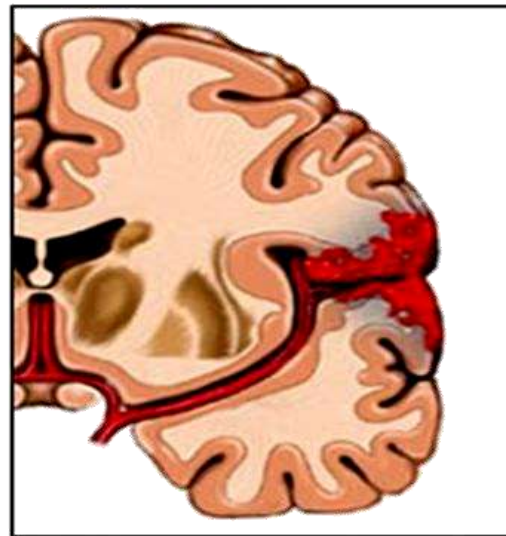
2 major types of Stroke

Ischemic stroke

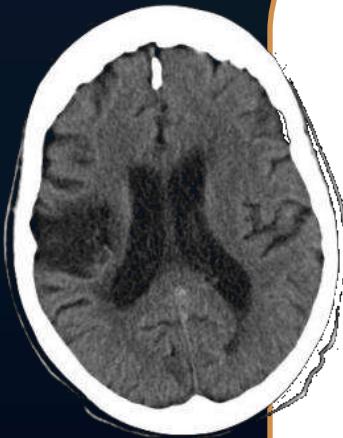


A clot blocks blood flow to an area of the brain

Hemorrhagic stroke



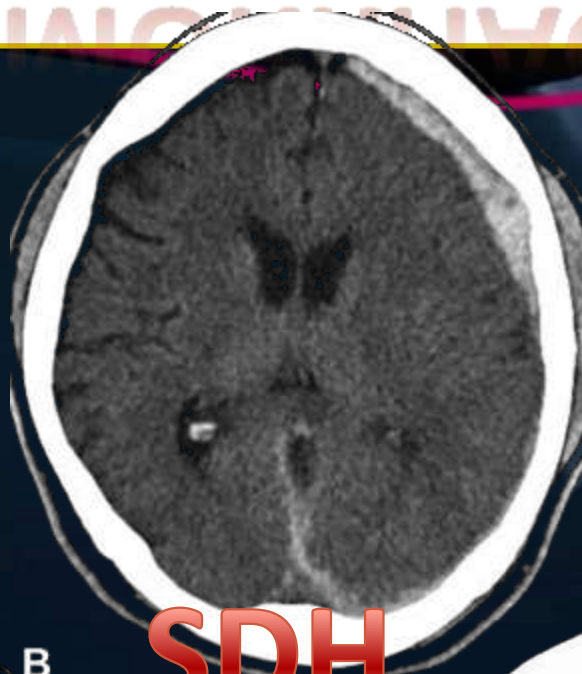
Bleeding occurs inside or around brain tissue



HEMORRHAGES



EDH



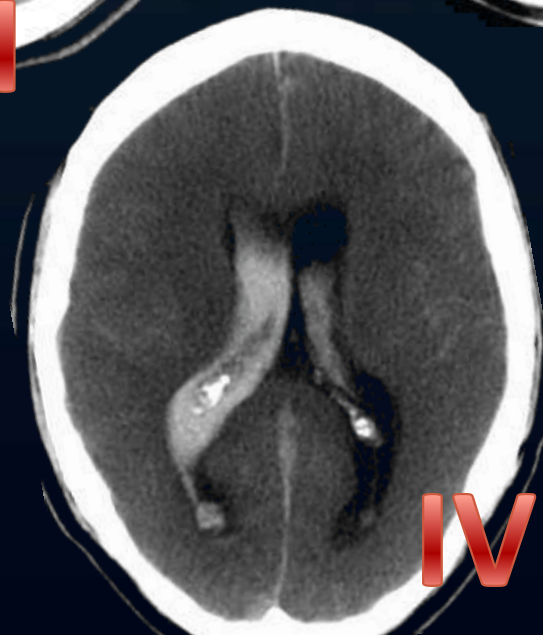
SDH



SAH



ICH

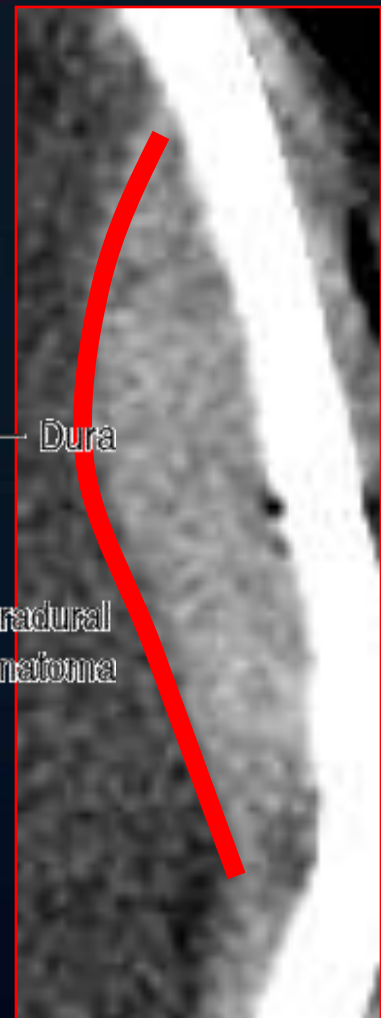
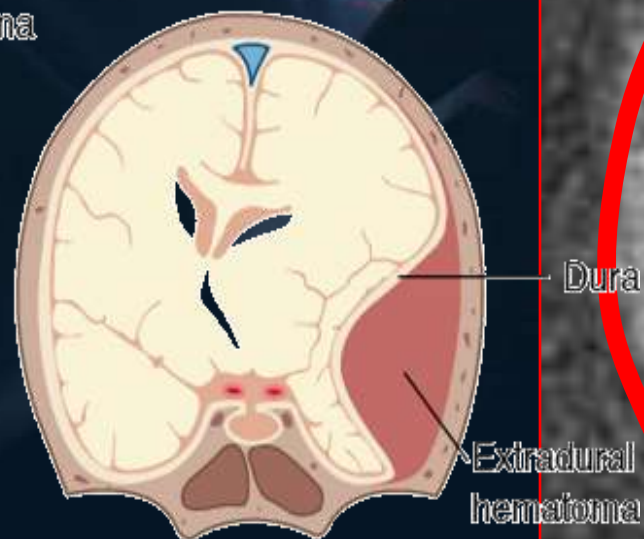
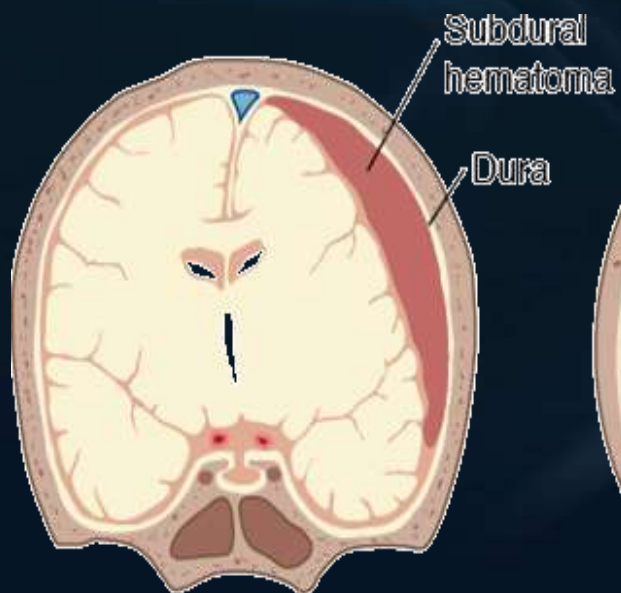
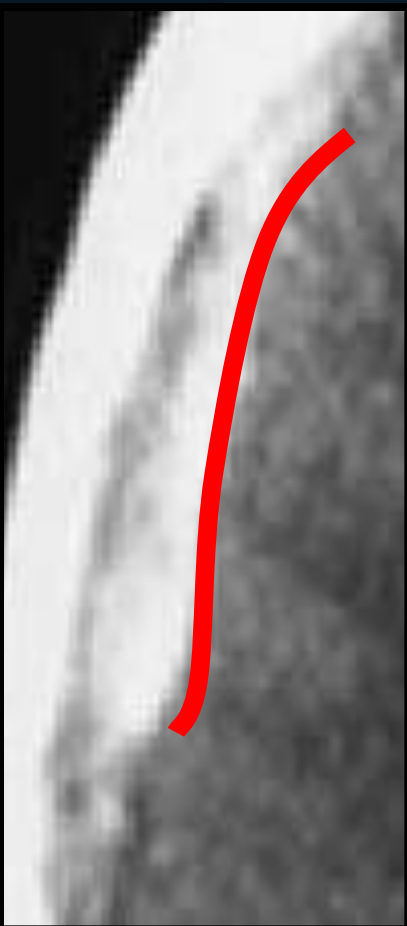


IVH

SUB

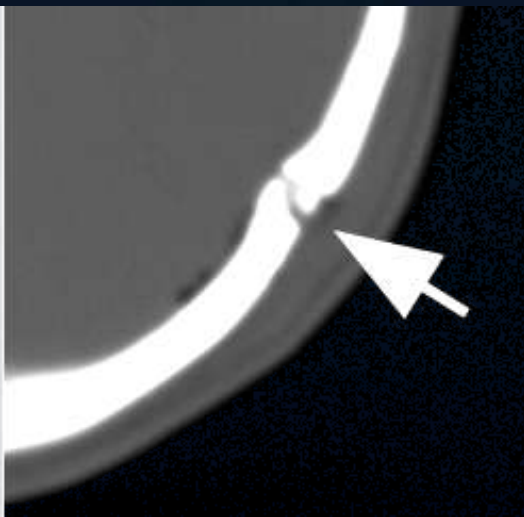
OR

EXTRA ?

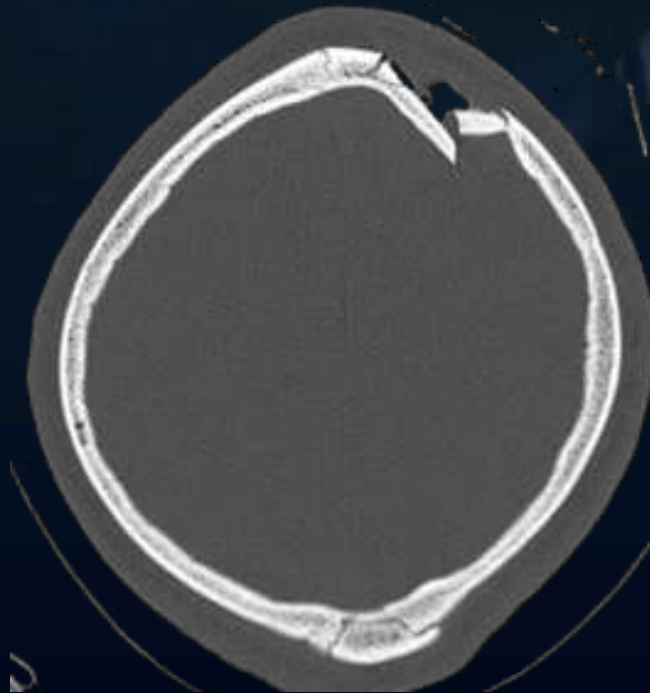


Skull Fractures

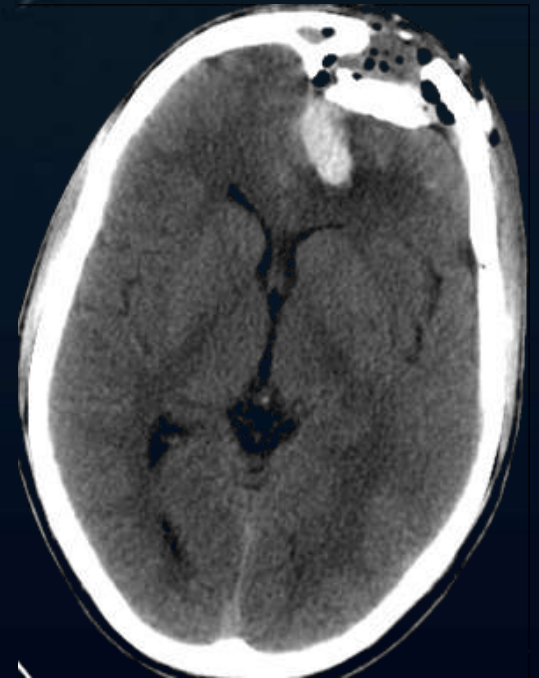
Fissure

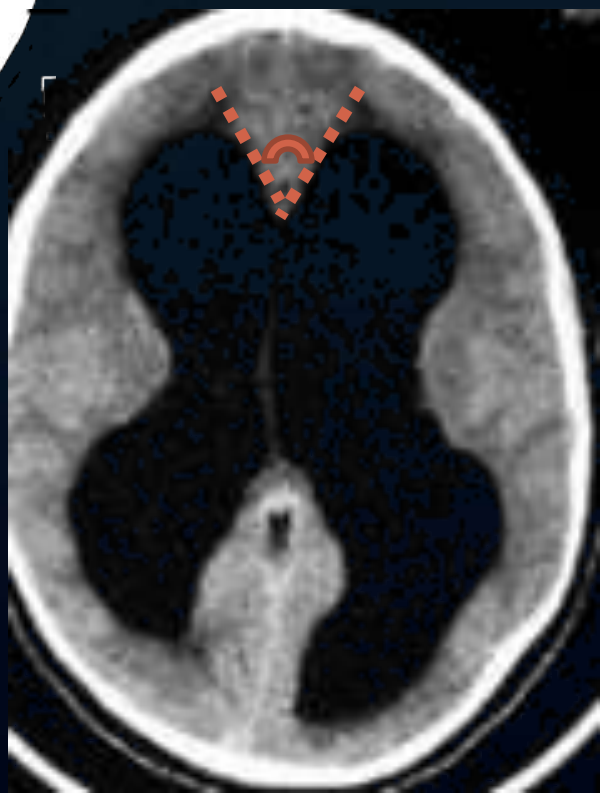
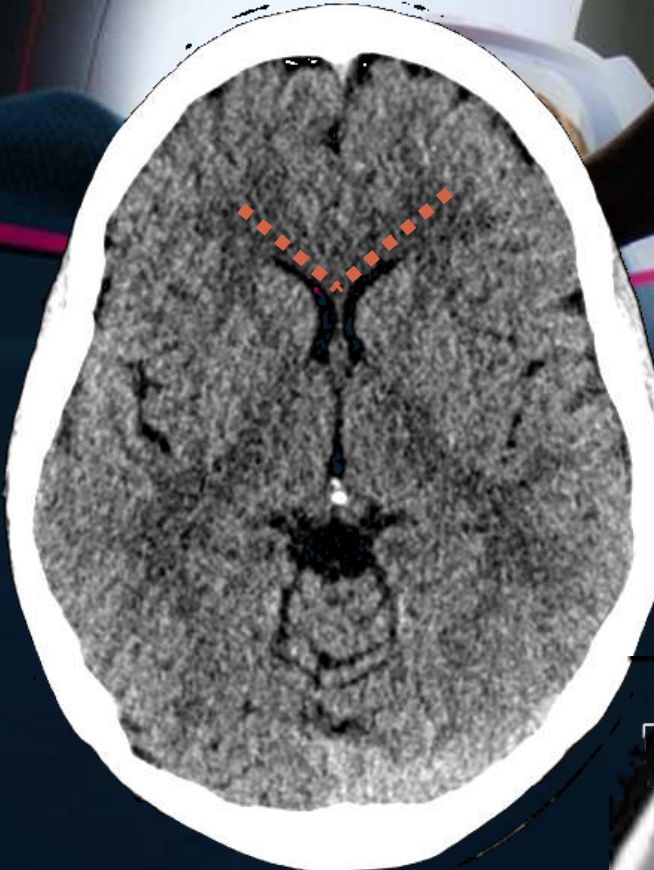


Depressed



Comminuted





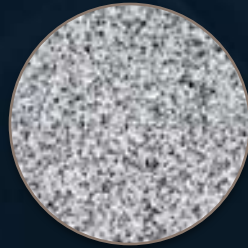
A patient is lying in a CT scanner, positioned horizontally. A bright red laser line is projected across the patient's body, likely for alignment purposes. The patient is wearing a blue hospital gown. The background is dark, and the lighting is focused on the patient and the laser line.

C E CT
Is Mandatory

BRAIN TUMORS
DIAGNOSIS or Follow up

Patterns of contrast enhancing :

Non enhancing



ENHANCING



HOMO

HETERO

Uniform

Non Uniform

MARGINAL



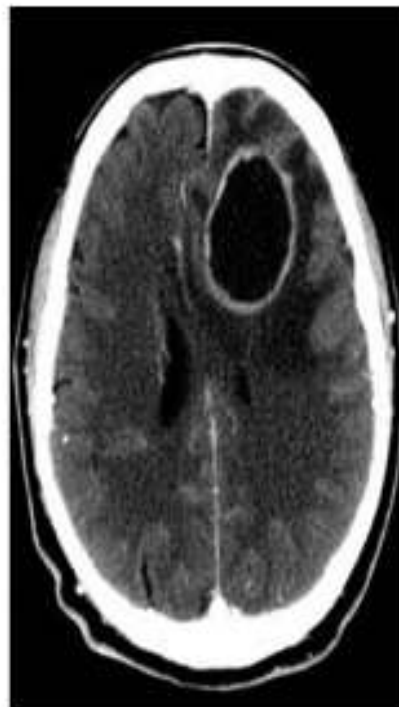
Glioma

Heterogeneous
Enhancement



Glioblastoma

Non Uniform
Ring Enhancement



Abscess

Uniform Ring
Enhancement

Meningioma

Homogeneous
Enhancement





Emergency CT Brain Lecture – Video

<https://www.youtube.com/watch?v=TBP5Pj URzQ&t=90s>

CT Brain – Round Video

<https://www.youtube.com/watch?v=2k8QCAuixjI&t=710s>

Thank You

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May 2022
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