

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

RADIOLOGY

Review

LECTURE 4

CT BRAIN

Emergences



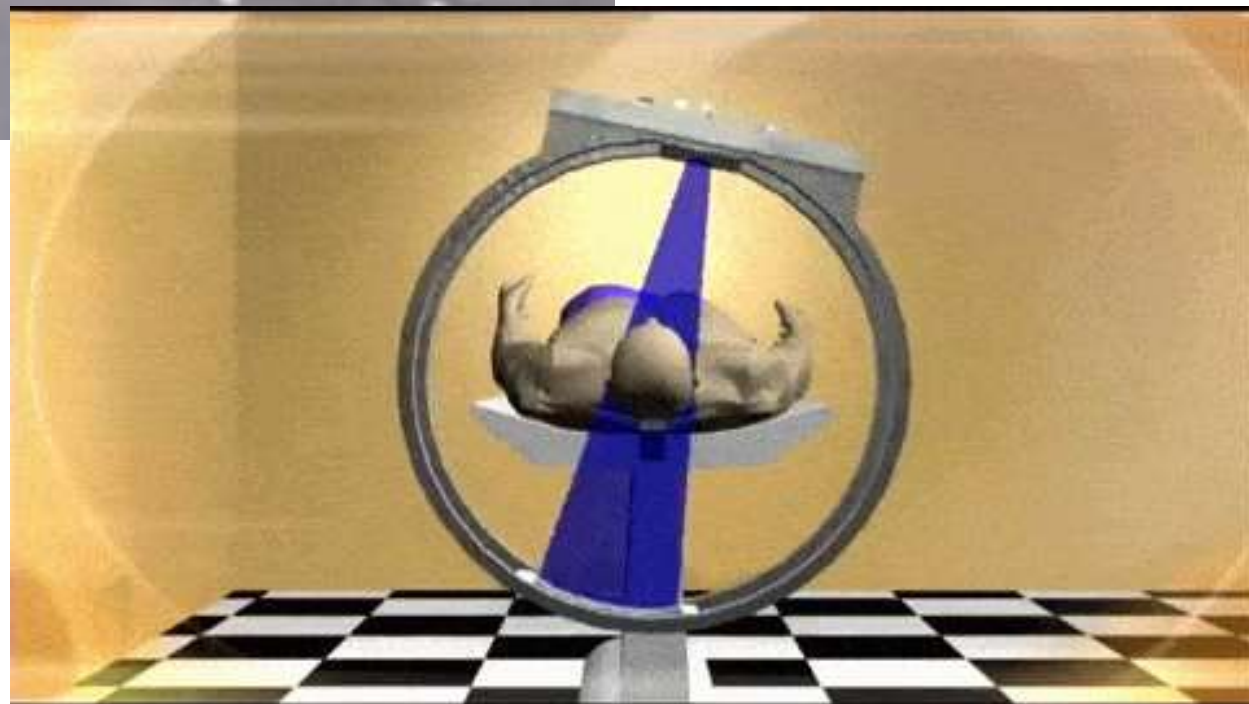
BY

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Lecturer of Radiology – Sohag University

Certified Trainer – Supreme Council of Egyptian Universities

Saudi German Hospital - Hail



TRAUMA

- ✓ Fractures
- ✓ Hemorrhages
- ✓ Contusions



MEDICAL

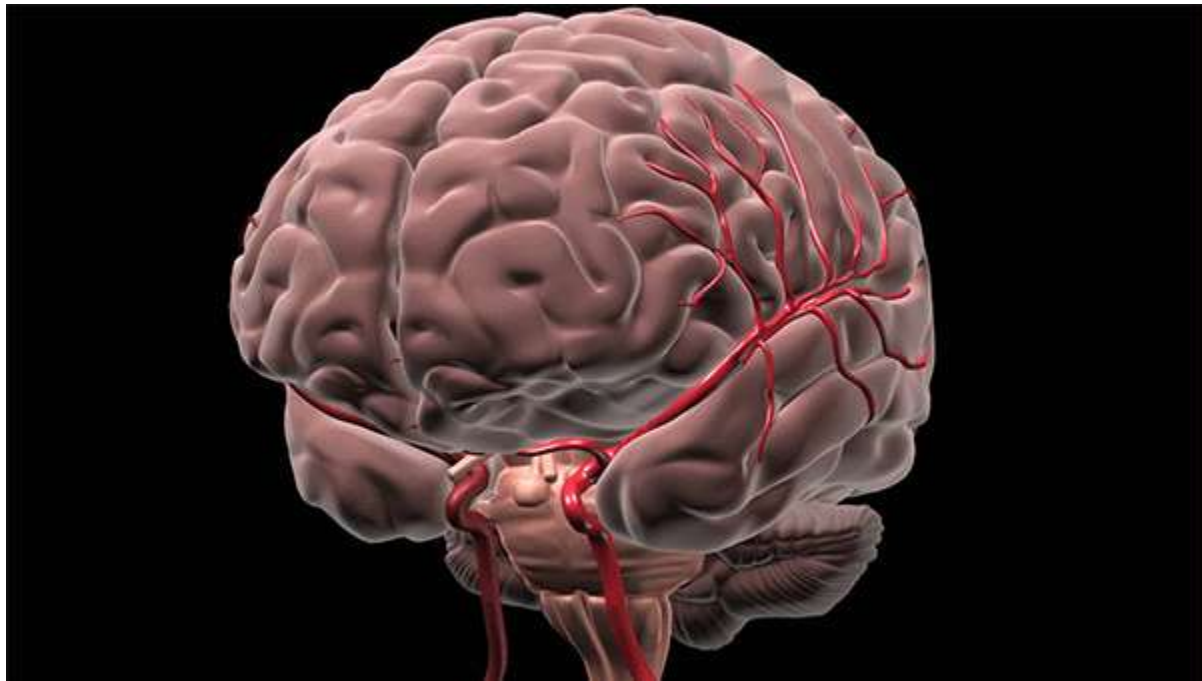
- ✓ Strokes
- ✓ Hydrocephalus

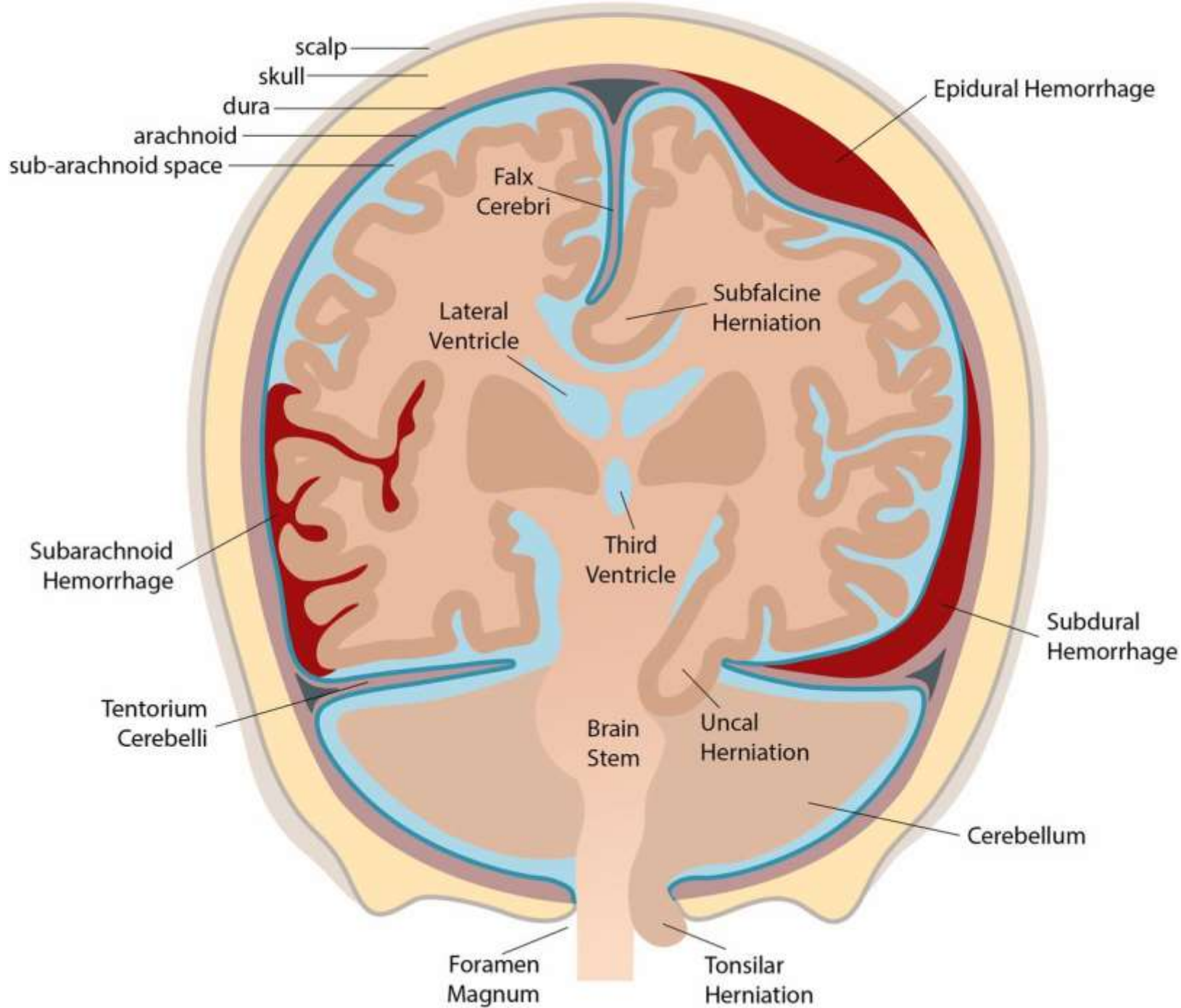
- ✓ BRAIN HERNIATION

TRAUMA



HEMORRHAGES





HEMORRHAGES



EDH



SDH



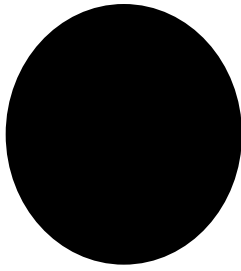
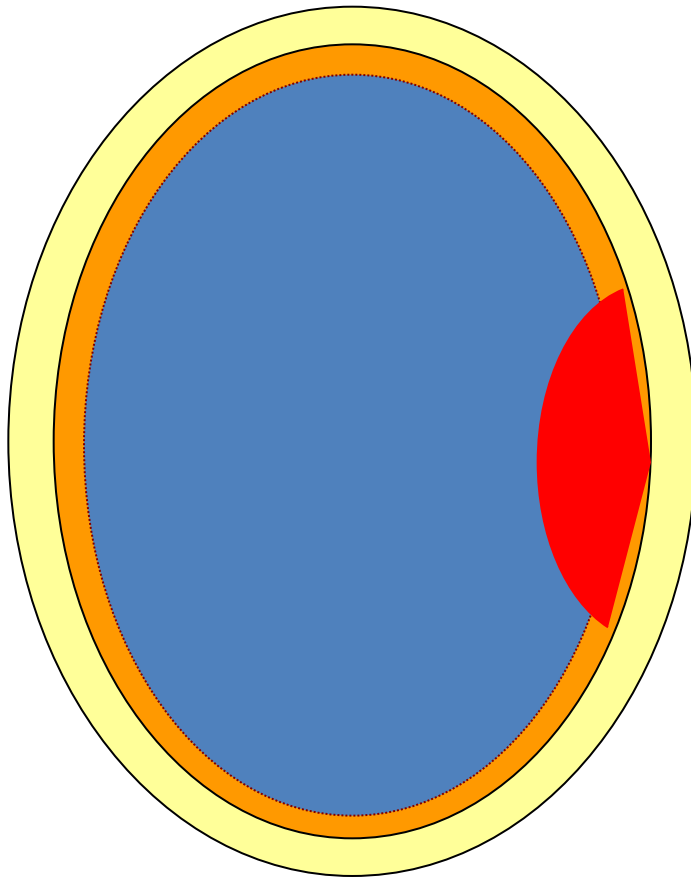
SAH



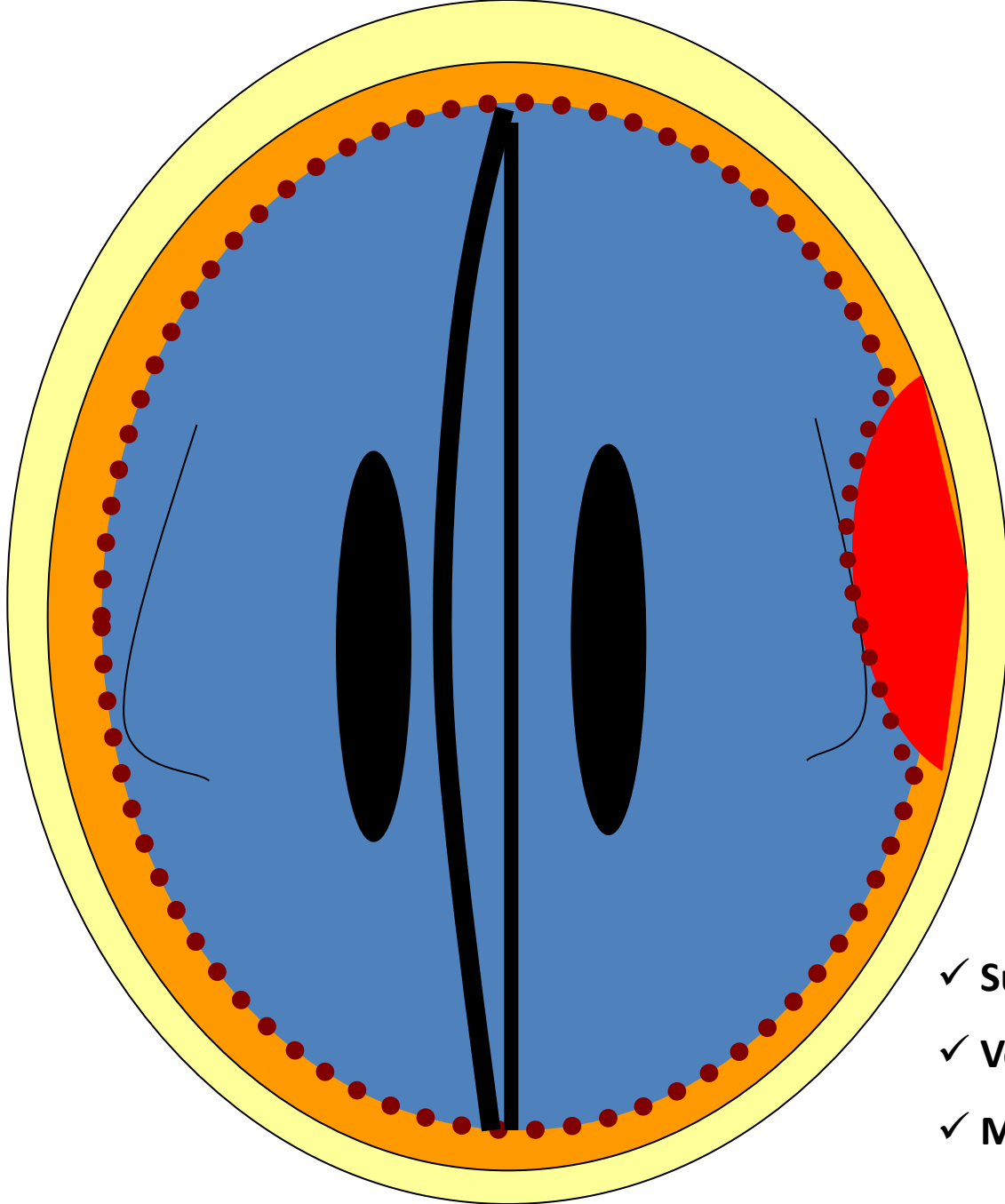
ICH



IVH

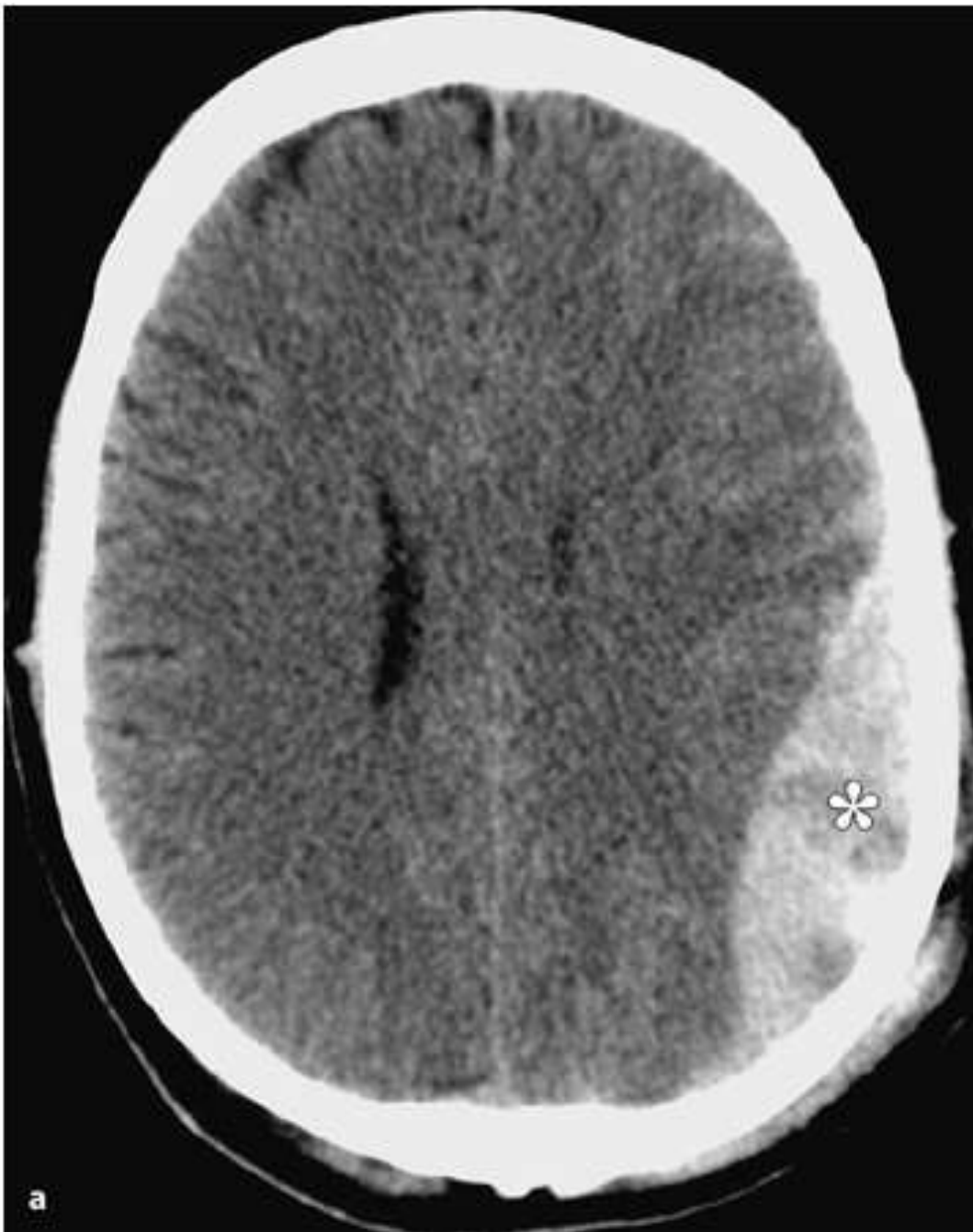


*Extra Dural
or
EpiDural*



Mass effect

- ✓ Sulci Effacement
- ✓ Ventricle compression
- ✓ Medline Shift



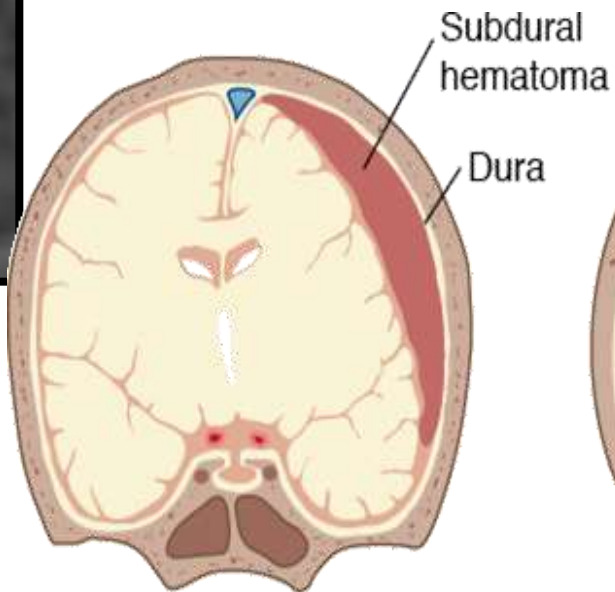
**Epidural hematoma.
A 55-year-old patient**



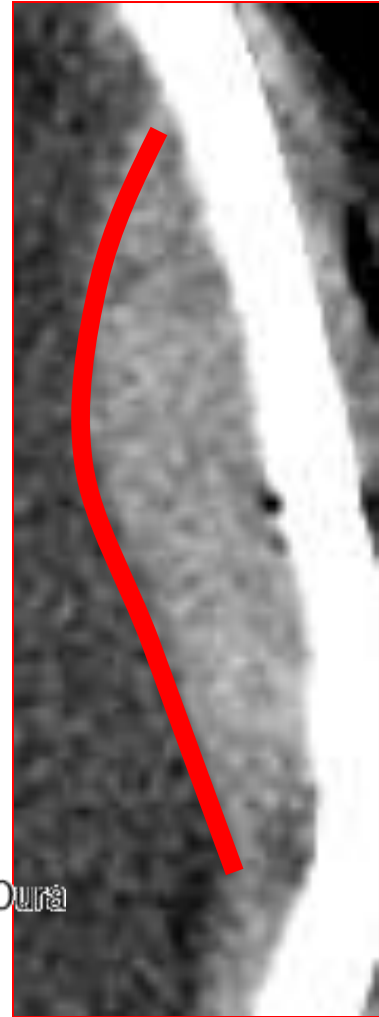
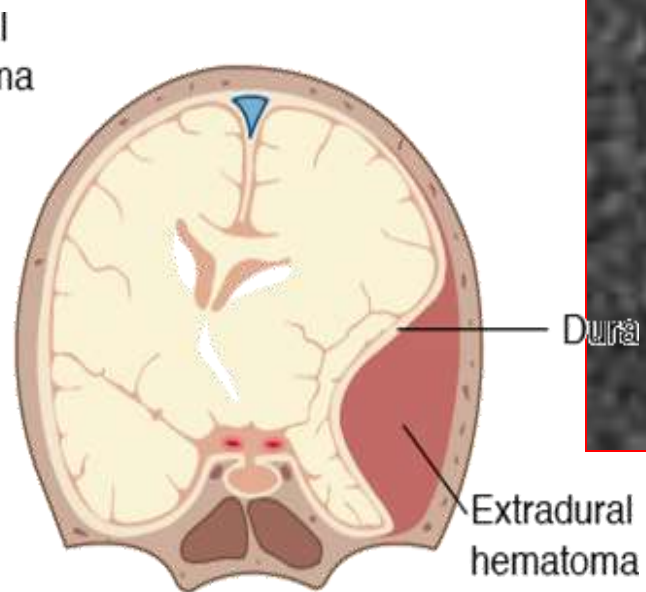
Contrast-enhanced angio-CT
The causative
ruptured aneurysm,



SUB

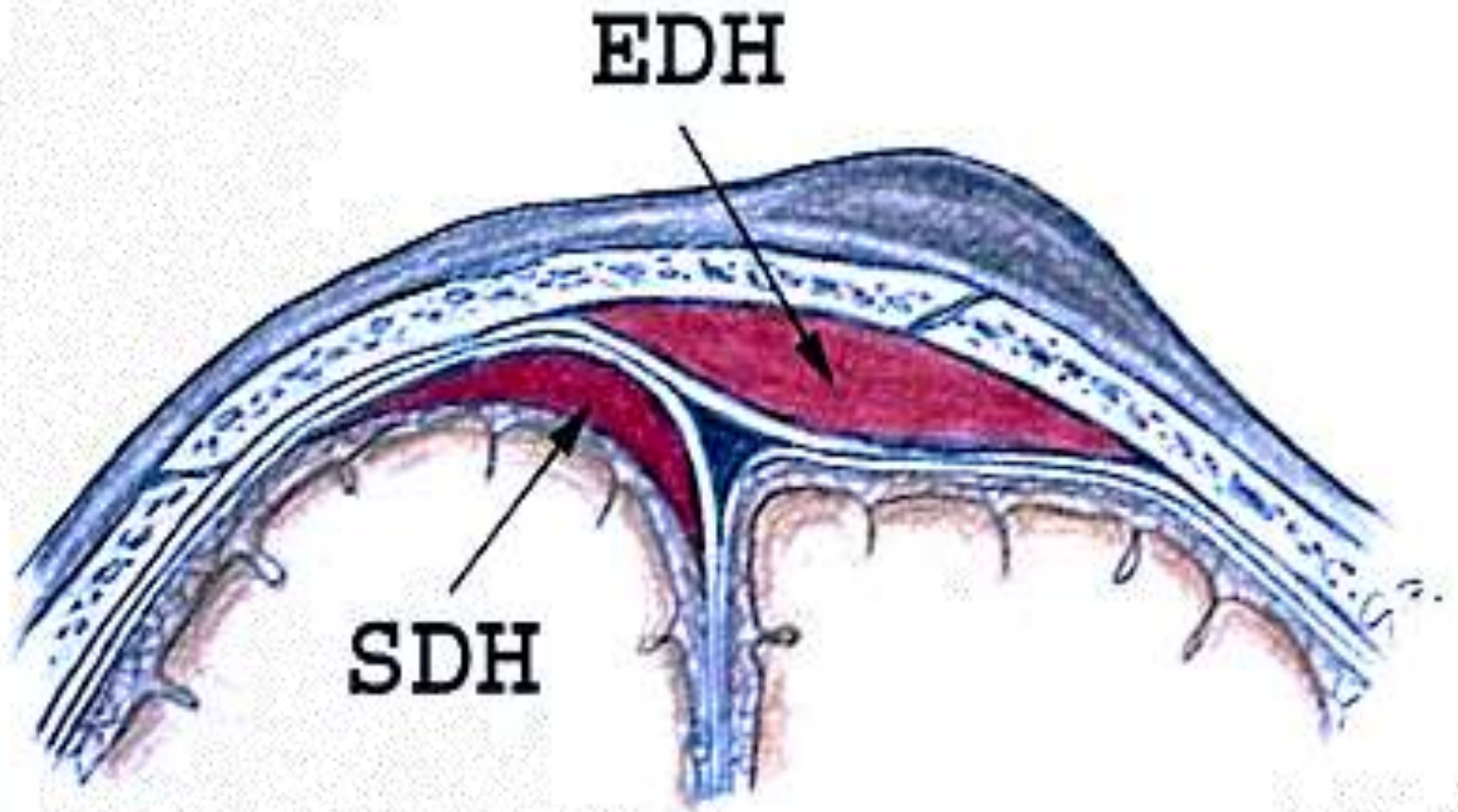


EXTRA





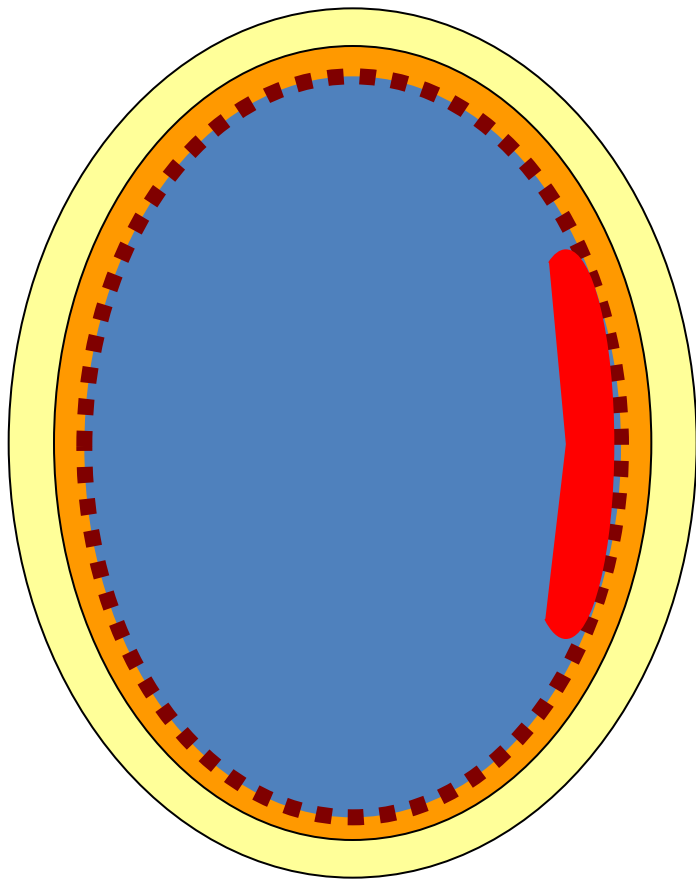
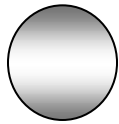
Epidural Hematoma	Sever trauma	Arterial
Subdural Hematoma	Mild Trauma	Venous



Don't Forget

EDH can cross **Midline** *but not Sutures*

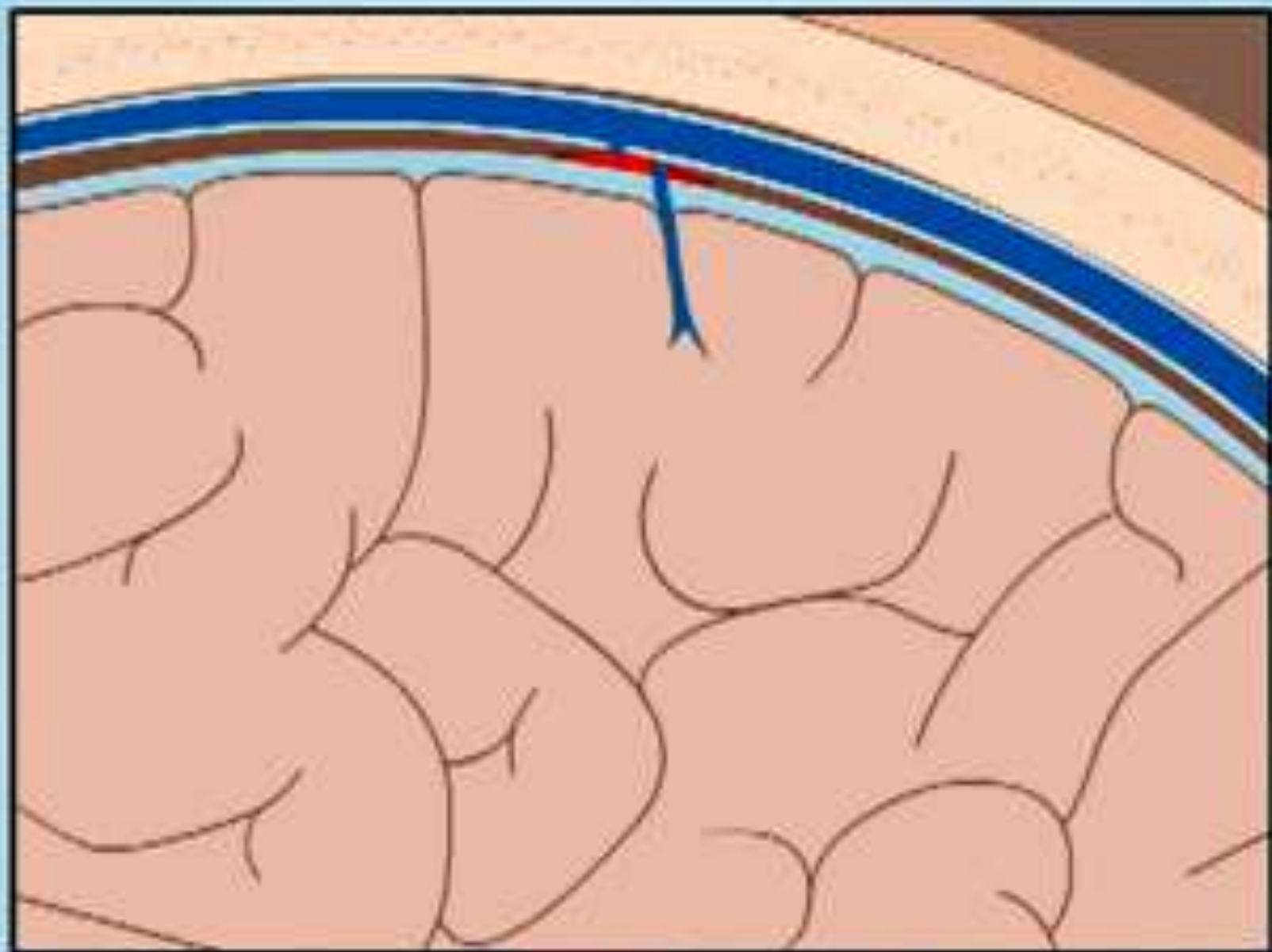
SDH can Cross **sutures** *but not Medline*



Sub Dural



Home



[Home](#)

SUBDURAL HEMATOMA STAGES

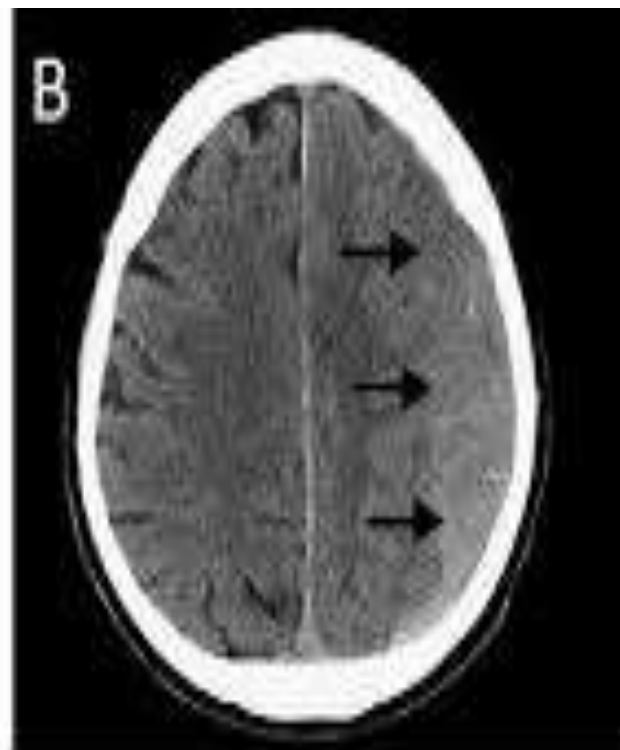
ACUTE

<3 Day

SUBACUTE 3:14days

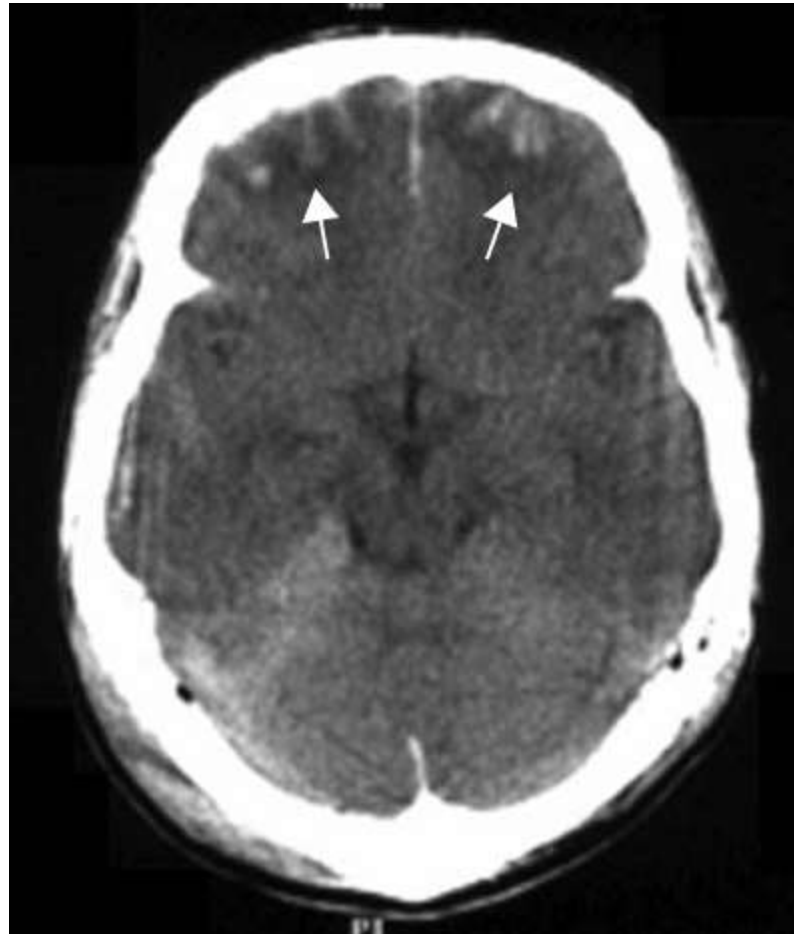
CHRONIC >2 w



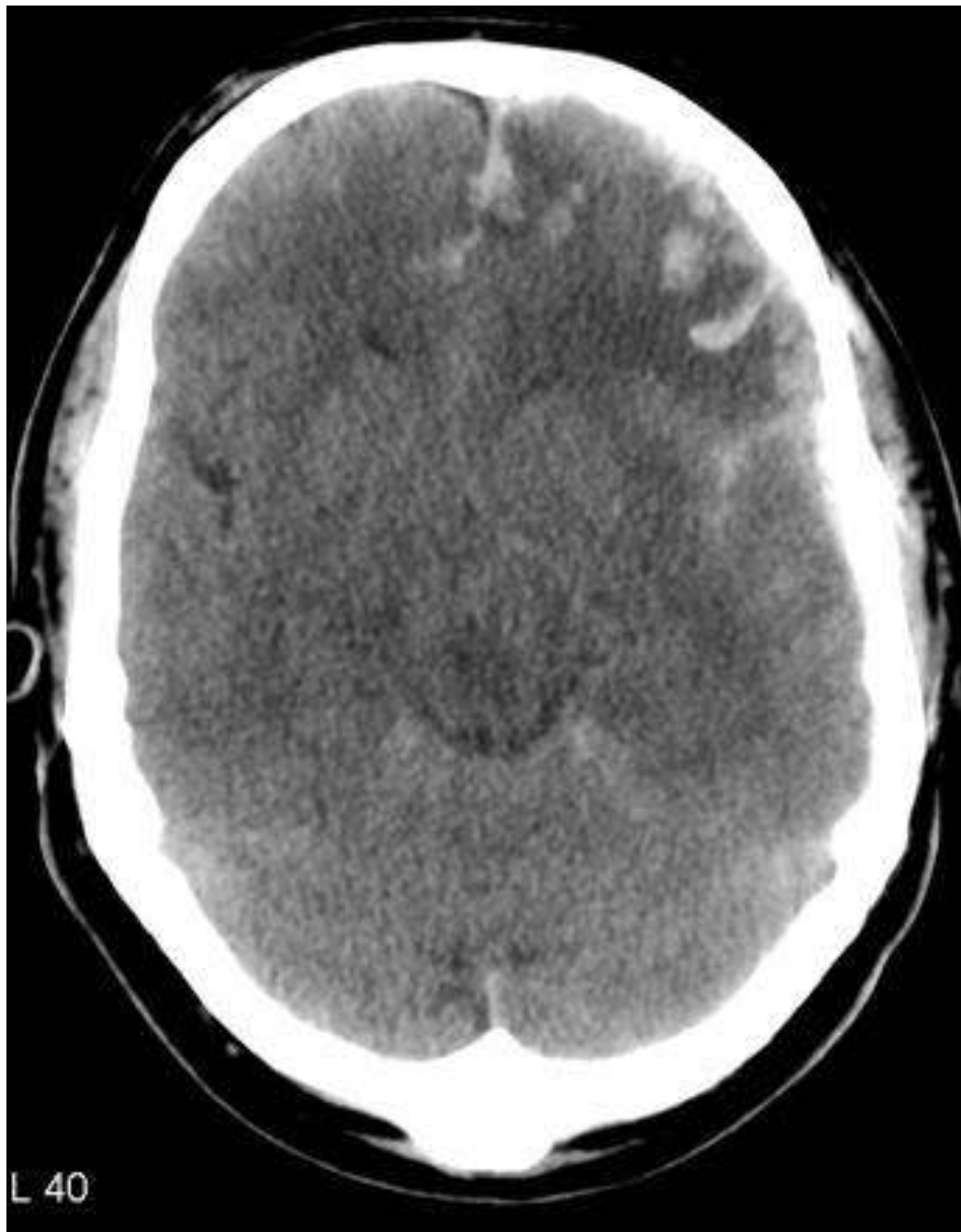


CEREBRAL CONTUSION

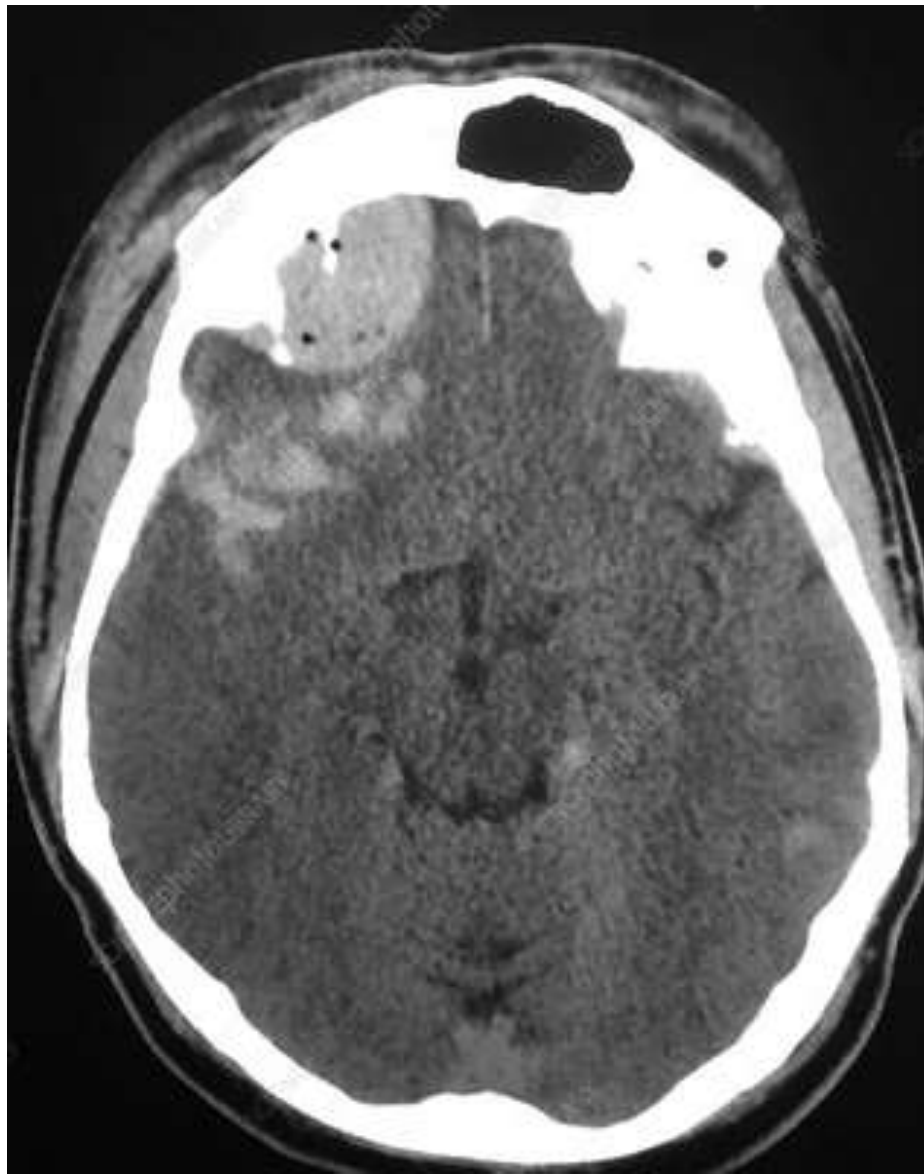




- Multiple focal areas of **low or mixed attenuation** intermixed with tiny areas of increased density representing **petechial haemorrhage**.



L 40



- **Contusions + Epidural Hematoma**



- hyperdense lesion located in the splenium of corpus callosum (arrow), consistent with Diffuse axonal injury

(MRI)

is the **best modality** for demonstration of **edema** and contusion.

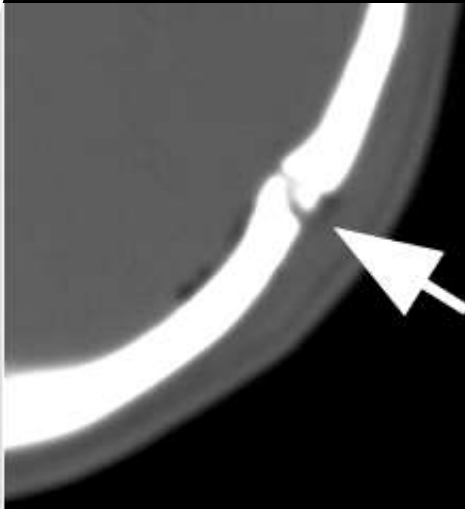
SKULL FRACTURES

👉 BONE WINDOW IS A MUST

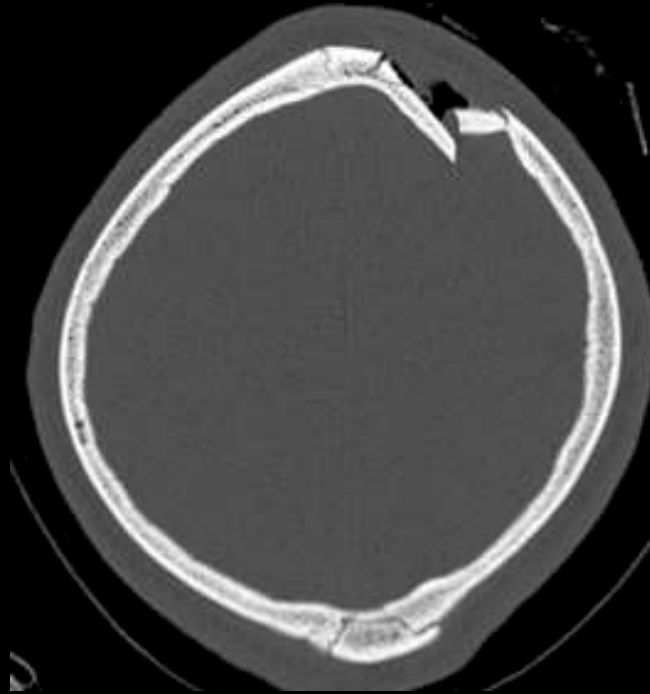


Skull Fractures

Fissure



Depressed



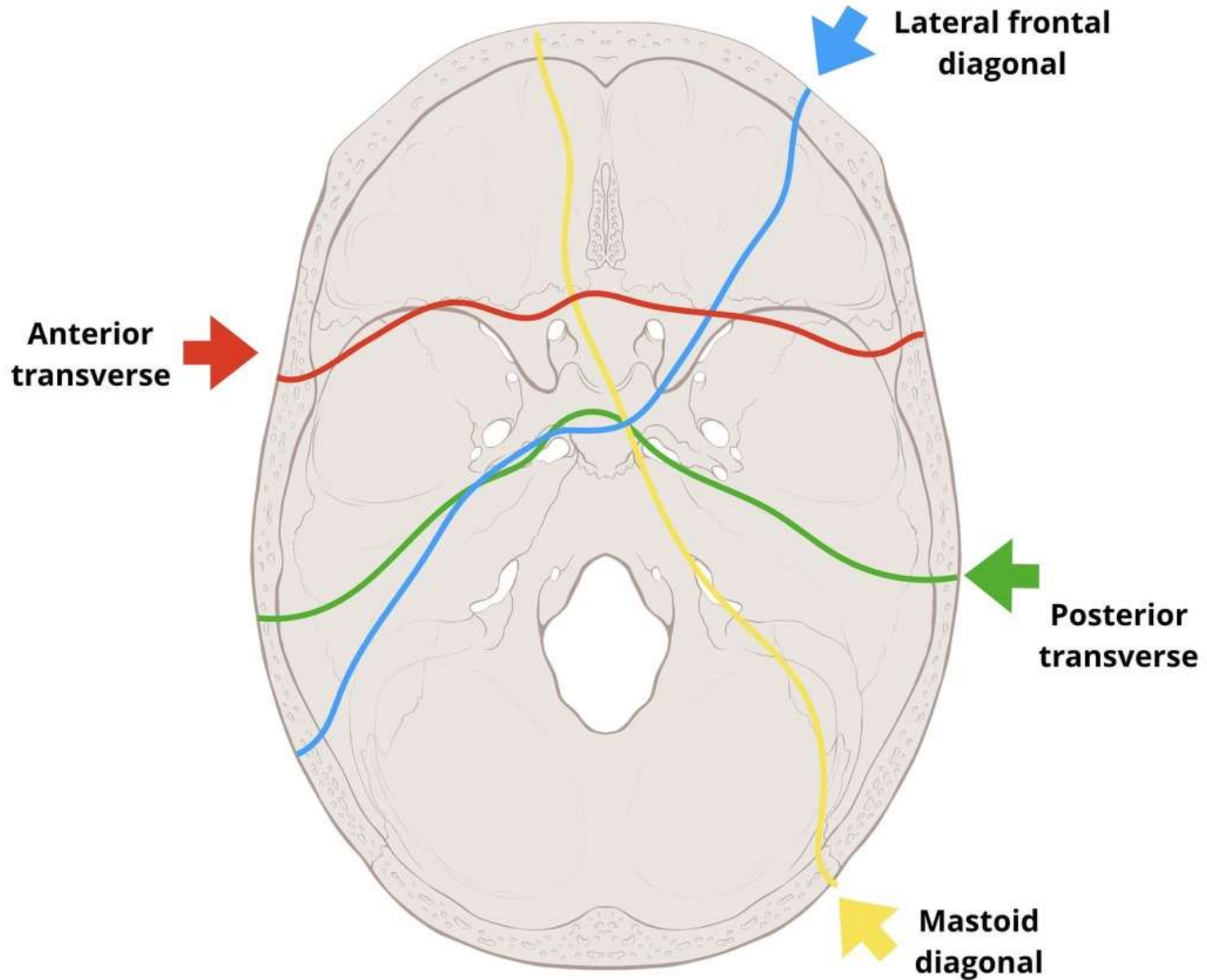
Comminuted



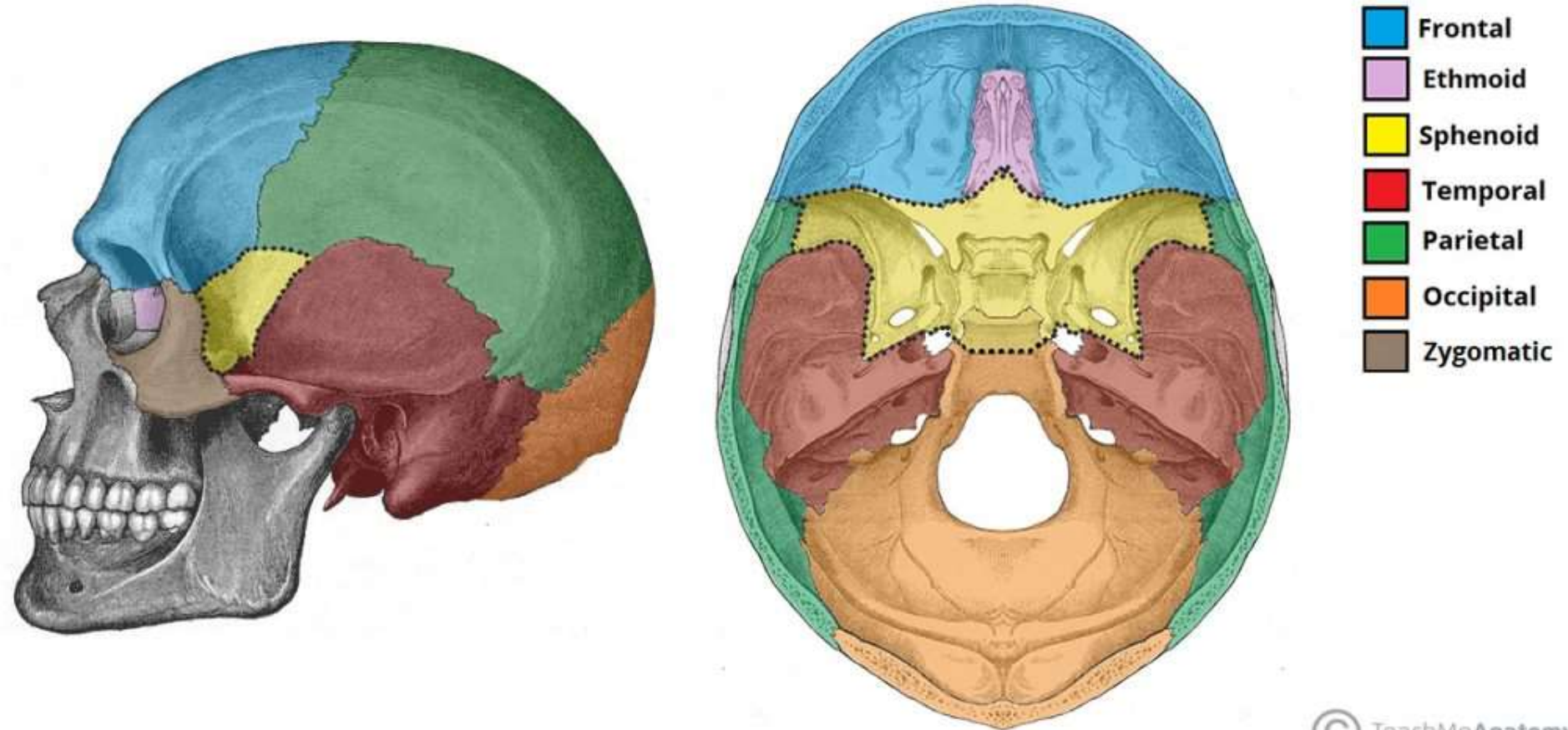
Trans-sphenoidal basilar skull fractures

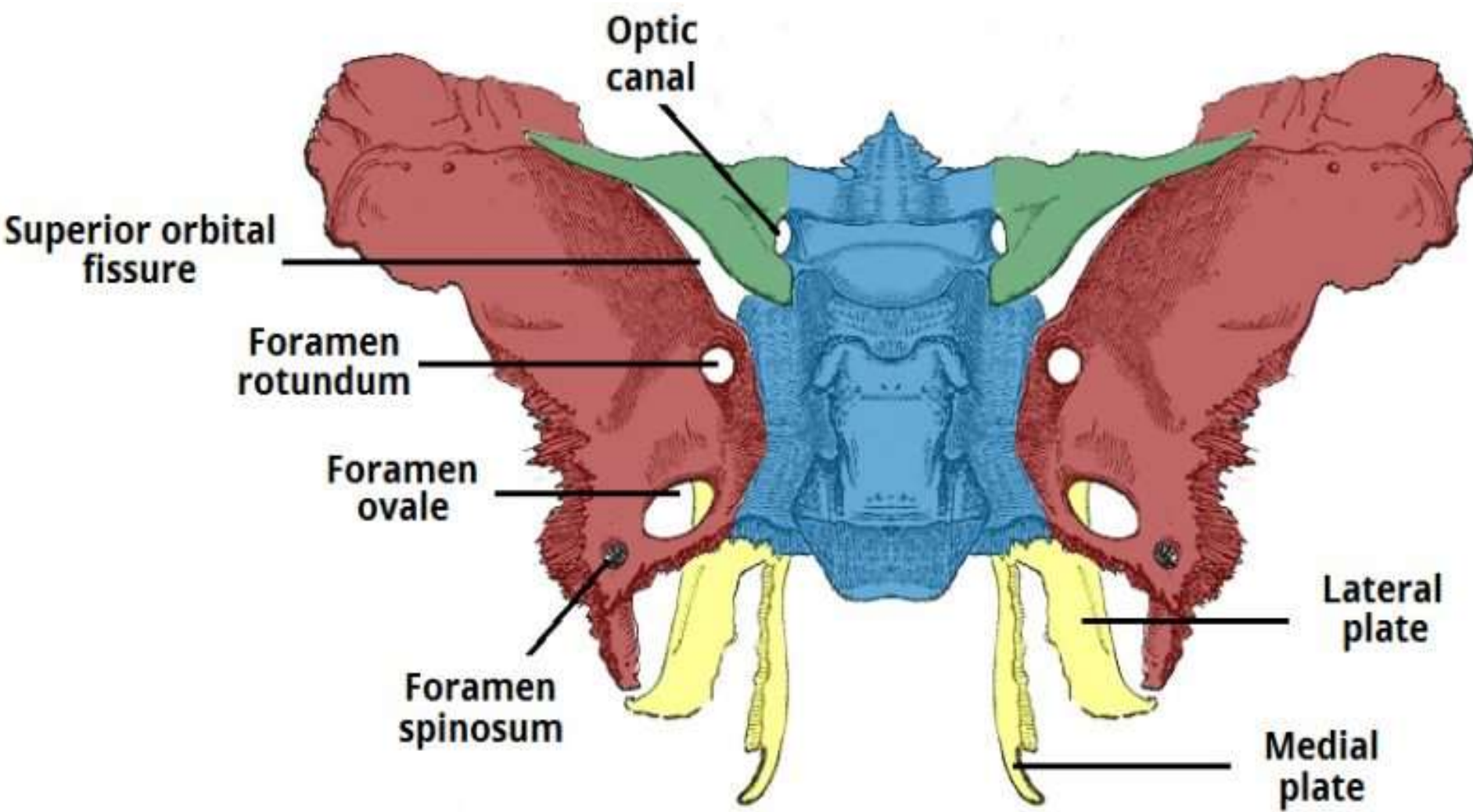
- ✓ Serious type of basilar skull fracture
- ✓ Usually severe traumatic brain injury
- ✓ **Serious complications** including injury of :
 - Internal carotid arteries
 - Optic nerves
 - Dural tear with CSF leak.

Transsphenoidal basilar skull fractures



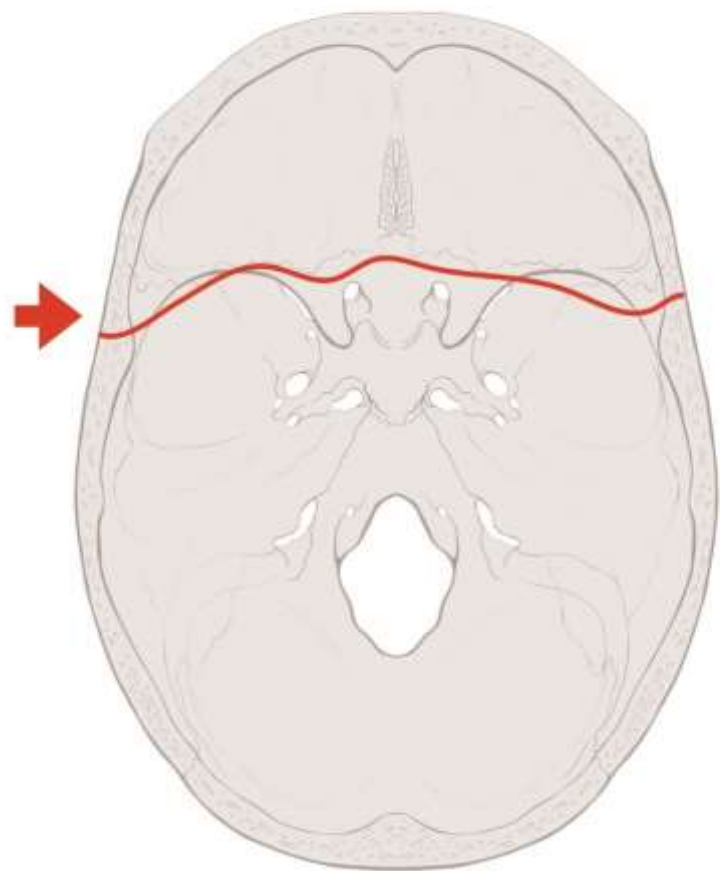
SKULL BASE BONES



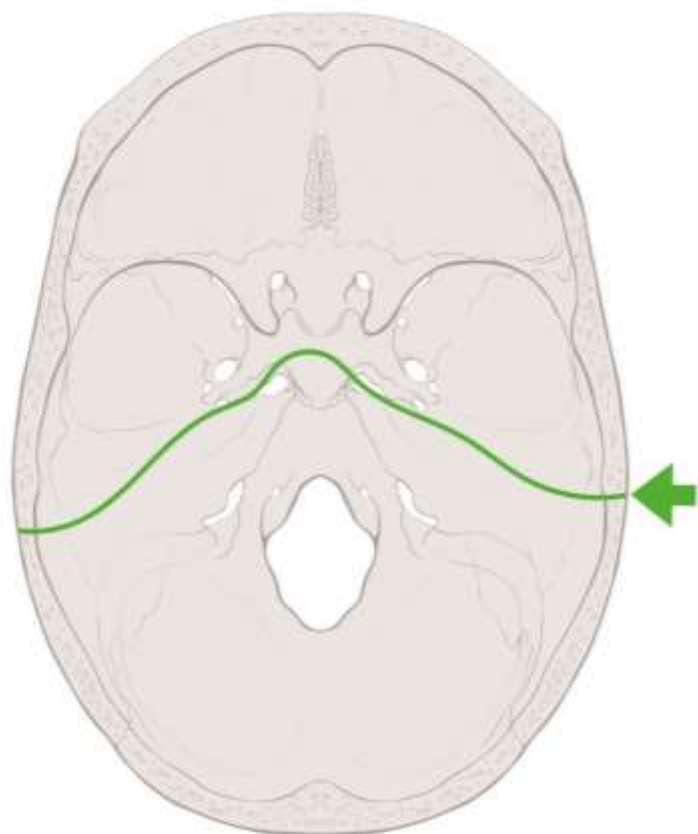


- Body
- Lesser wing
- Greater wing
- Pterygoid process

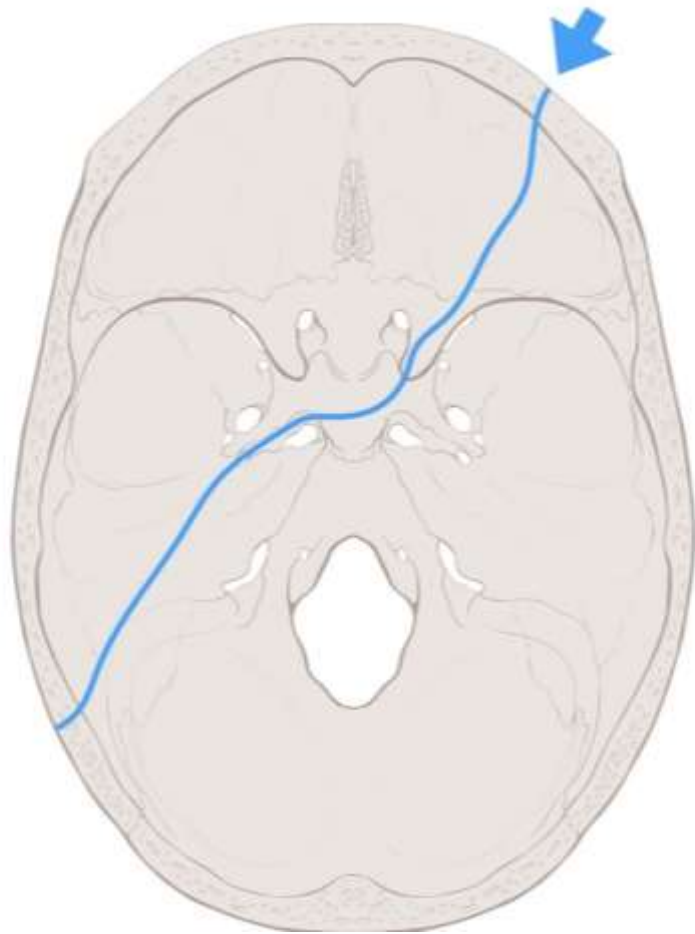
**Anterior transverse
transsphenoidal basilar skull fracture**



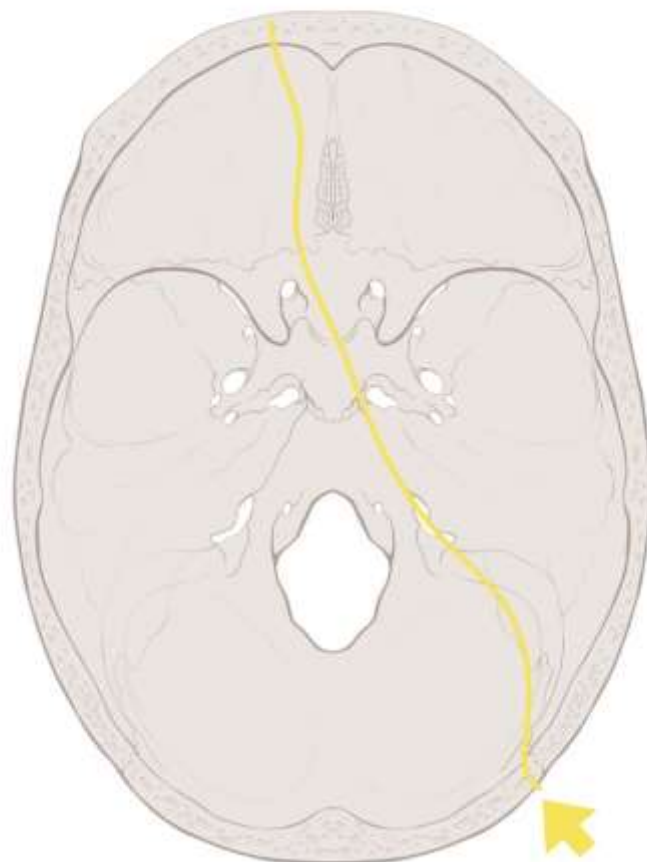
**Posterior transverse
transsphenoidal basilar skull fracture**



**Lateral frontal diagonal
transsphenoidal basilar skull fracture**

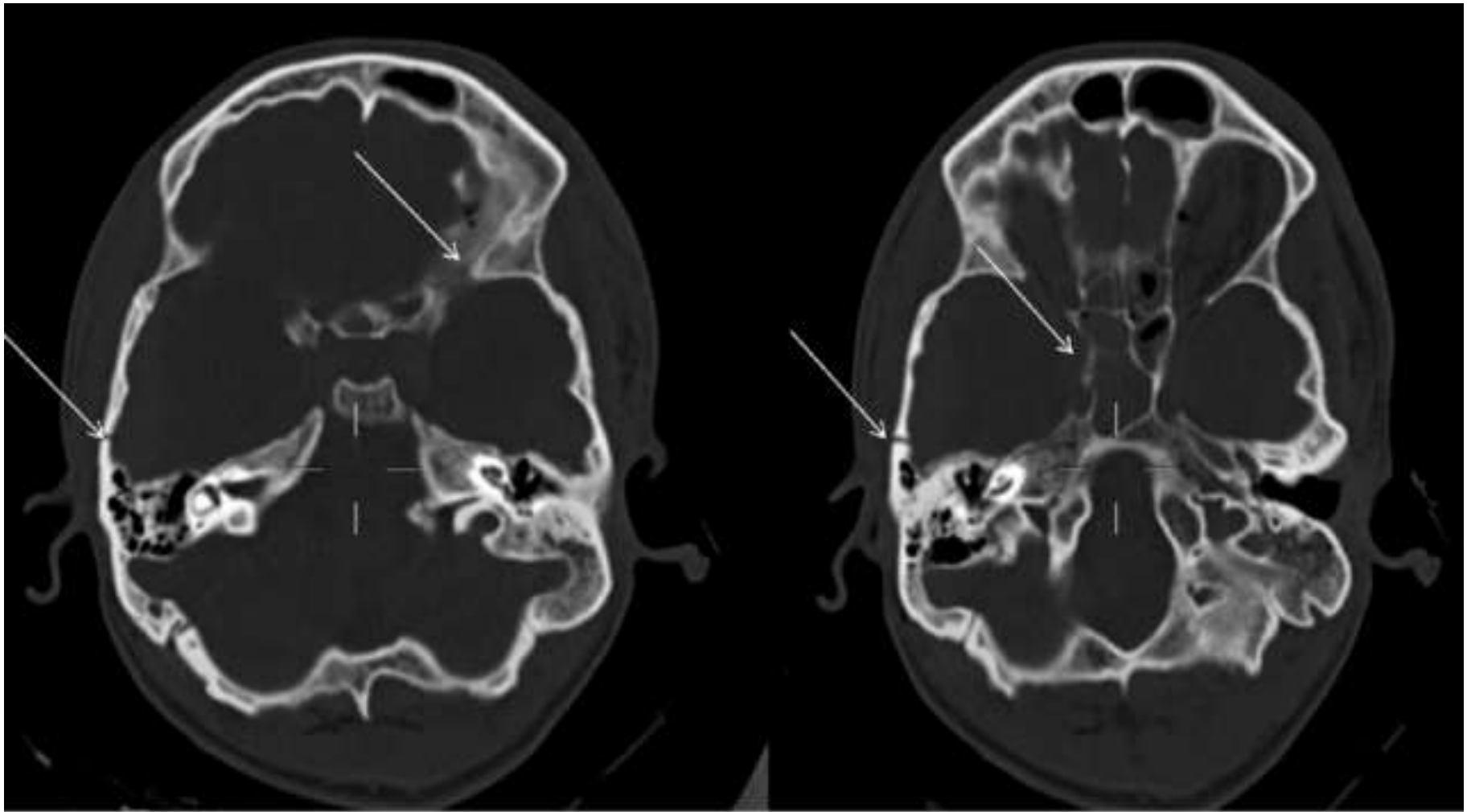


**Mastoid diagonal
transsphenoidal basilar skull fracture**



Don't Forget

Skull Base Fracture is usually seen at more than one cut level



Axial skull base CT scan with bone windows reveals :

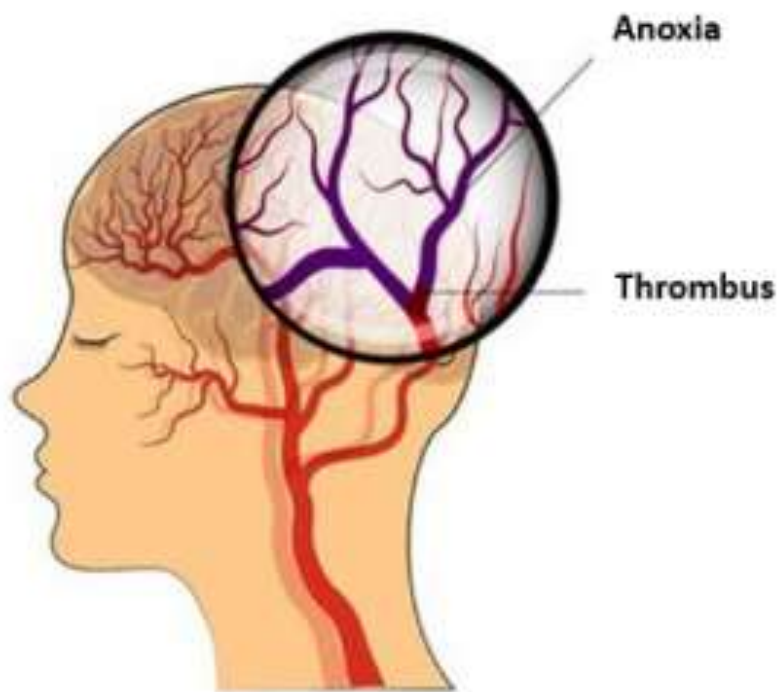
a fracture involving **right petrous bone, sphenoid sinus,**
and extending to the **contralateral left orbital roof** and **clivus.**

Stroke

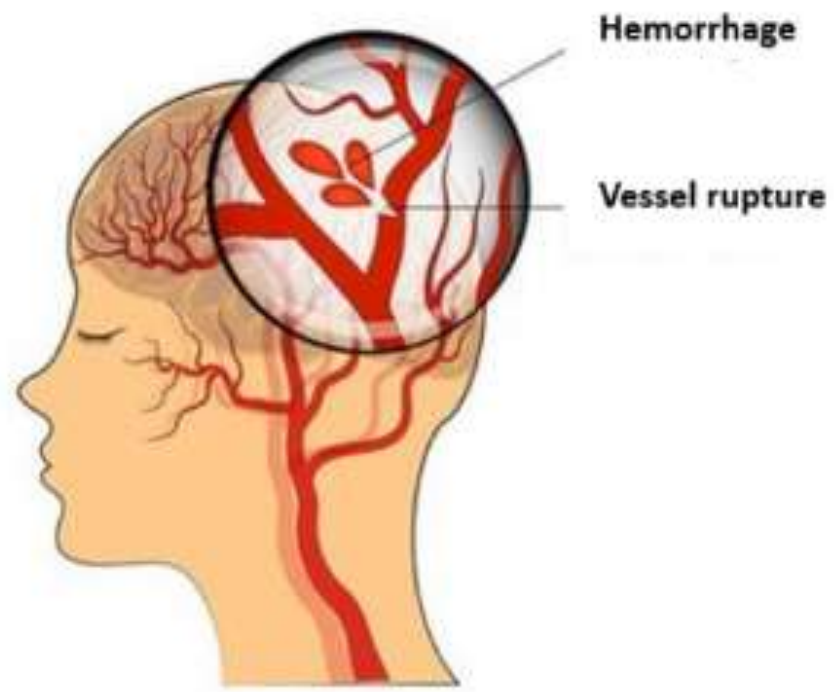


Clear Stroke is not a problem for diagnosis

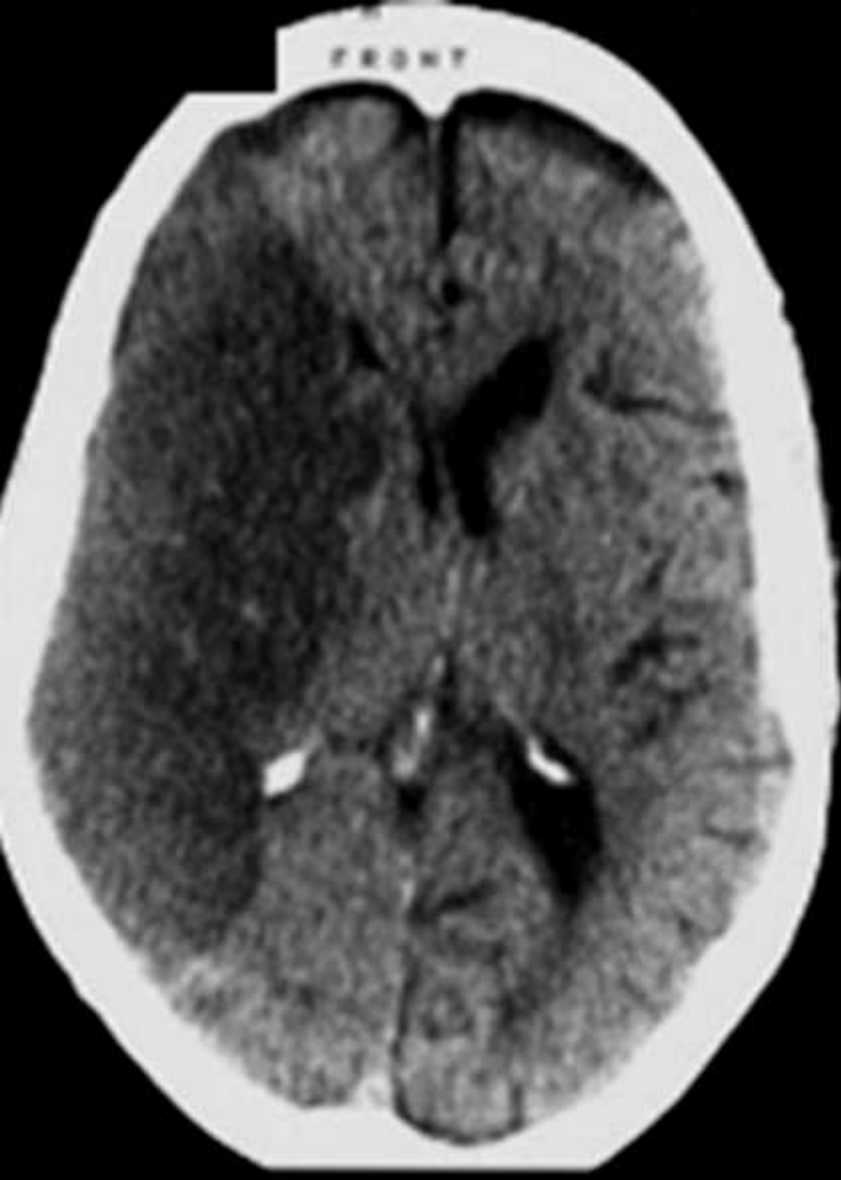
..... So, Search For Hidden signs !!



ISCHEMIC STROKE



HAEMORRHAGIC STROKE

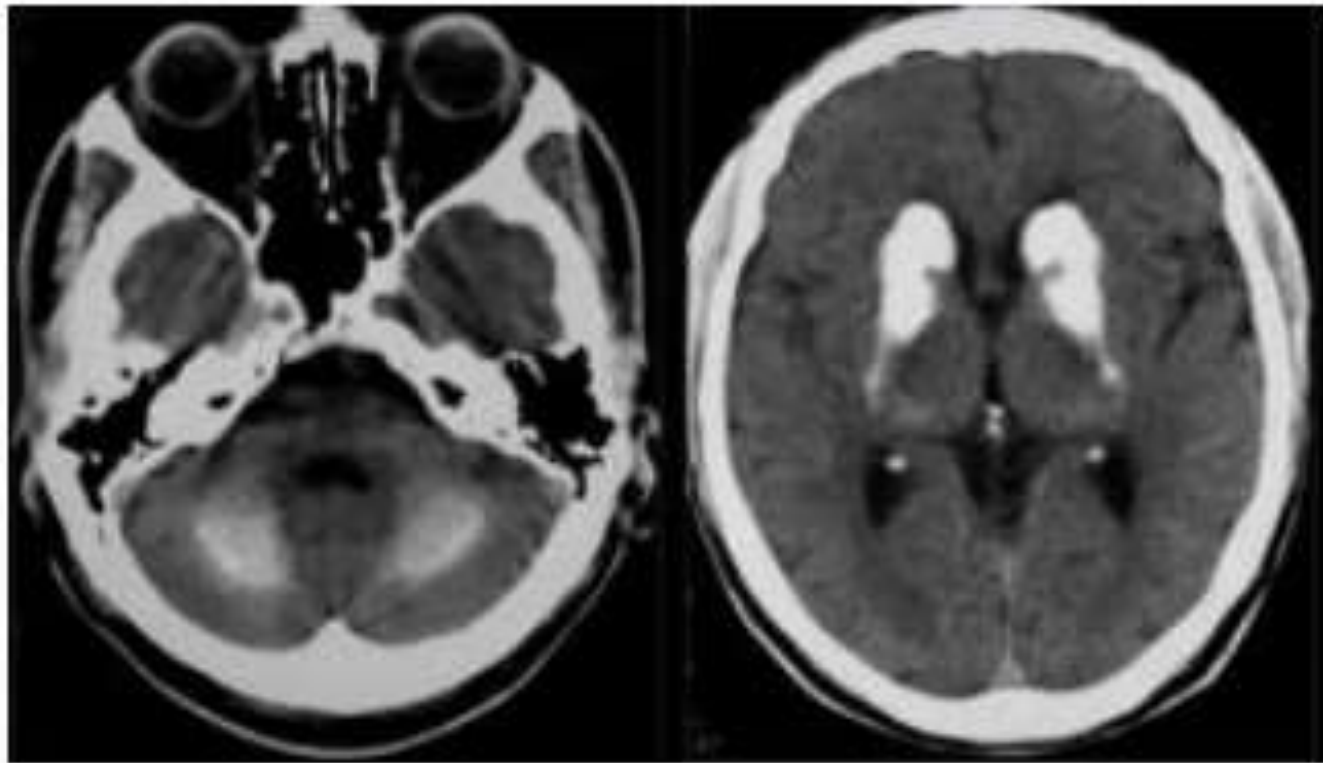


***Large Rt Cerebral Area of low density
This represents a right middle cerebral artery
territory infarct***

***Lt parietal intra Cerebral
Hemorrhage***



Calc. mimic Haemorrhage



(usually symmetric) **Normal variant:** calcification in the basal ganglia & **Dentate Neuc**li in Cerebellum

→ Infarction

- **How to Diagnose :**

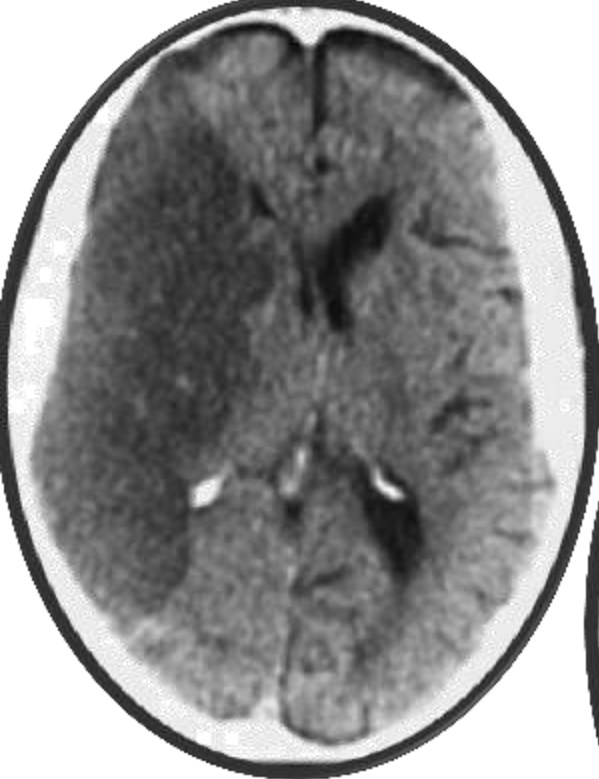
- Neurological deficit
related to site of infarction

- Hypo dense lesion

- 3 Stages :

- ✓ Acute
- ✓ Subacute
- ✓ Chronic”





Days

+ Mass effect



weeks

No Mass effect



Months

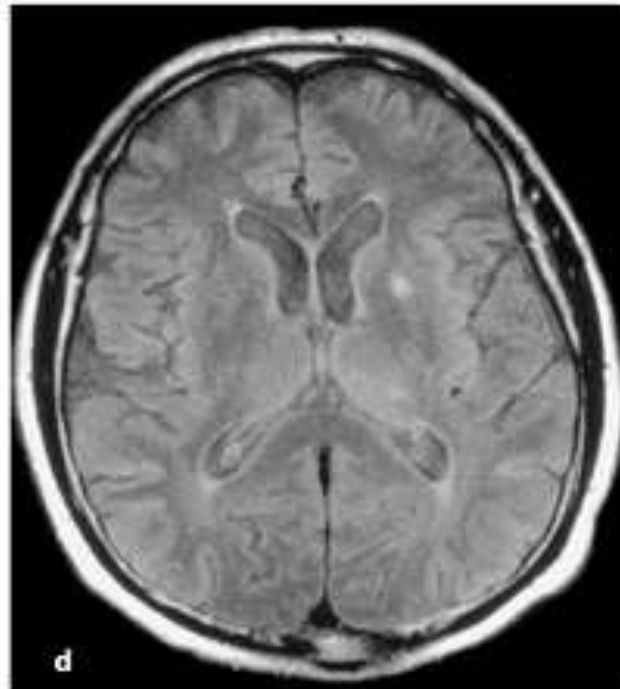
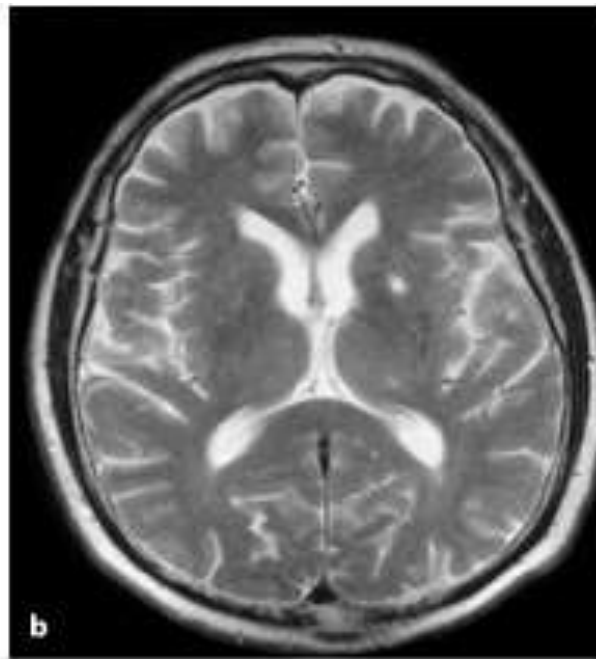
+ Evacu

But....

Infarction

**Is more difficult to be diagnosed
When**

EARLY & / or SMALL



Lacunar infarctions

A- CT: a small hypodense lesion,

B- hyperintense on the T2WI.

C- Diffusion-weighted imaging reveals no hyperintensity indicating that this lacunar infarction is older.

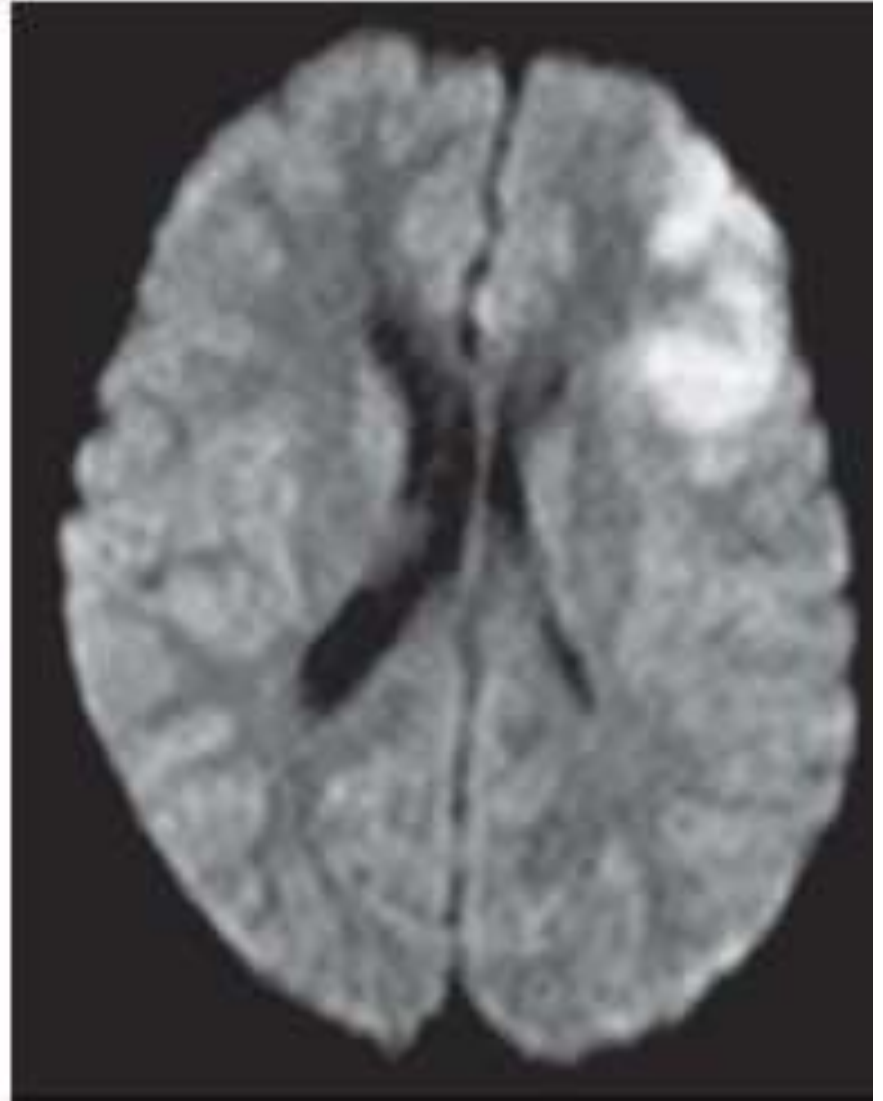
D- FLAIR a clearly visible lacunar infarction

Don't Forget

Diffusion is the first Sequence can detect infarction as **EARLY** as possible



On **FLAIR** the infarction is not yet visible,



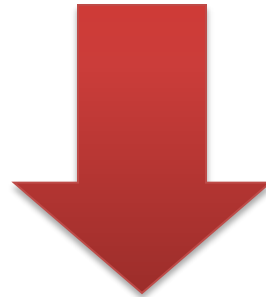
On DWI an infarction in the left MCA

Early CT Signs Of Cerebral Infarction

**DENSE ARTERY
SIGN**

**INSULAR RIBBON
SIGN**

Thrombus → Obstruct A.



**DENSE ARTERY
SIGN**



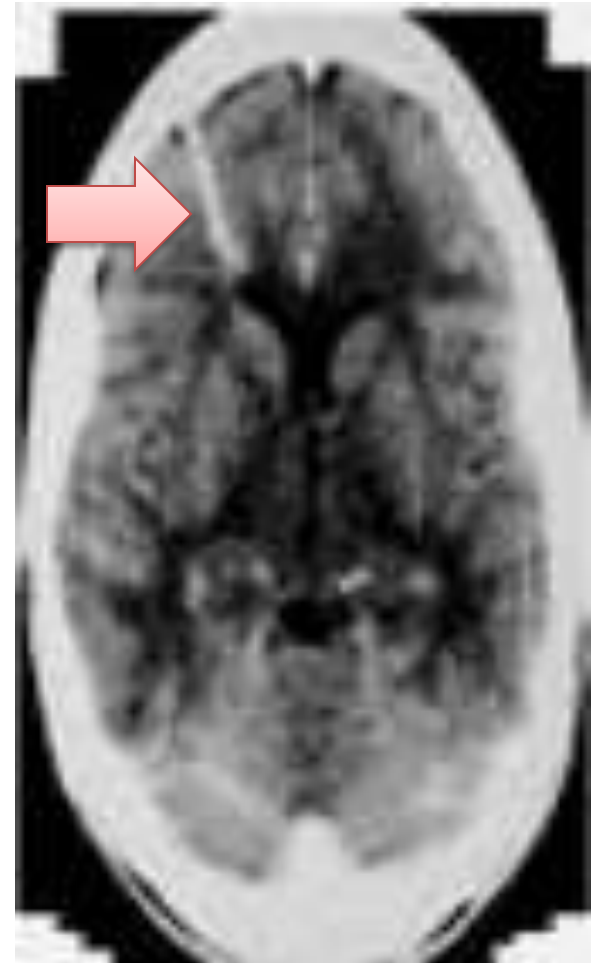


Don't Forget
It may be Faint

Donot confuse with

Venous Angioma

- ✓ Faint Linear hyperdensity
- ✓ Not At a site of vessel

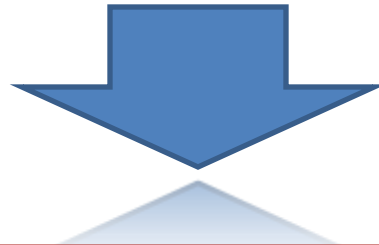


What about this scan ?

**Basilar A.
Thrombosis**



**THE HYPODENSITY
MAY BE
CORTICAL & DEEP**

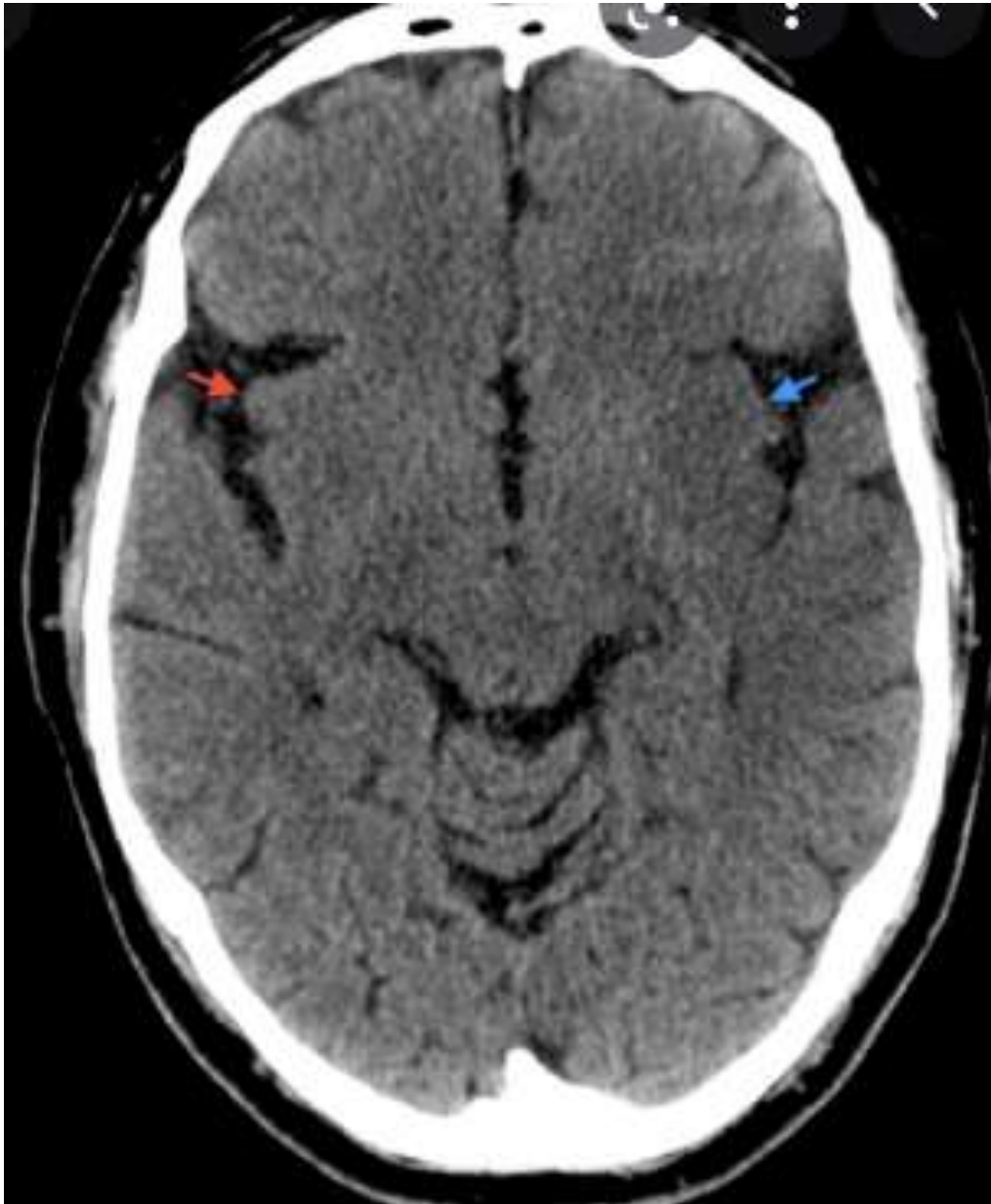


**Insular Ribbon
Sign**

**Loss of definition of the gray-white interface
of the insular cortex**



- Rt Normal (*Yellow arrow*)
- Lt , Notice loss of **GW differentiation**



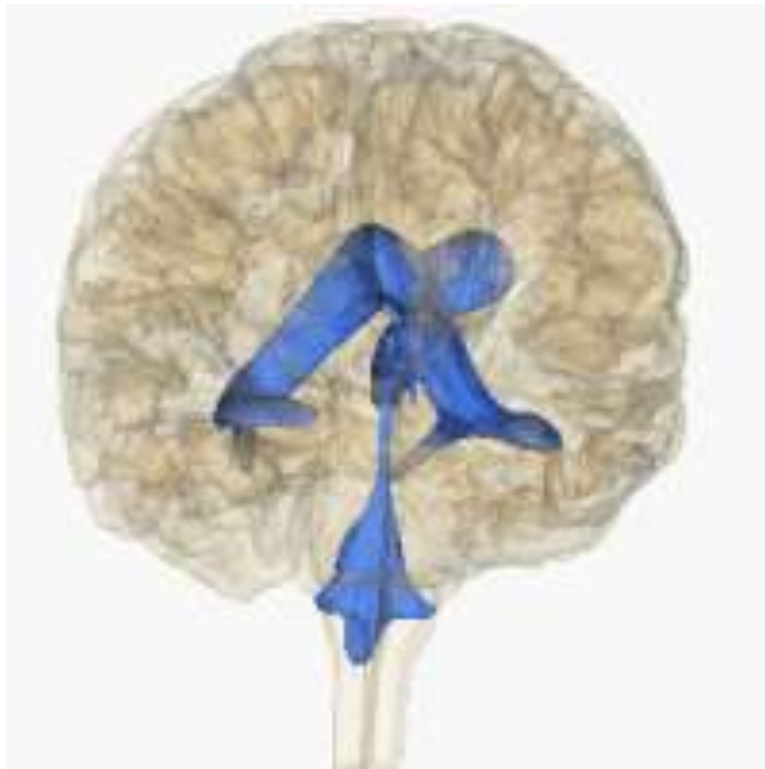
N.B.

MORE EARLY

MORE FAINT

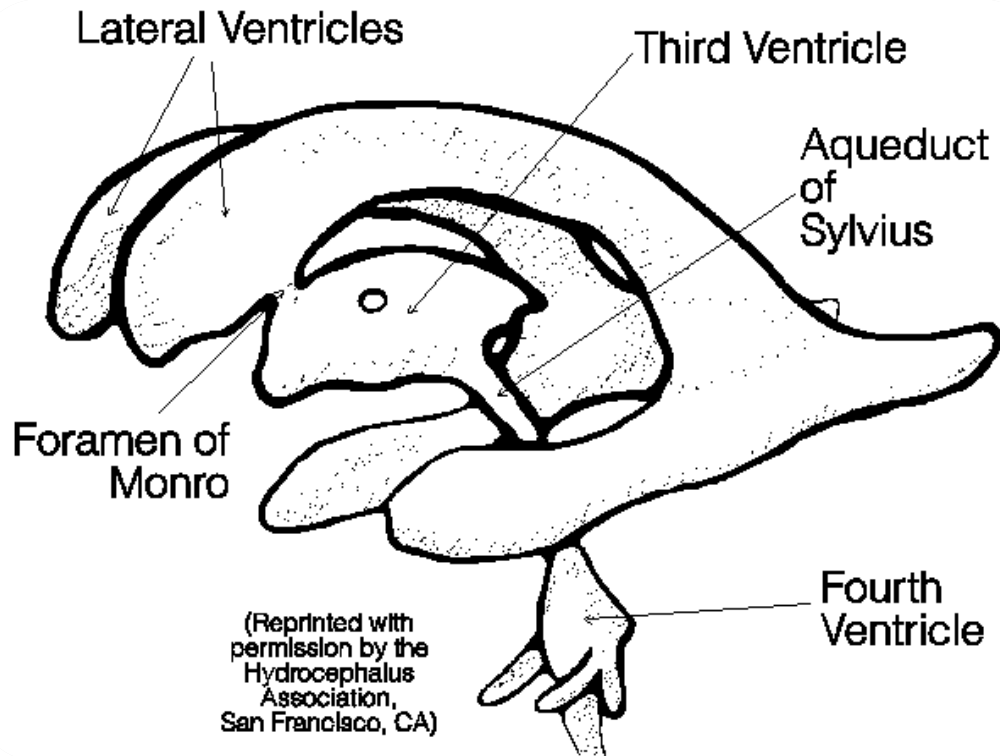
Lt Normal / Rt Early Infarction

HYDROCEPHALUS



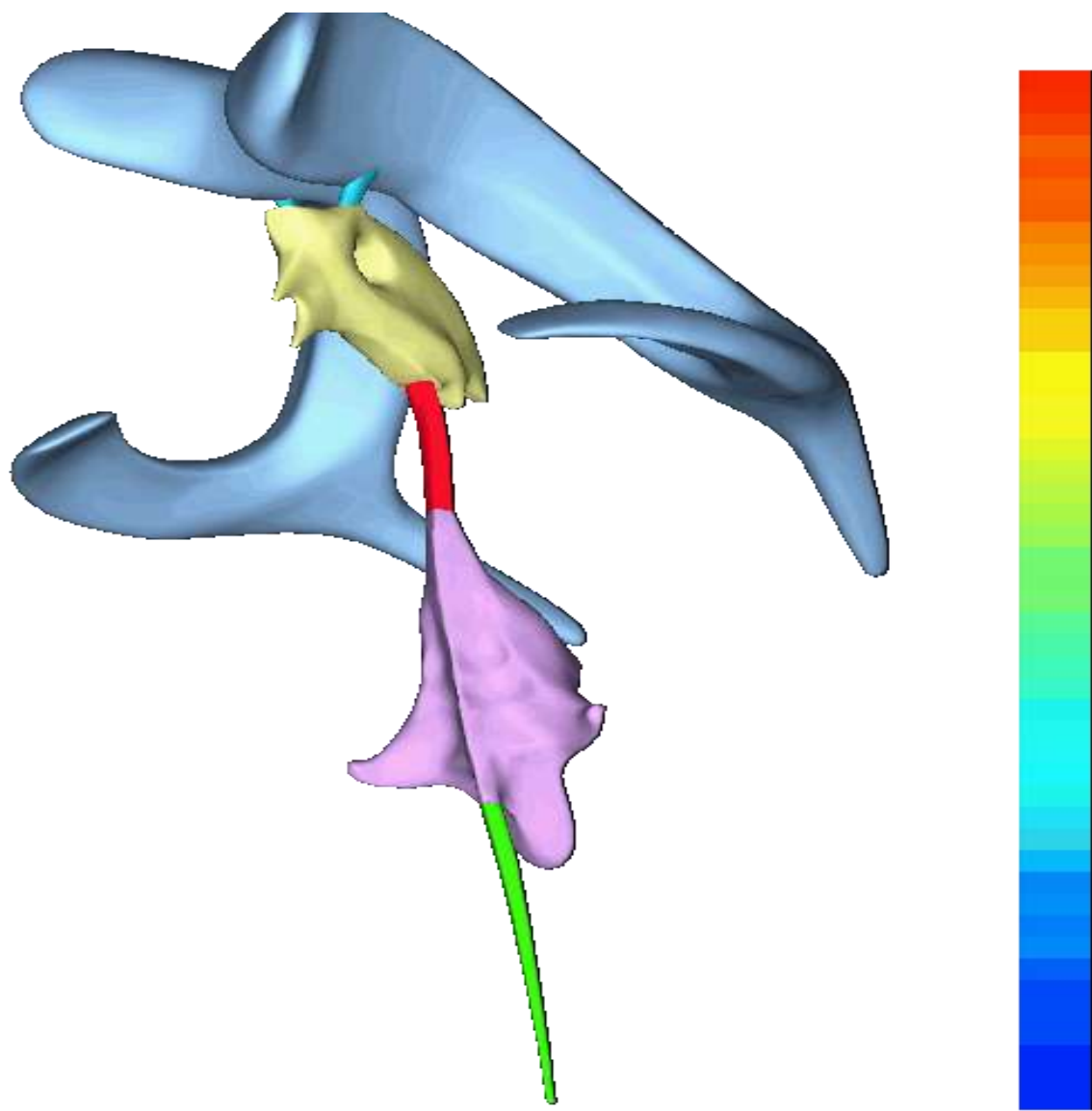
.....Increase intra ventricular pressure

Ventricular system



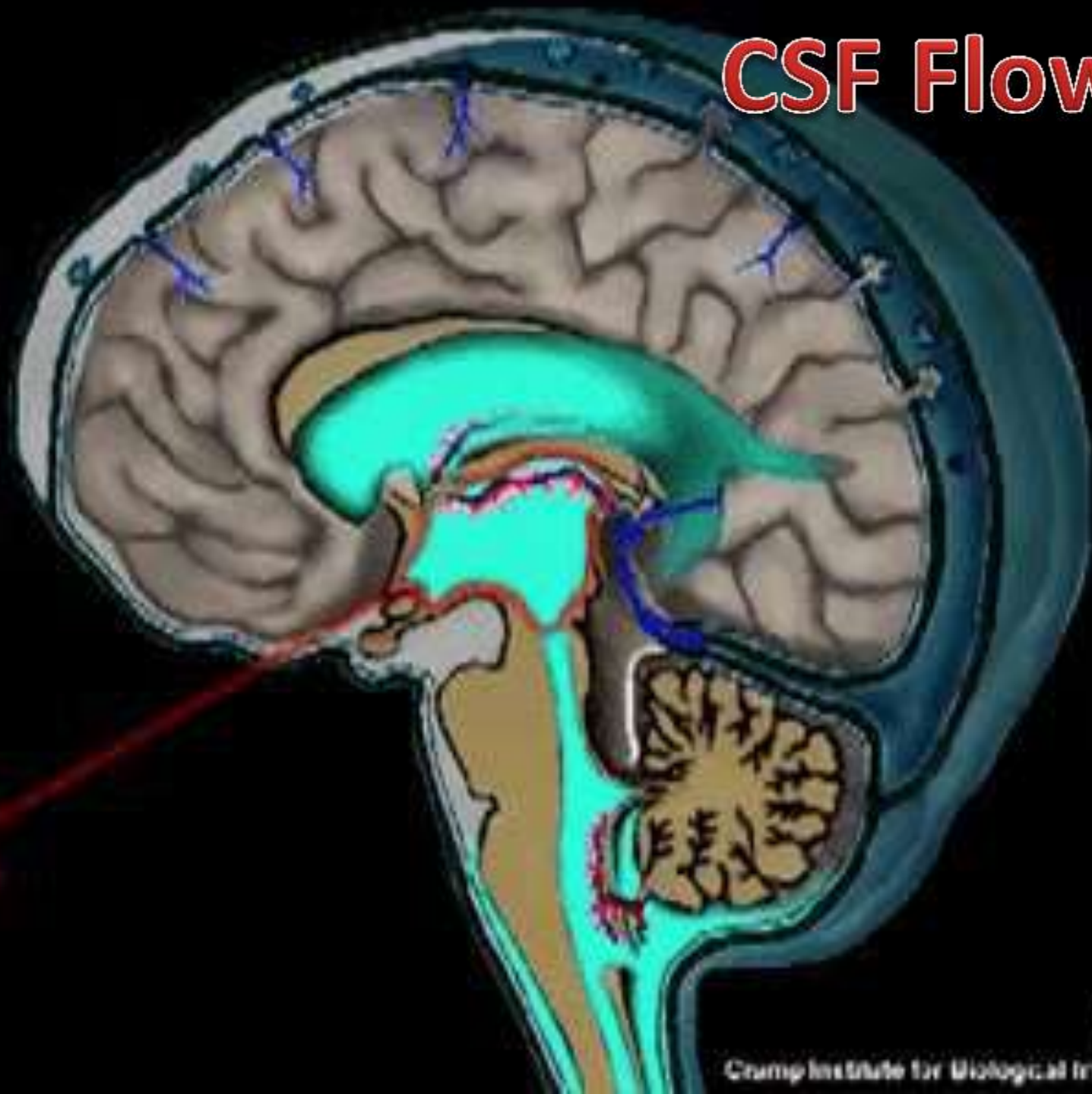
San Francisco, CA)
Association,
Hydrocephalus
Association of the
(Reprinted with

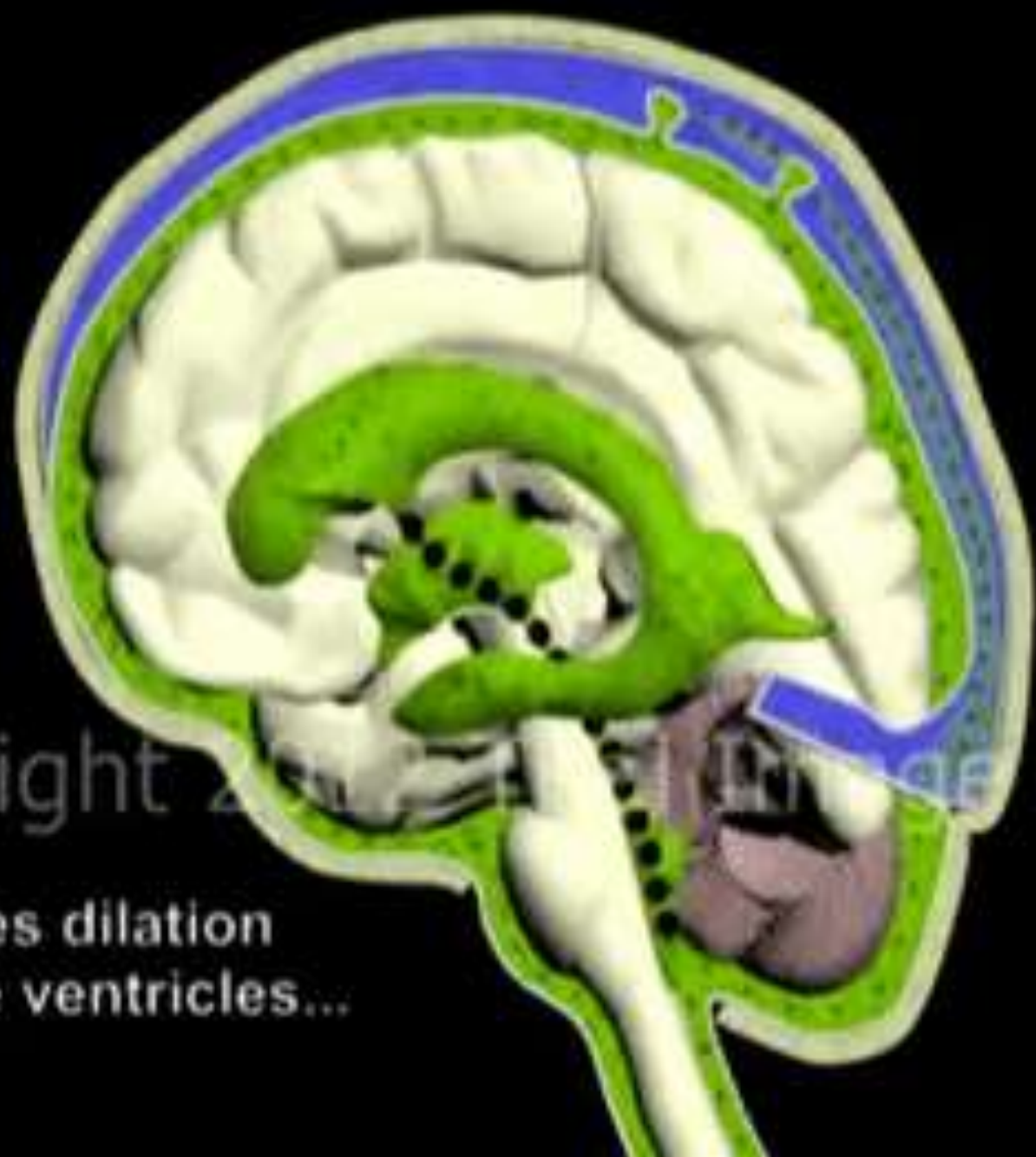
Ventricle
Fourth



CSF Flow

Third
Ventricle





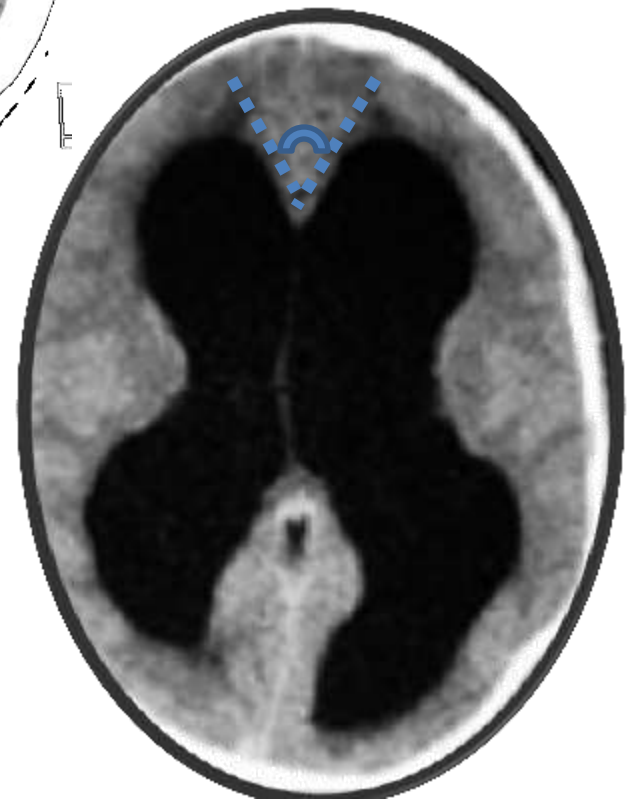
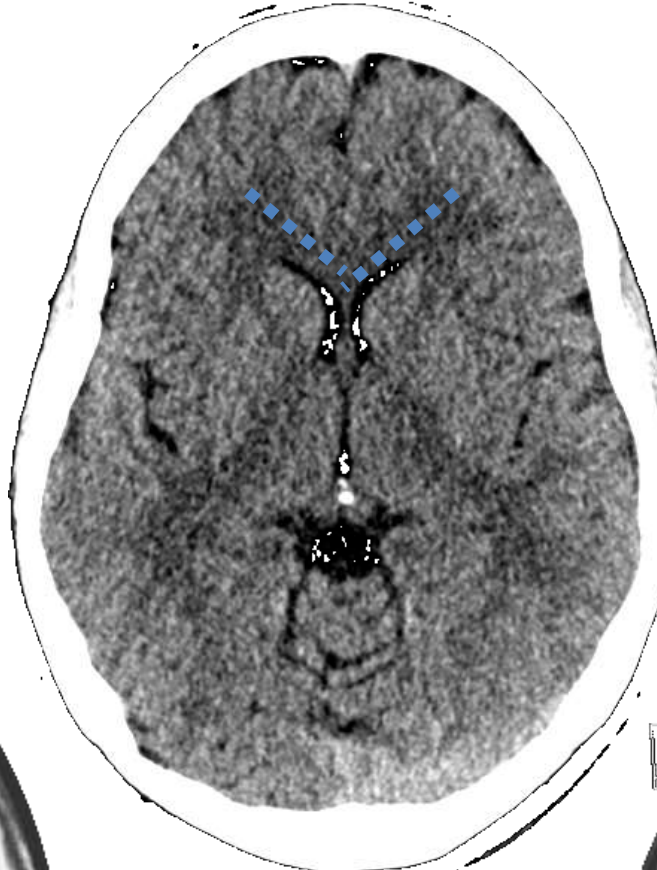
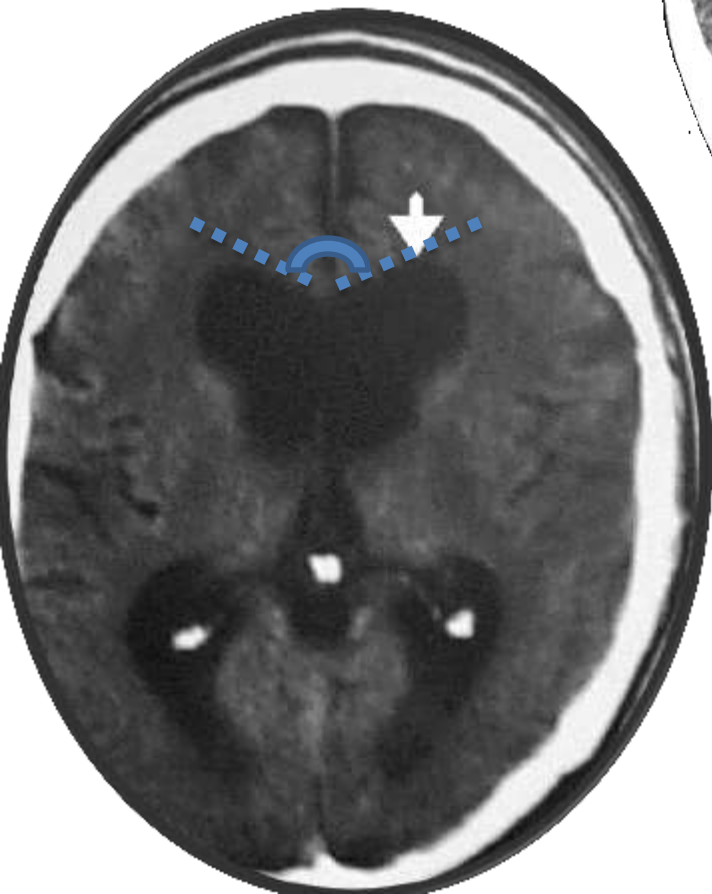
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causes dilation
of the ventricles...

Hydrocephalus

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





Angle Differentiate

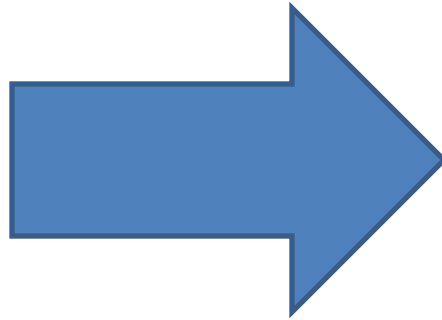
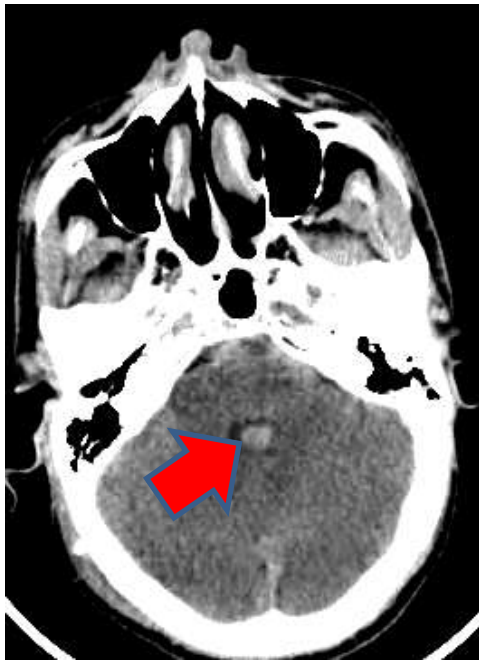
Hydrocephalus →

&

← **Normo-tensive**

ventricular

Dilatation



Male patient , 44 y

Acute IV hage → **Acute obstructive hydrocephalus**

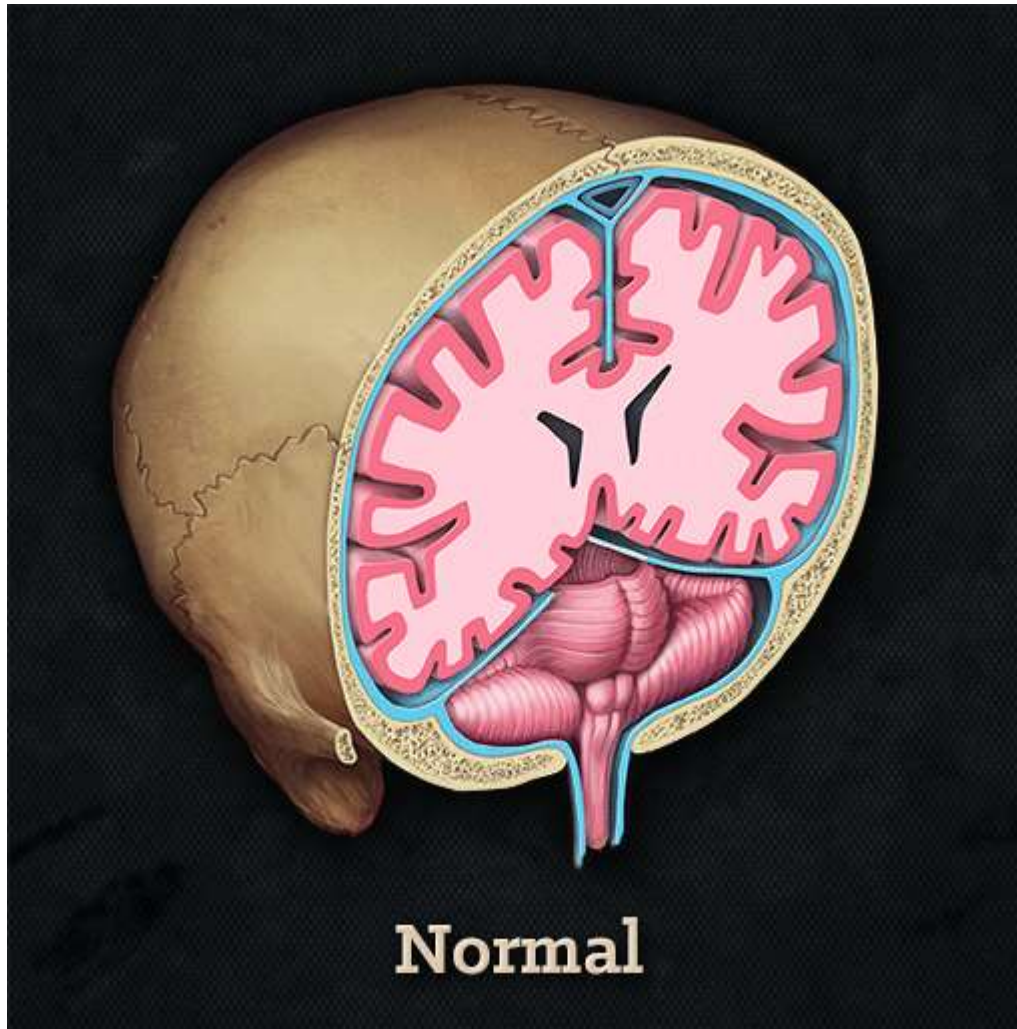


Don't Forget

VP Shunt is not always positioned well !!

So..... Confirm it by CT

BRAIN HERNIATION

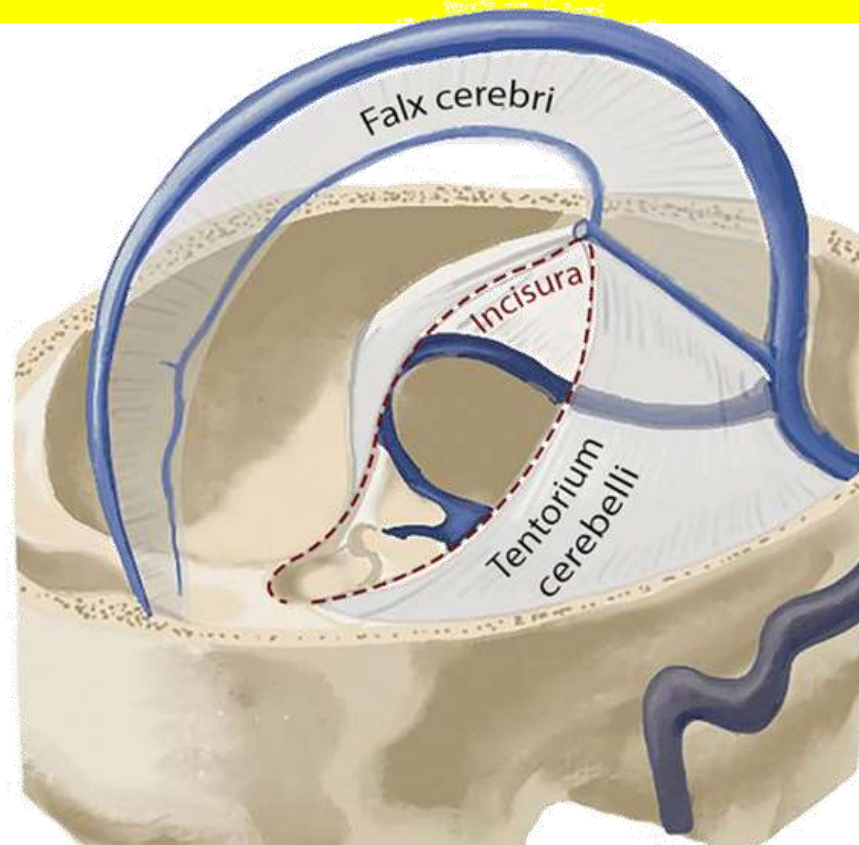


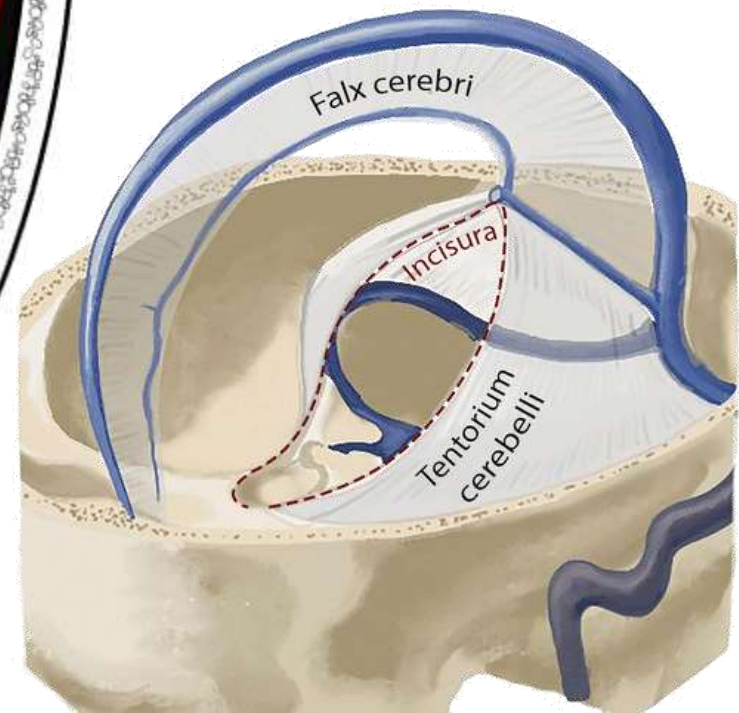
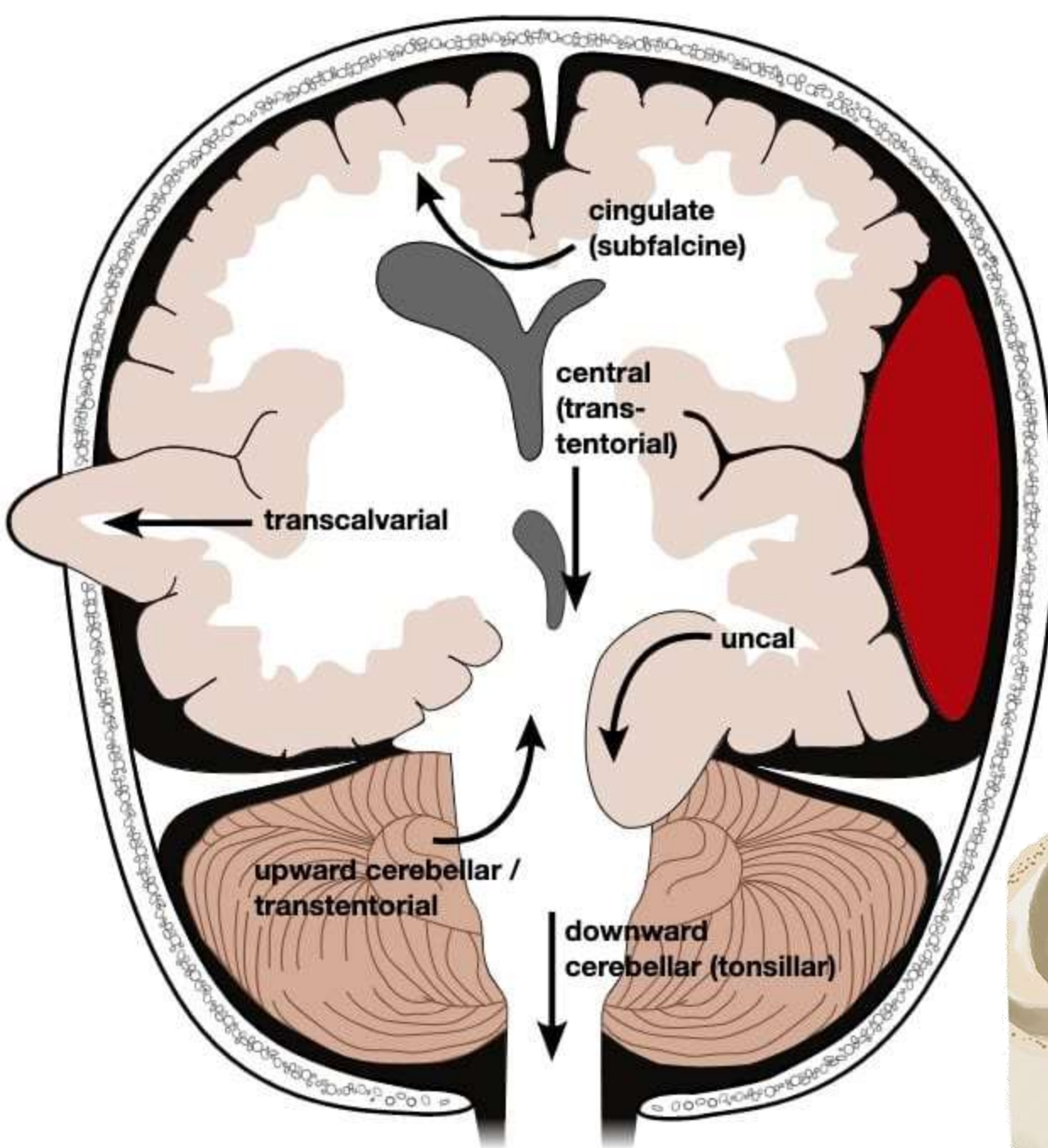
Shift of brain tissue

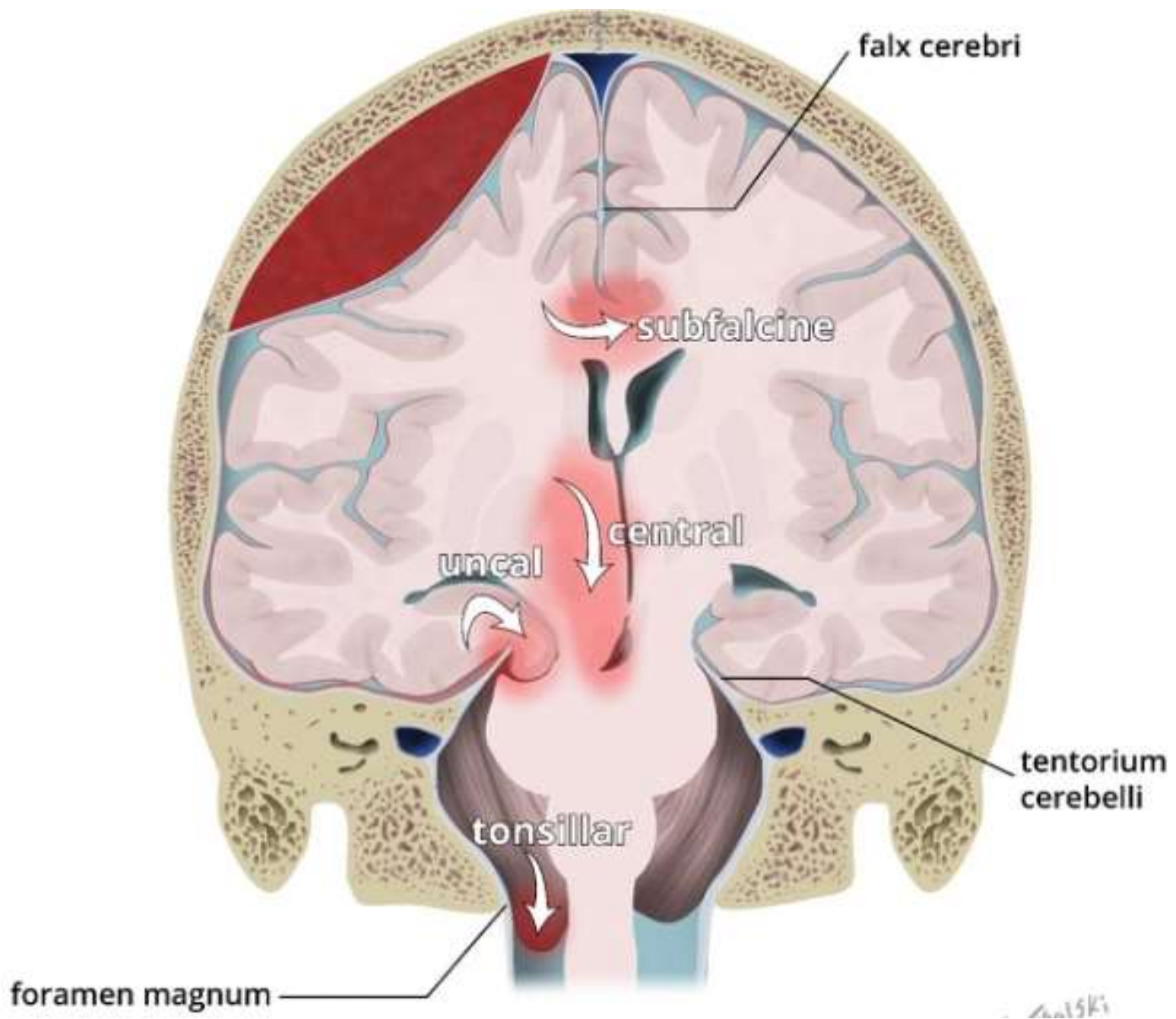
from normal location → into adjacent space

as a result of **MASS EFFECT**.

Life-threatening condition, requires prompt diagnosis.



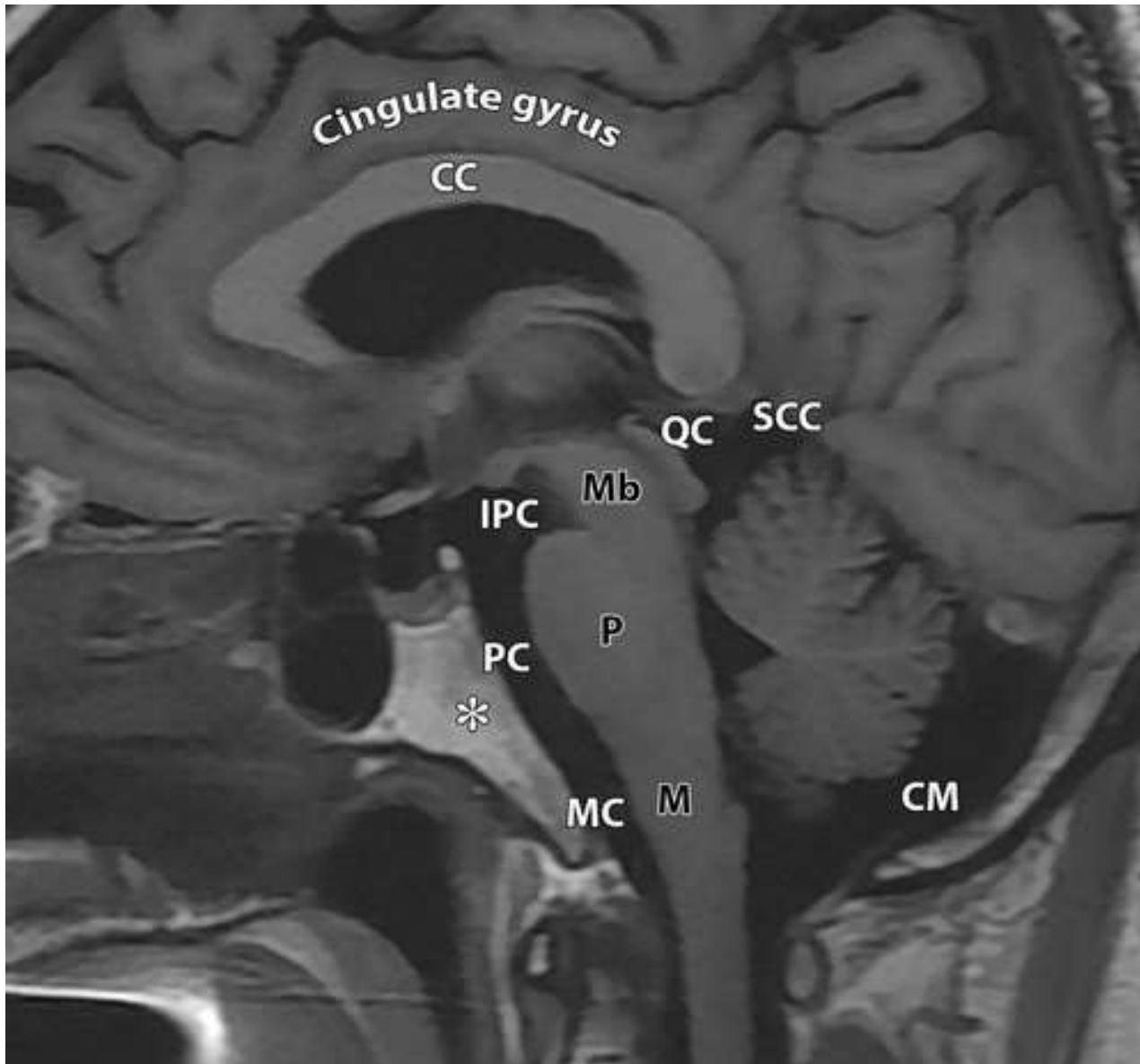




Anatomy To Understand Brain Herniations



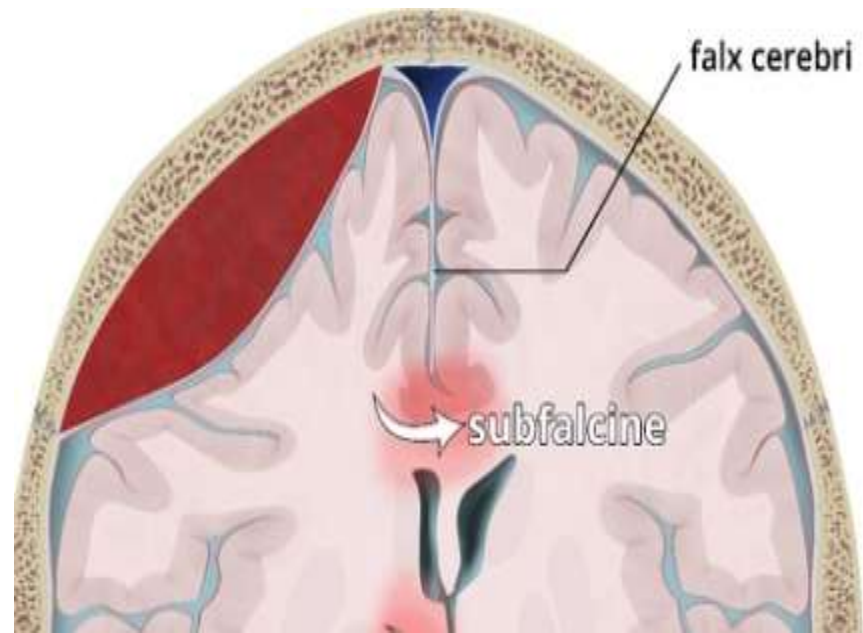
- corpus callosum (*CC*),
- cingulate gyrus (*CG*),
- hippocampus (*H*),
- **Tentorium**
(white arrowheads),
- **tentorial incisura**
(dashed oval),



- **Cisterna magna (CM)**,
- **Interpeduncular cistern (IPC)**,
- **Medullary cistern (MC)**,
- **Pontine cistern (PC)**,
- **Quadrigeminal cistern (QC)**,
- **Supracerebellar cistern (SCC)**.
- **corp^us callosum (CC)**,
- **Clivus (*)**

brainstem divisions are as follows:

medulla (M),
midbrain (Mb),
 and **pons (P)**







**Axial CT image
Subdural hematoma**

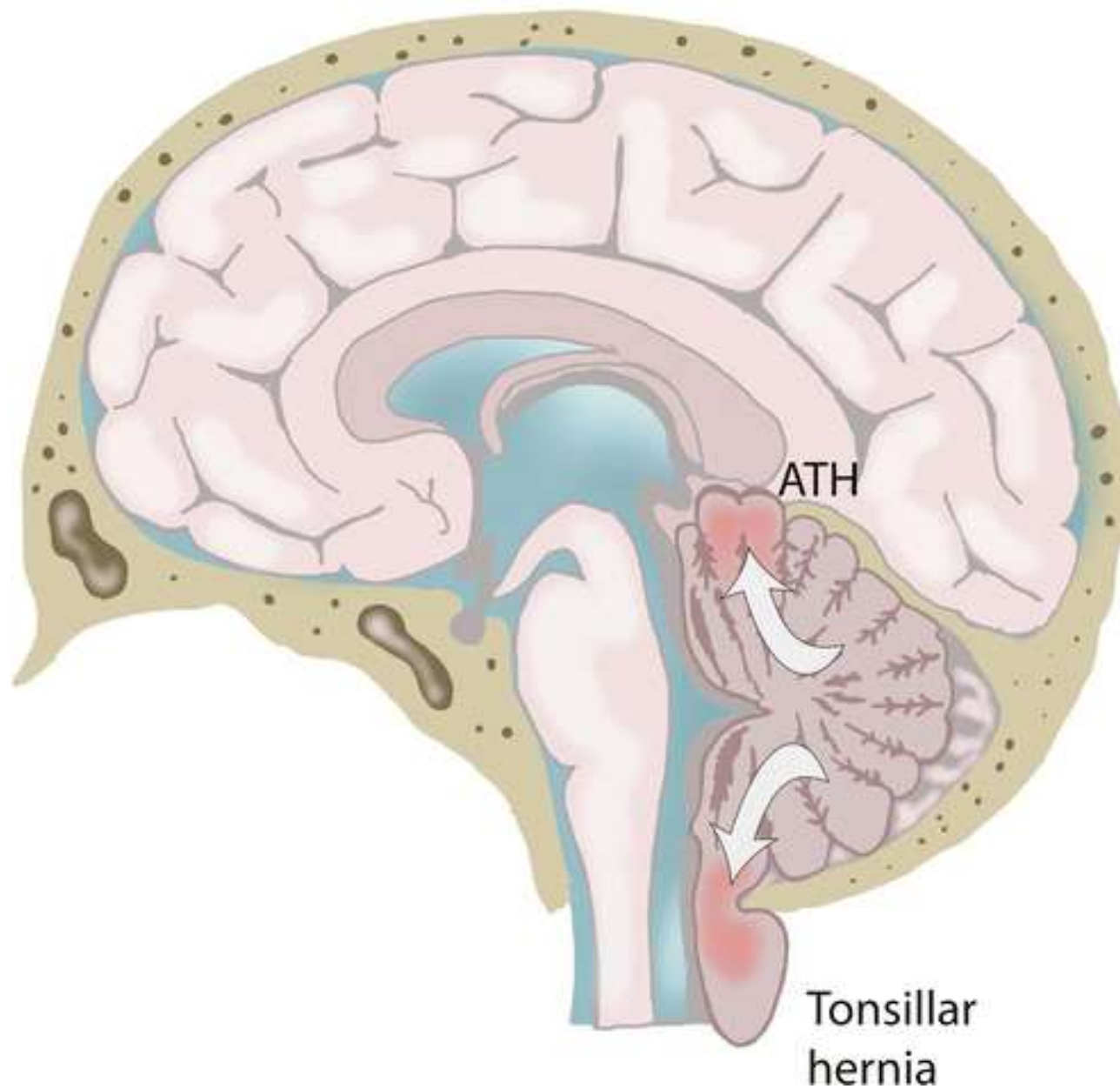
Uncus displaced downward across the tentorial incisura (curved arrow).

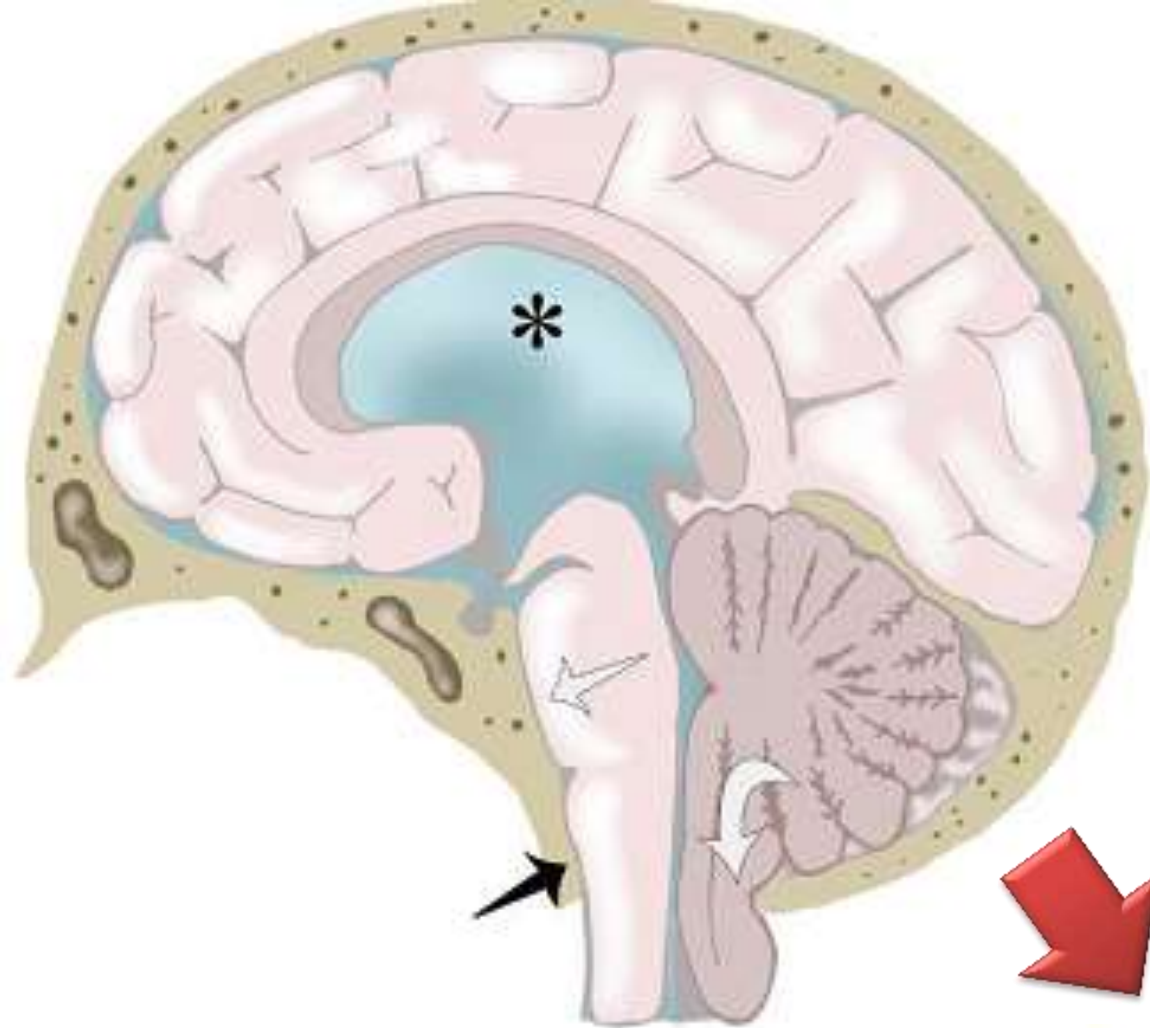
The ipsilateral **perimesencephalic** cistern (double headed arrow) is widened,

Contralateral cistern is compressed.

- Note the contralateral dilatation of the temporal horn of the lateral ventricle (*).

ATH
Ascending
Transtentorial
Herniation





Sagittal T1-weighted MR



Downward displacement
of the cerebellar tonsils

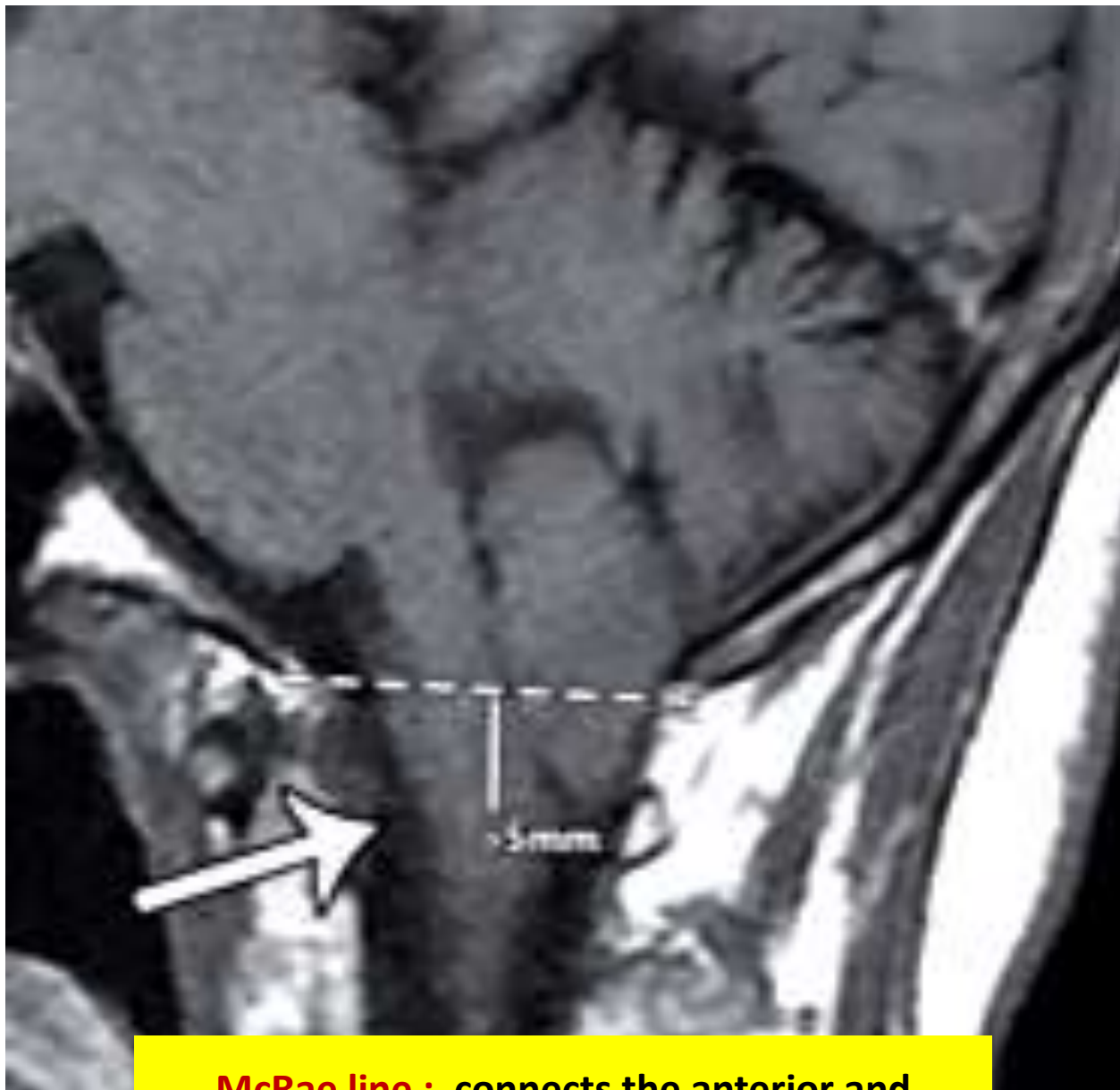
(>5 mm)

relative to the **McRae line**
(dashed line).

→ Note :
Obliteration of
cisterna magna,

anterior displacement of
the medulla (arrow),

and hydrocephalus (*).



McRae line : connects the anterior and posterior margins of the foramen magnum

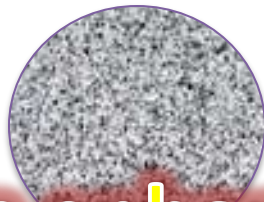
C E C T

In Few Words

Patterns of contrast enhancing

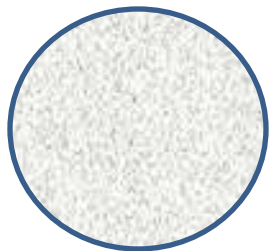
Finally

Don't Forget



Non enhancing

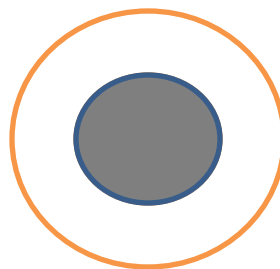
ENHANCING



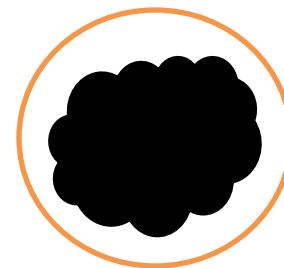
HOMO



HETERO



Uniform



Non Uniform

MARGINAL

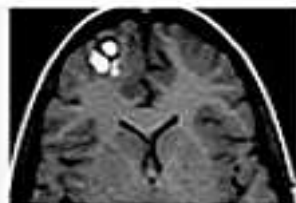
CECT

Is Mandatory

BRAIN TUMORS & Vascular Lesions

DIAGNOSIS or Follow up





- Young Age - Small - Related to Cortex
- Slow flow or Thrombosed - Dense /High signal



- Variable Size 'May cause Mass effect'
- Dense in CT with Faint Enhance +Ca
- MR: Black Edge in all seq. + Pop corn Like Core

◆ Cryptic AVM or Occult AVM

◆ Cavernous angioma

VASCULAR MALFORMATION

◆ AVM

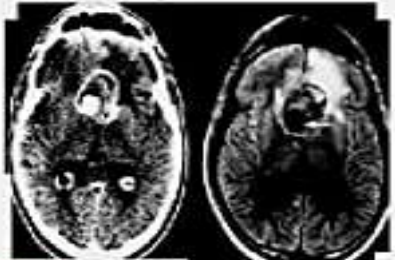
◆ Aneurysm

small <2.5 cm Giant >2.5 cm

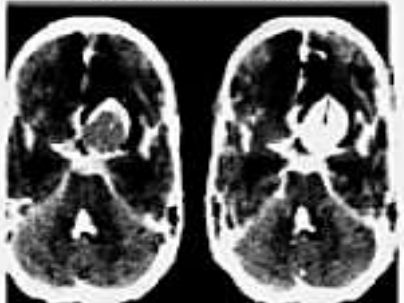
- Intact -
Strong Enhance
Site of Vessel



- THROMBOSED -
-CT Partially Non enh core
-MR wholly

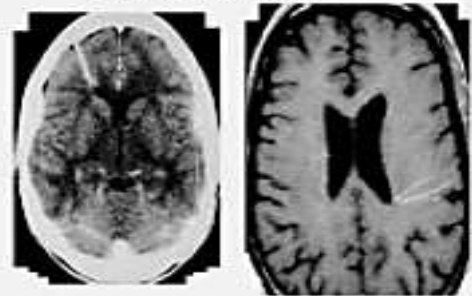


- RUPTURED -
+ SubArachnoid haze

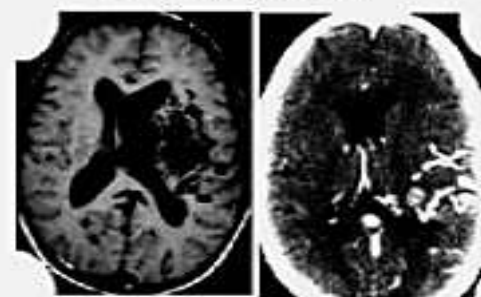


◆ Venous angioma

- Normal Variant
- Faint Linear Enhance
- Not site of Vessel



- Serpigeous Enhancing
- MR Serp. Signal Void



Glioma

Heterogeneous
Enhancement



Gliblastoma

Non Uniform
Ring Enhancement



Abscess

Uniform Ring
Enhancement

Meningioma

Homogeneous
Enhancement



+ Edema



Cerebral Edemas

CYTOTOXIC

VASOGENIC





**cytotoxic oedema
(infarction)**



**vasogenic oedema
(tumour/abscess)**



NEXT

REVIEW OF BRAIN SOL



SOURCES & FURTHER READING

- **A–Z of Emergency Radiology** - Rakesh R.Misra
- **EMERGENCY RADIOLOGY** – Imaging and Intervention , Borut Marincek · Robert F. Dondelinger
- <https://pubs.rsna.org/doi/full/10.1148/rg.2019190018>
- <https://radiopaedia.org/articles/loss-of-the-insular-ribbon-sign>
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- <https://teachmeanatomy.info/head/osteology/sphenoid-bone/>

Thank You

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