

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ



Lecture 1

CT BRAIN

Anatomy & Common Lesions

By

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Lecturer at Virtual Medical Academy – KSA

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Consultant of radiology - sohag Police Clinics & Military Hospital



CT

Invented By

- Dr. G. N.

Hounsfield

1971

Sir Godfrey Hounsfield

1919 - 2004

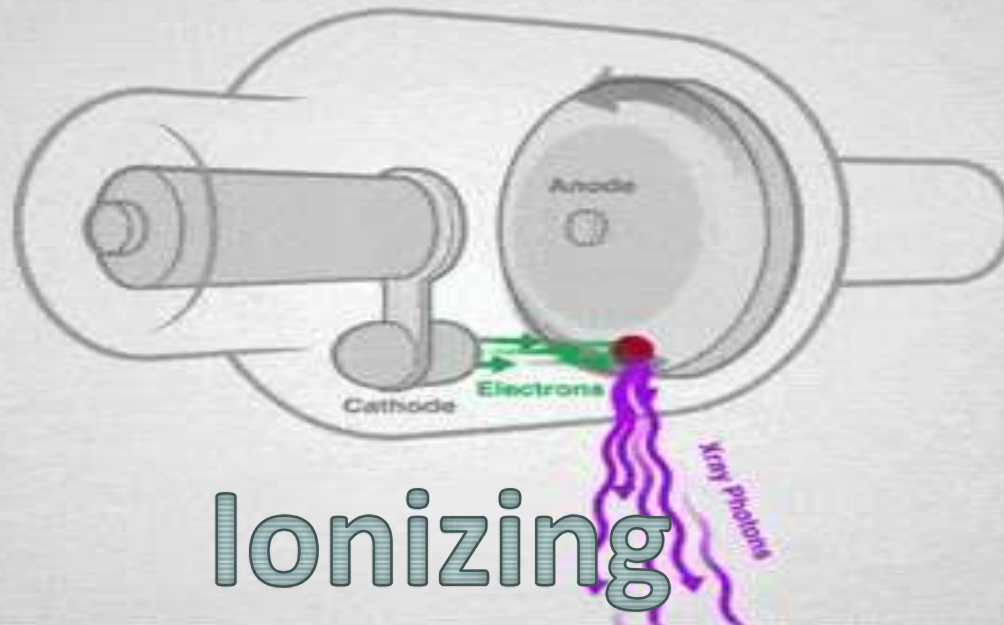
Won
Noble Prize

1979



CT Energy

X ray



Ionizing
Radiation



! CAUTION

X-RAY IN USE

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

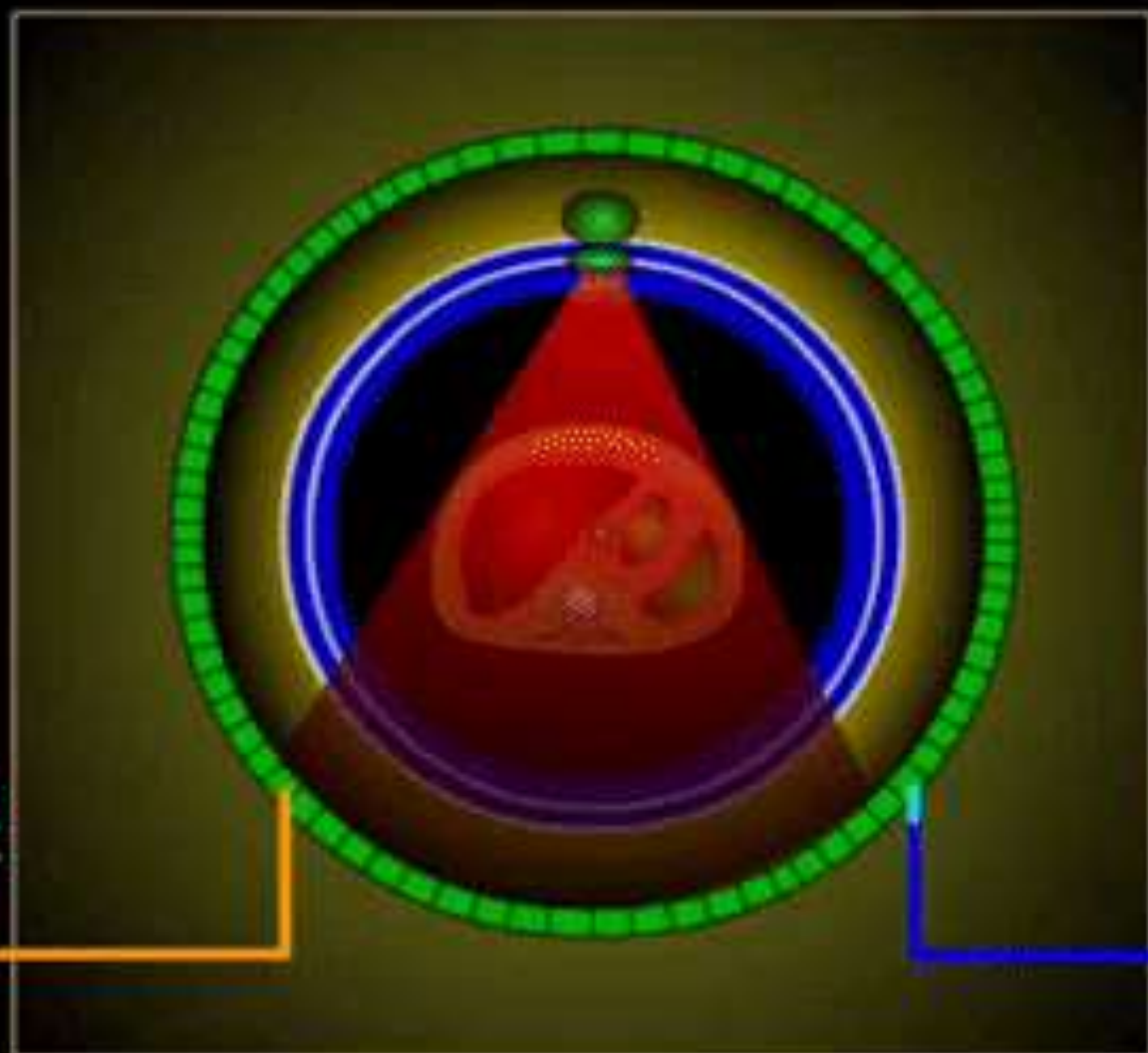








**POWER
SUPPLY**



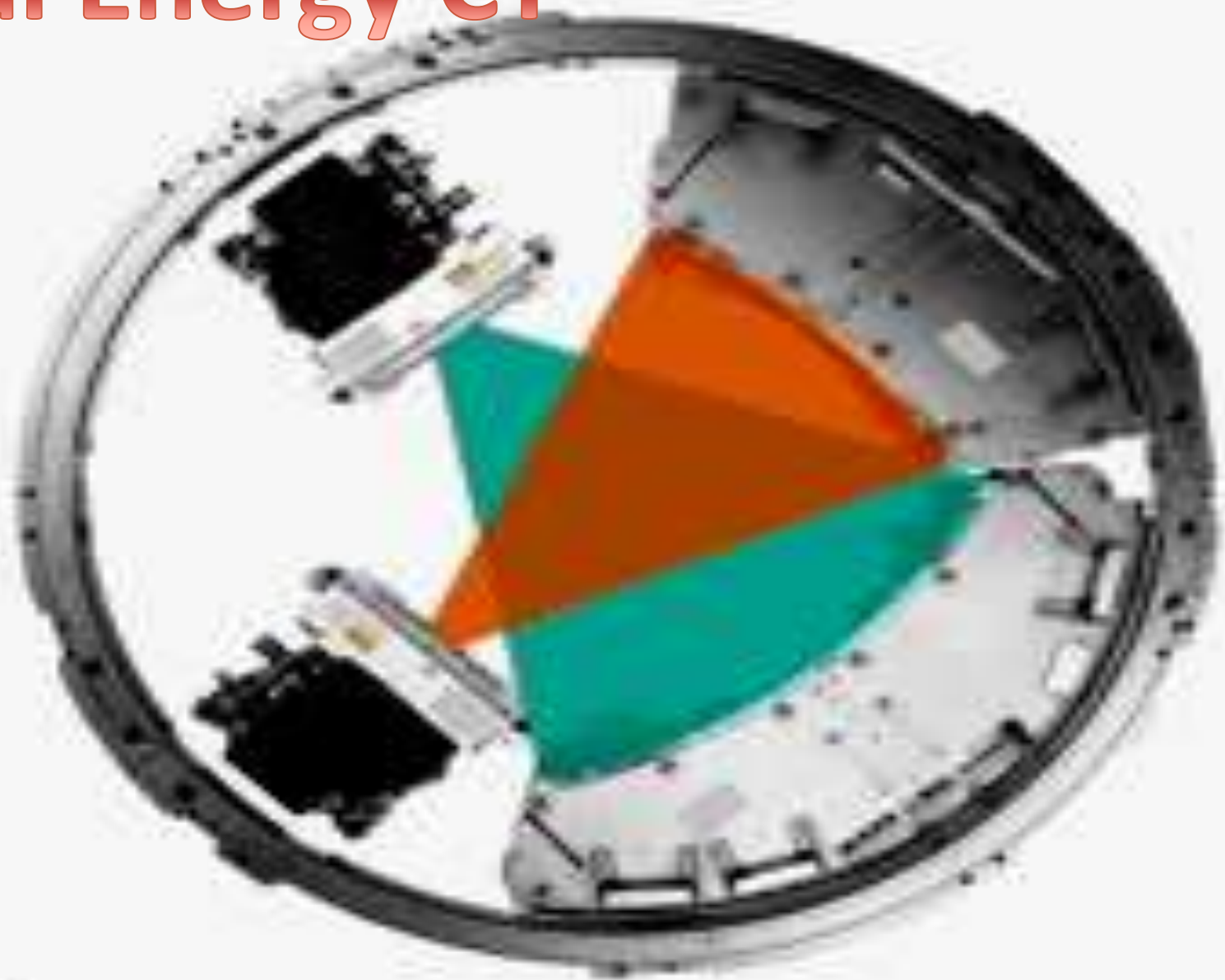
**OUTPUT
SIGNAL**

4th Generation

M. Mongkolsuk

11/04/2004

Dual Energy CT





PresenterMedia

Key Word

Density

• Iso

Hyper dense

Hyper

Dense

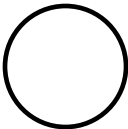
Hypo

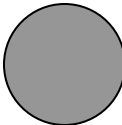
Hypo dense

HOUNSFIELD UNIT

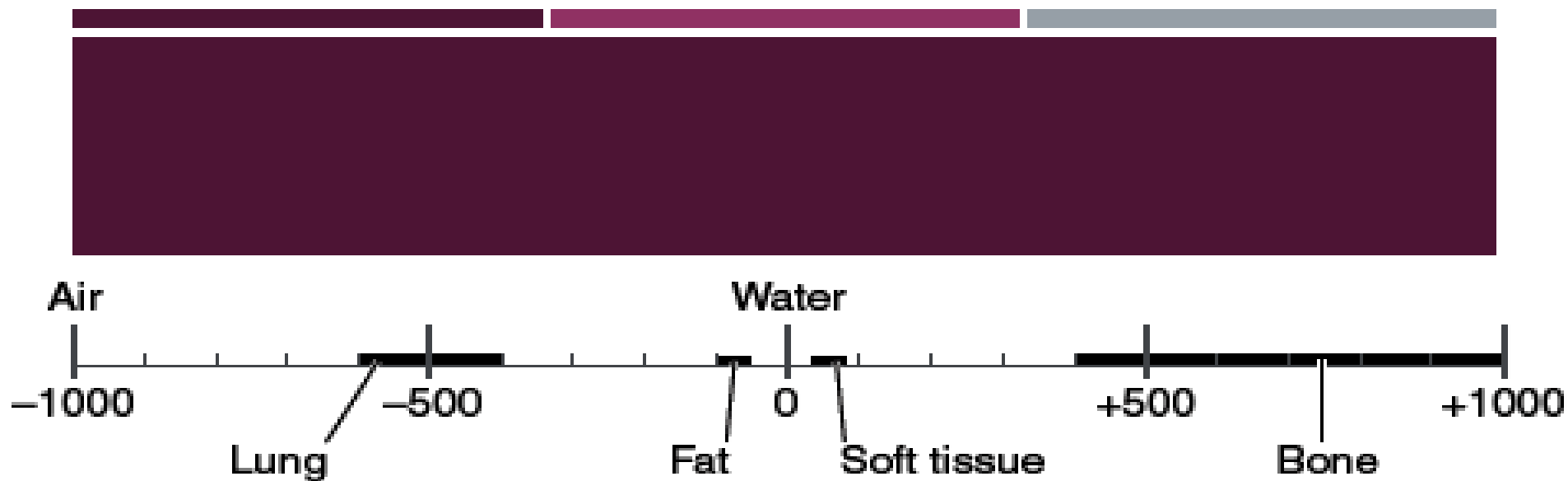
HU

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

■ Hyper dense 

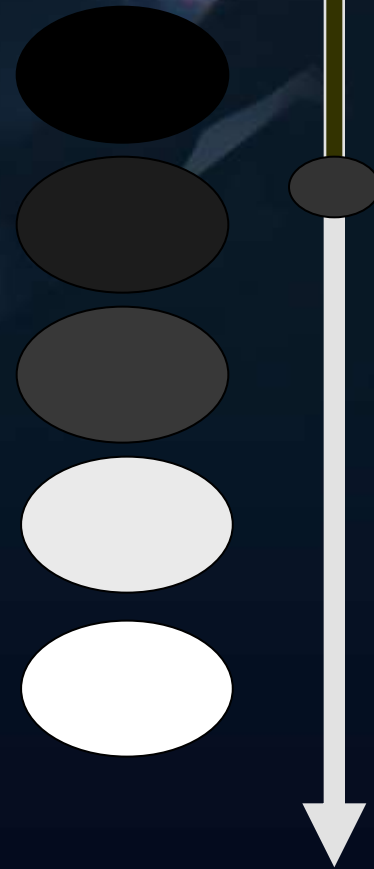
■ Iso dense 

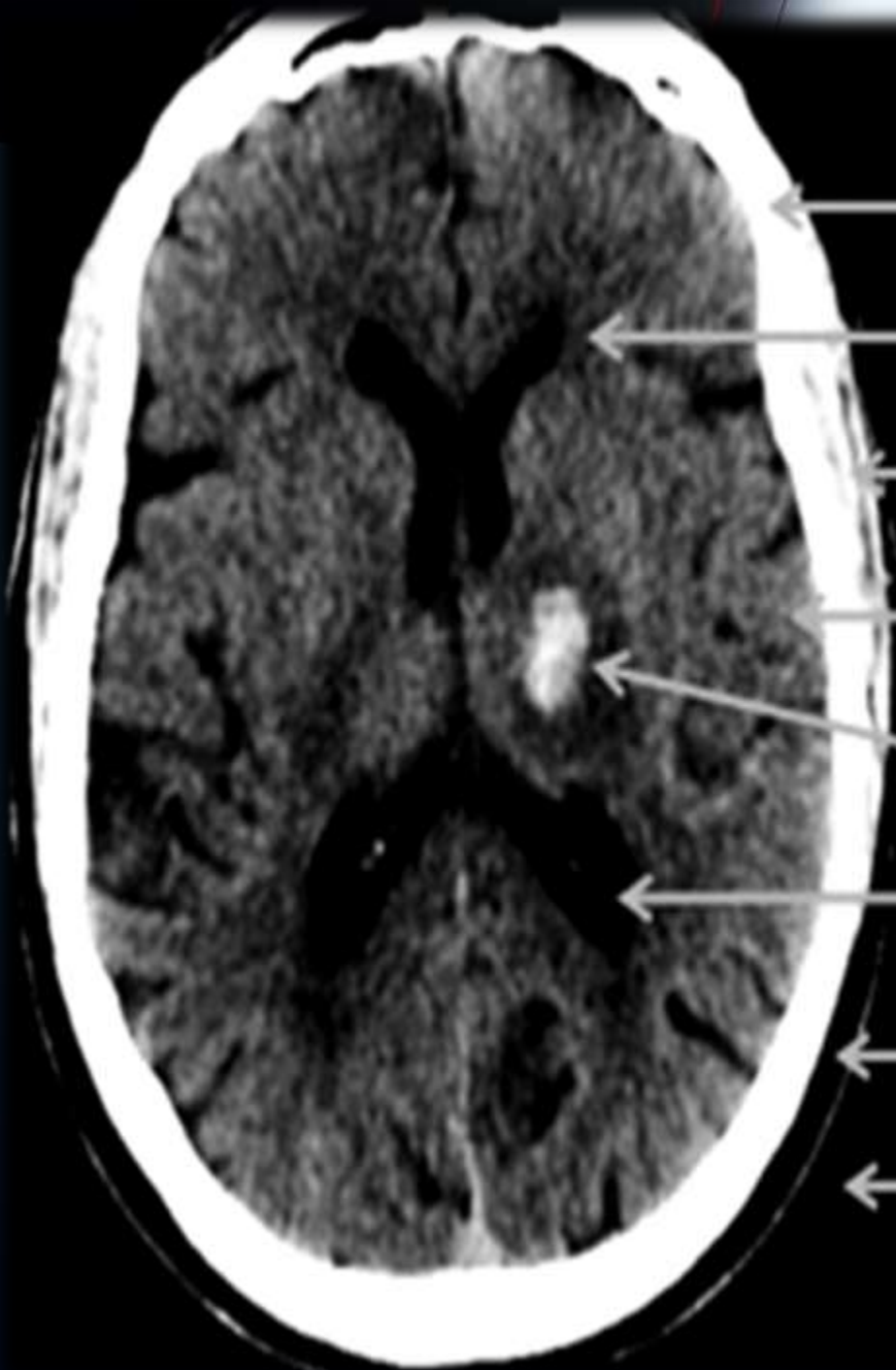
■ Hypo dense 



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



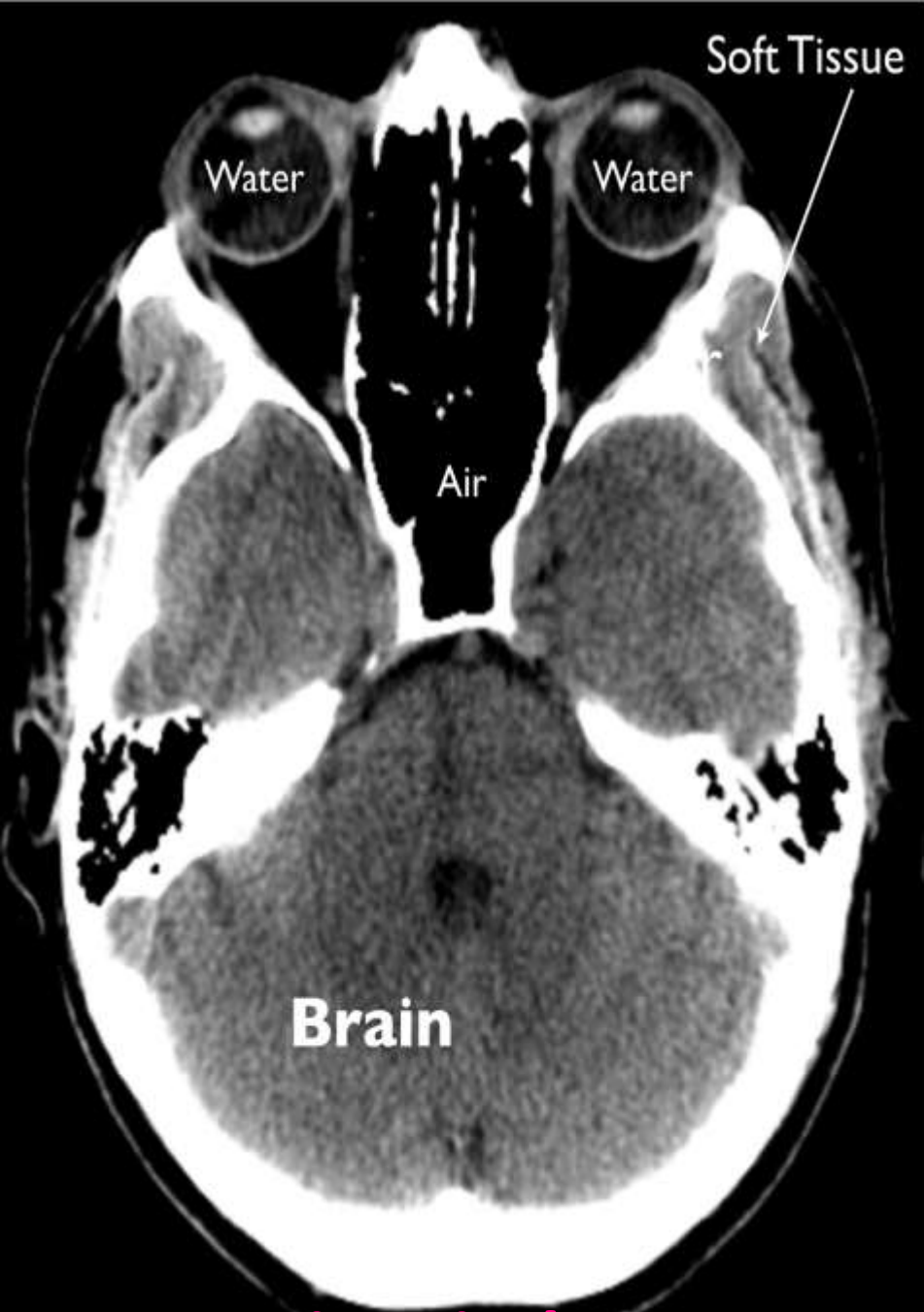


CT Number Ranges in Hounsfield Units (HU)

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 hand is resting on the patient's shoulder. The scene is dimly lit, with a bright light source from the scanner. A red line is visible across the image.

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

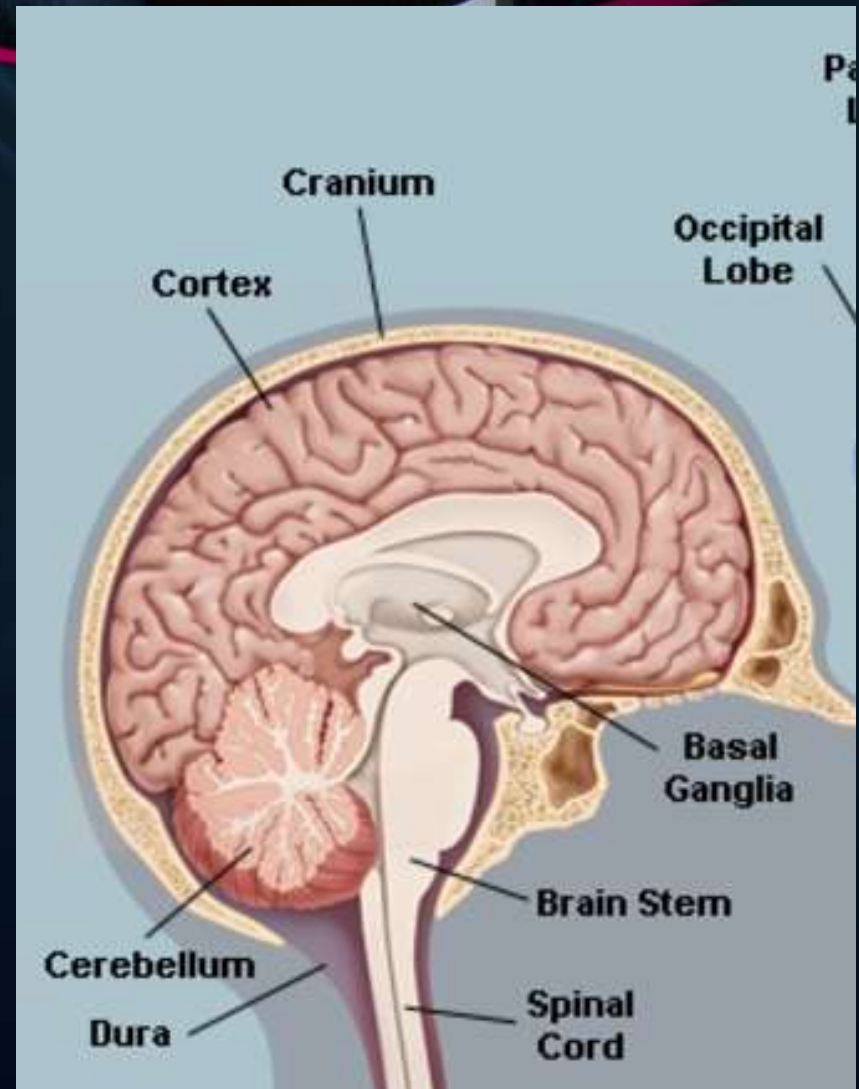


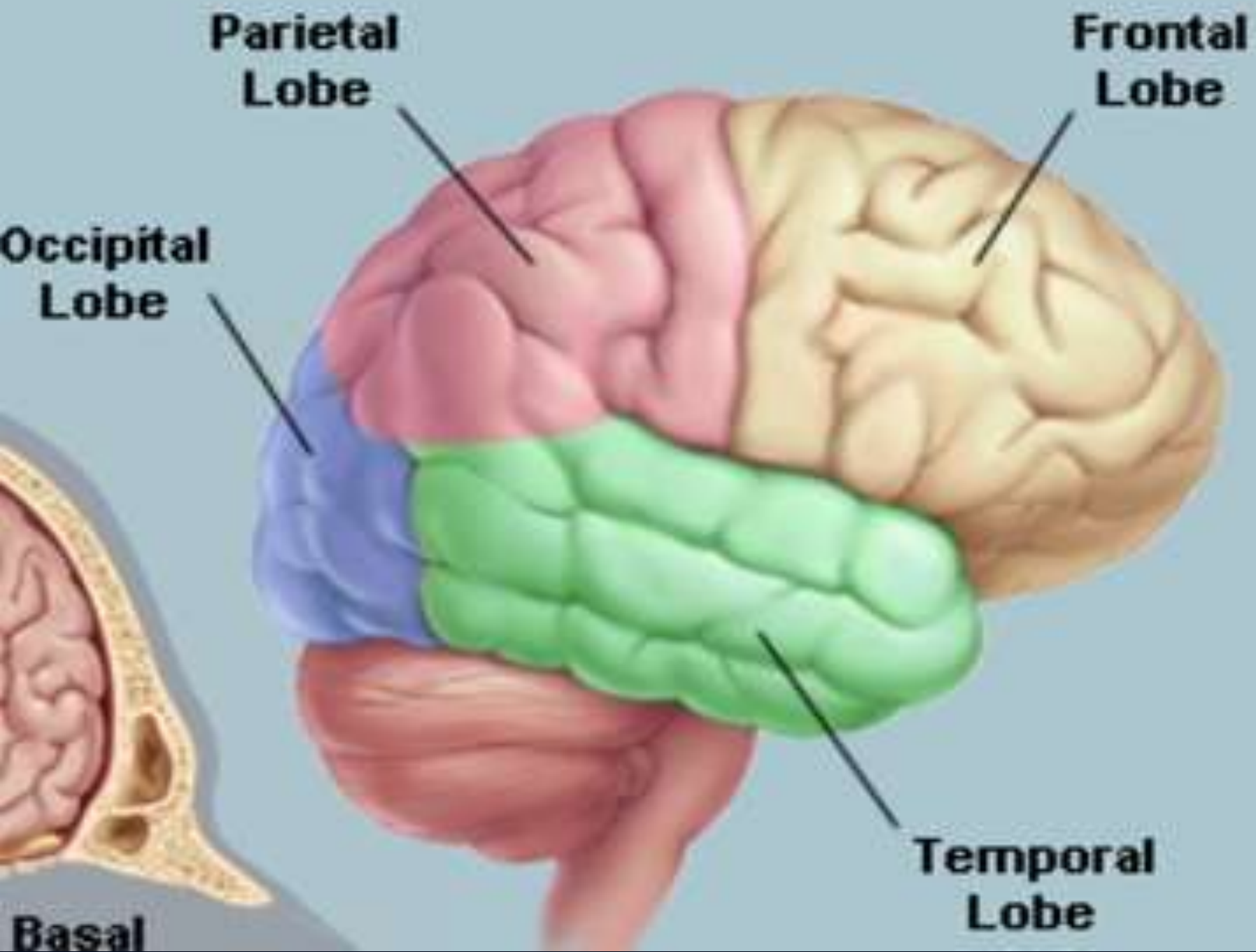
Normal Finding & Anatomy CT Brain



BRAIN CT ANATOMY

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

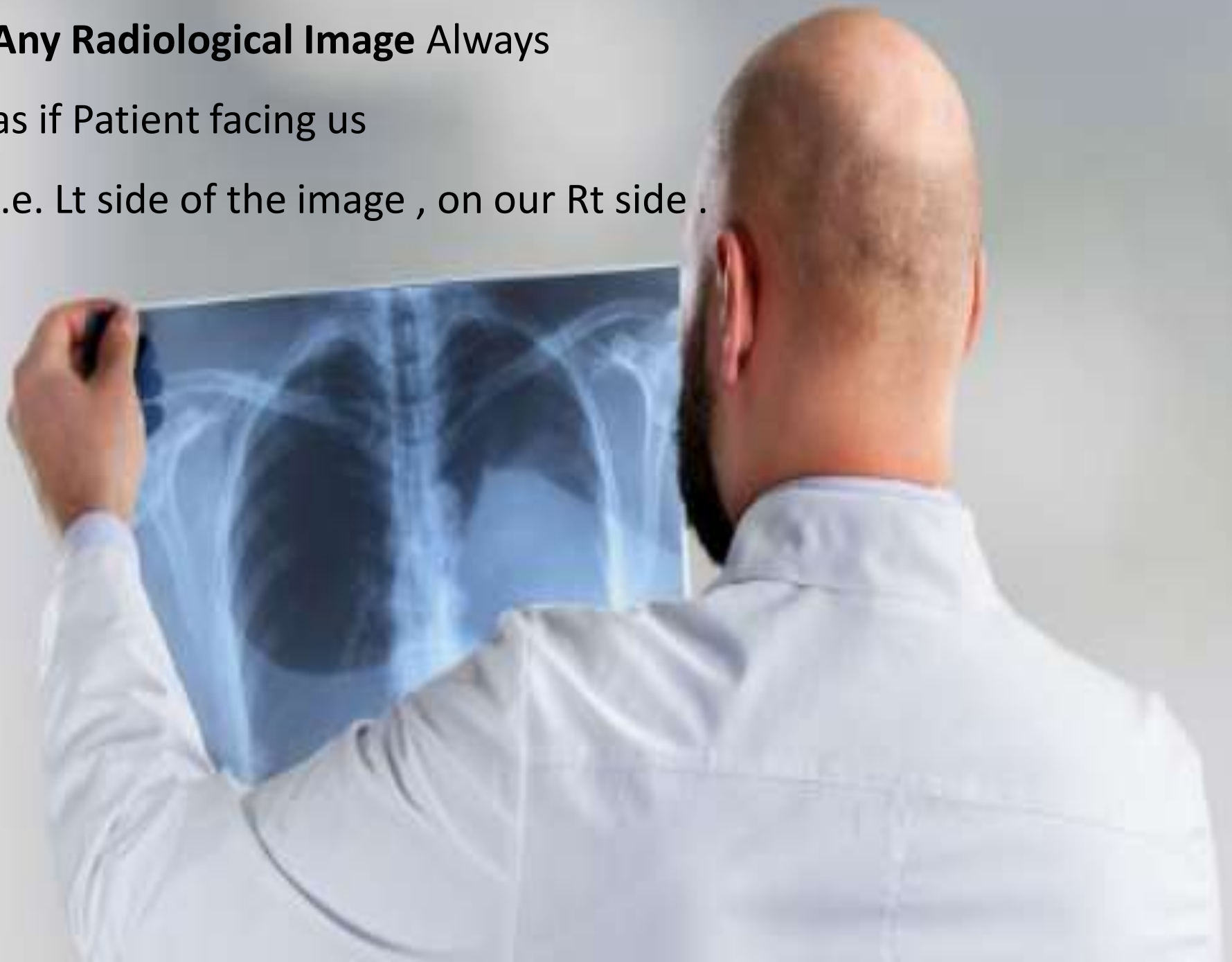




Any Radiological Image Always

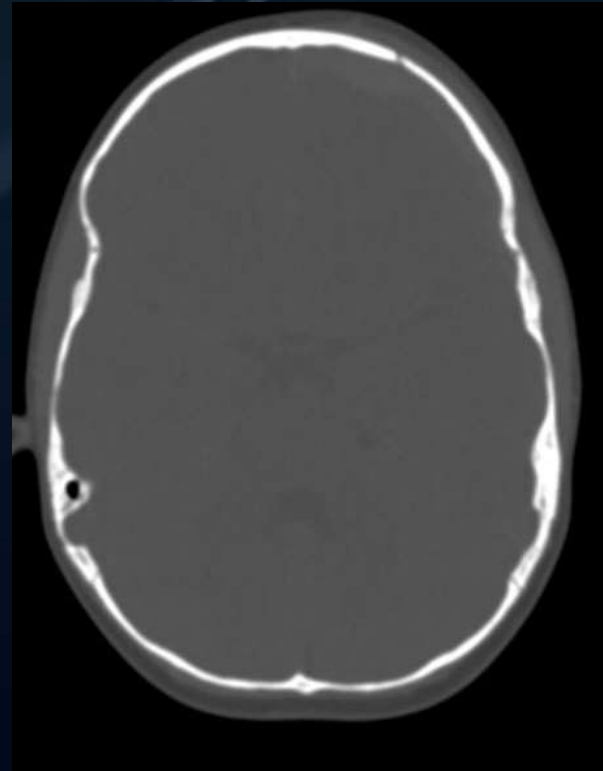
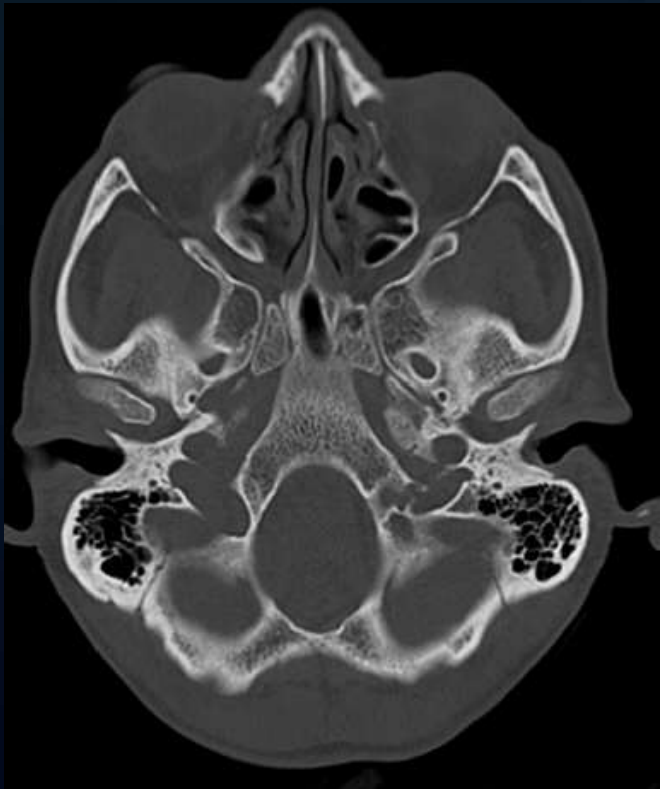
as if Patient facing us

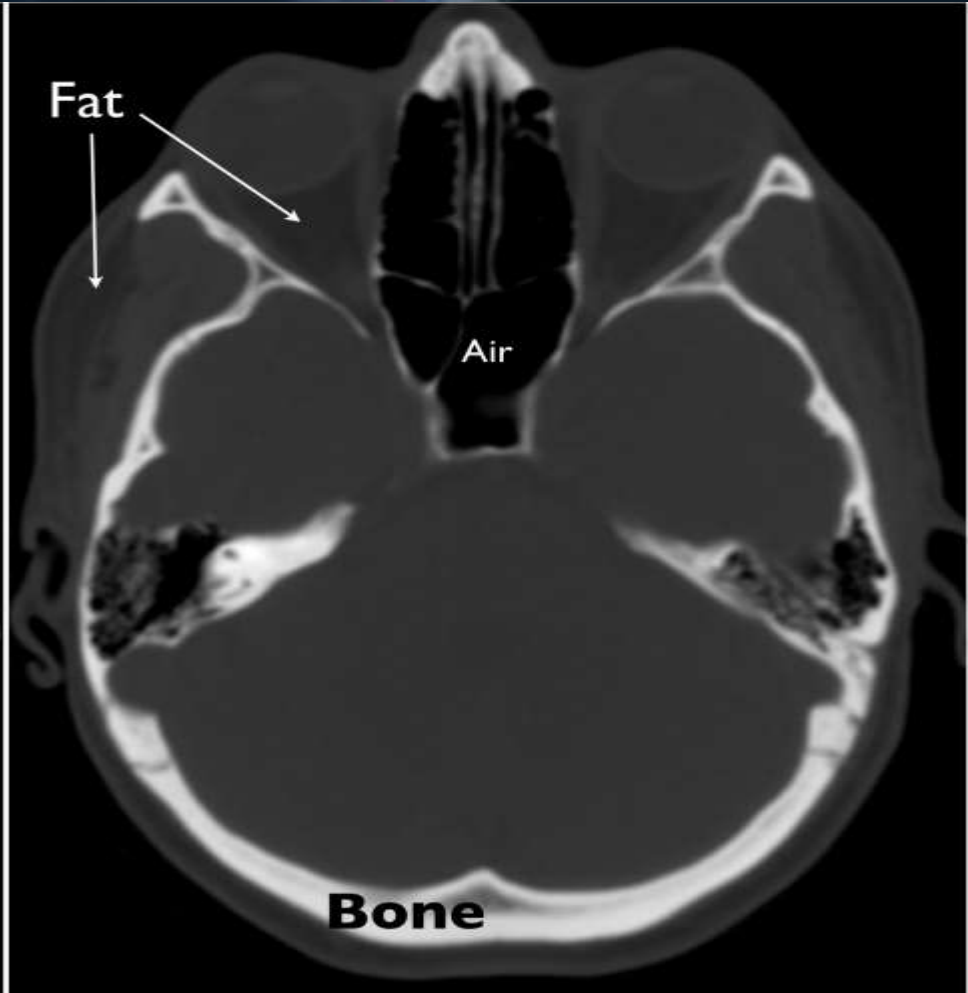
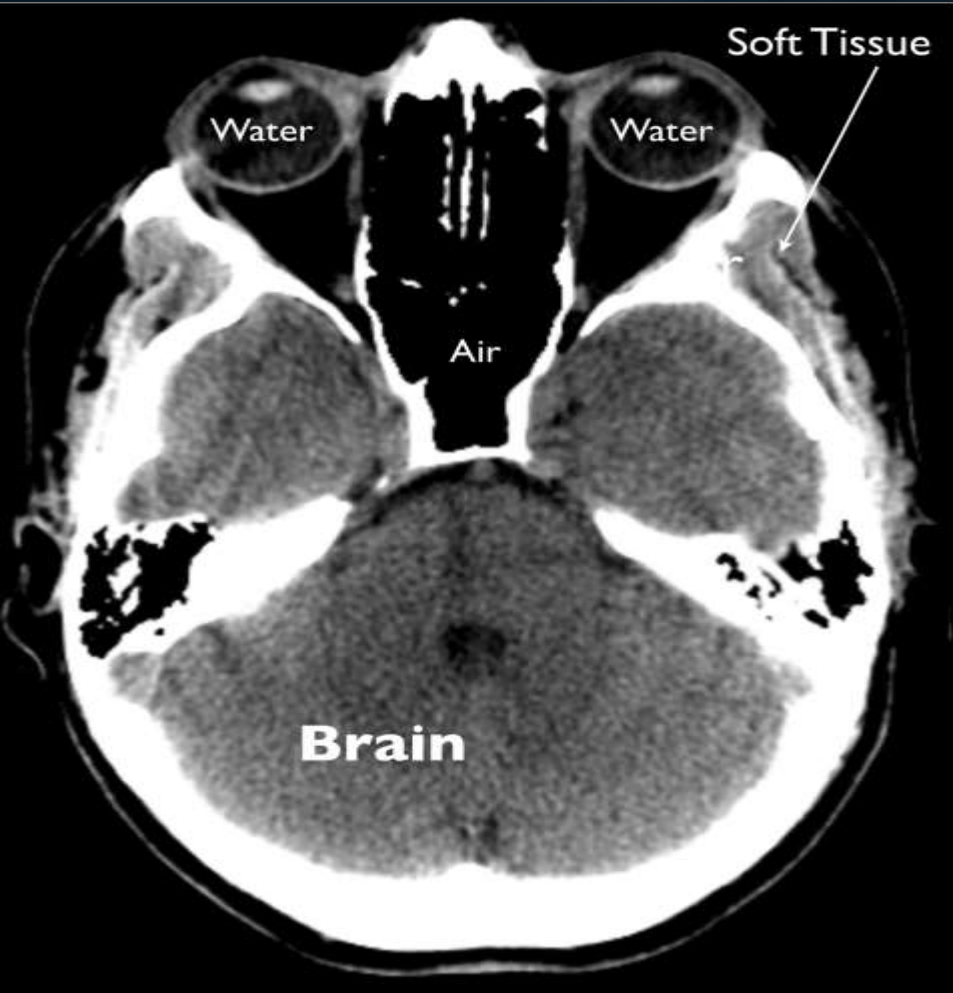
i.e. Lt side of the image , on our Rt side .



Skull bones

- Skull Base
- Cranial bones



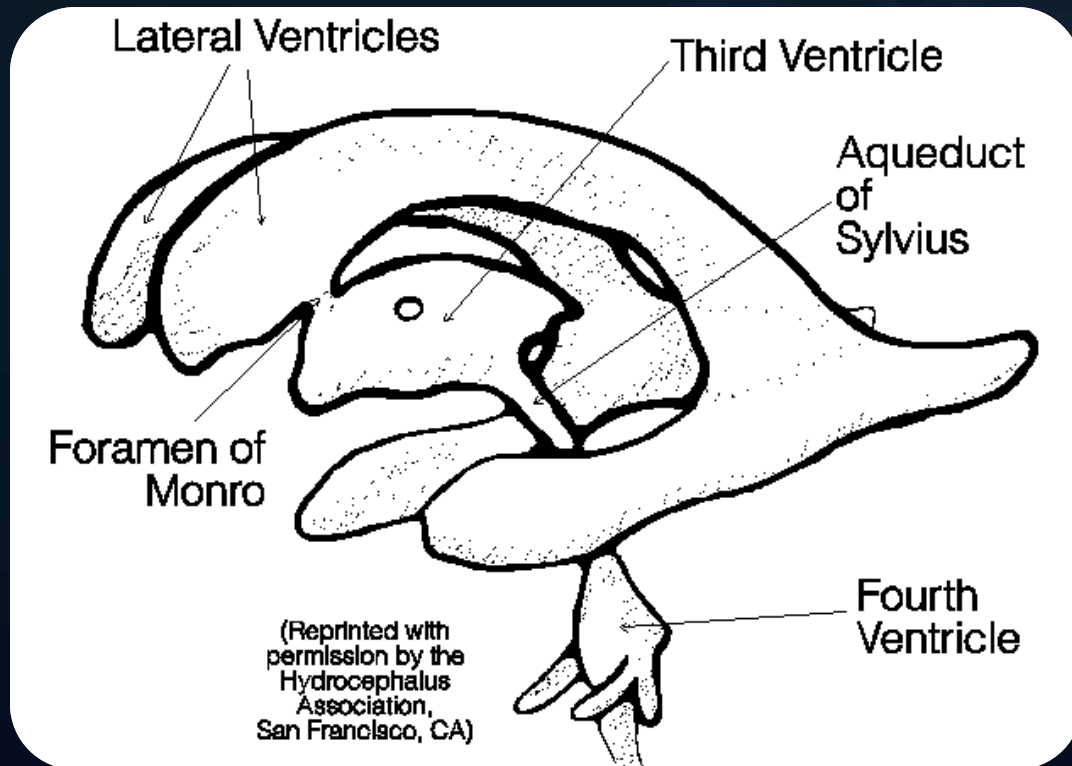


Hemispheres & Cerebellum

Frontal Lobe



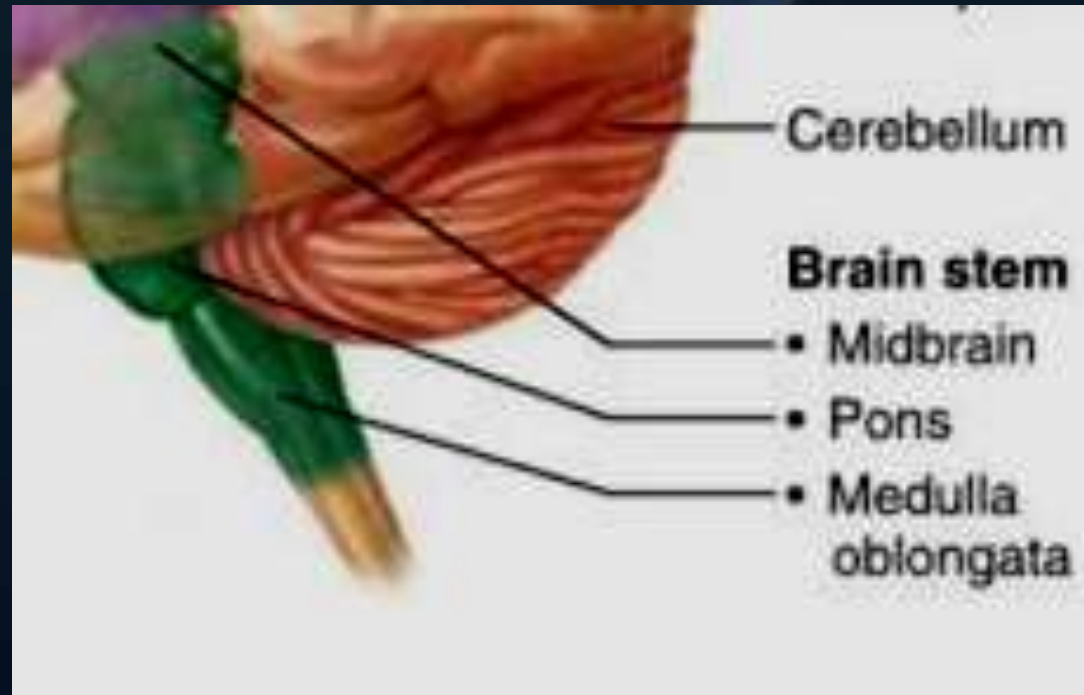
Ventricular system

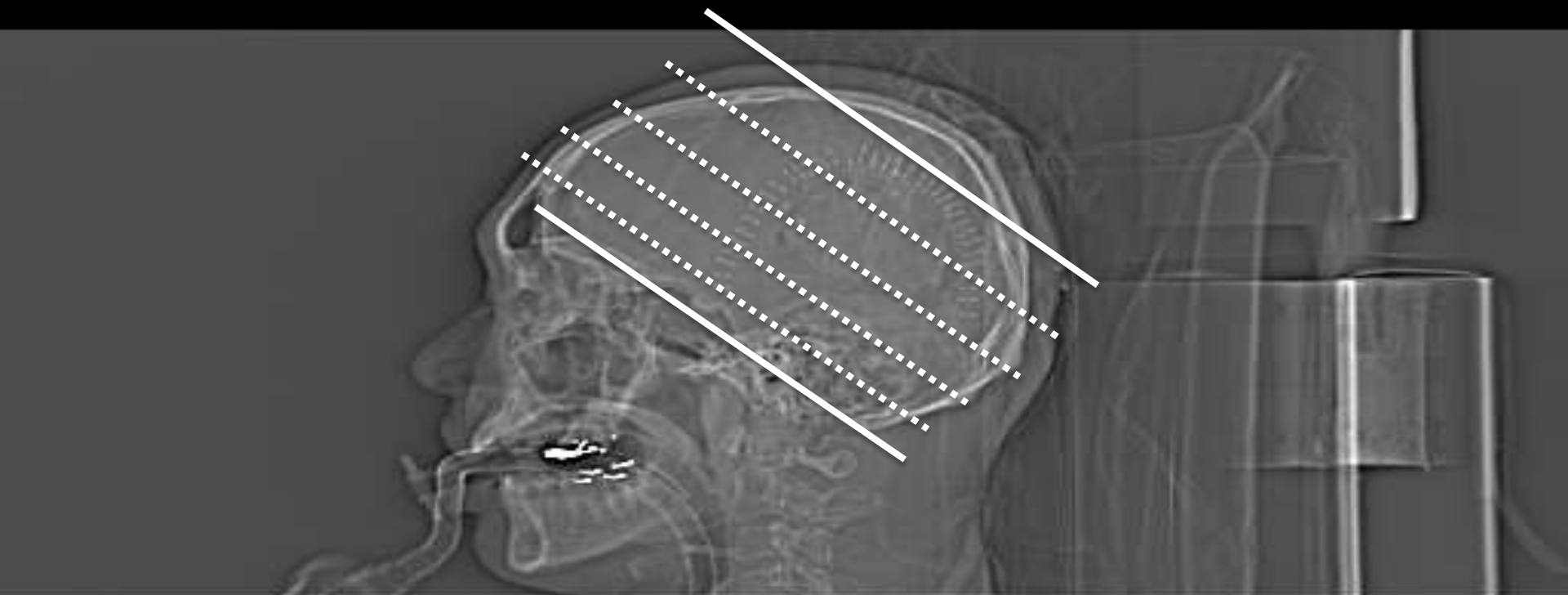




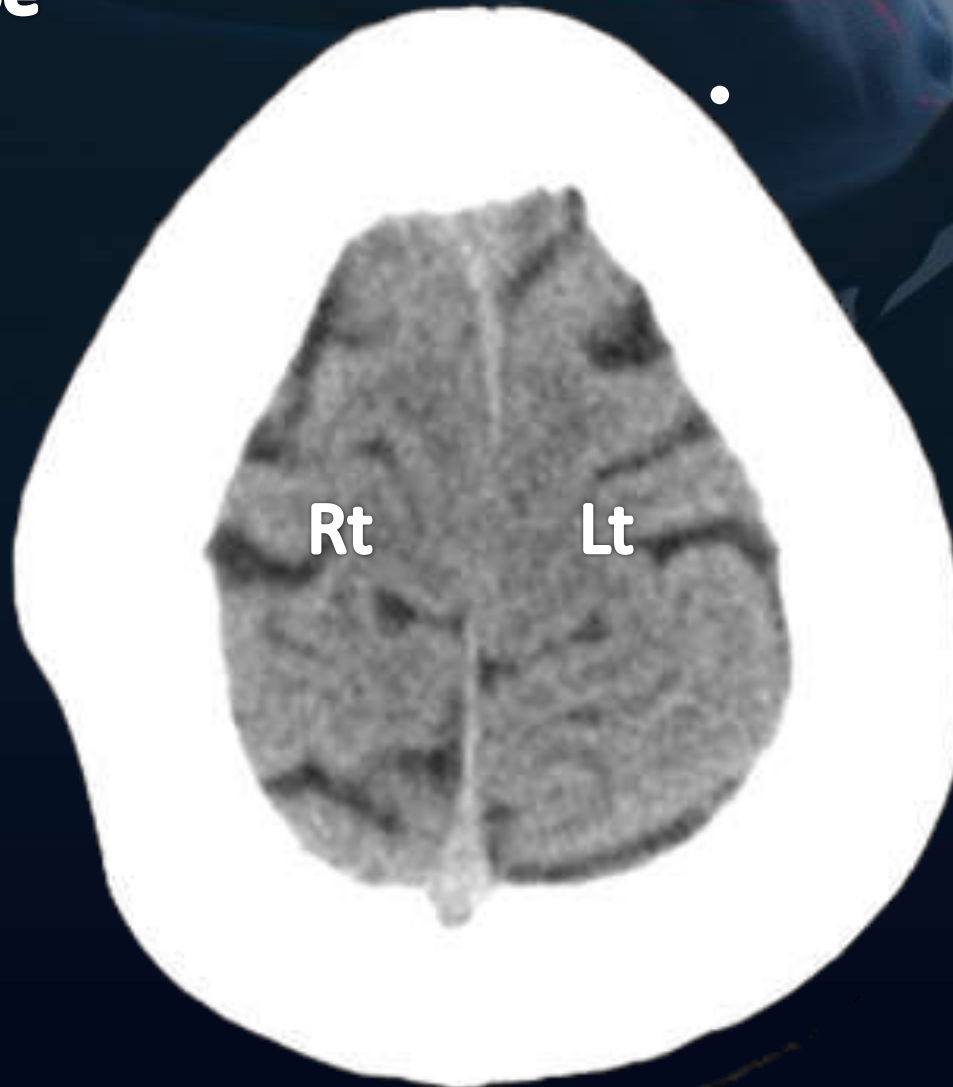
Crump Institute for Biological Imaging

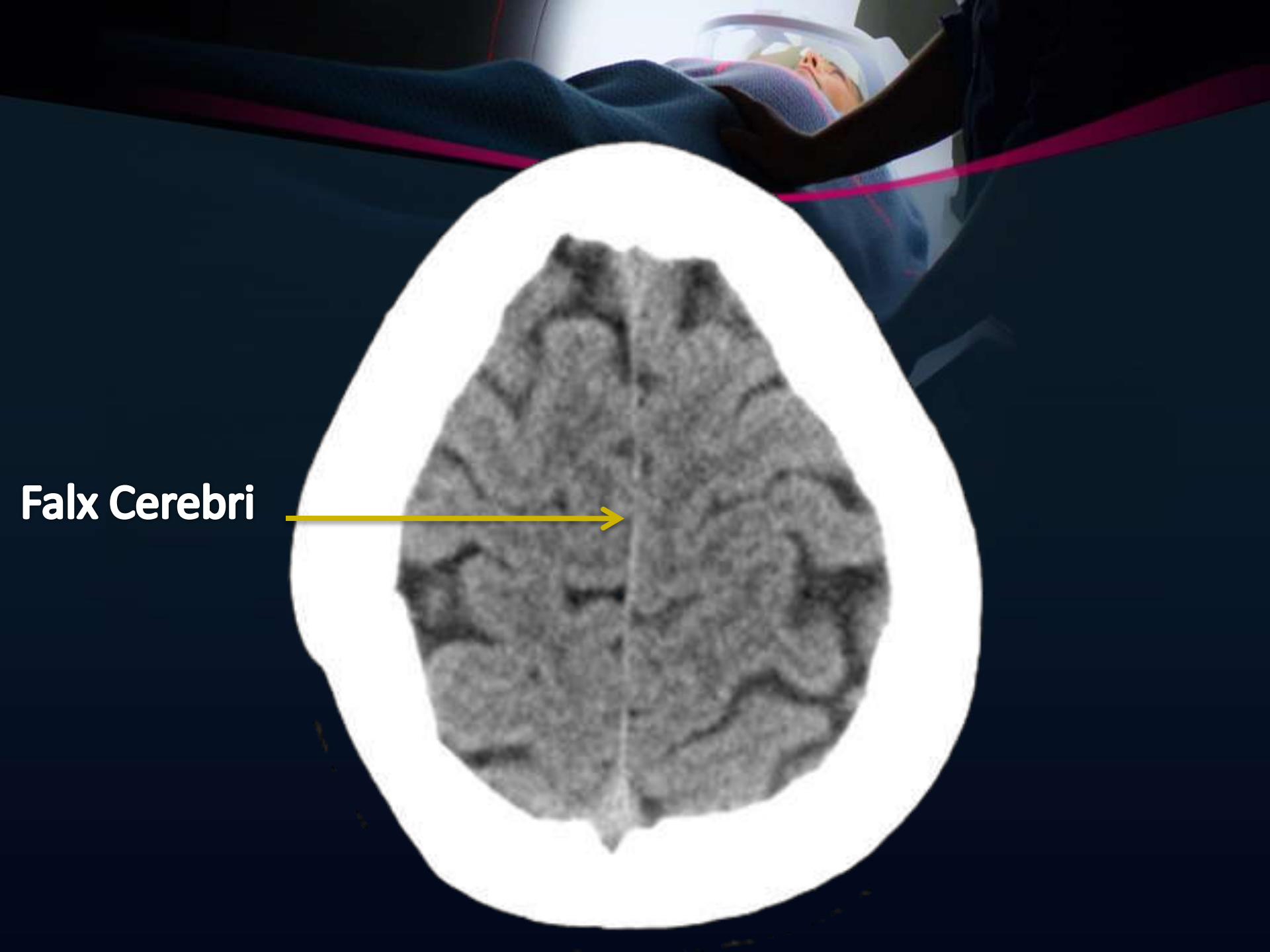
4- Brainstem



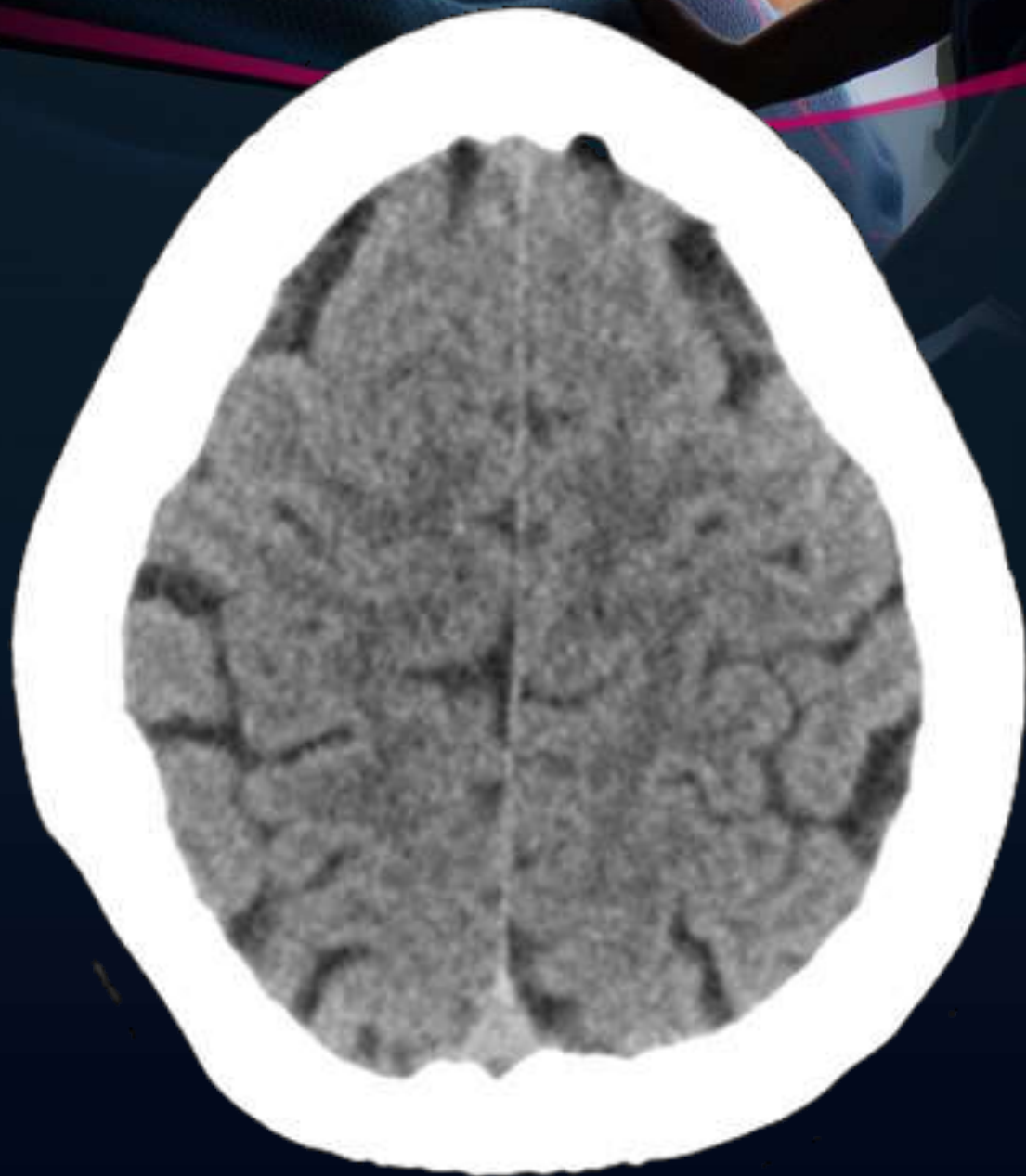


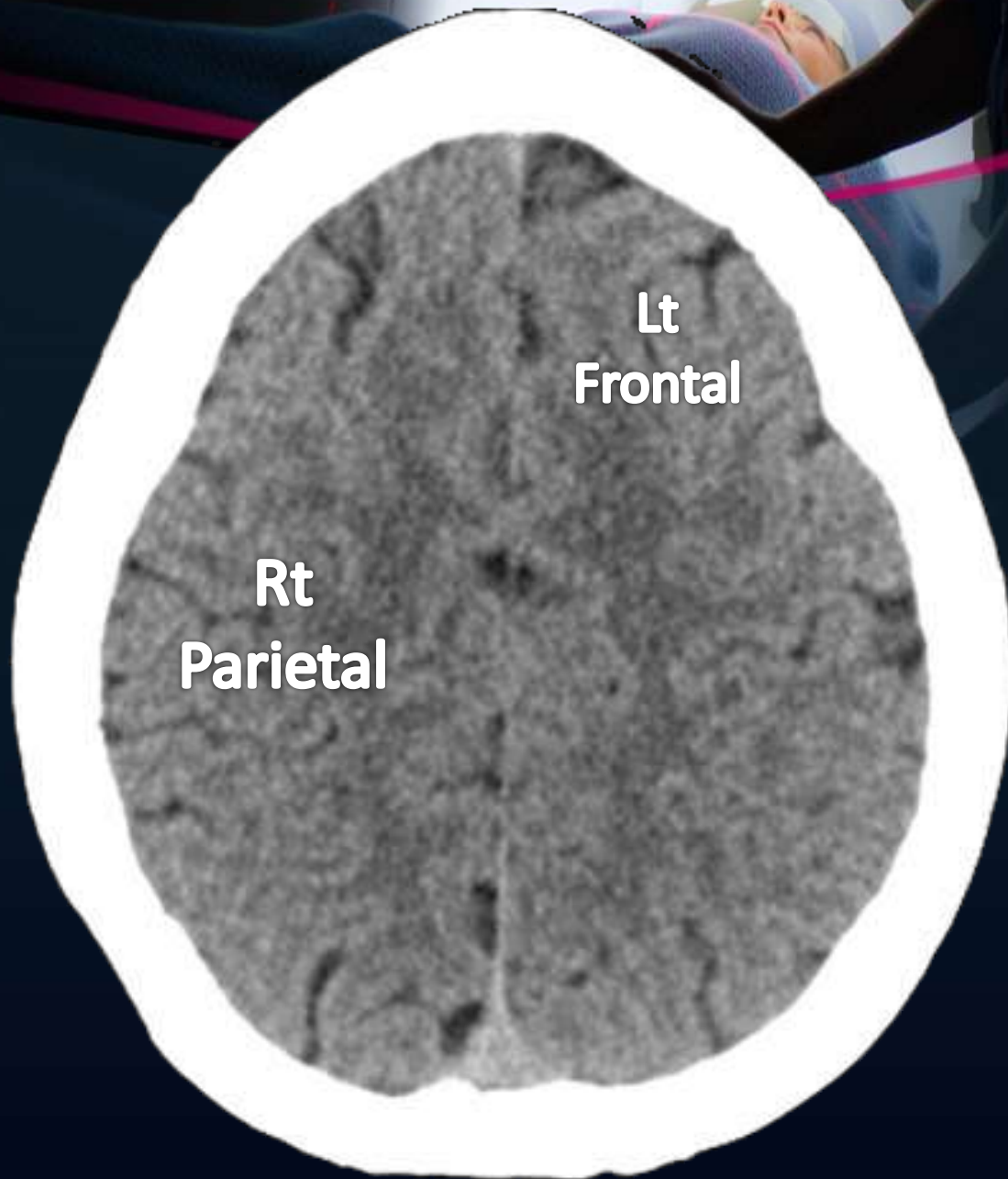
Parietal Lobe





Falx Cerebri

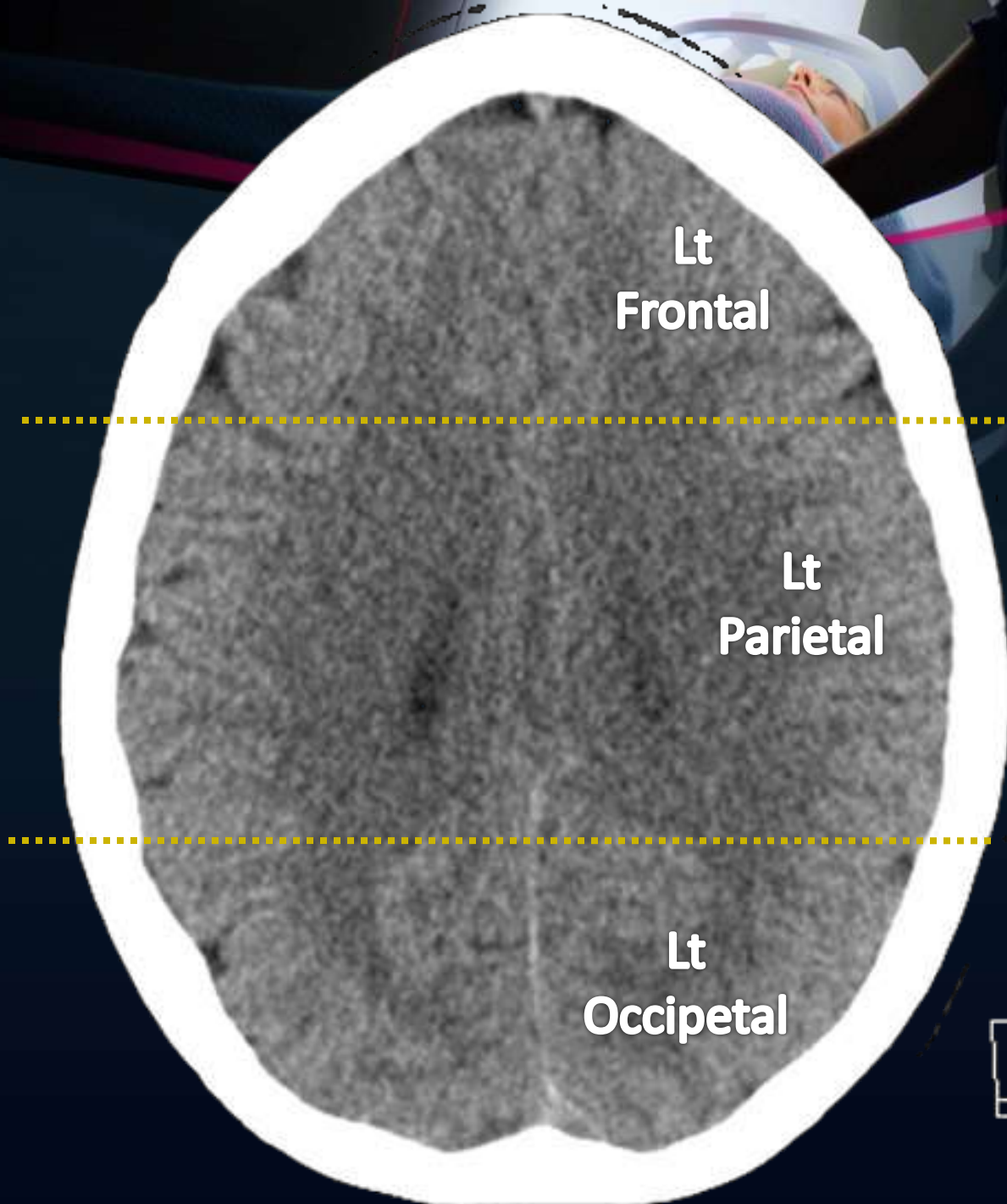




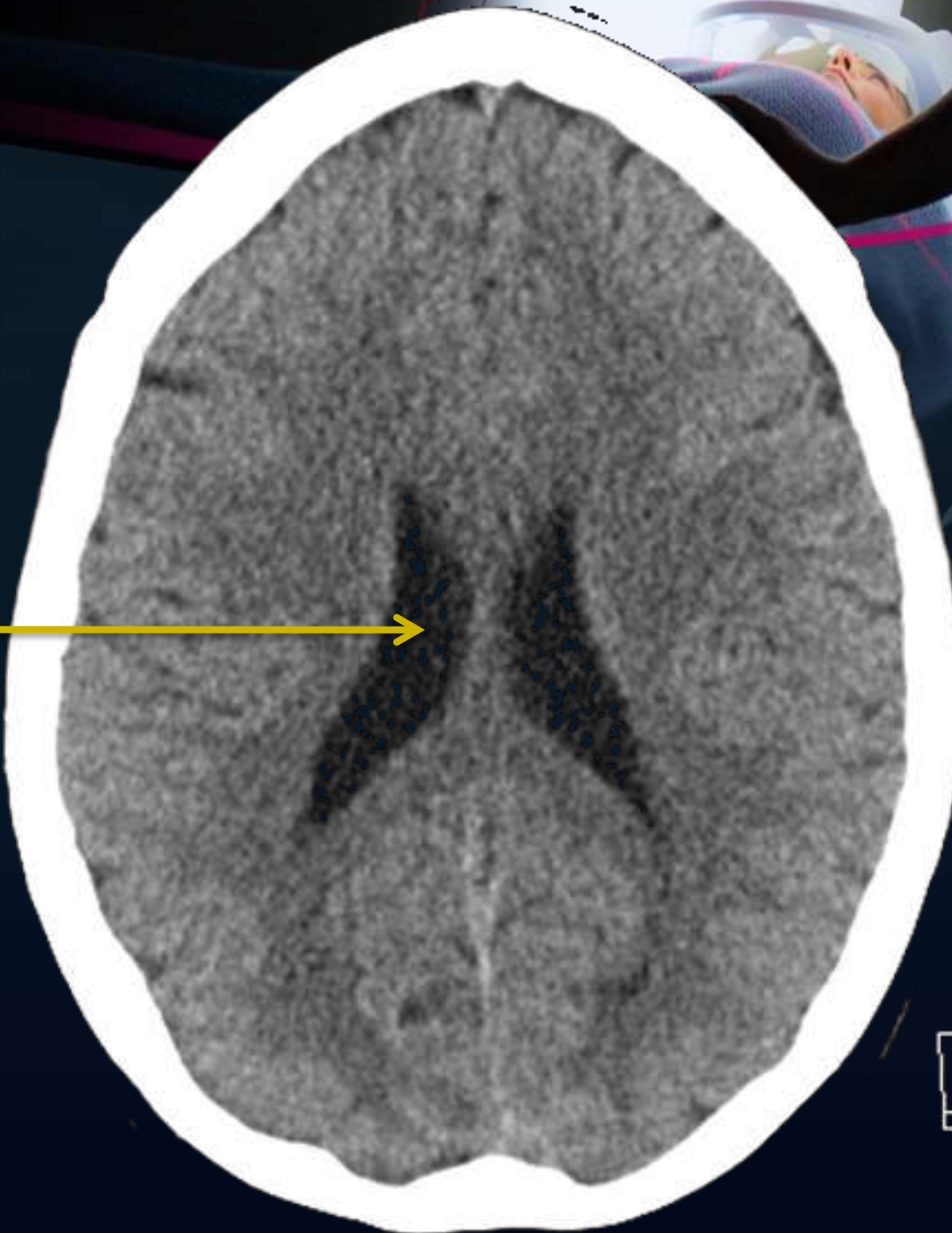
Lt
Frontal

Rt
Parietal





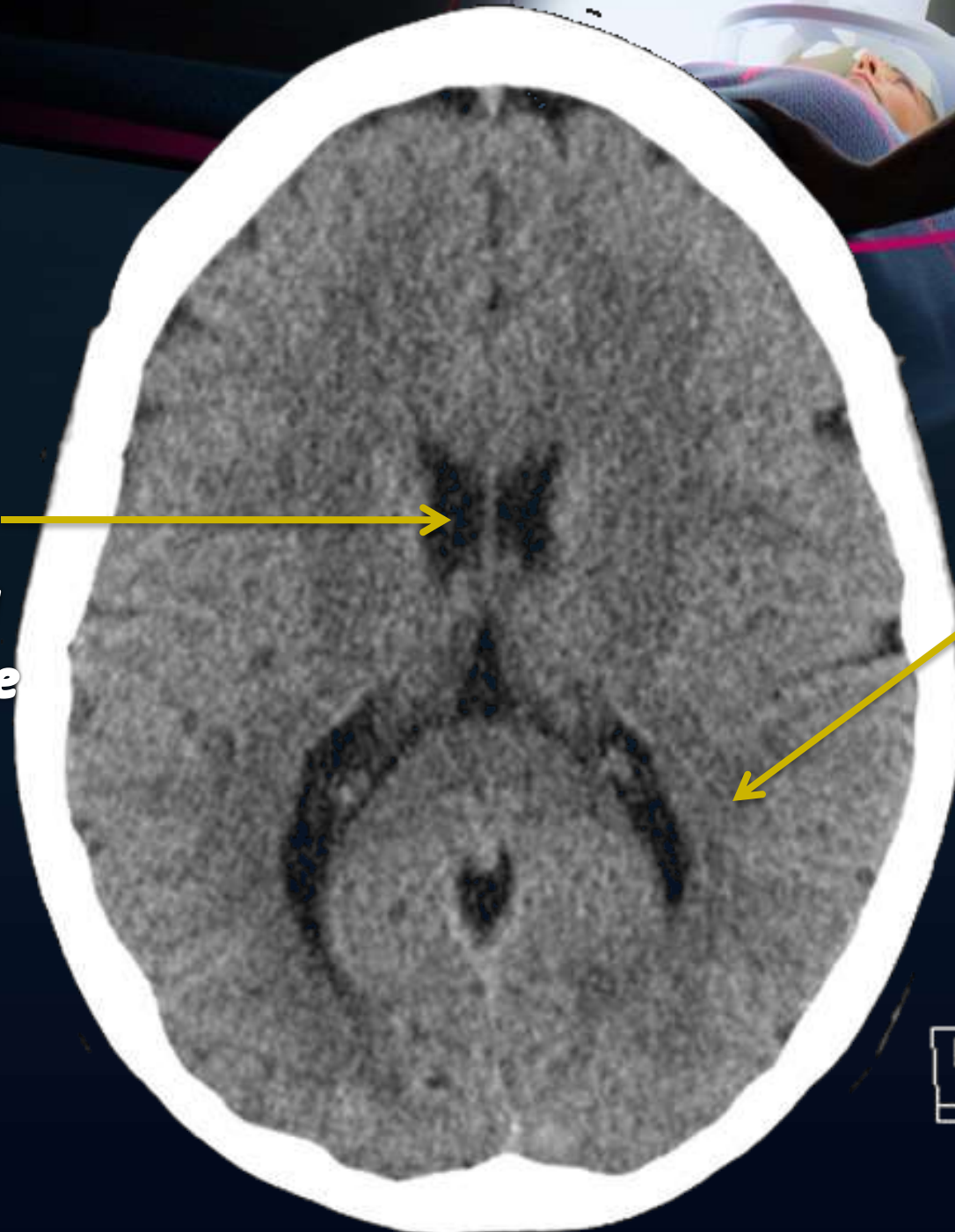
Rt
Lateral
Ventricle
"Body"



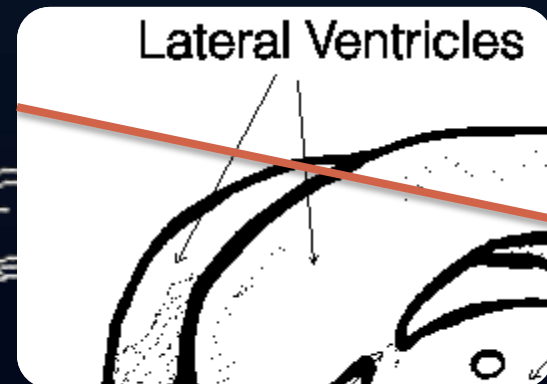
Lateral Ventricles



Rt
"Ant
horn"
*Lateral
Ventricle*



Lt
"Post horn"
*Lateral
Ventricle*



Ant Horn

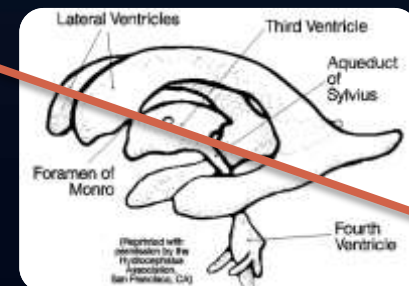
**3rd
Ventricle**

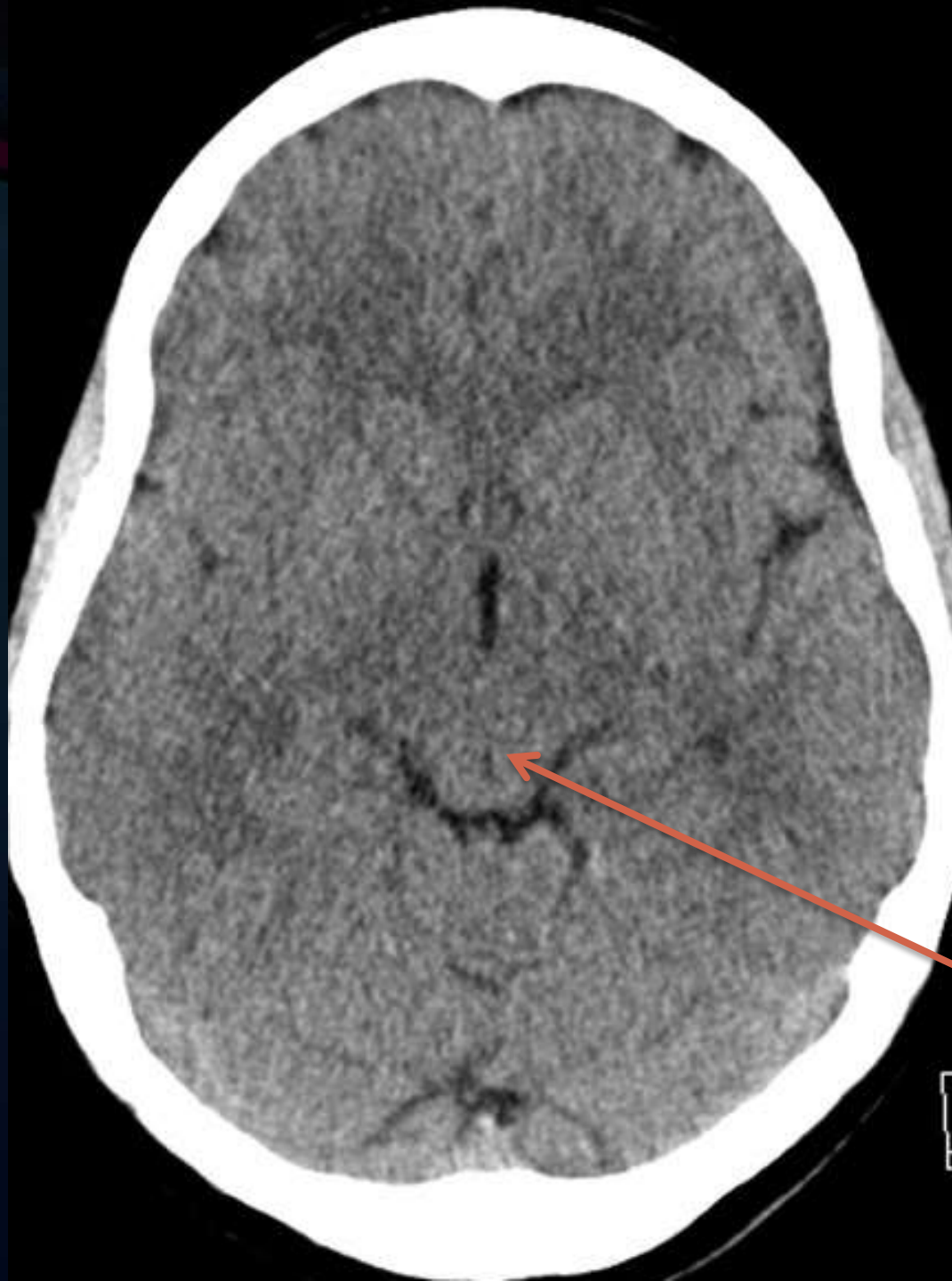
Quadrate n

Lentiform n

Thalamus

**Internal
Capsule**

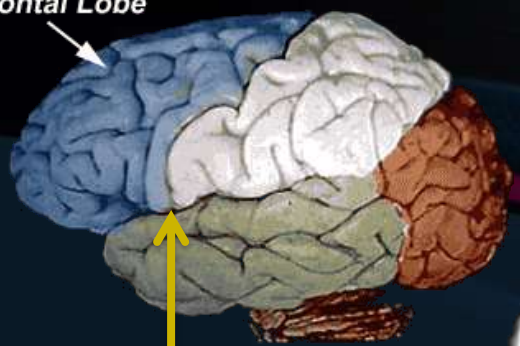




Midbrain



Frontal Lobe

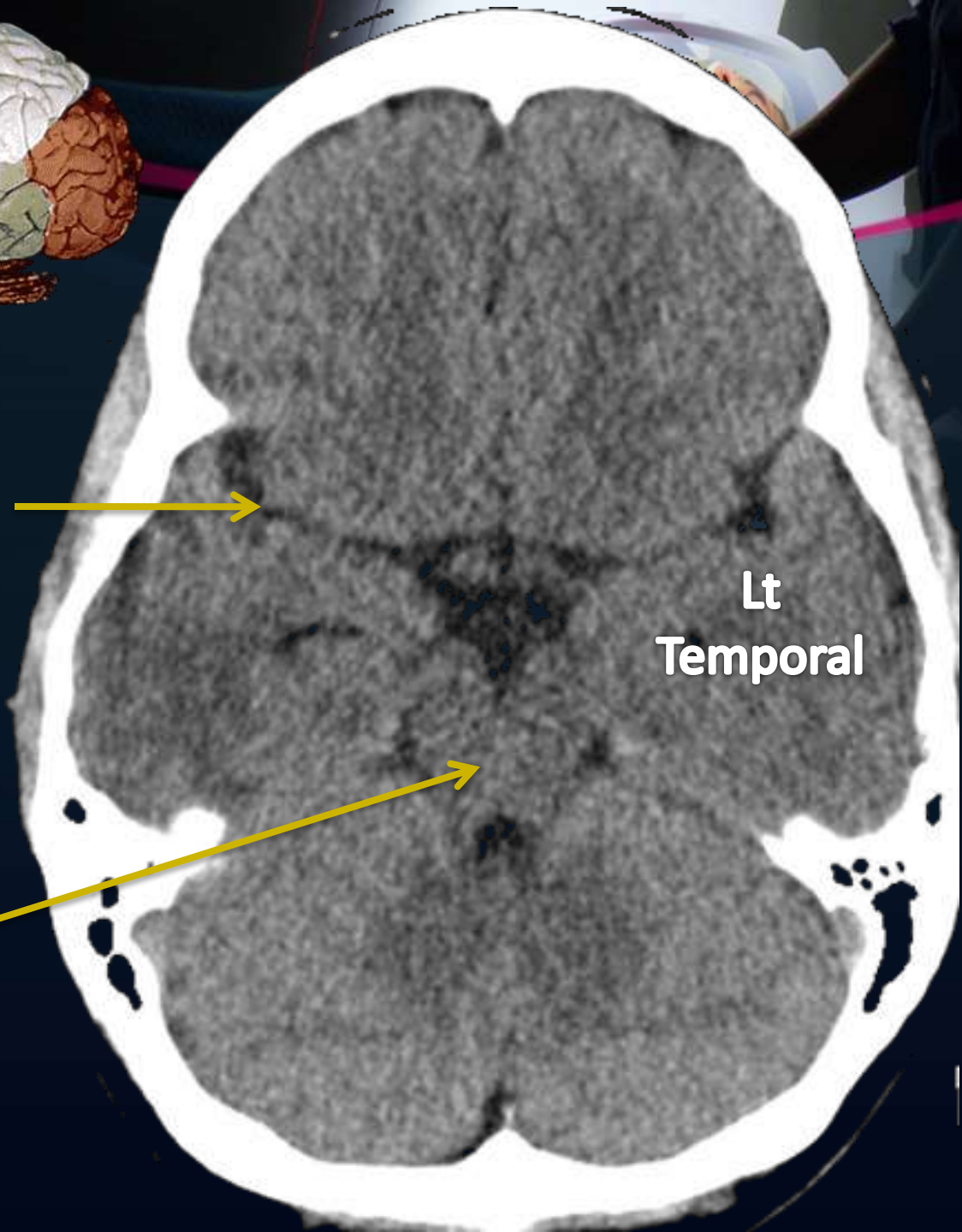
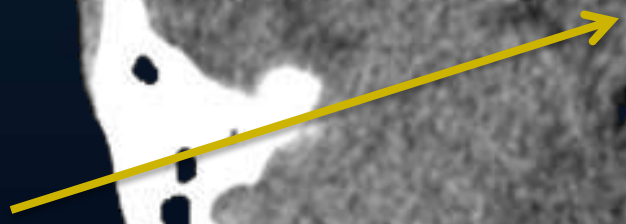


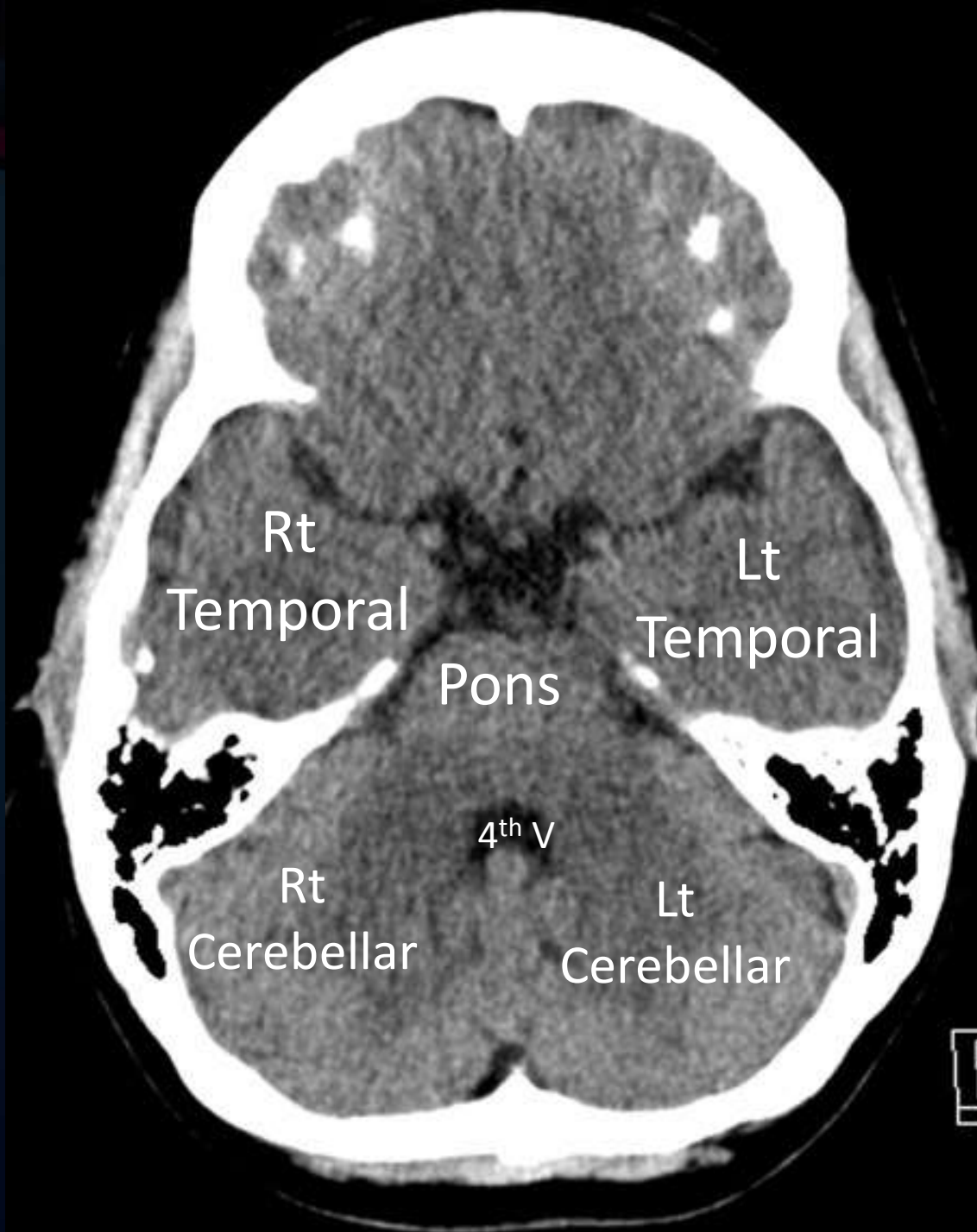
Sylvain
Fissure



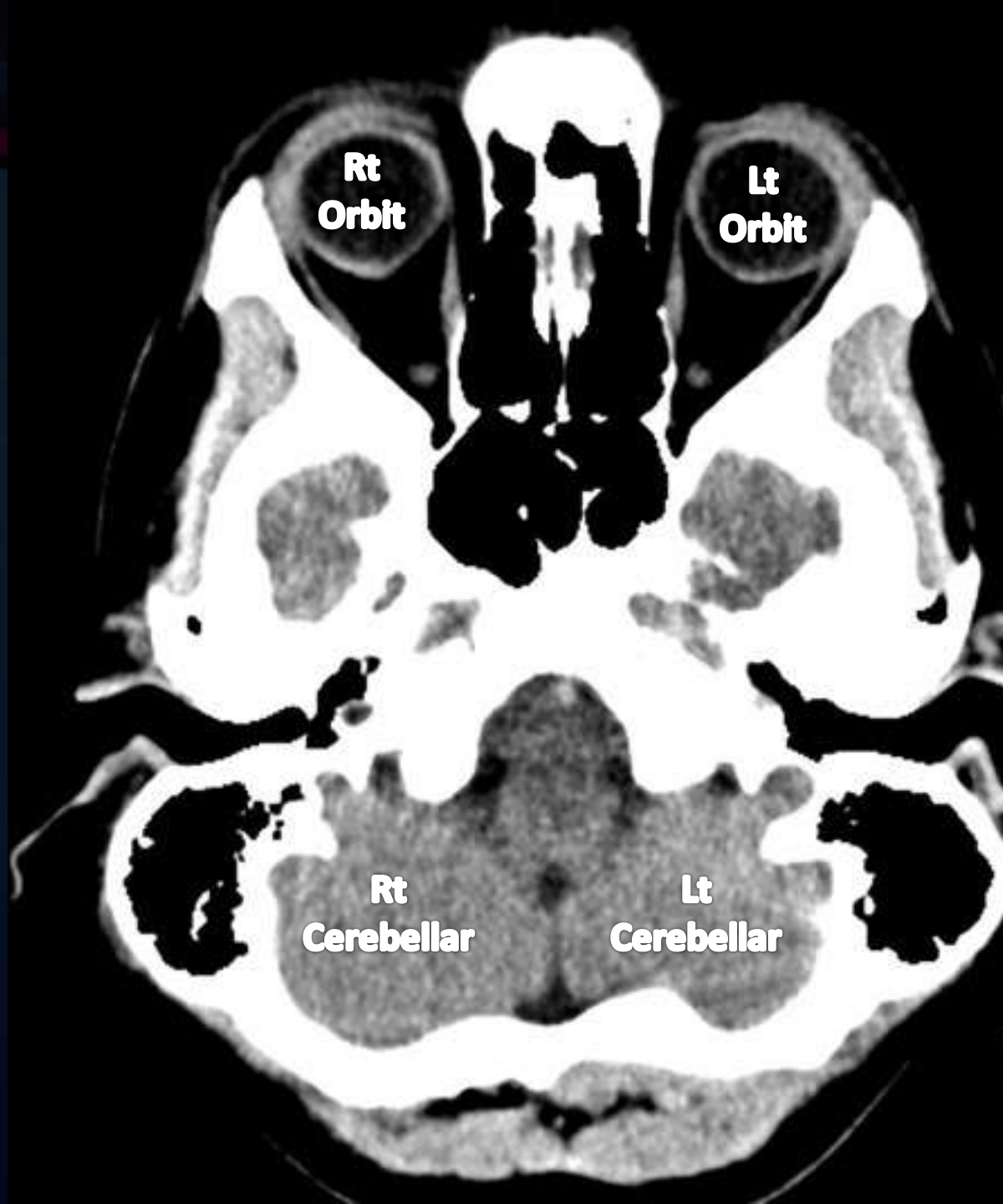
Lt
Temporal

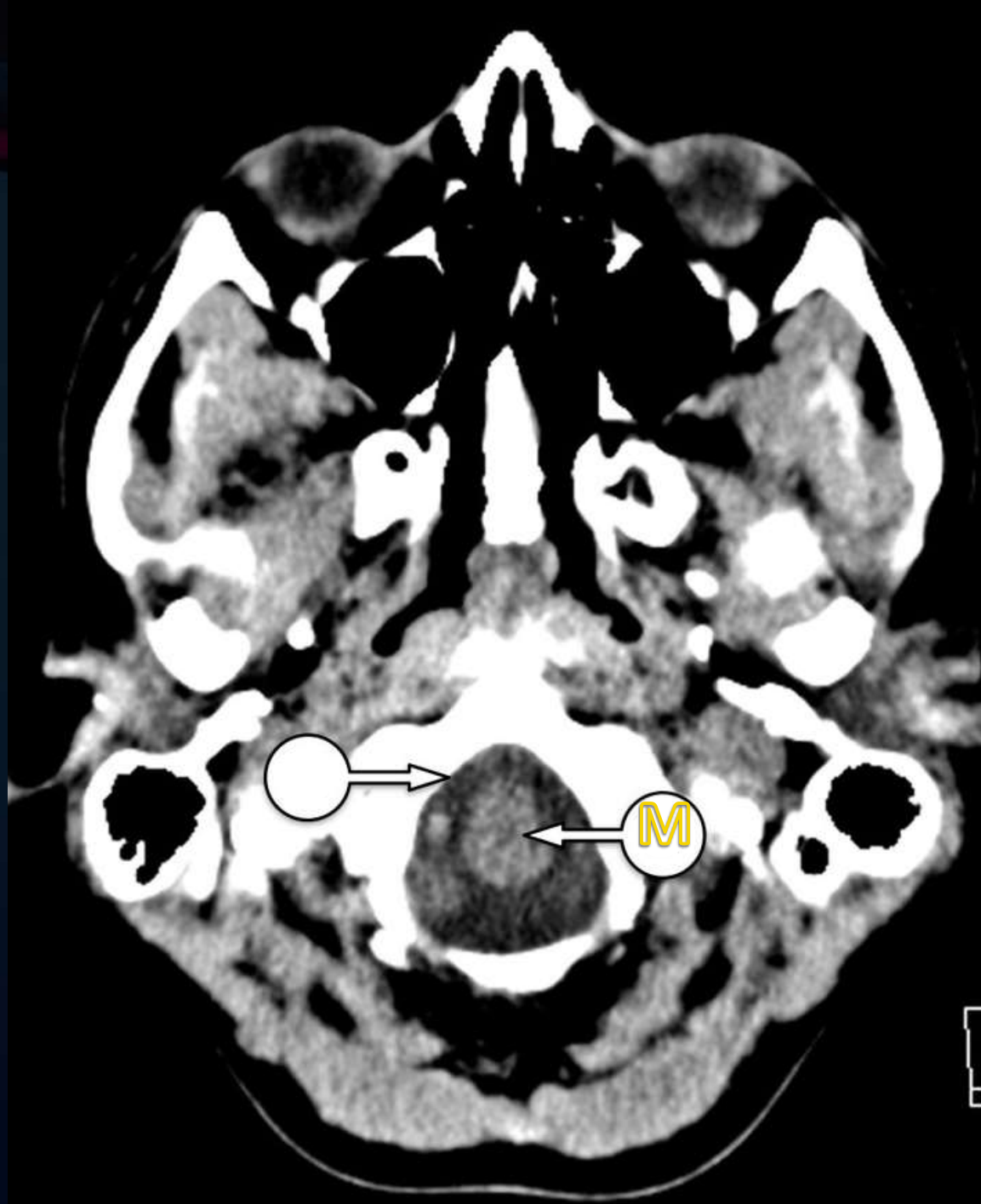
Midbrain





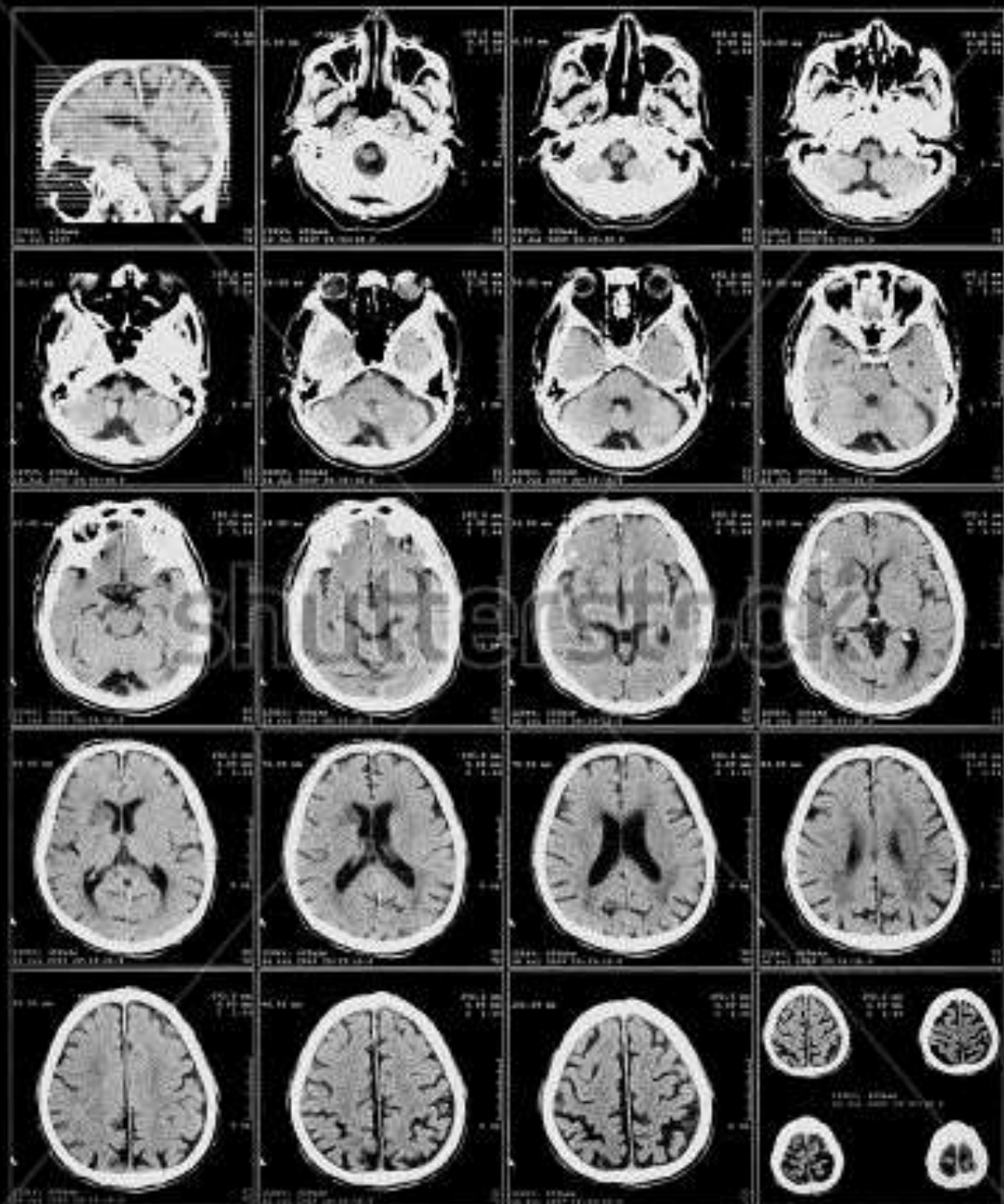


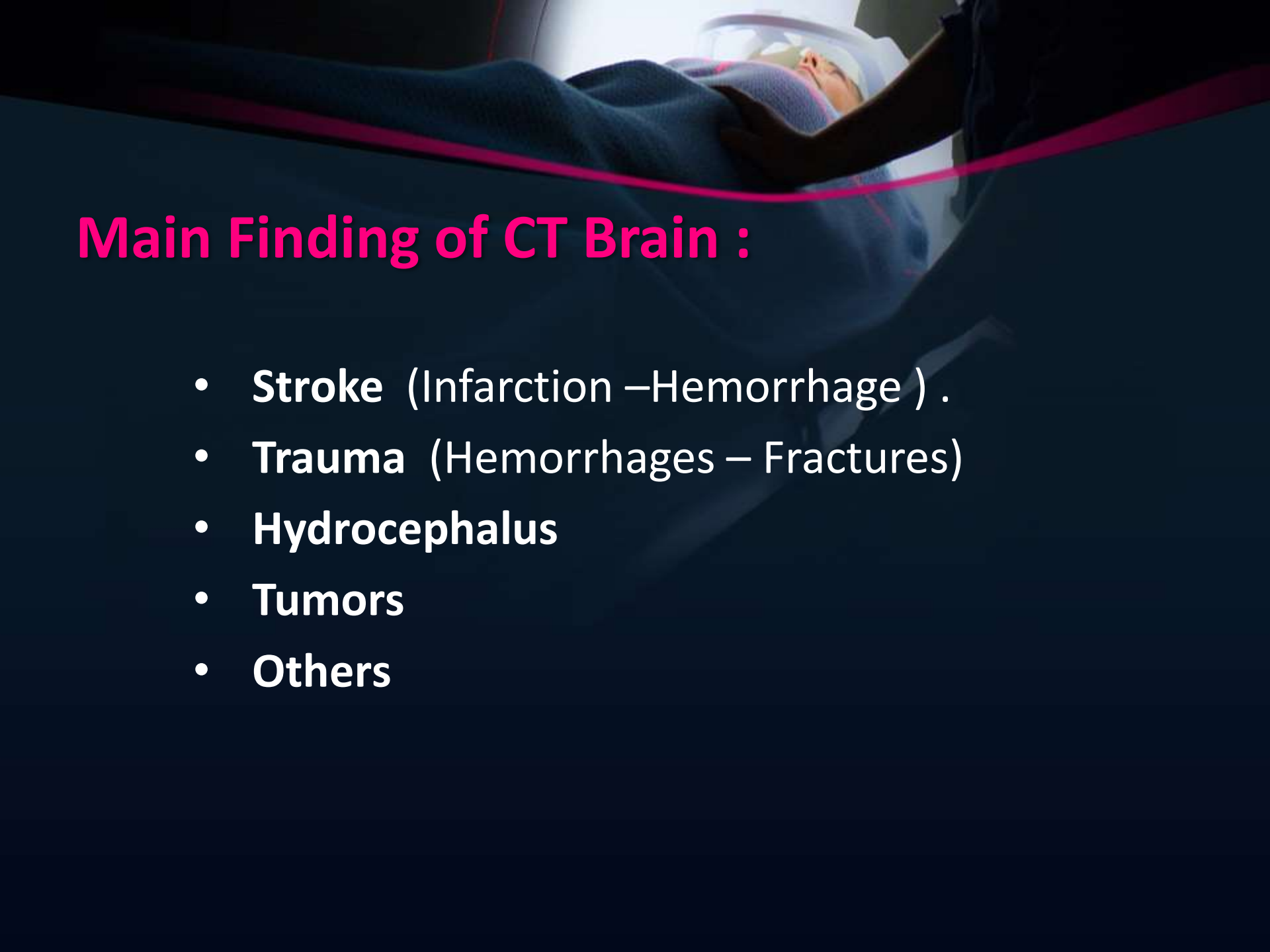




**Common
Finding &
Emergency
CT Brain**







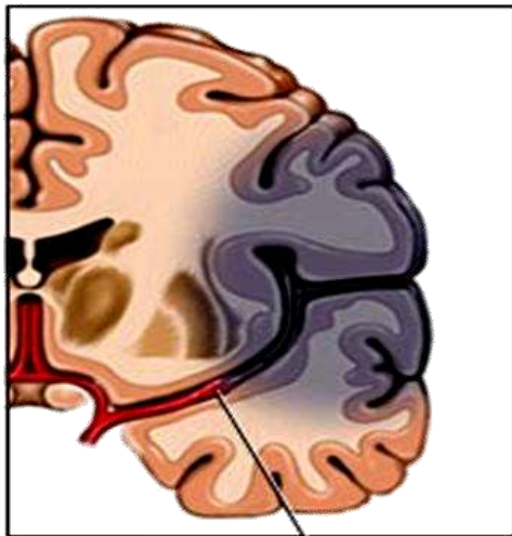
Main Finding of CT Brain :

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

STROKE

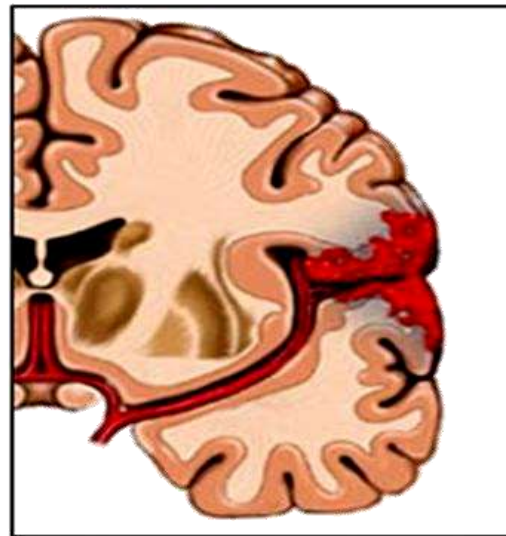
2 major types of Stroke

Ischemic stroke



A clot blocks blood flow to an area of the brain

Hemorrhagic stroke



Bleeding occurs inside or around brain tissue



→ Infarction

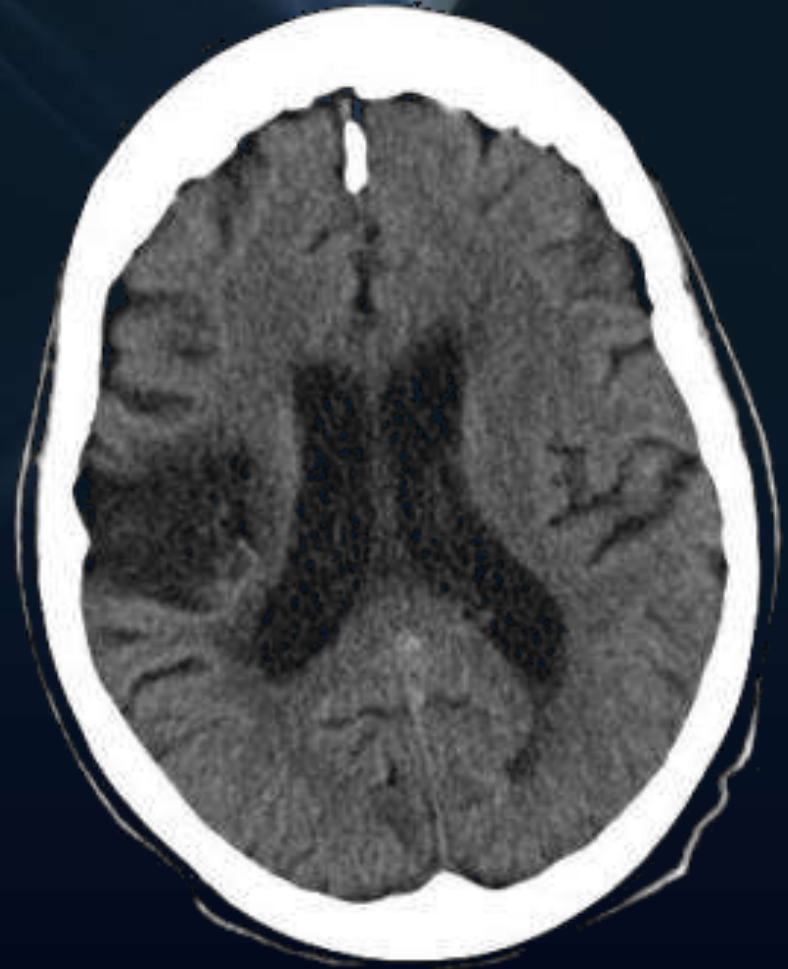
- **How to Diagnose :**

- 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**

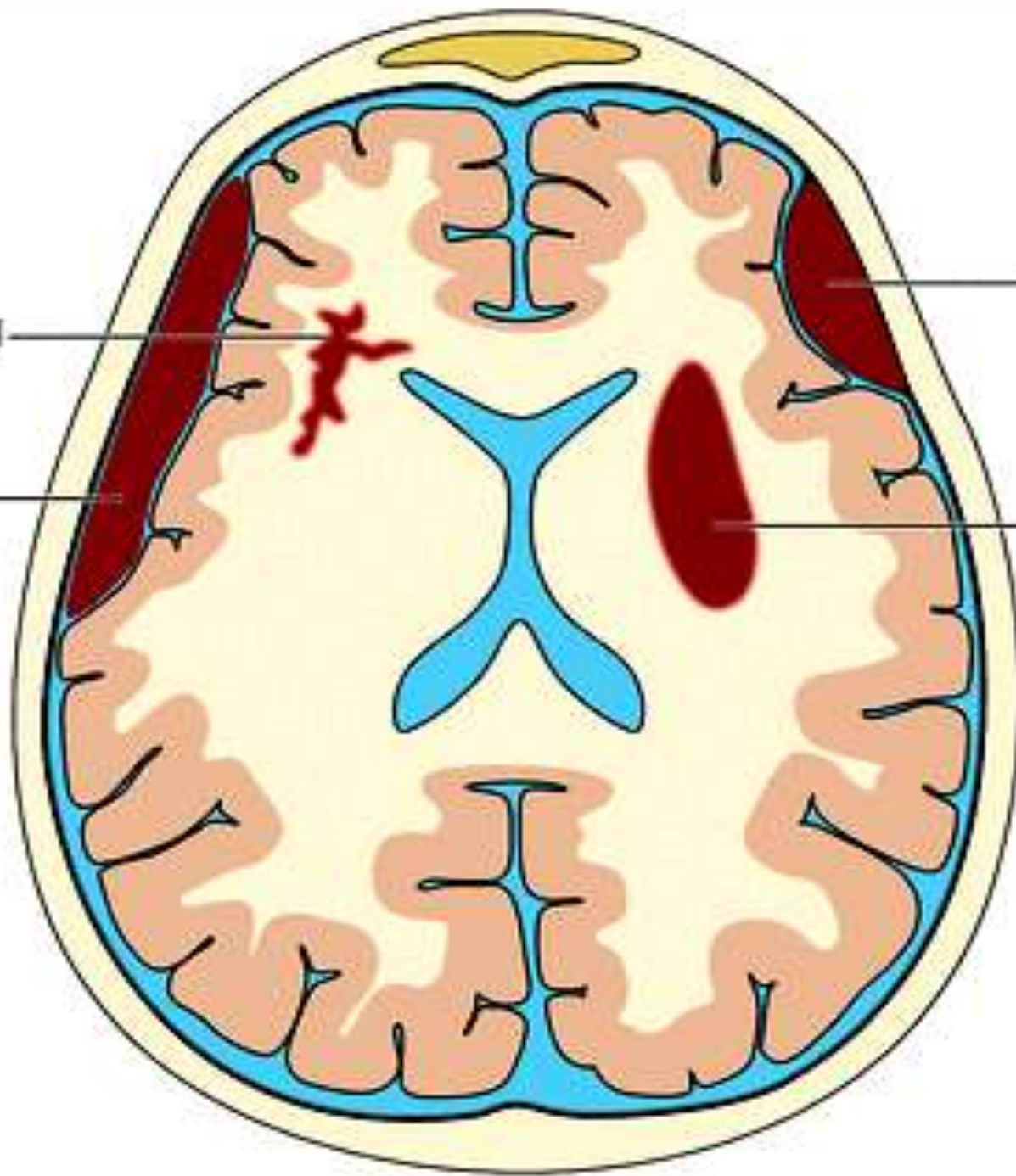


Subarachnoid
hemorrhage

Subdural
hemorrhage

Epidural
hemorrhage

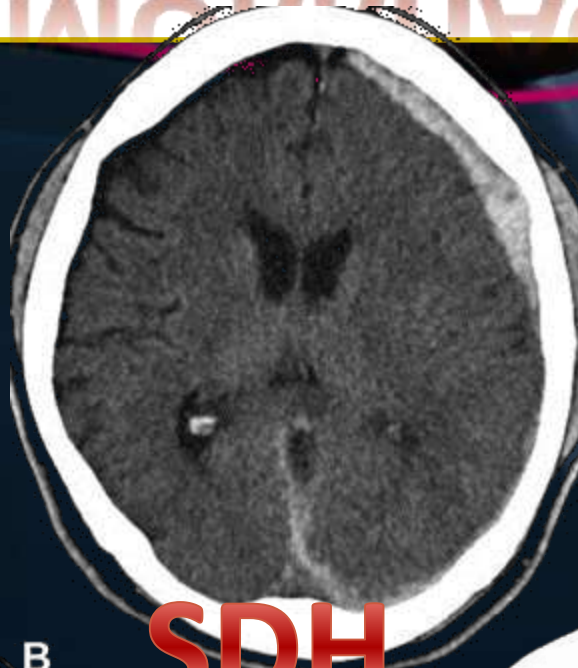
Intracerebral
hemorrhage



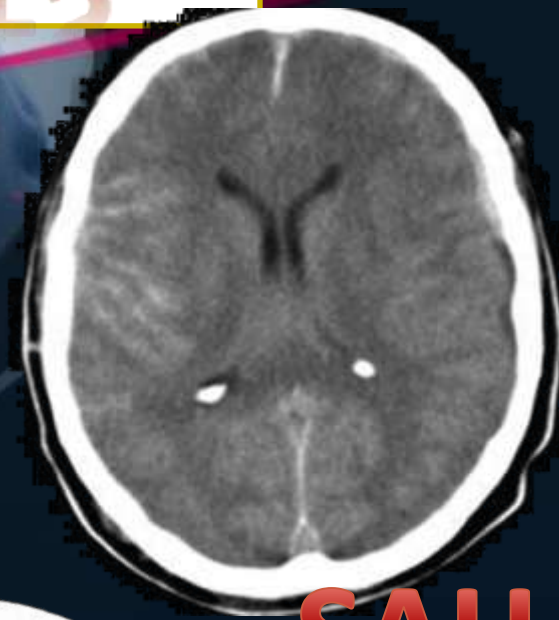
HEMORRHAGES



EDH



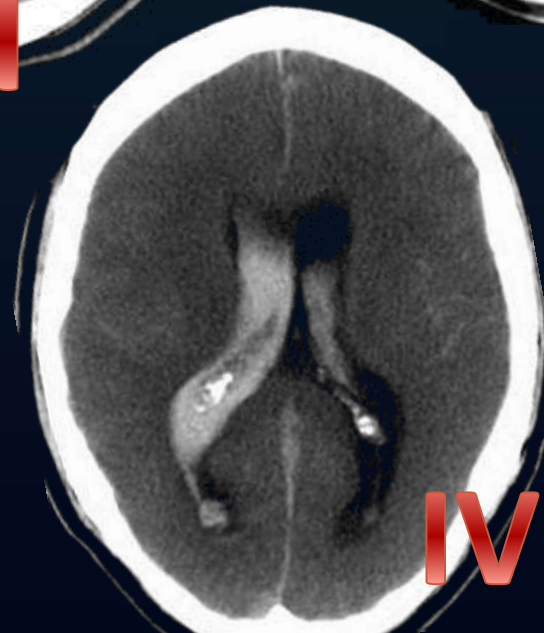
SDH



SAH

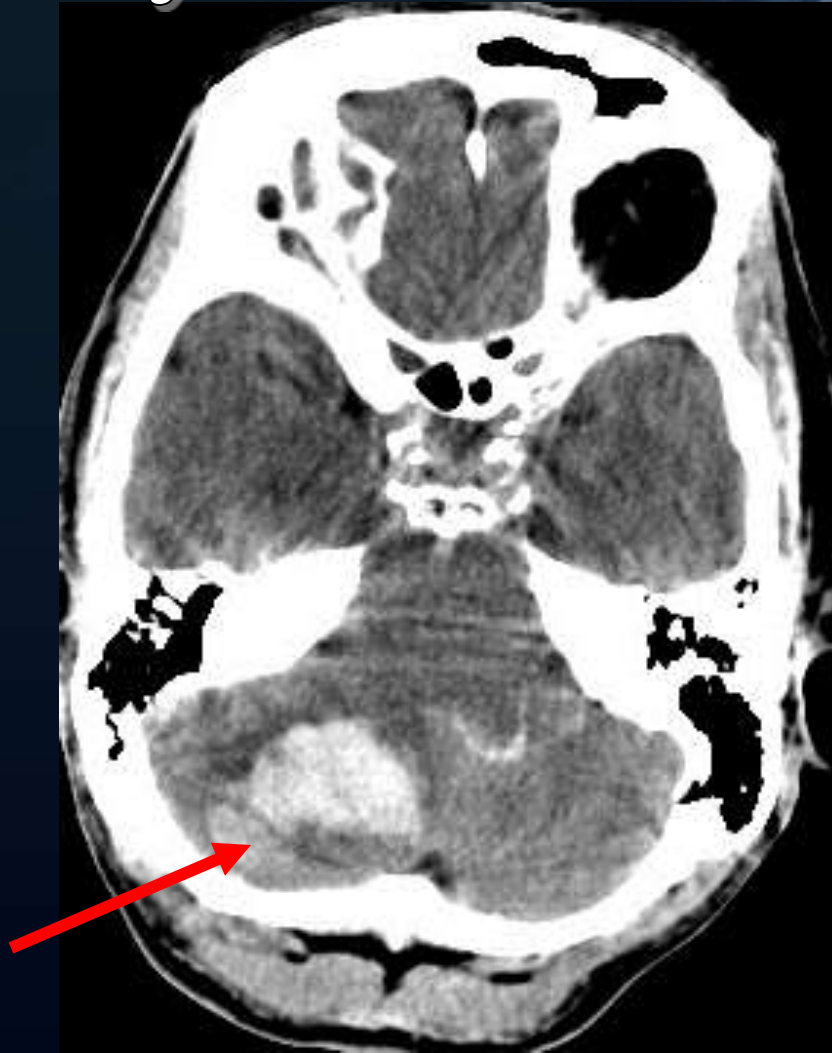


ICH



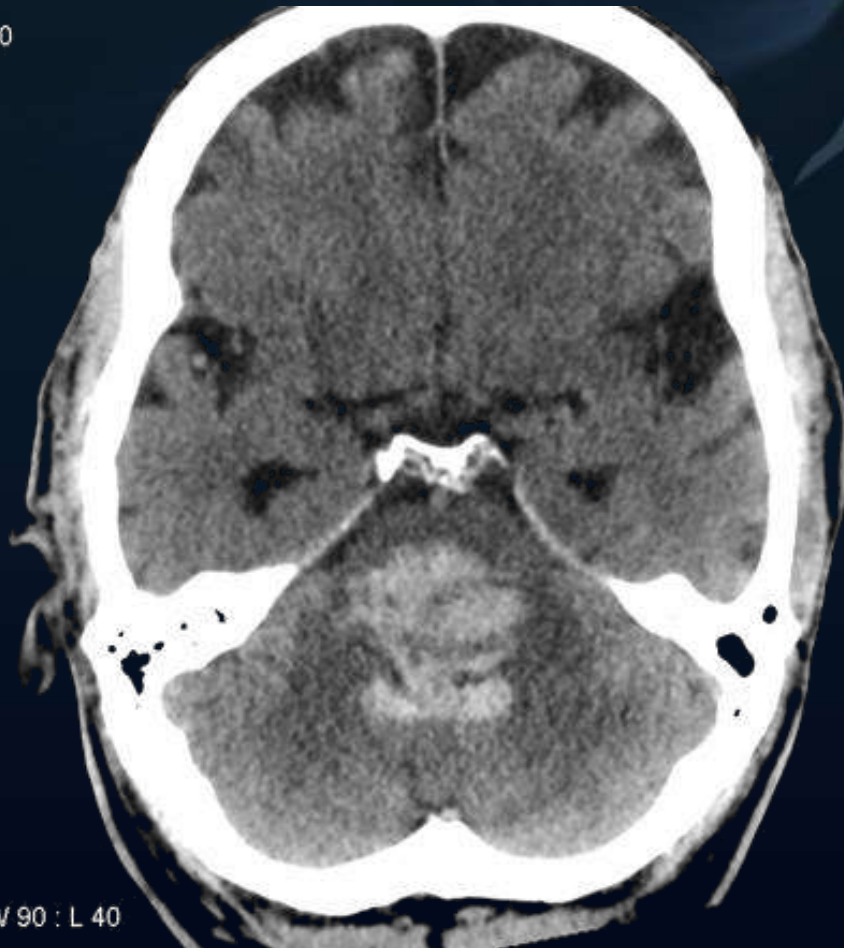
IVH

Cerebellar Hemorrhage

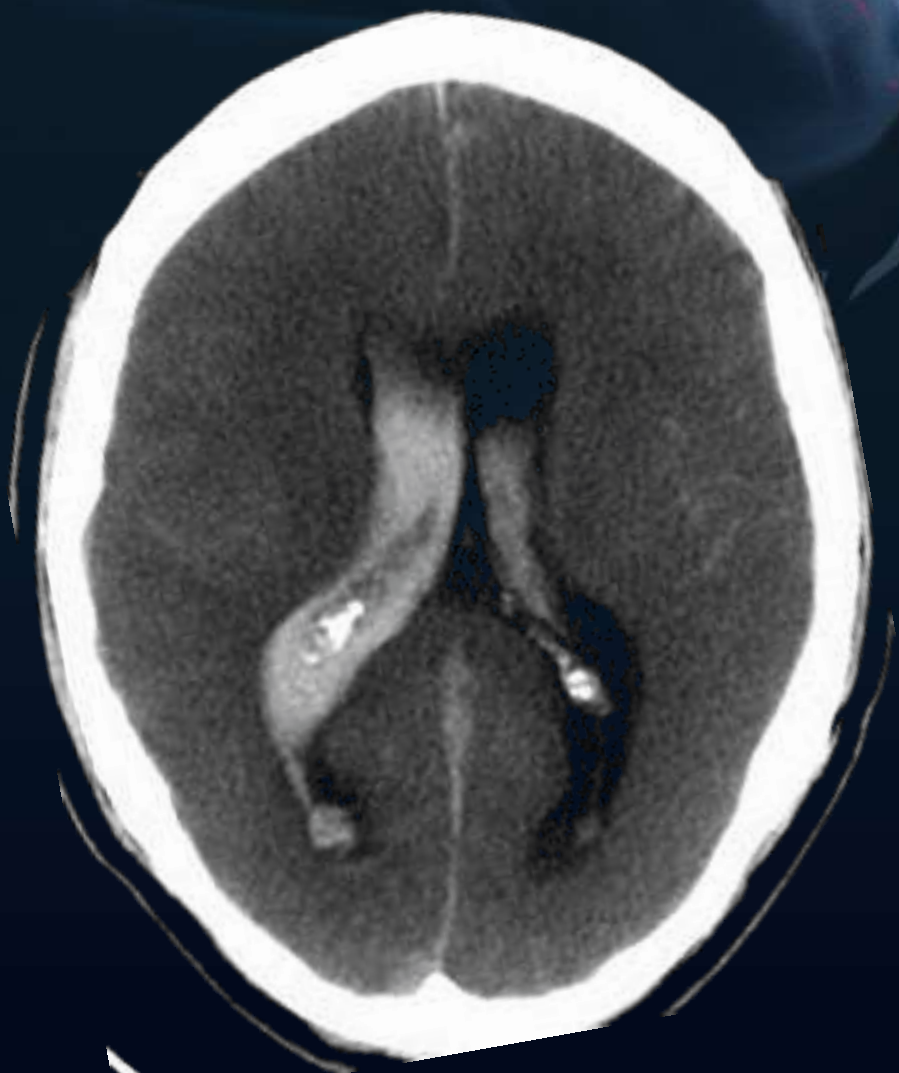


Brainstem Hemorrhage

10

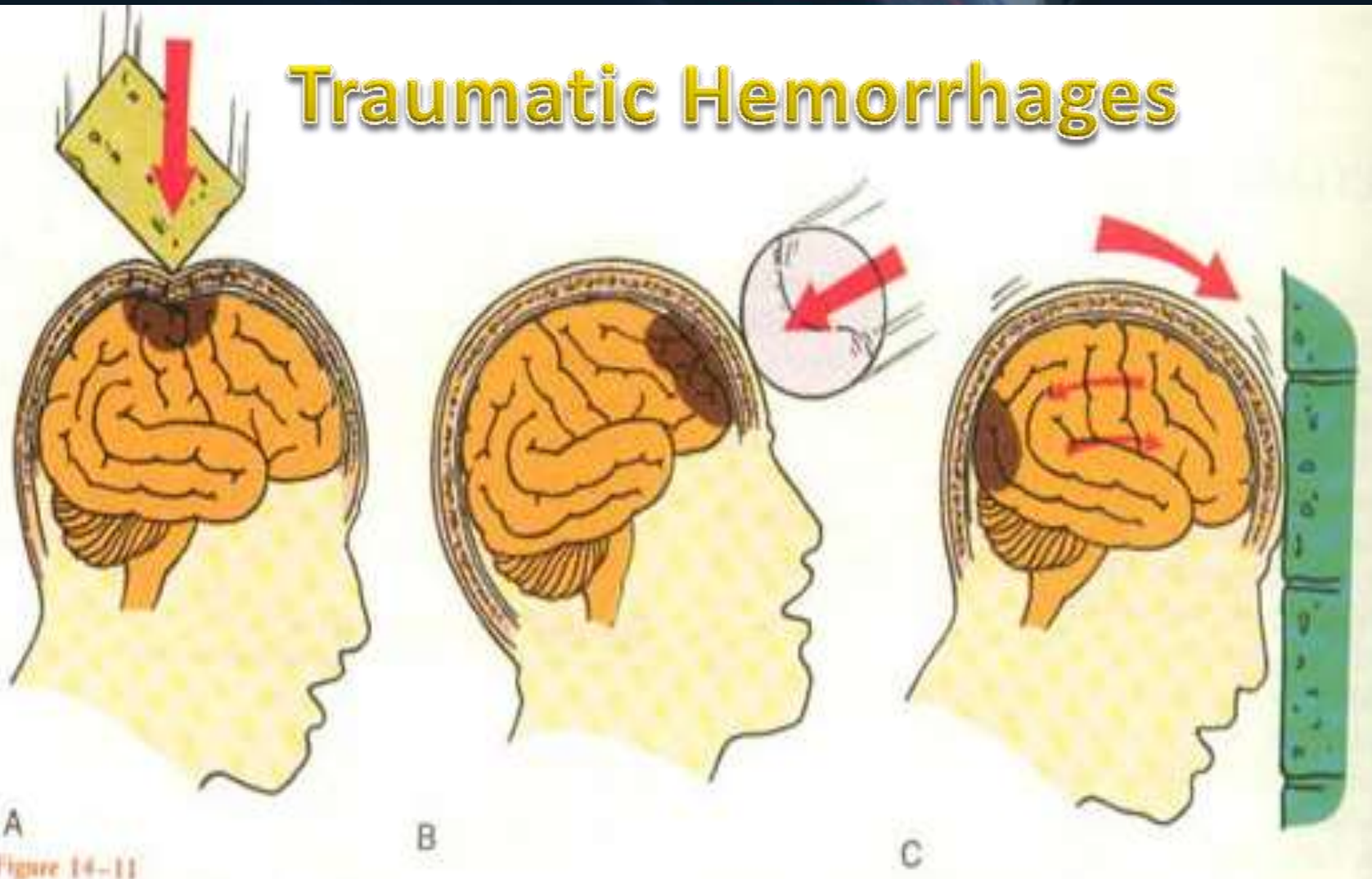


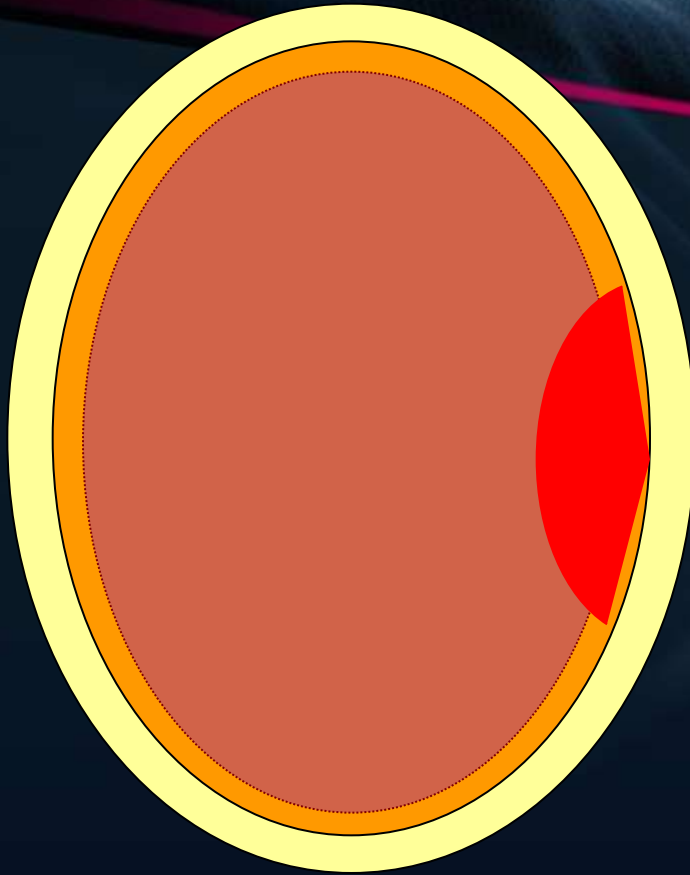
W 90 : L 40



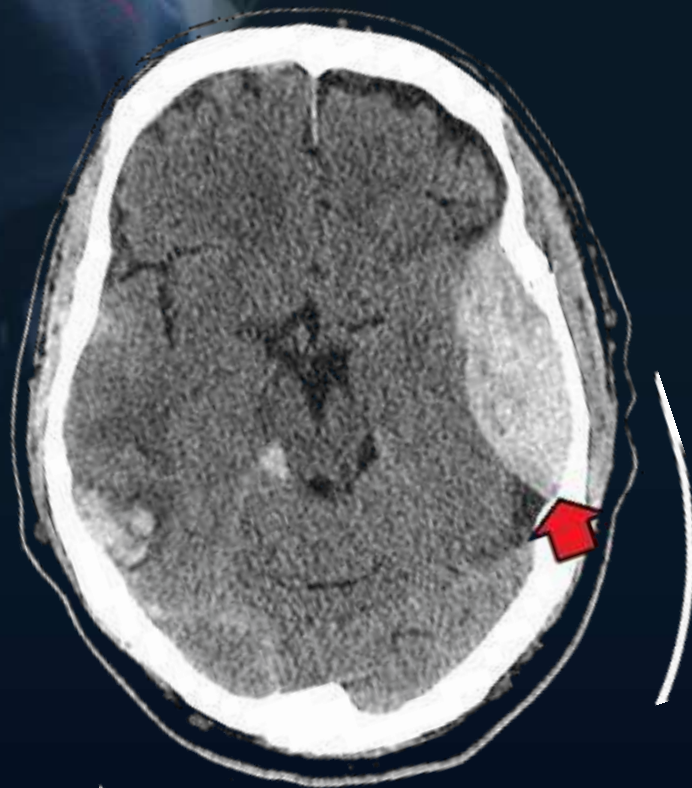
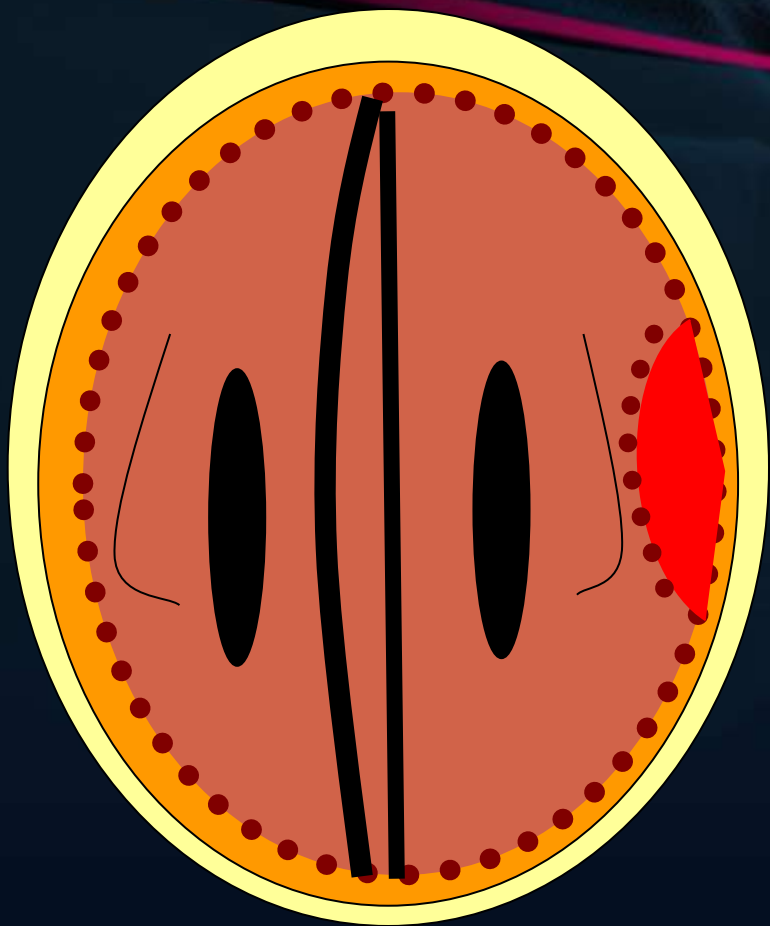


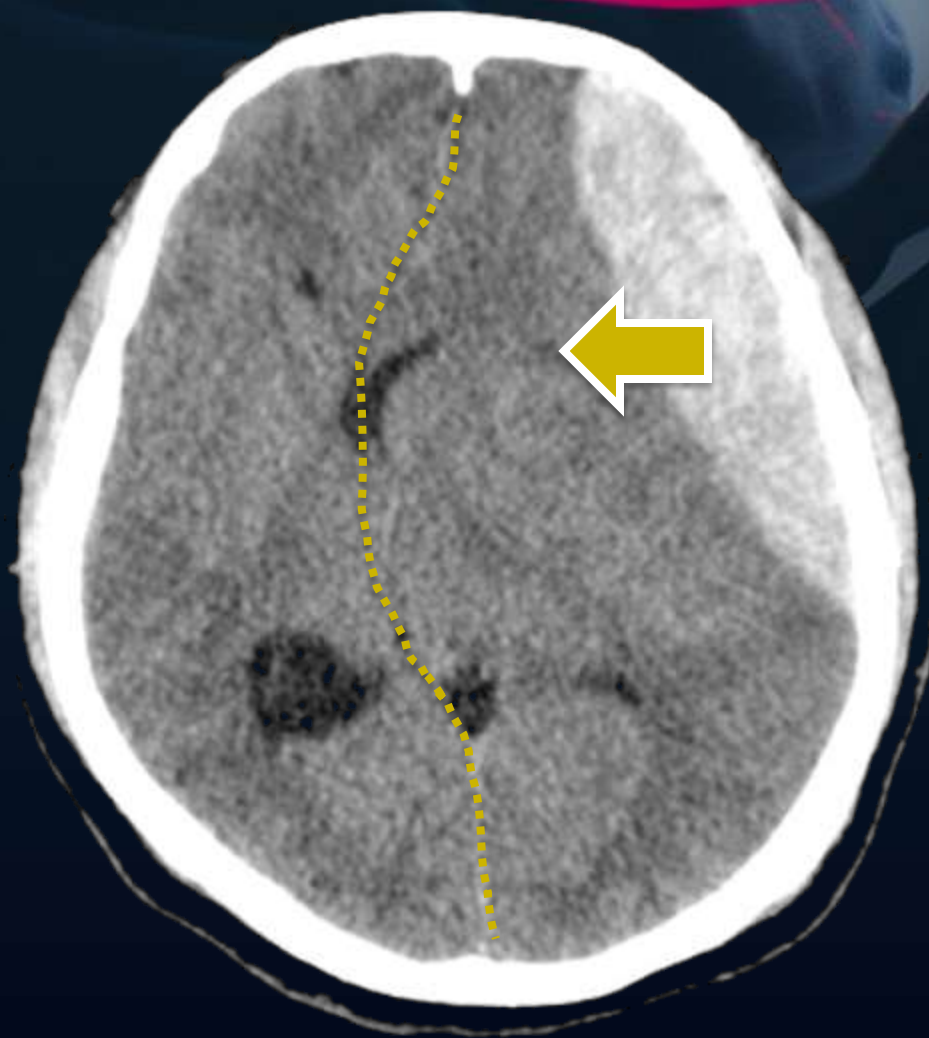
Traumatic Hemorrhages

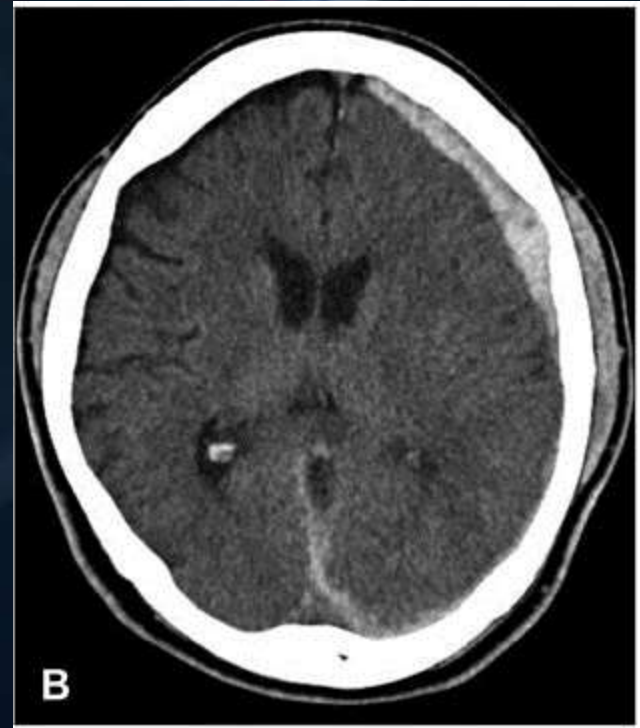
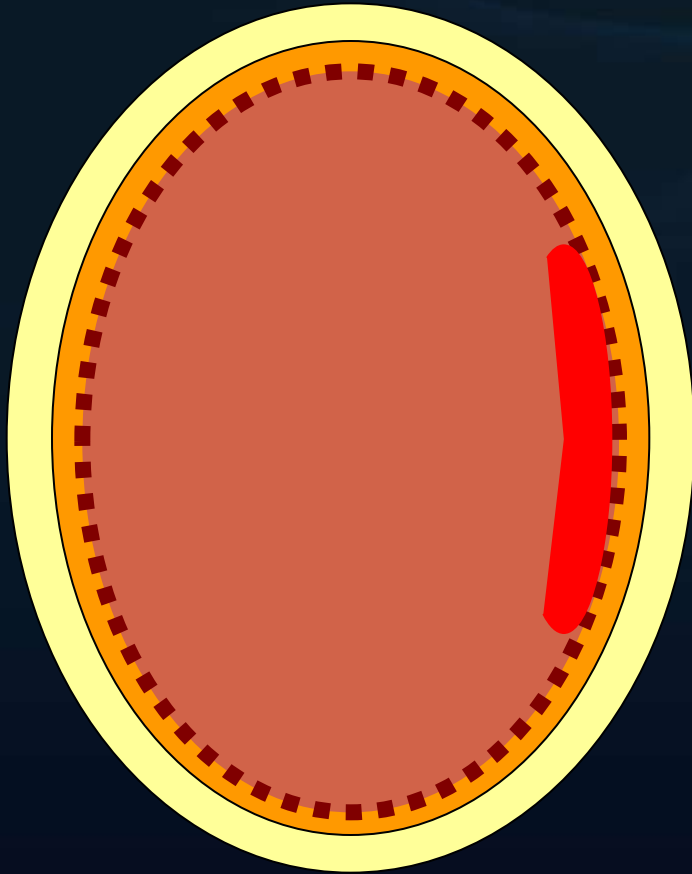




***Extra Dural
or
EpiDural***



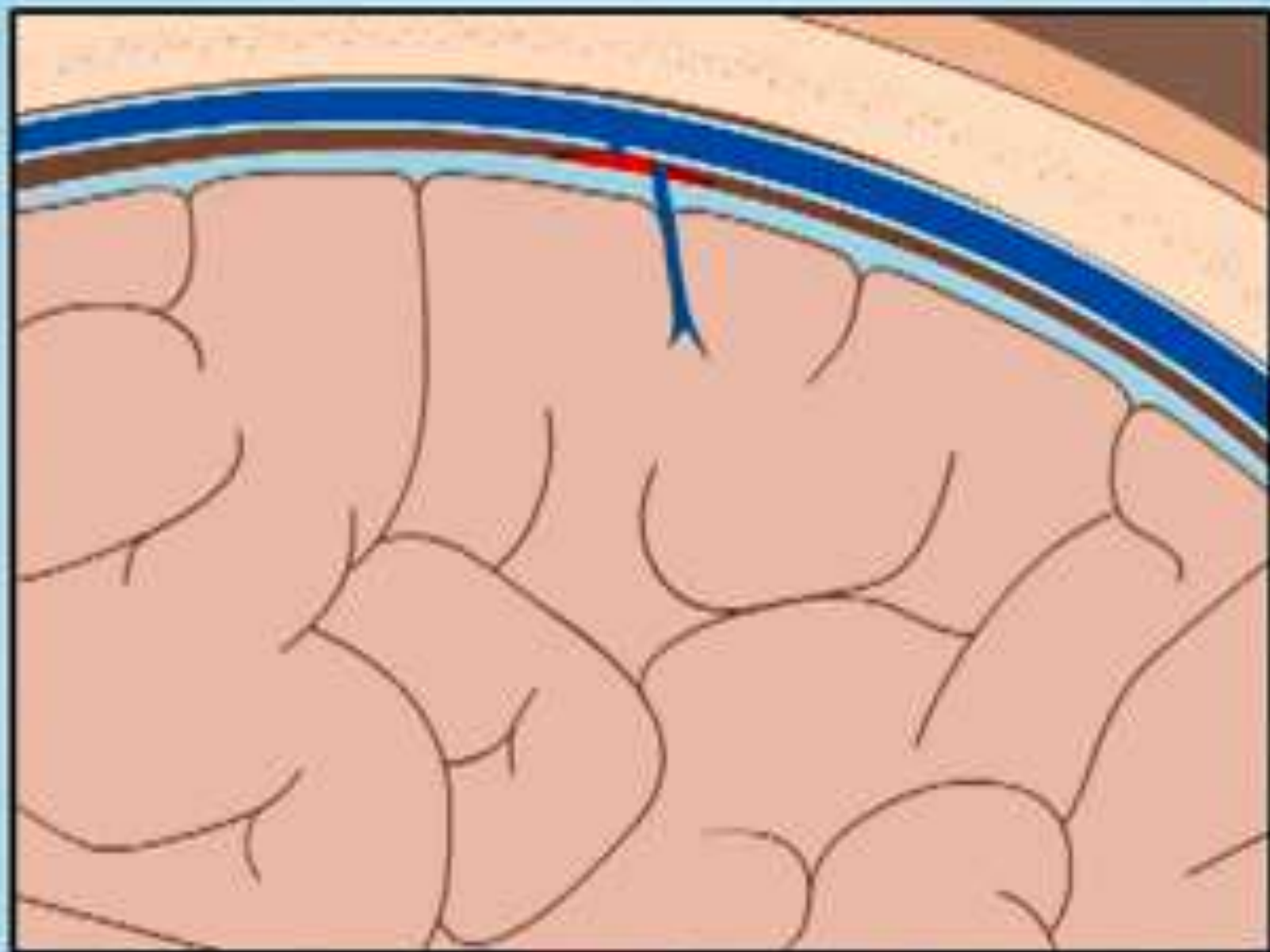




Sub Dural



Home



[Home](#)



SUBDURAL HEMATOMA STAGES

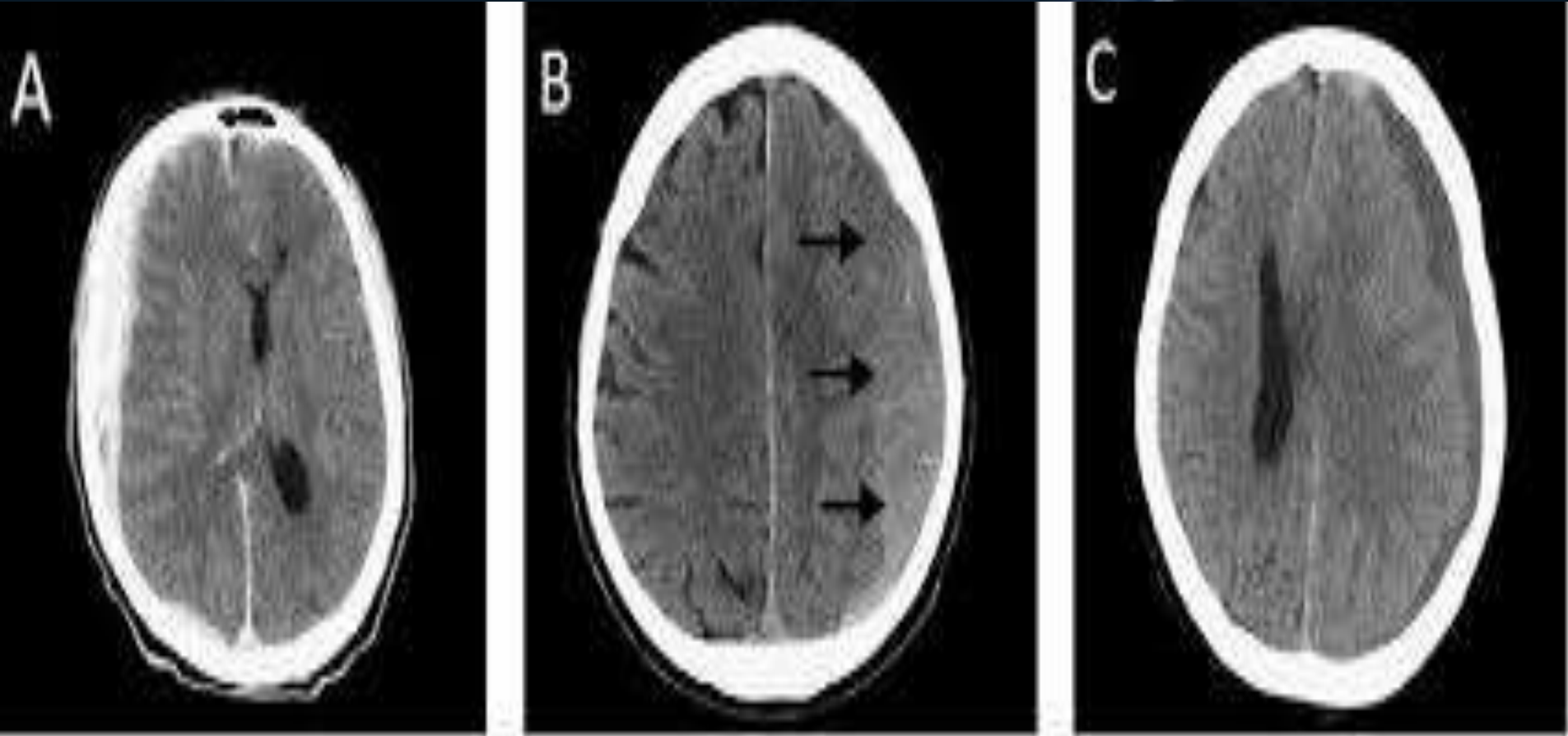
ACUTE <3 Day

SUBACUTE

3:14days

CHRONIC > 2 w

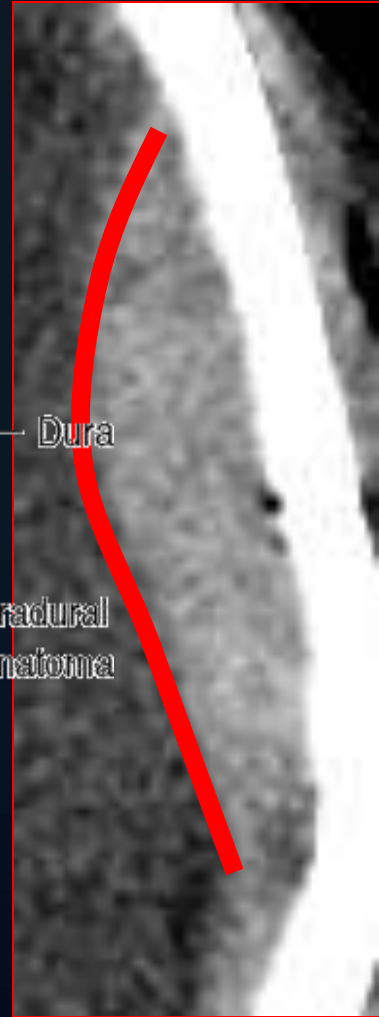
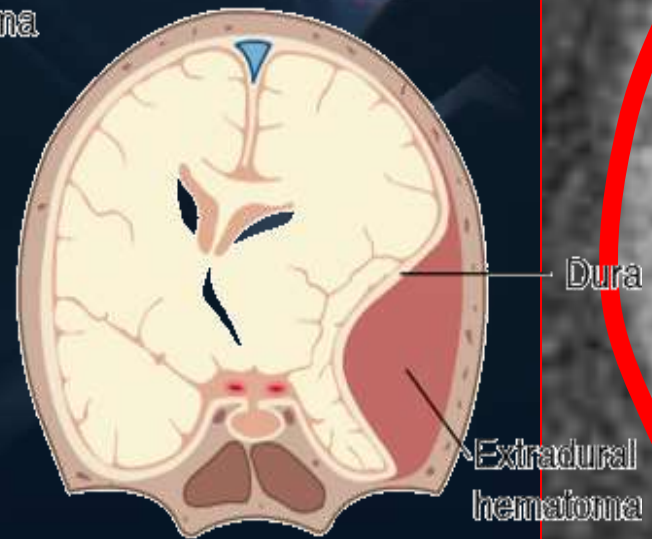
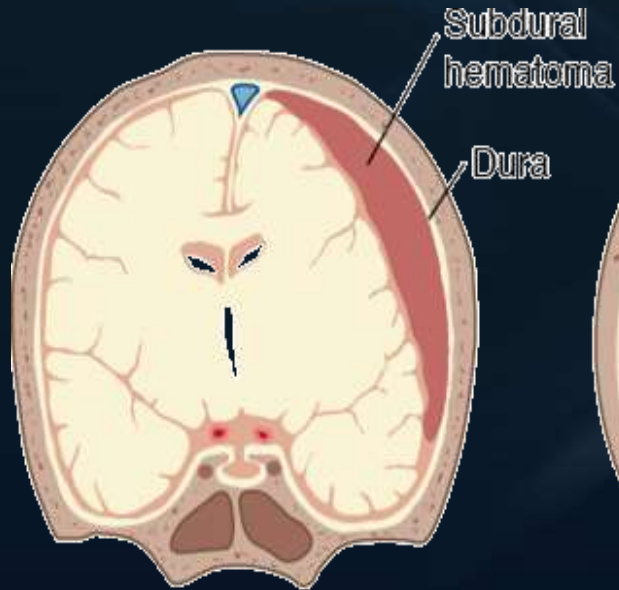
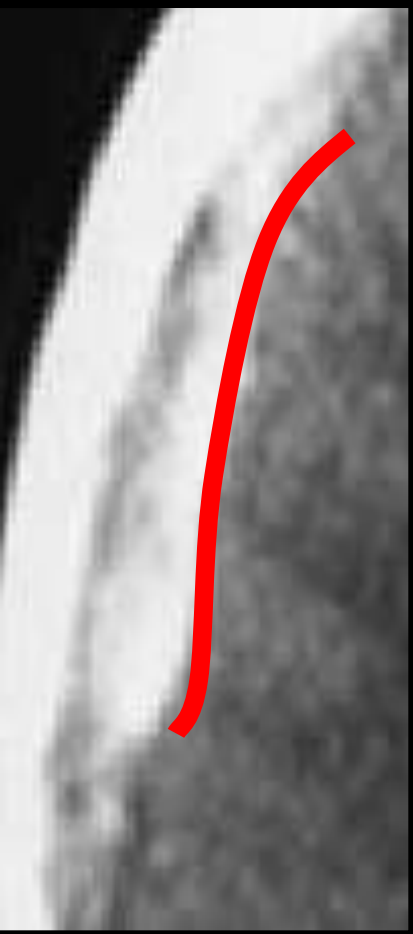




SUB

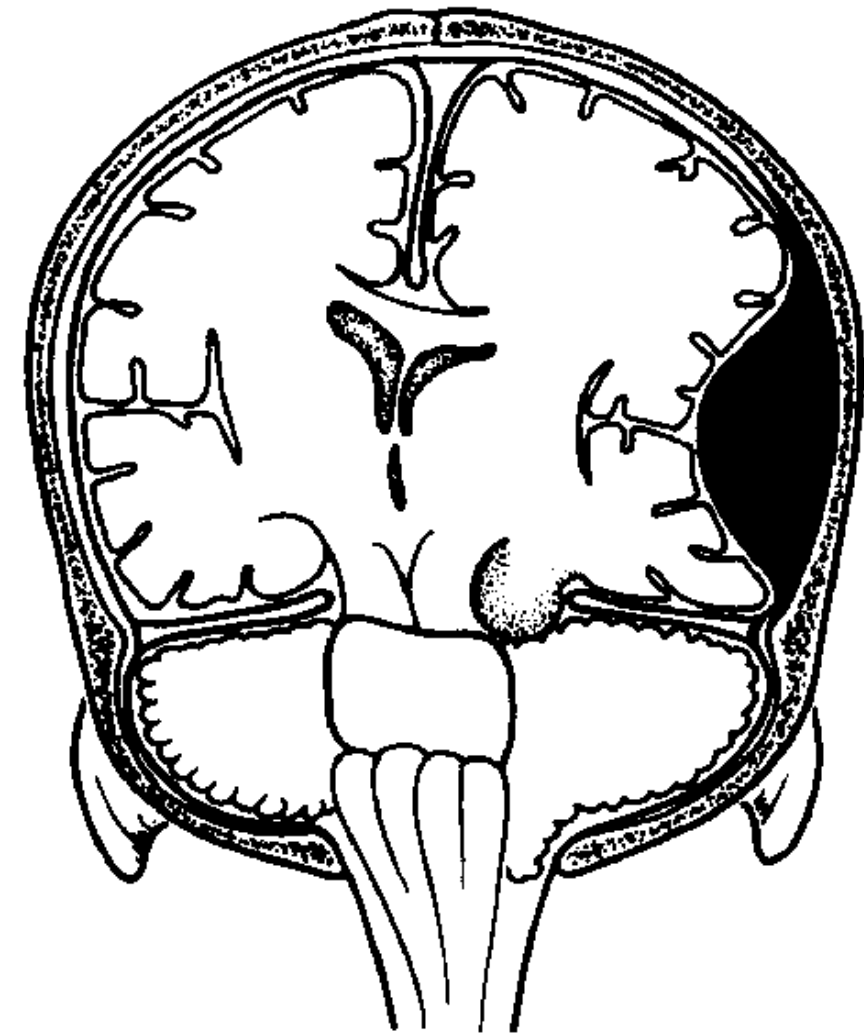
OR

EXTRA ?

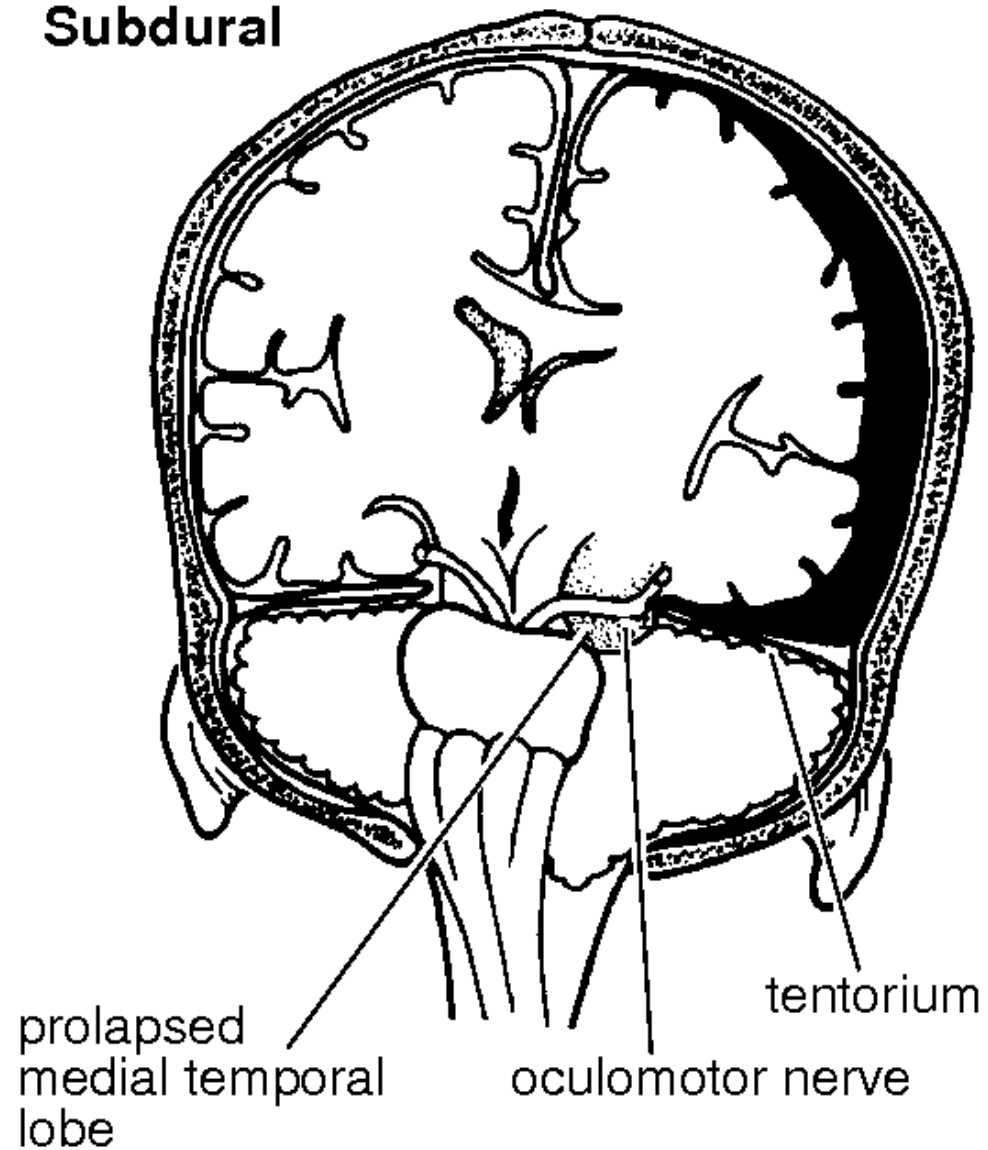


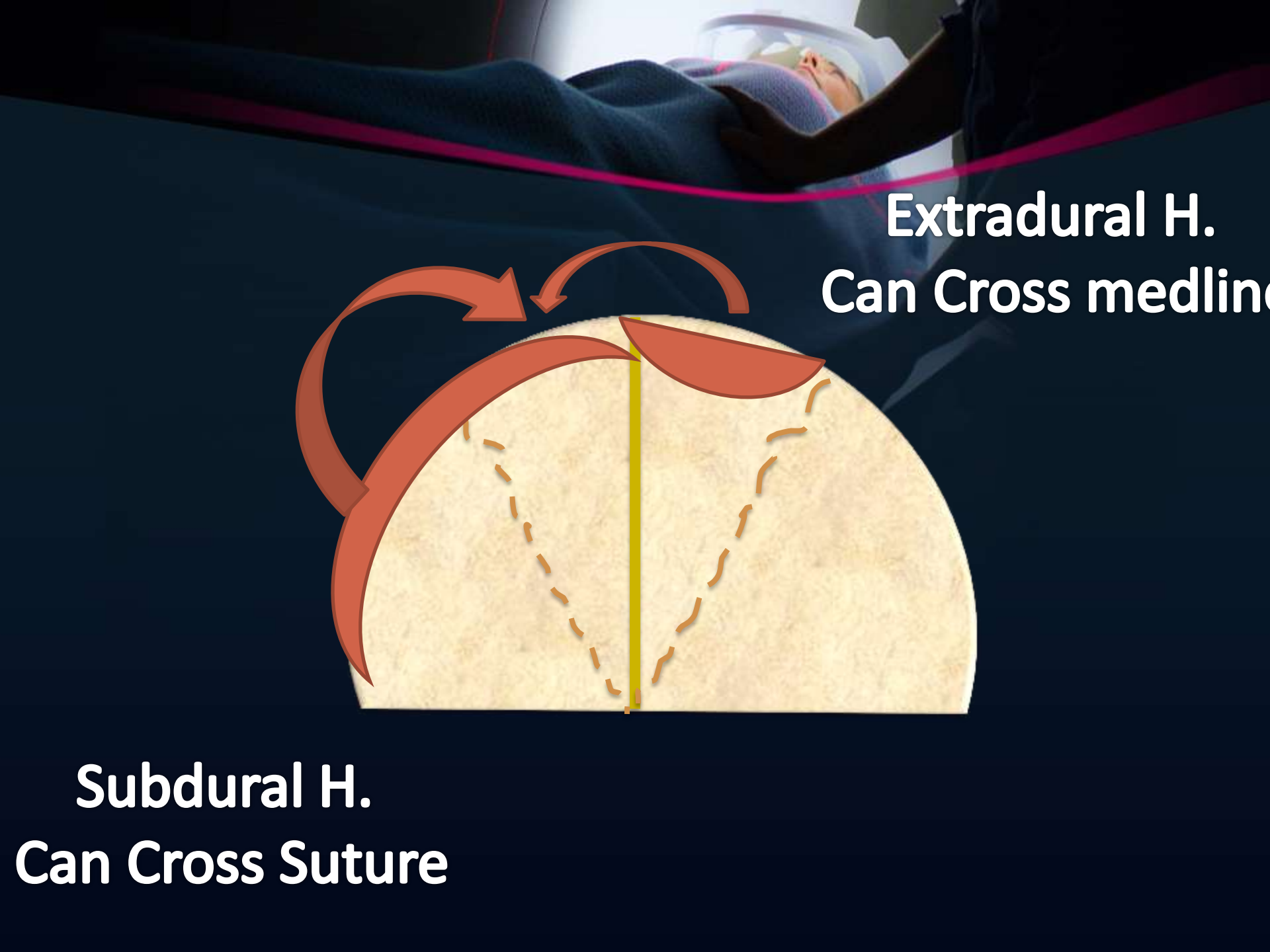
INTRACRANIAL HAEMORRHAGE

Extradural



Subdural



The image shows a patient lying in a hospital bed, partially covered by a blue blanket. A diagram of a brain cross-section is overlaid on the lower half of the image. The diagram is a semi-circle with a vertical yellow line down the center. Two red arrows curve from the top of the semi-circle towards the center line. A red wedge-shaped area is shown on the right side of the top of the semi-circle. Dashed orange lines form a V-shape on the left side of the semi-circle. The text 'Extradural H. Can Cross medline' is on the right, and 'Subdural H. Can Cross Suture' is on the left.

**Extradural H.
Can Cross medline**

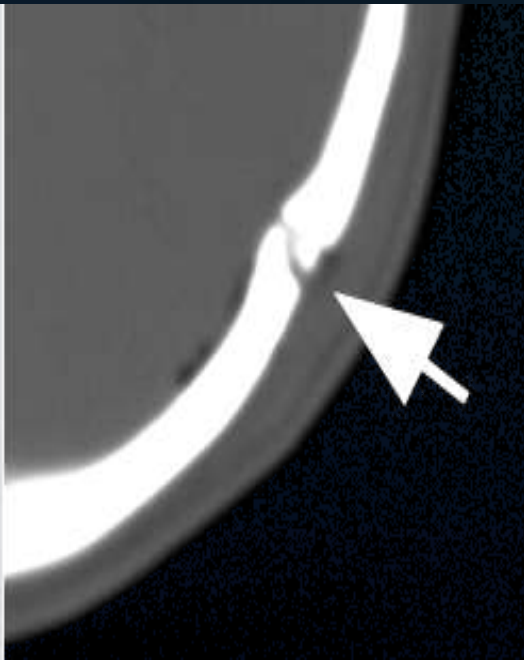
**Subdural H.
Can Cross Suture**



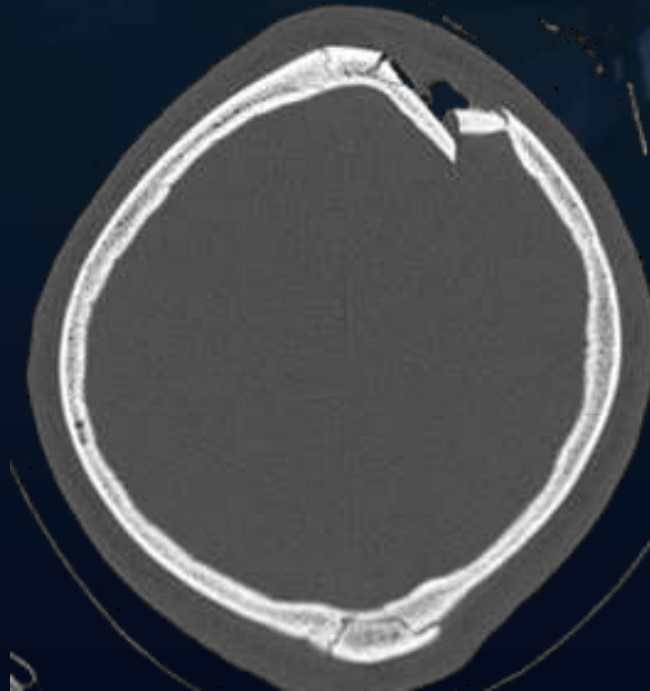
Subarachnoid Haemorrhage

Skull Fractures

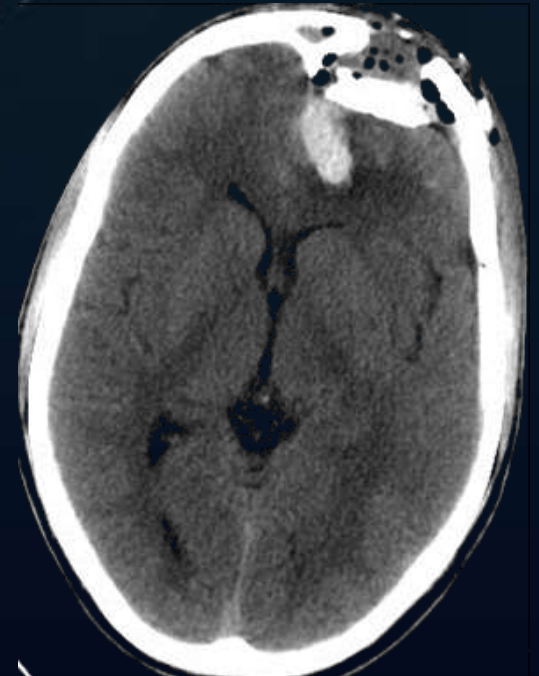
Fissure



Depressed

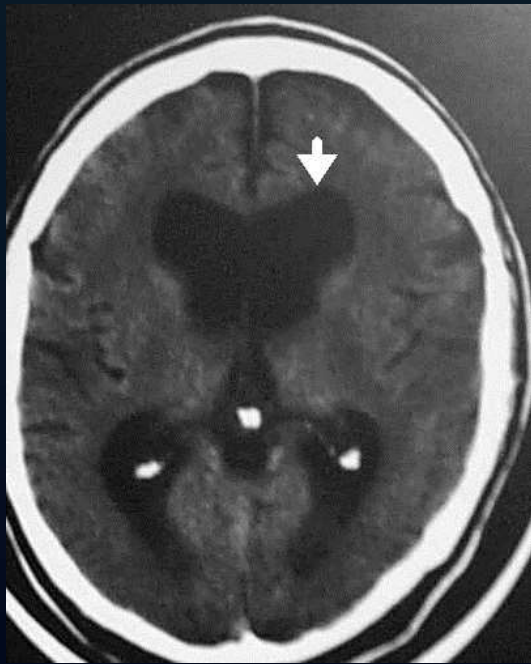


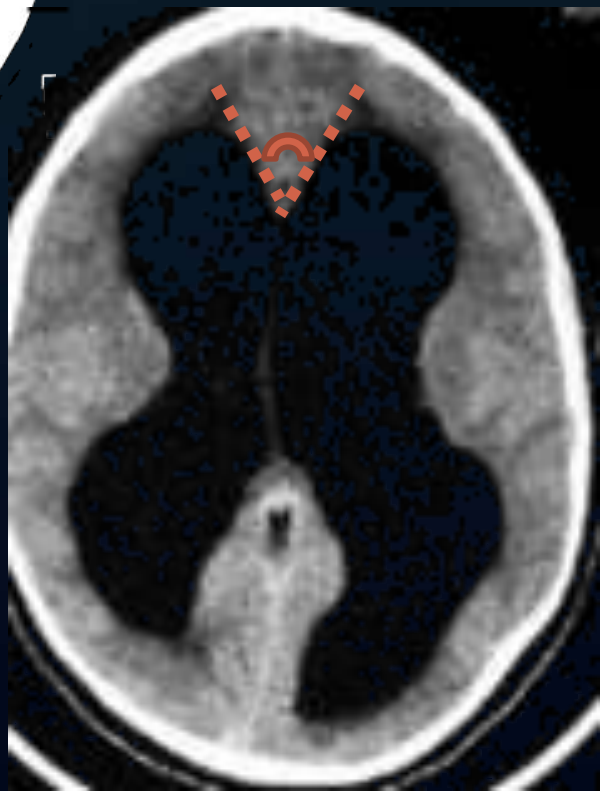
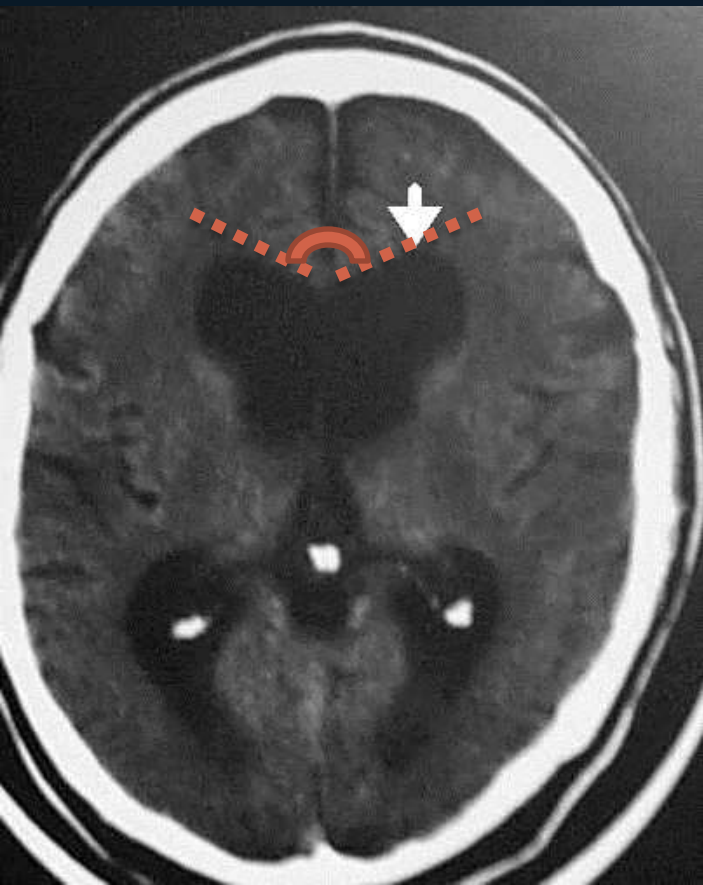
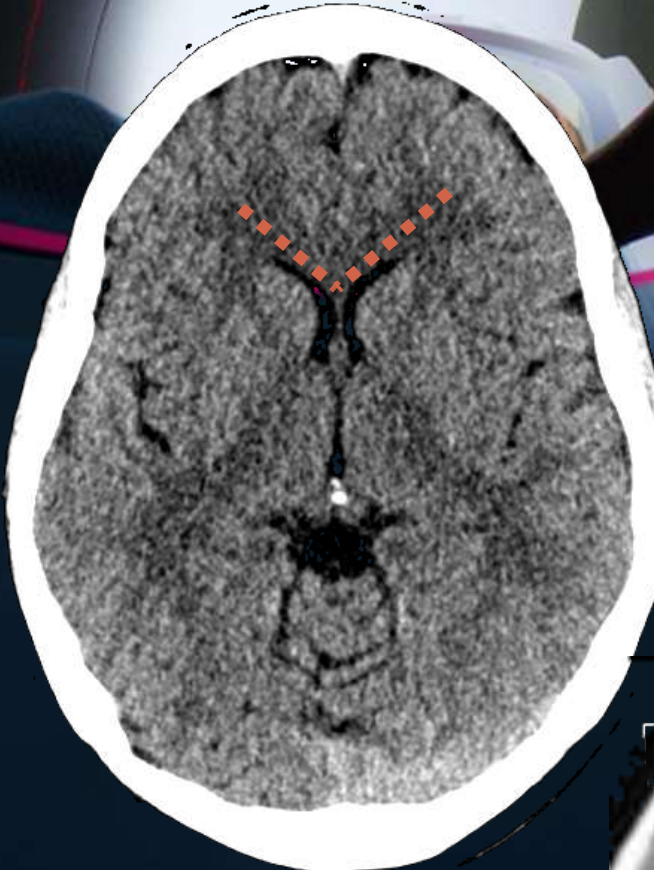
Comminuted



Hydrocephalus

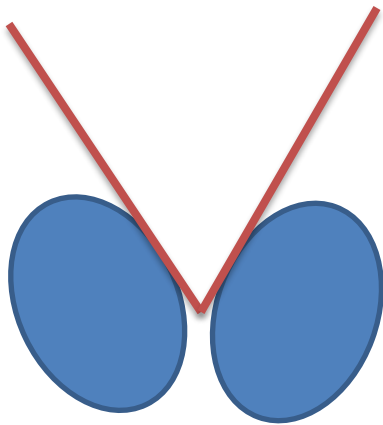
- Increase intra-ventricular pressure
- **Communicating & Non communicating**



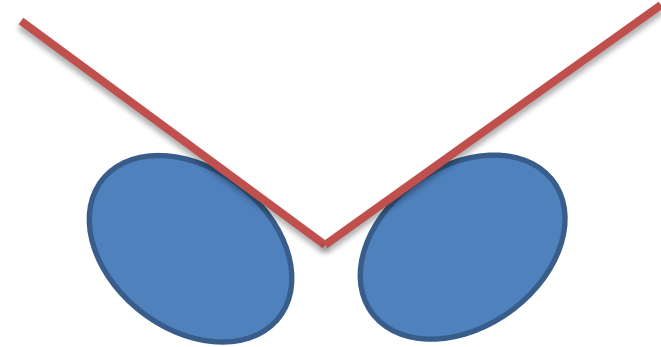


Normotensive Vs Hydrocephalic

Ant. Horns Angle



Acute Angle = High Pressure

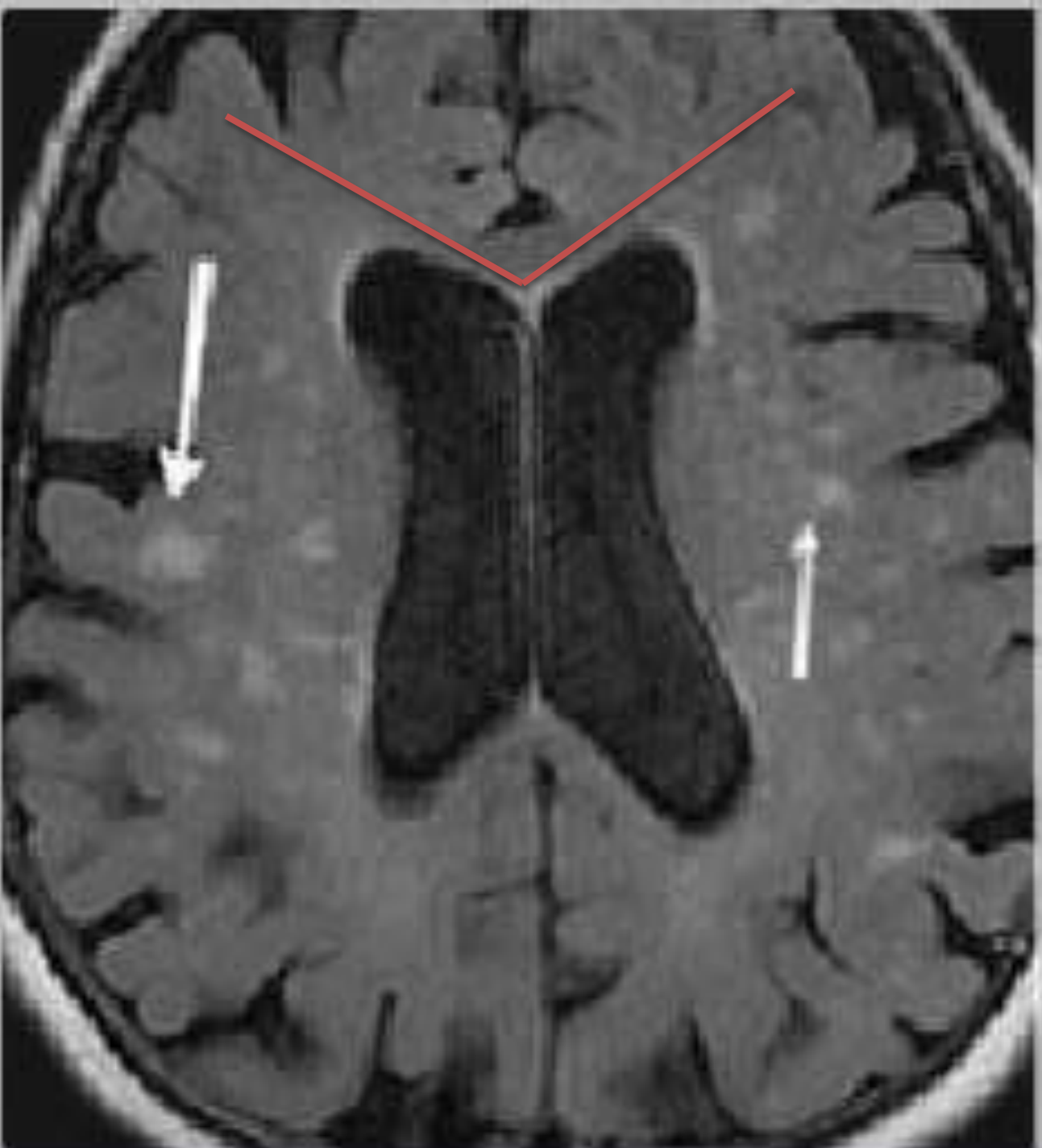


Obtuse Angle = Normotensive

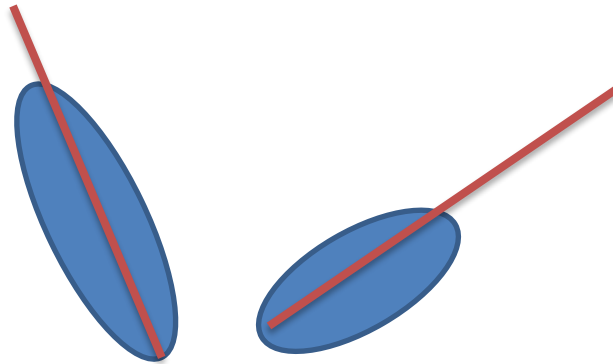


+/- Temporal Horn Dilatation

Picture of Dementia



When Unilateral Ant Horn is Anteriorly oriented ?

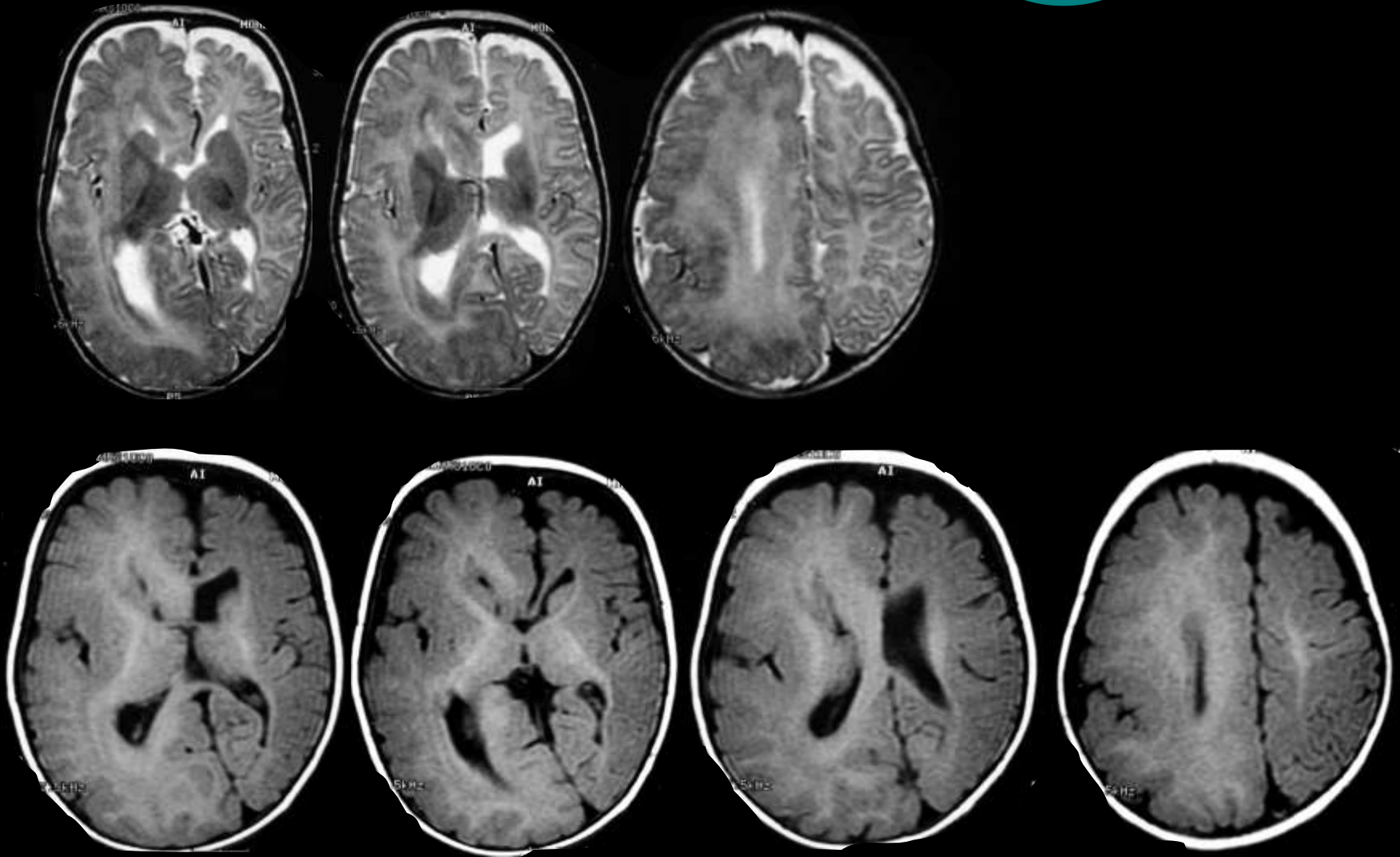


HEMI MEGAL ENCEPHALY

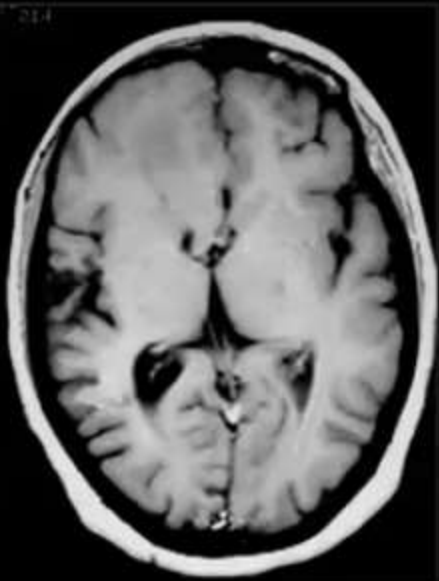
Enlarged Part or all of one hemisphere & lateral ventricle

Hemimegalencephaly

M 3M



Full screen (normal)



Few
Sulci

WM abnormal signal

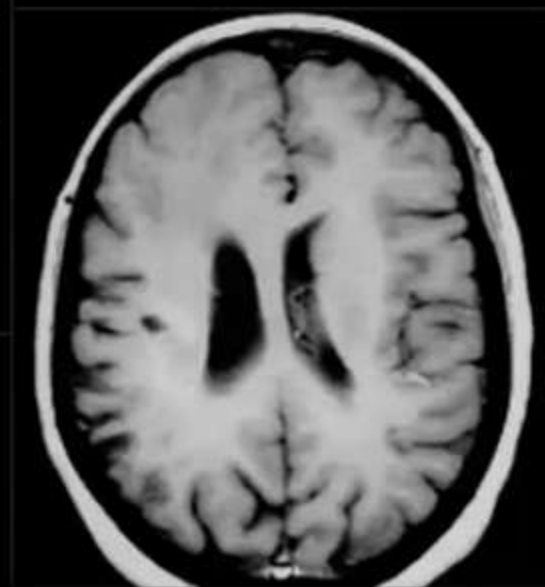


Straightened Ant.
Horn

F 30Y

Focal

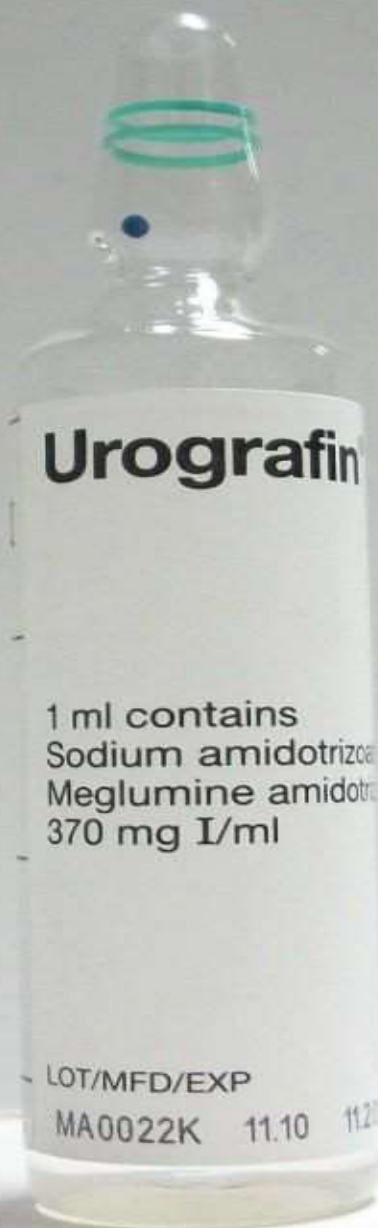
megaloencephaly

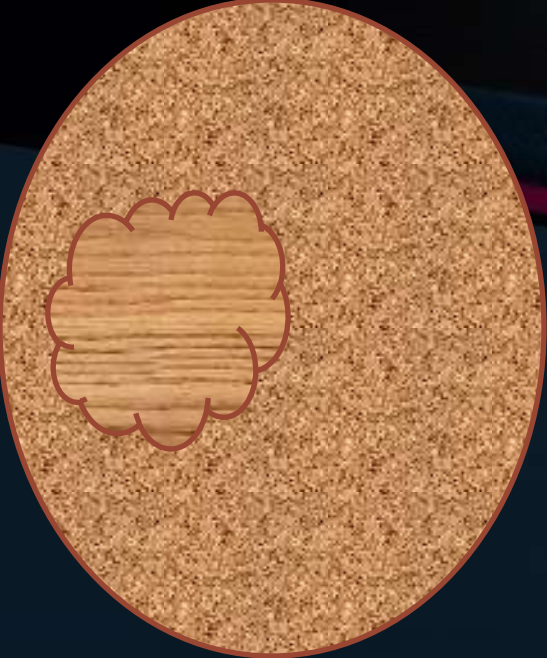


Basics of Enhanced CT



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

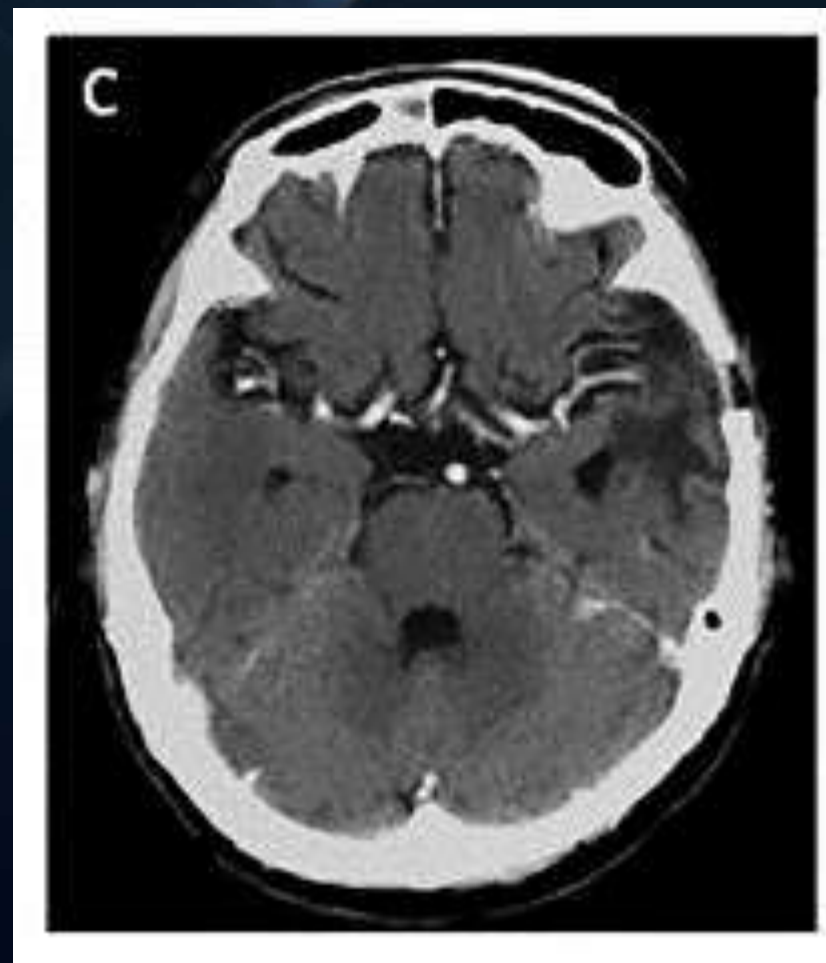
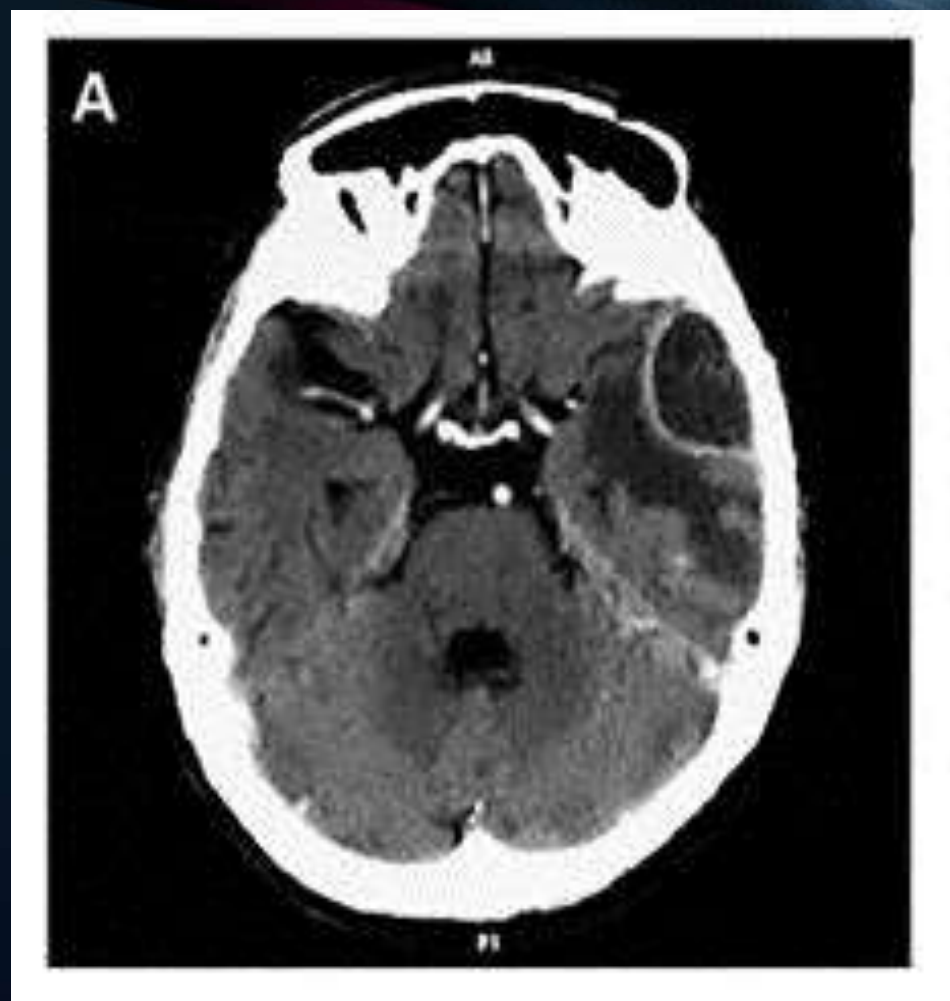
HETERO

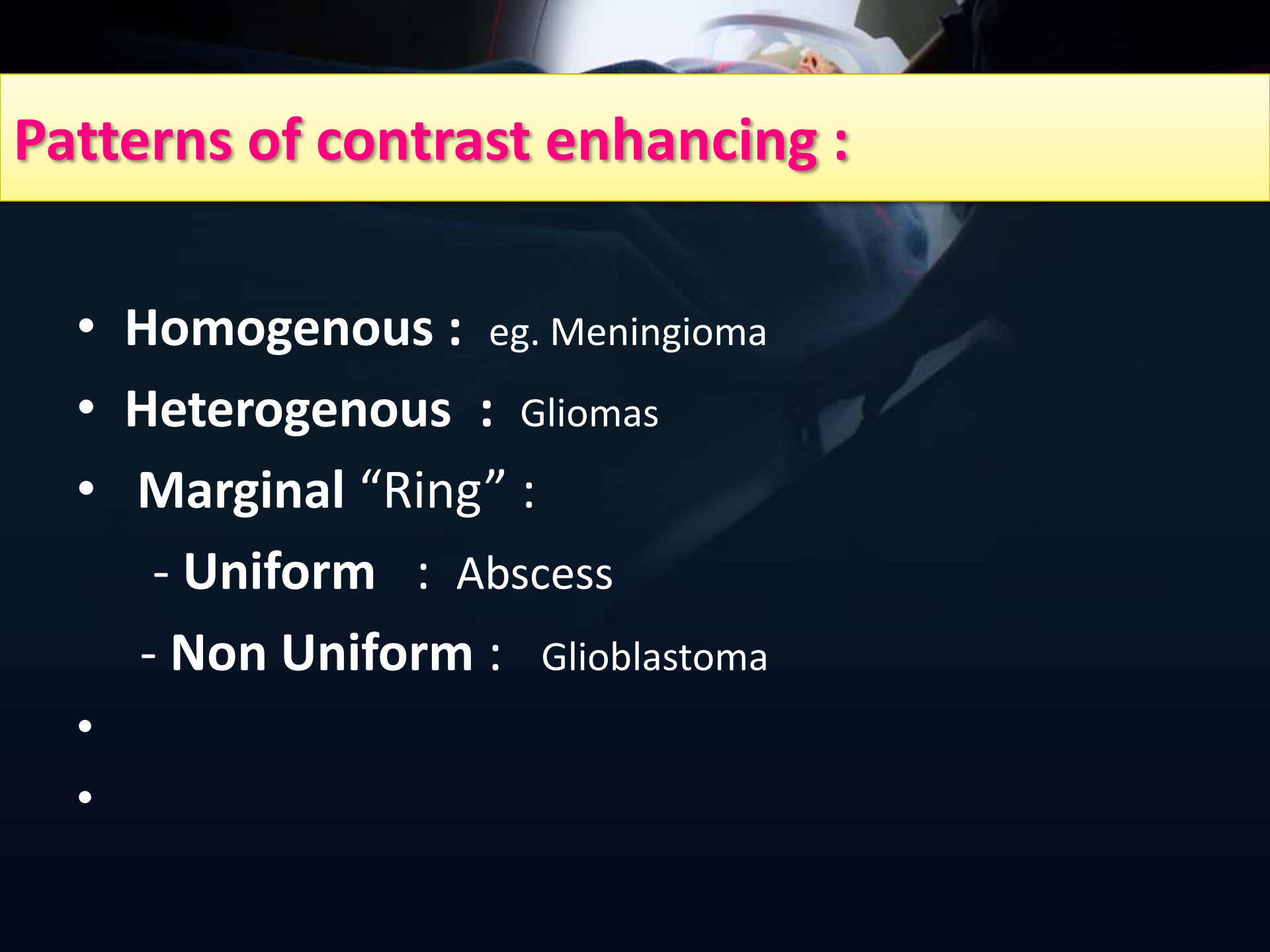
Uniform

Non Uniform

MARGINAL





A patient is lying on a table, positioned for a medical scan. A red laser line is visible on the patient's forehead. The background is dark, and the patient is wearing a white garment.

Patterns of contrast enhancing :

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

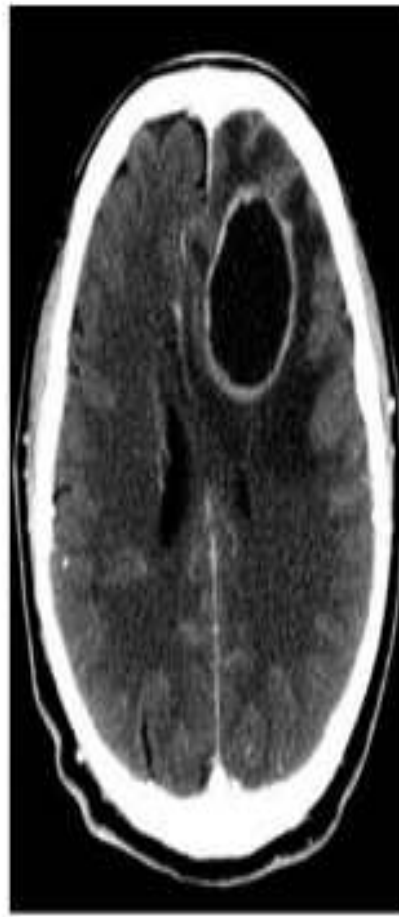
Glioma

Heterogeneous
Enhancement



Glioblastoma

Non Uniform
Ring Enhancement



Abscess

Uniform Ring
Enhancement

Meningioma

Homogeneous
Enhancement



SUMMARY

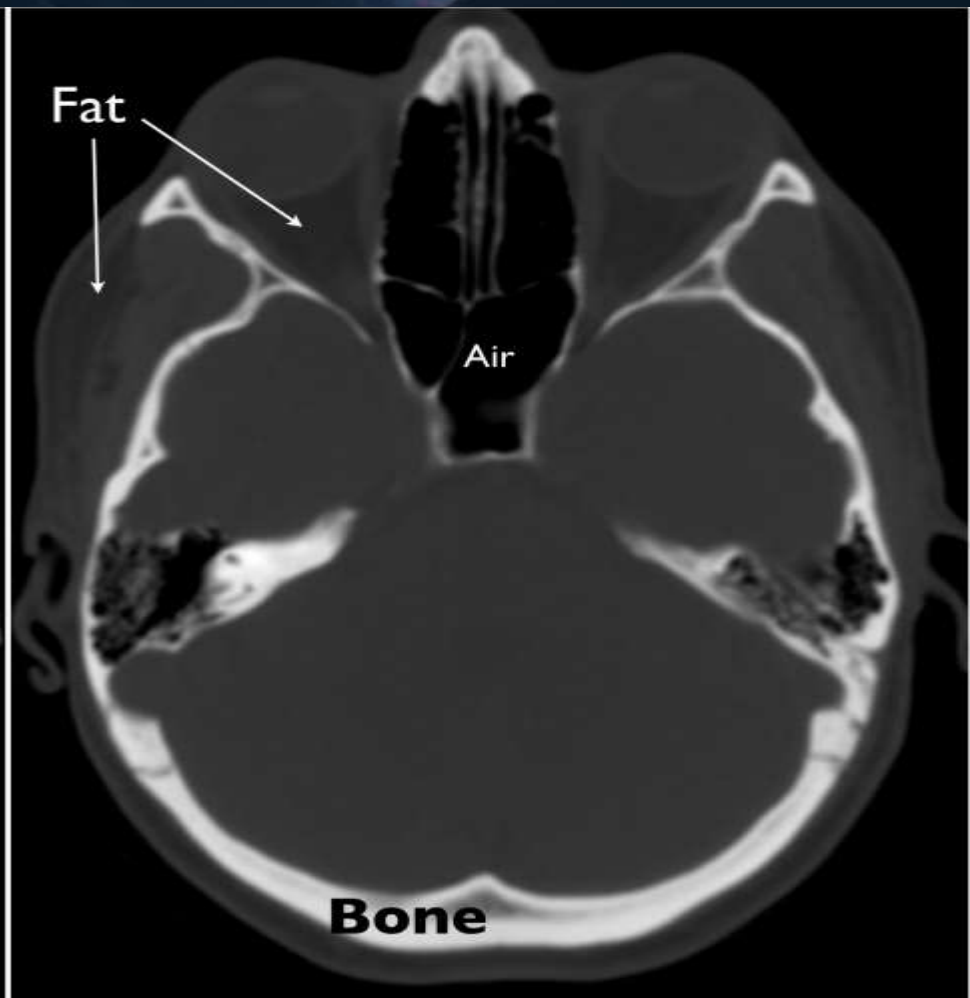
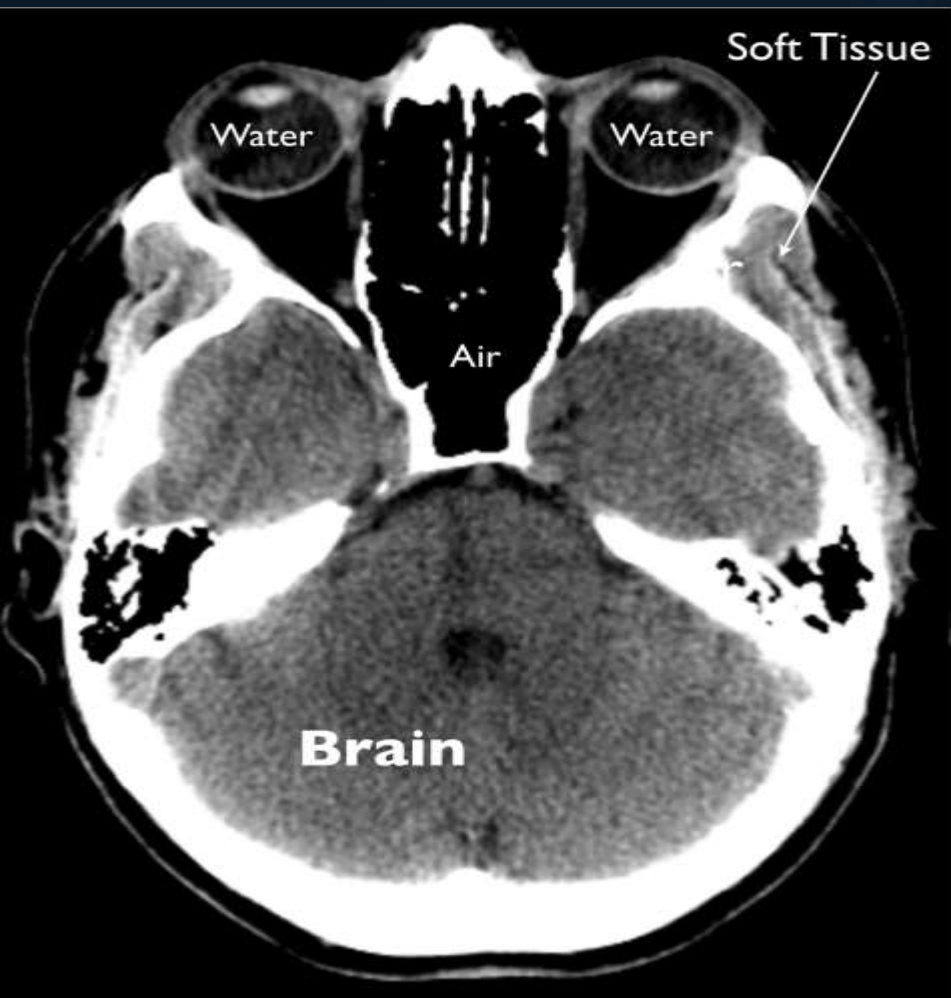




Brain window

Vs

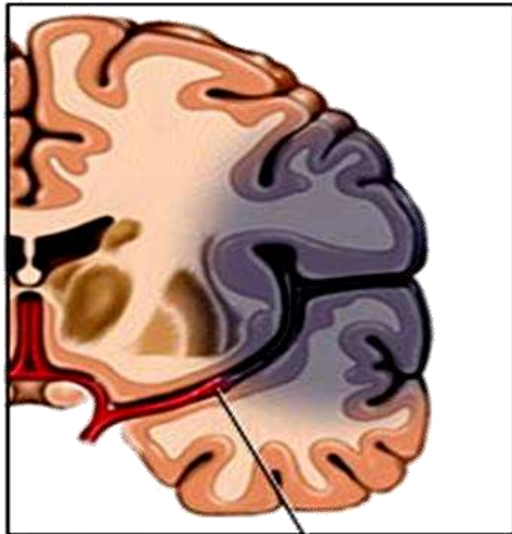
Bone window



STROKE

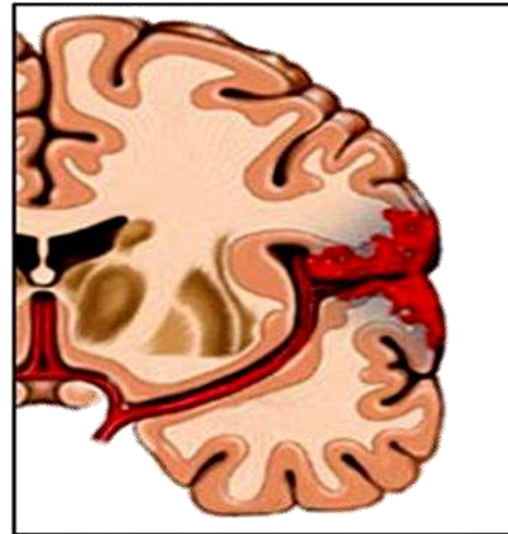
2 major types of Stroke

Ischemic stroke



A clot blocks blood flow to an area of the brain

Hemorrhagic stroke



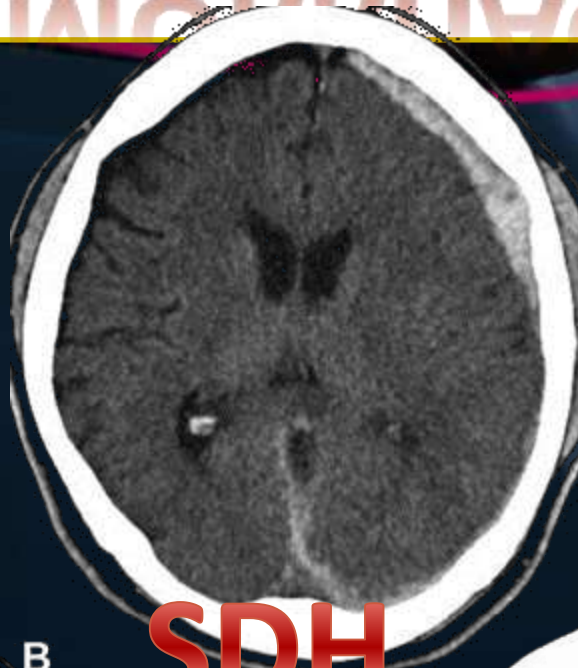
Bleeding occurs inside or around brain tissue



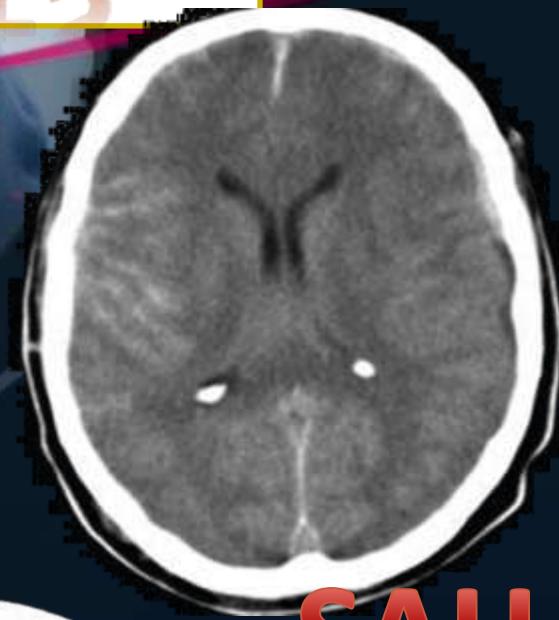
HEMORRHAGES



EDH



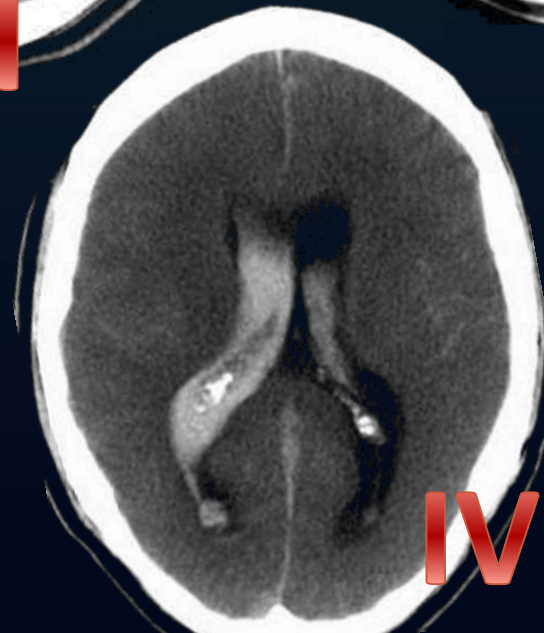
SDH



SAH



ICH

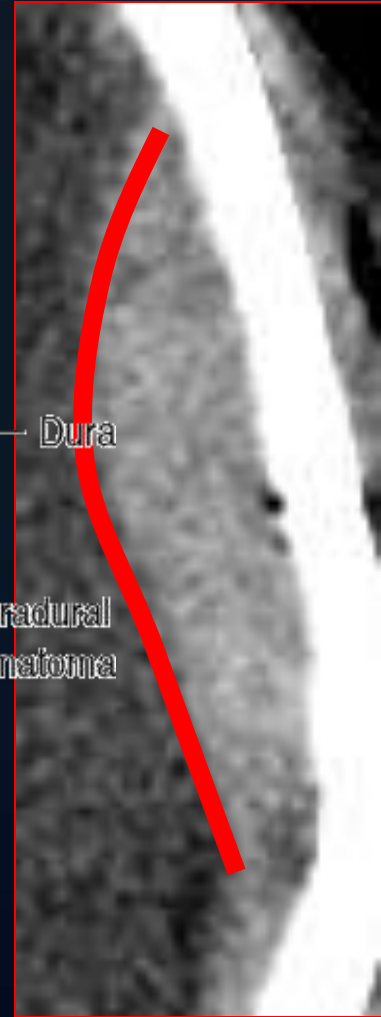
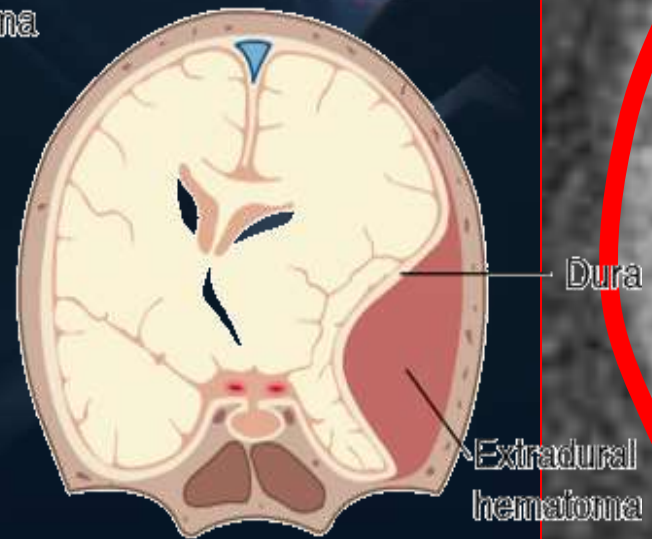
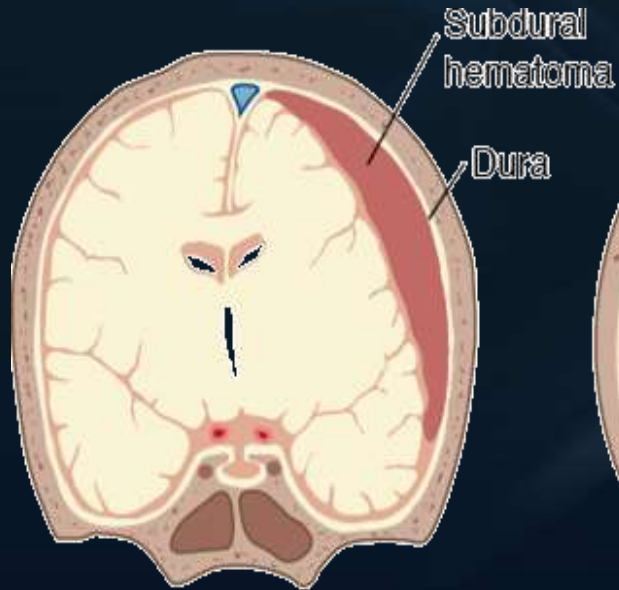
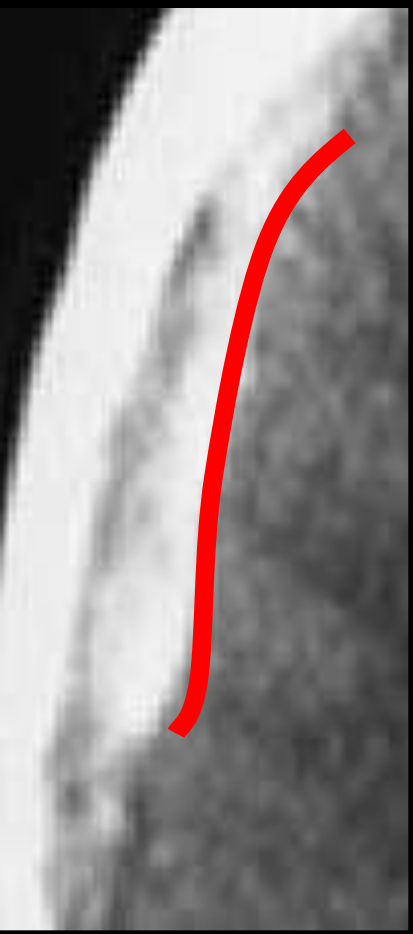


IVH

SUB

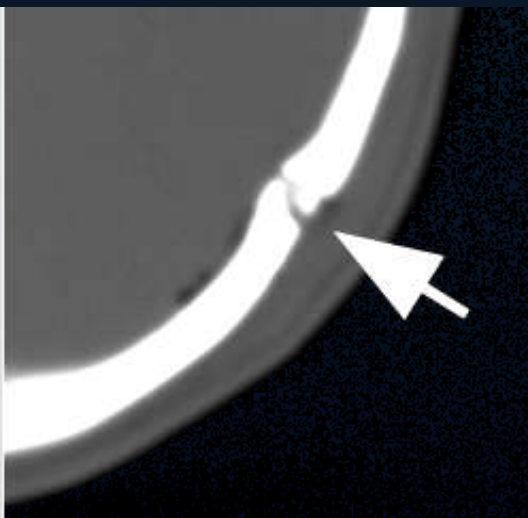
OR

EXTRA ?

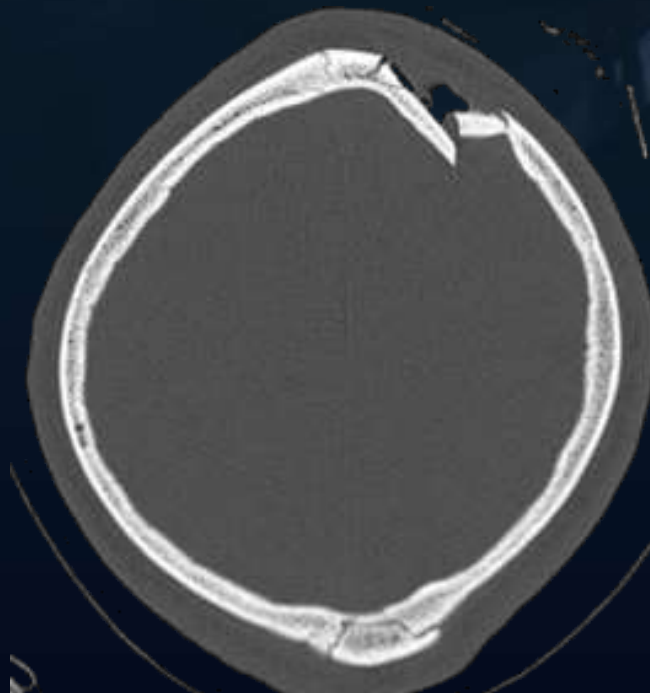


Skull Fractures

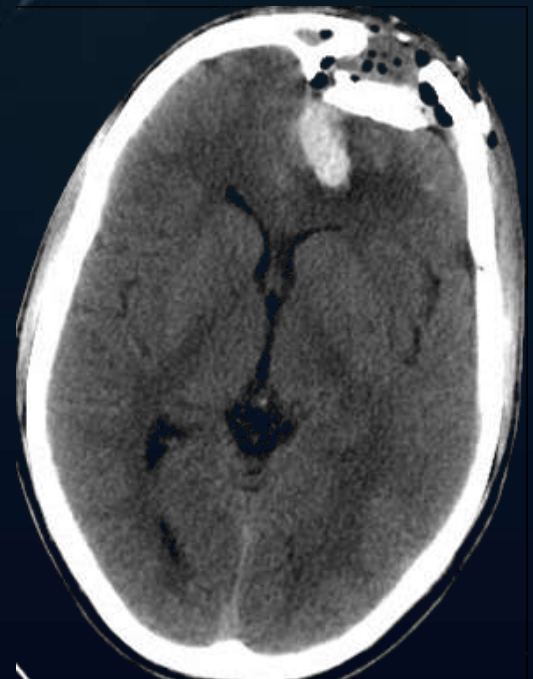
Fissure

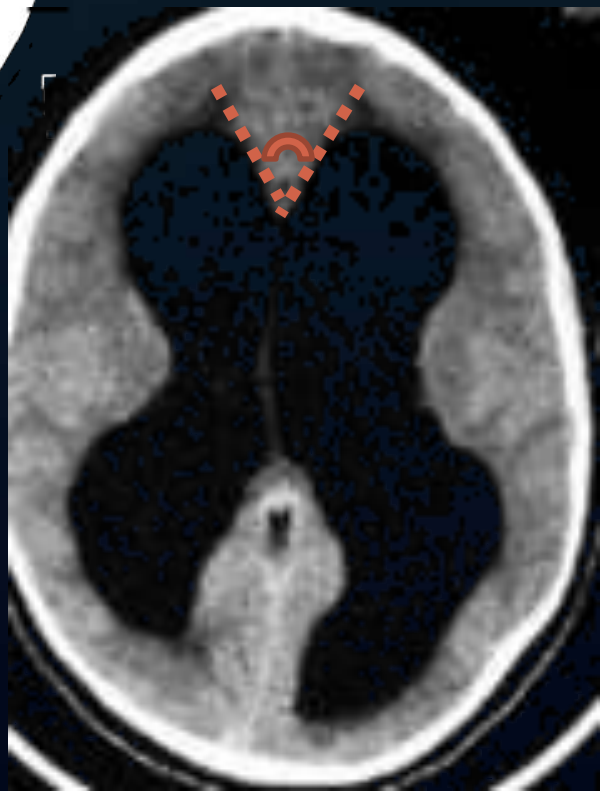
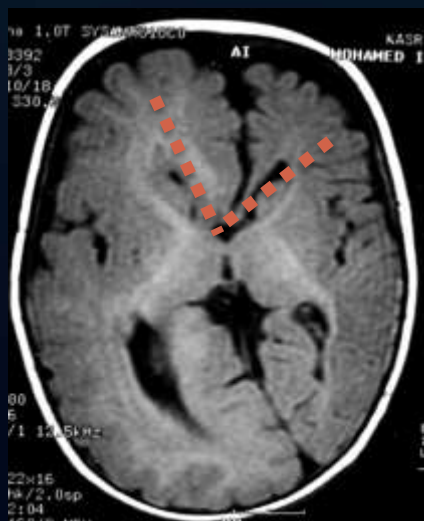
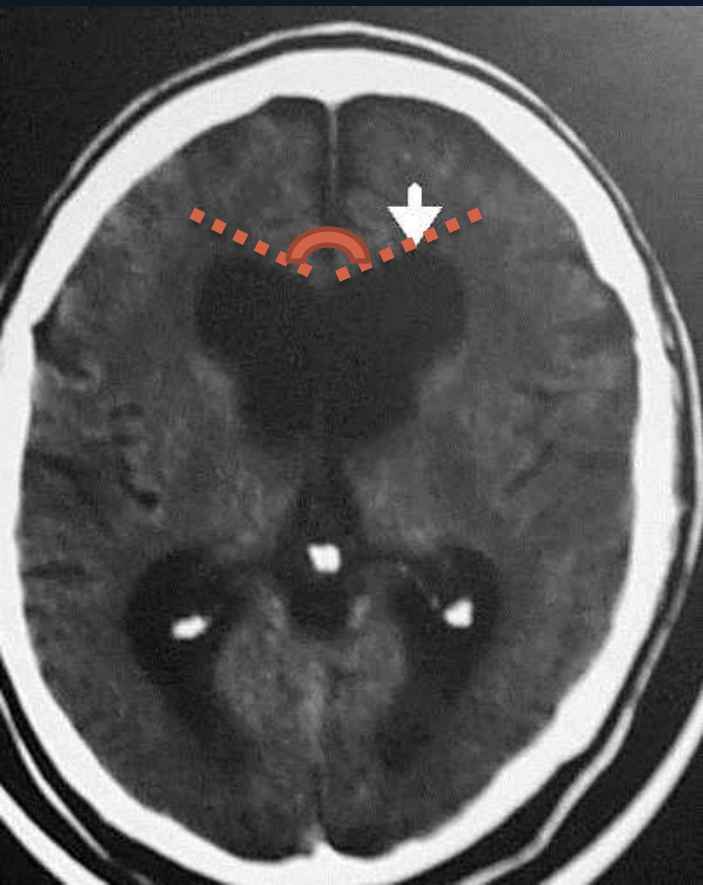
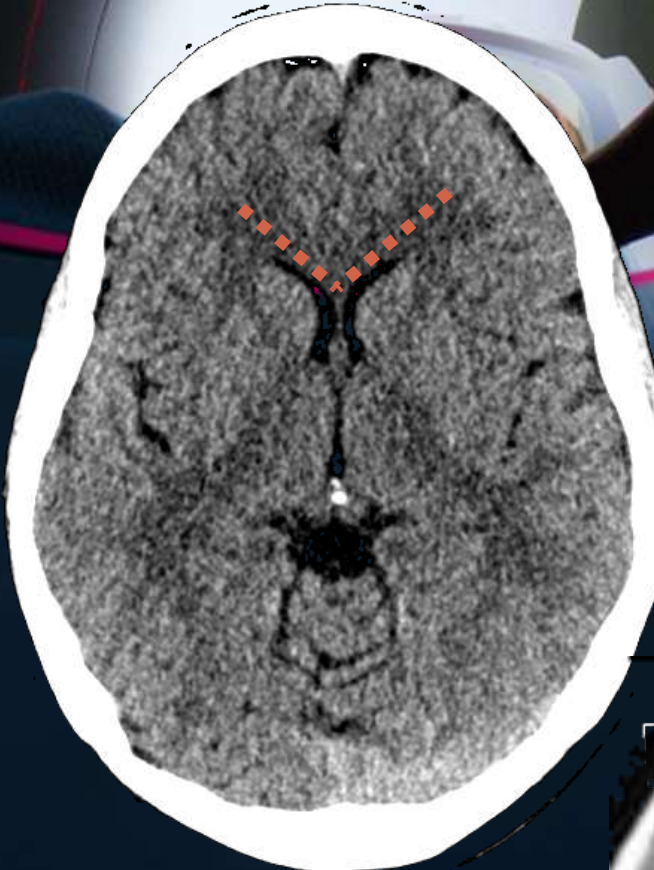


Depressed



Comminuted





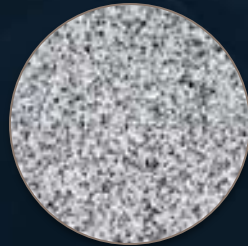


C E C T
Is Mandatory

BRAIN TUMORS
DIAGNOSIS or Follow up

Patterns of contrast enhancing :

Non enhancing



ENHANCING



HOMO



HETERO



Uniform



Non Uniform

MARGINAL

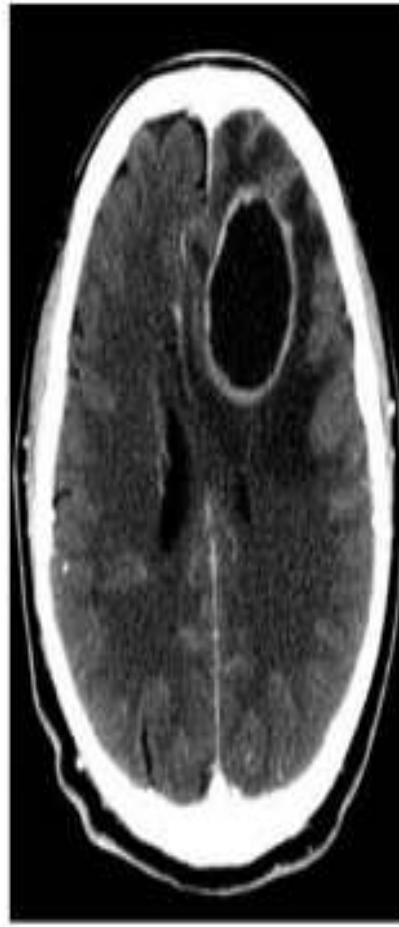
Glioma

Heterogeneous
Enhancement



Glioblastoma

Non Uniform
Ring Enhancement



Abscess

Uniform Ring
Enhancement

Meningioma

Homogeneous
Enhancement





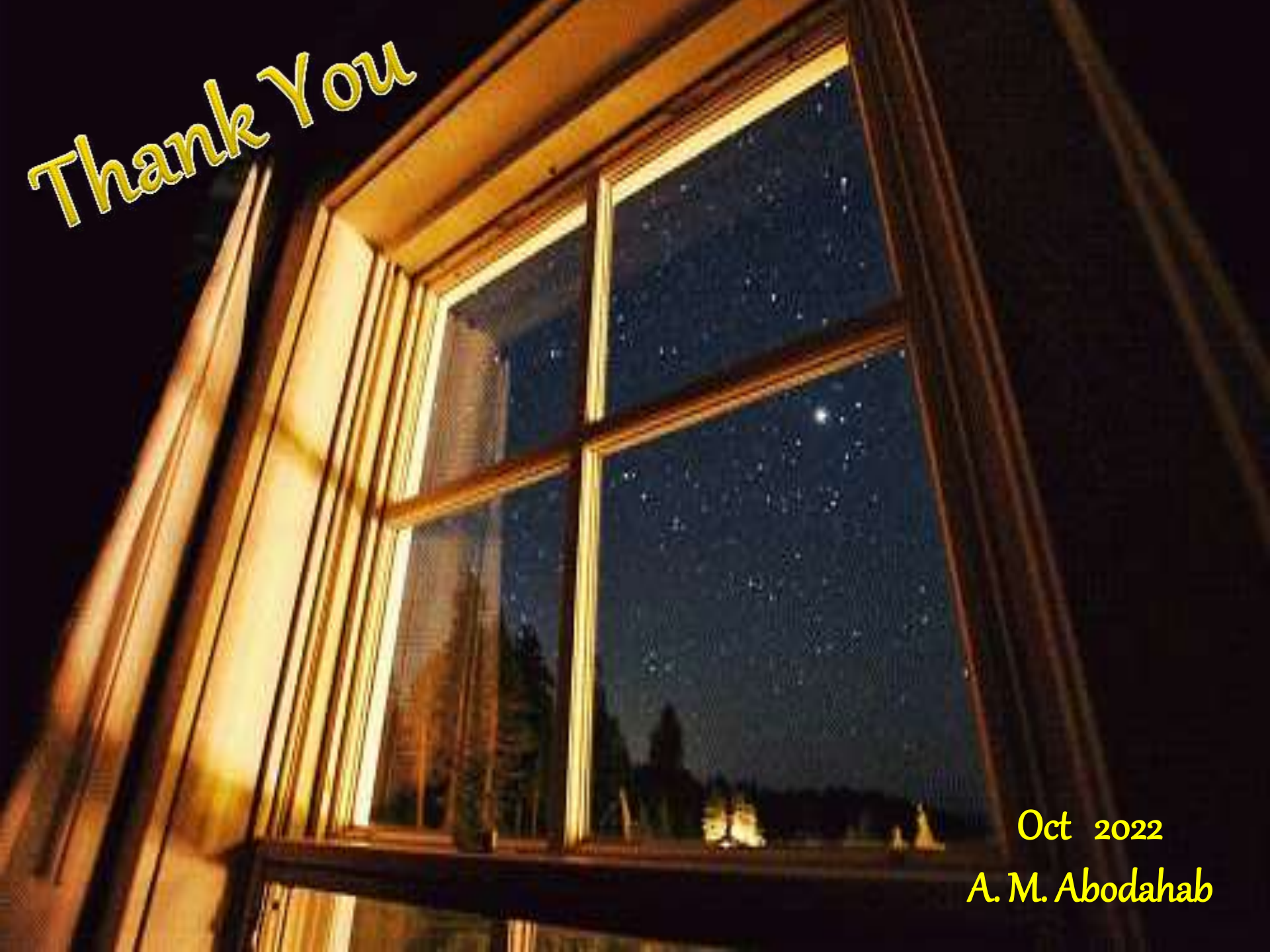
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Thank You

Oct 2022

A. M. Abodahab