MAKERERE UNIVERSITY

Leveraging 100 years of Excellence in Building a Transformed Society

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Mak-CHS

Head CT scans Indication and Imaging patterns

Indications

- GCS <13 when assessed - irrespective of time post injury.
- GCS <15 two hours post injury - discuss with surgeon.
- Any deterioration in condition.
- Suspected open or depressed skull fracture.
- Any sign of basal skull fracture.
- Post traumatic seizure.
- Focal neurological deficit.

Introduction - TBI

- Any type of bleeding inside the skull or brain is a medical emergency.
- The most common causes of hemorrhage are trauma, stroke and subarachnoid hemorrhage due to a ruptured aneurysm.
- Complications are increased ICP as a result of the hemorrhage, surrounding edema or hydrocephalus due to obstruction of CSF

Introduction Cont'd

- TBI is a major public health problem.
- Estimated yearly global incidence of 69 million and with an increasing prevalence over the past 25 years.
- Imaging - CT and to an increasing extent, MRI plays a critical role in TBI management and prognostication.

Classification of TBI

- TBI is a clinical diagnosis traditionally classified using the Glasgow Coma Scale (GCS).
- GCS scores

✓ 13–15 are mild brain injuries

✓ 9–12 are moderate

✓ 3–8 are severe.

- There is a strong correlation between GCS score and morbidity and/or mortality.

Imaging utilization..

- Non-enhanced head CT is critical for;

- ❑ Triage,
- ❑ Diagnosis
- ❑ Follow-up
- ❑ Complications

CT Advantages

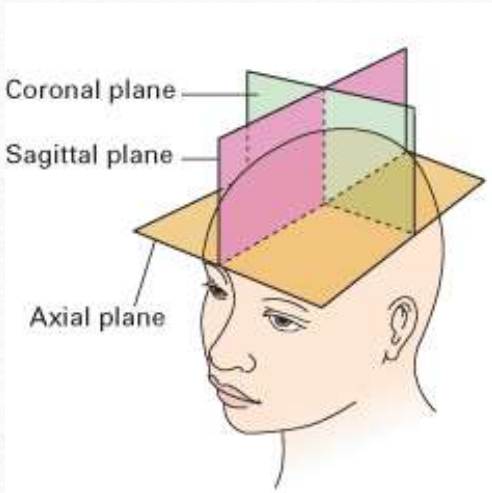
- Fast
- Available
- (Relatively) inexpensive
- Sensitive for intracranial hemorrhage

CT Limitations

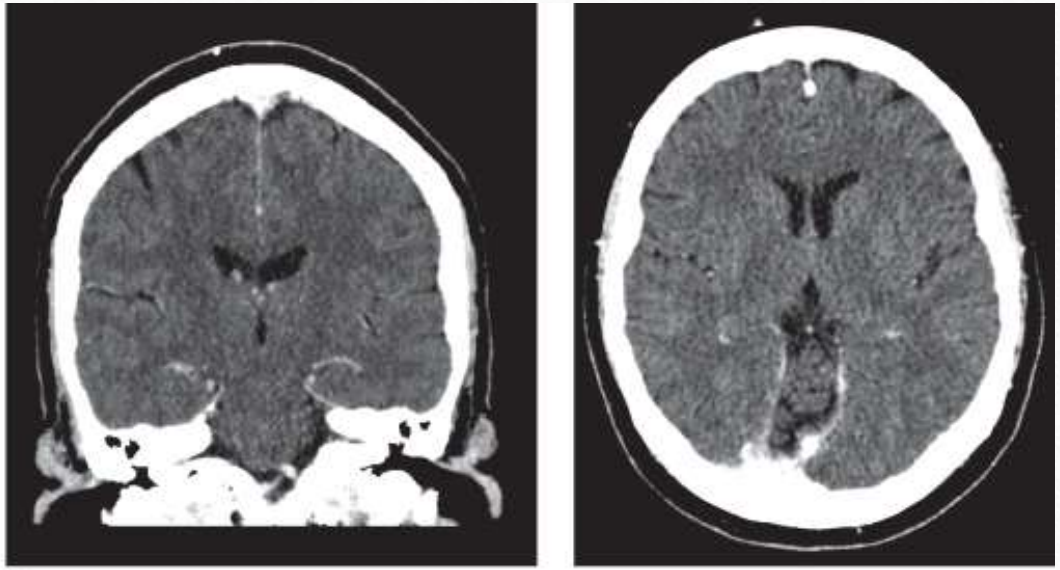
- There is radiation
- Bone artifact obscures visualization, especially posterior fossa and spinal cord
- Not very sensitive to some intraparenchymal lesions or brain edema
- Non-contrast CT misses many abnormalities
- Risk of allergic reaction to iodinated contrast media

CT Technique

- Non - contrasted CT scan
- Contrasted CT scan



(a)



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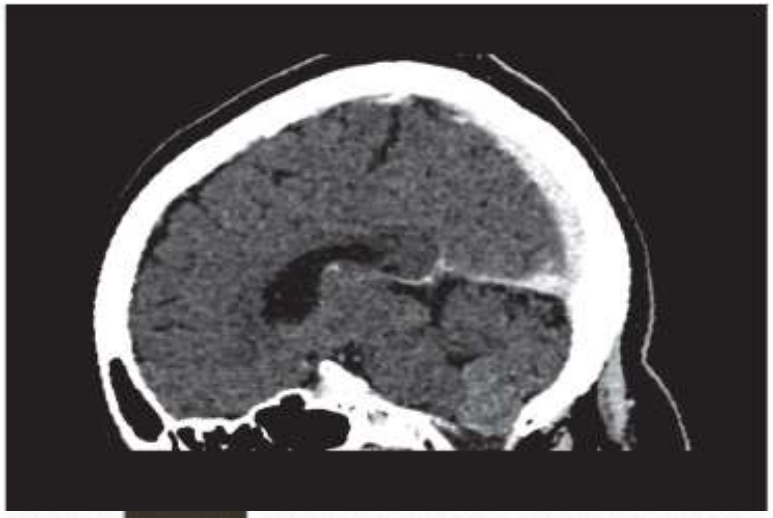
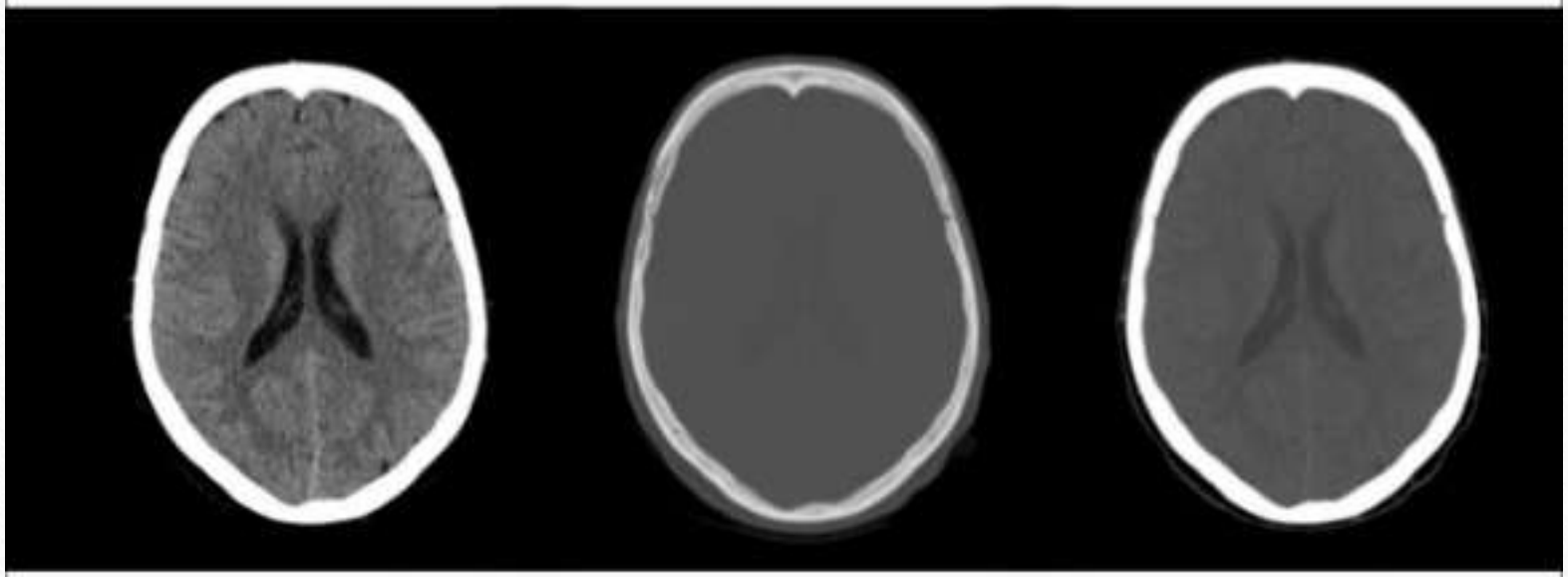


Window examples

- In head CT, 3 windows are commonly used

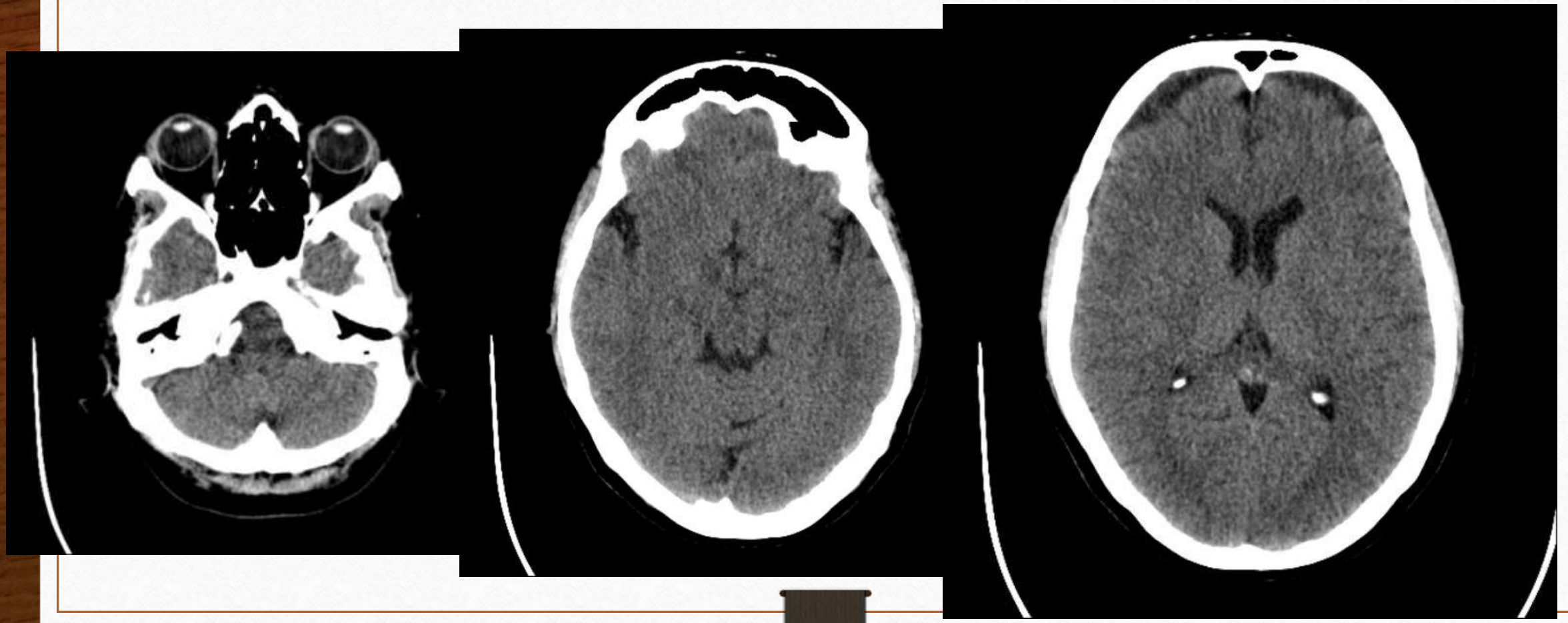


BRAIN window
W:80 L:40

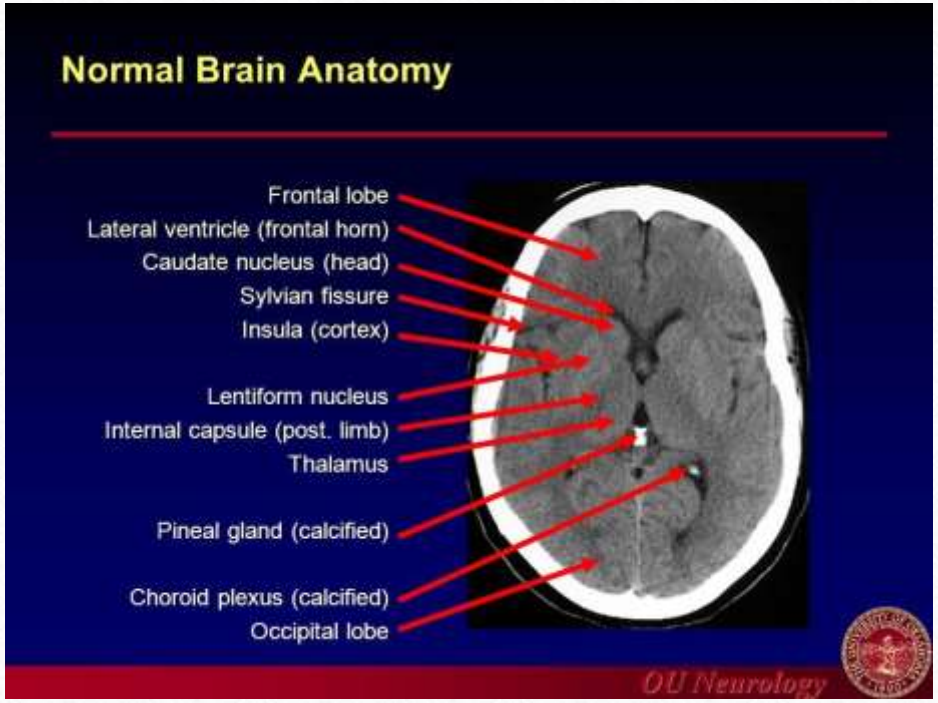
BONE window
W:2500 L:480

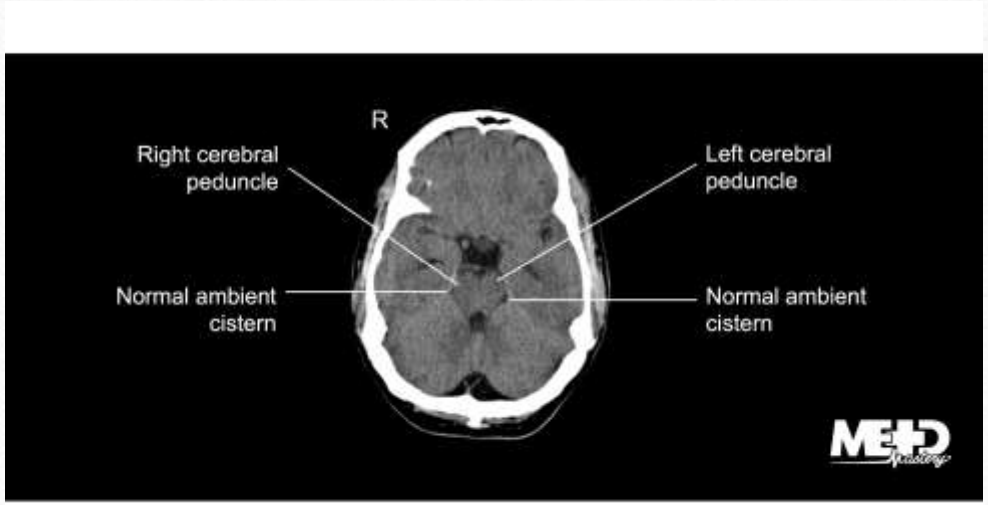
SUBDURAL window
W:350 L:90

Normal brain CT scan



Normal anatomy

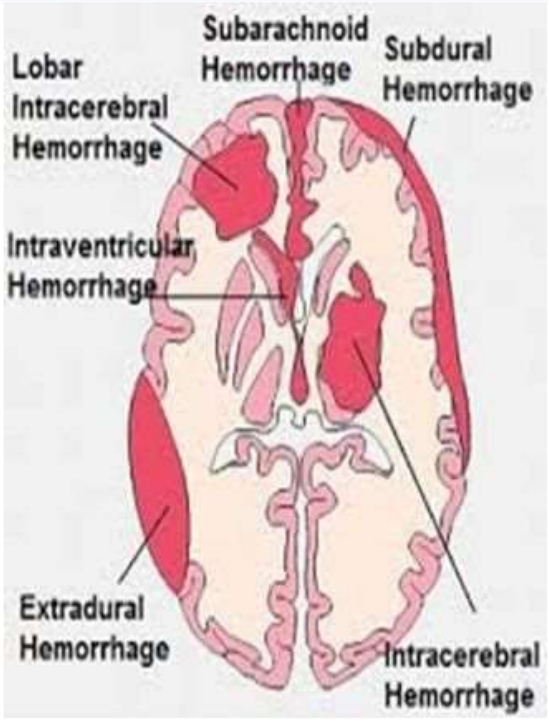




Localization of hemorrhage

- Extra-axial hemorrhage - Intracranial extracerebral.
- Intra-axial hemorrhage - intracerebral

Types of Intra Cranial Hemorrhgaes



- Intra axial
  - Intraparenchymal
  - Intraventricular
- Extra Axial
  - Subdural
  - Subarachnoid
  - Epidural

Extra-axial hemorrhage - Intracranial extracerebral

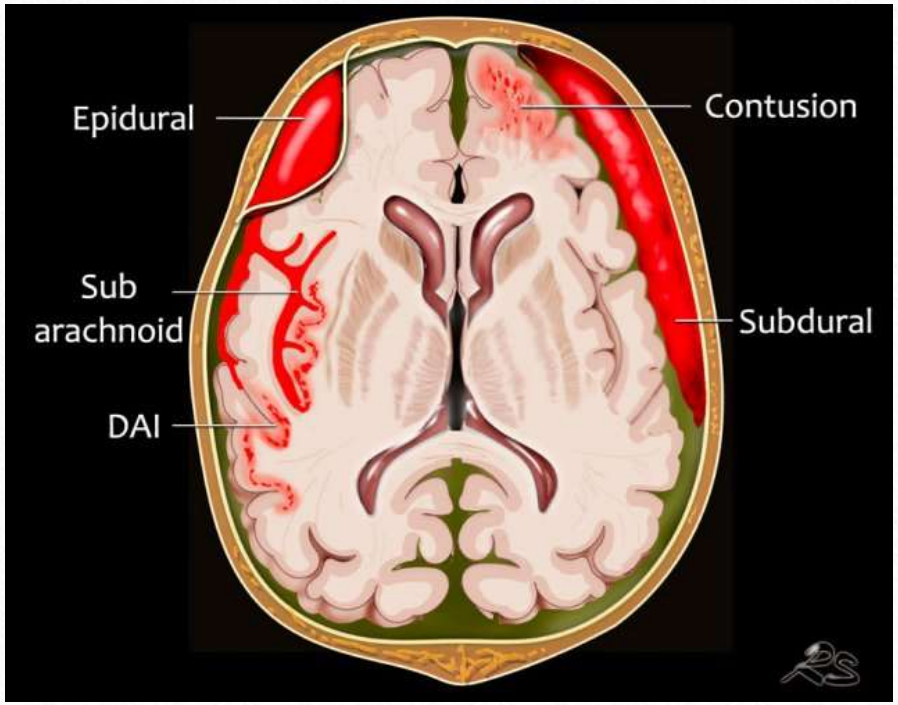
1. SAH - is bleeding under the arachnoid. Most commonly seen in trauma or rupture of an aneurysm.
2. SDH - is bleeding between the inner layer of the dura mater and the arachnoid mater. It usually results from traumatic tearing of the bridging veins that cross the subdural space.
3. EDH - is bleeding in the space between the dura mater and the skull. Seen in fracture of the temporal bone with rupture of the middle meningeal artery.

Intra-axial hemorrhage - intracerebral

1. Hemorrhagic contusion - small post-traumatic hemorrhages located near the skull in the area of the coupe and contre-coup.

2. Diffuse axonal injury (DAI) - diffuse injury at the level of the gray-white matter junction seen in high velocity injuries. CT has low sensitivity. Better seen on MRI.

Illustration…



Anatomy of the meninges

- Are the 3 membranes that envelop the brain and spinal cord namely:

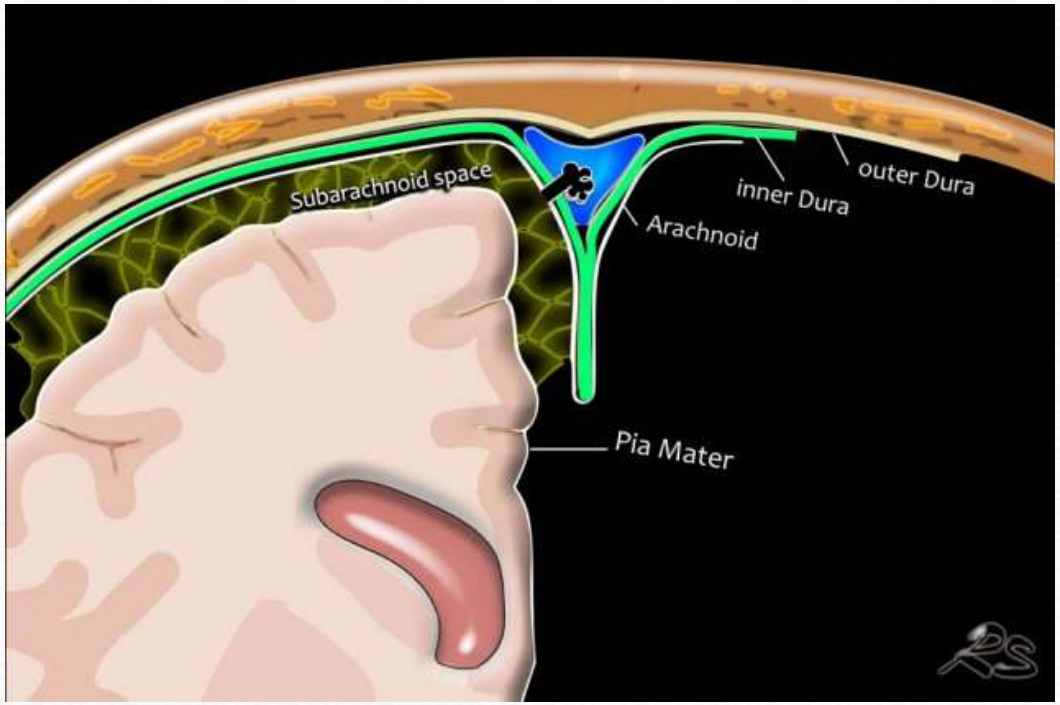
- The dura mater
- Arachnoid mater
- Pia mater

CSF is located in the subarachnoid space between the arachnoid mater and the pia mater.

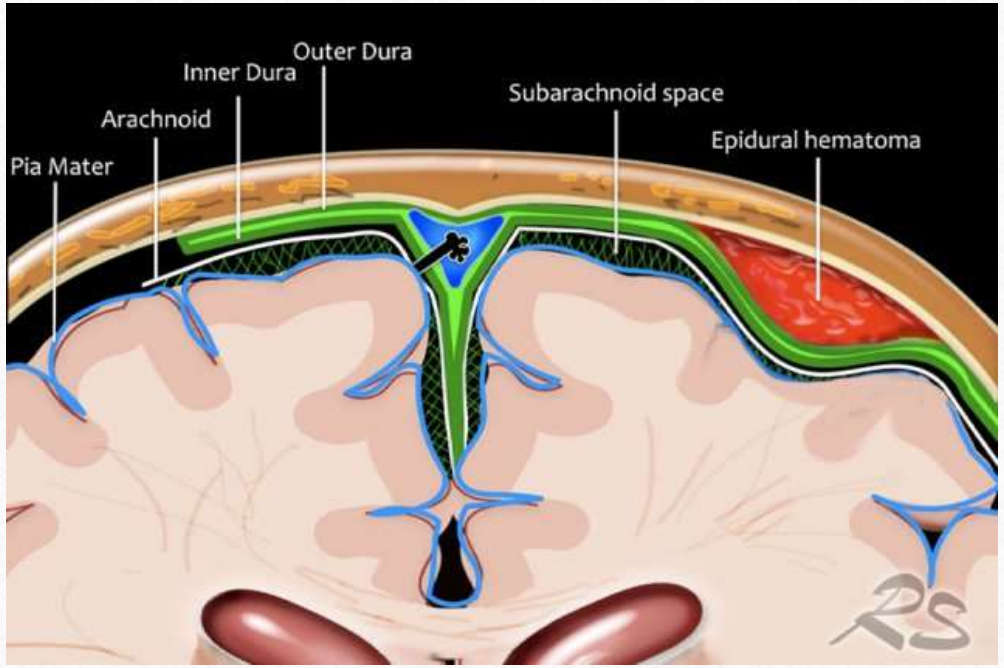
Meninges - anatomy

- **Dura mater** - Is the outermost meningeal layer that covers the brain and spinal cord.
- **Arachnoid** - Is the layer with delicate fibres which extend down through the subarachnoid space and attach to the pia mater.
- **Pia mater** - Is the innermost layer covering the brain.
  The arachnoid and pia mater together are sometimes called the leptomeninges.

Meninges - anatomy



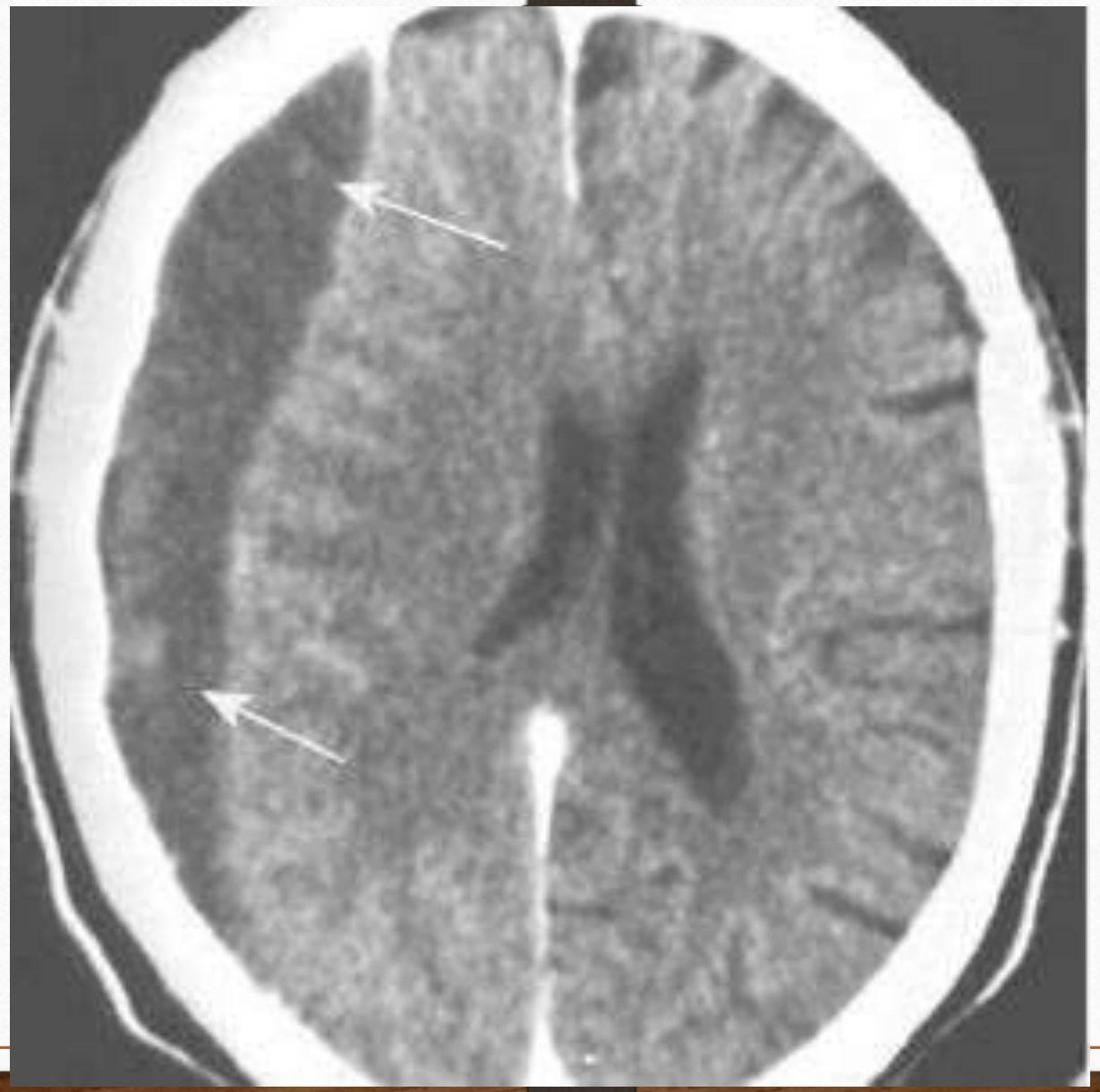
Epidural hematoma - EDH



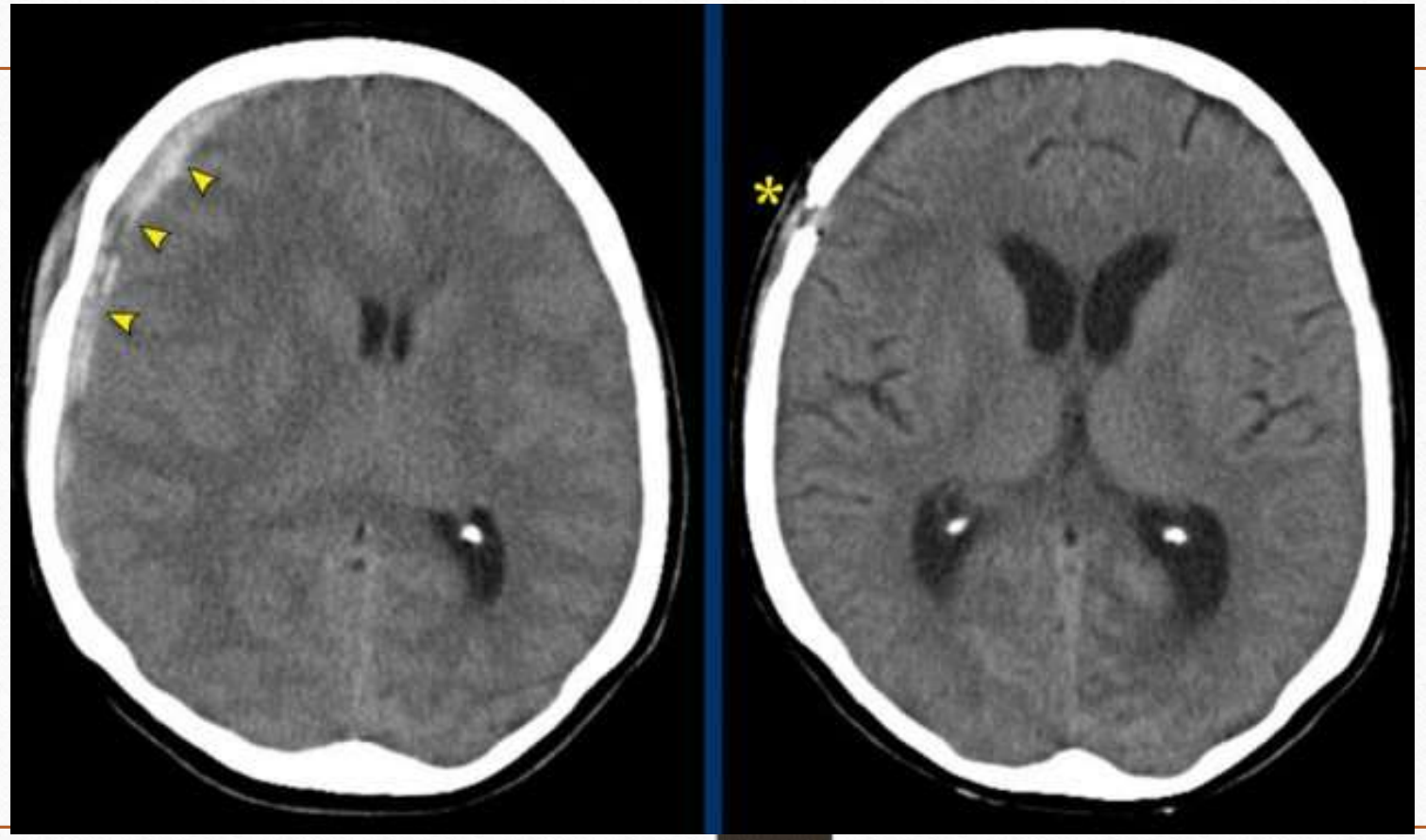
- An EDH is a bleeding that occurs between the dura and the skull.
- It is mostly seen in children who have head injury with fracture of the temporal bone resulting in tearing of the middle meningeal artery.
- In theory an EDH can cross the midline because it is located between the dura and the skull.
- However since the dura is tightly adherent to the adjacent skull near suture lines, an EDH usually does not cross suture lines.

A 11 year-old boy fell off his bike probably due to an epileptic convulsion.

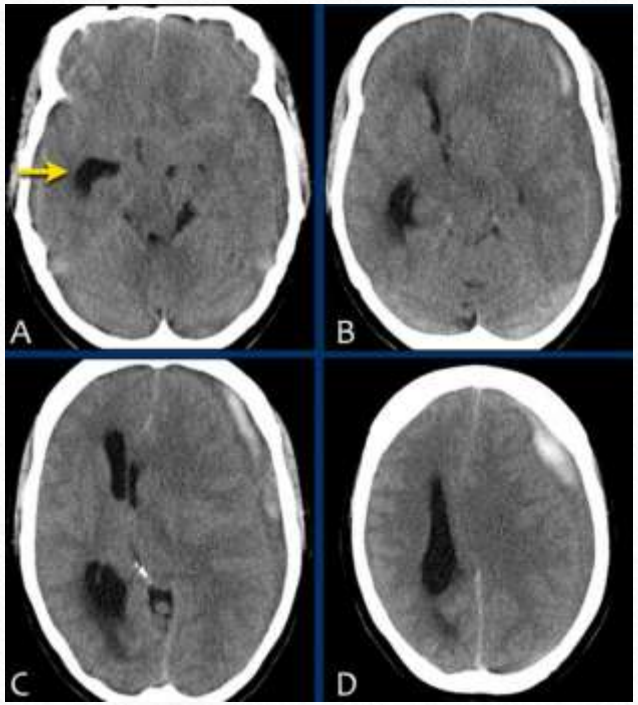
- ✓ Describe



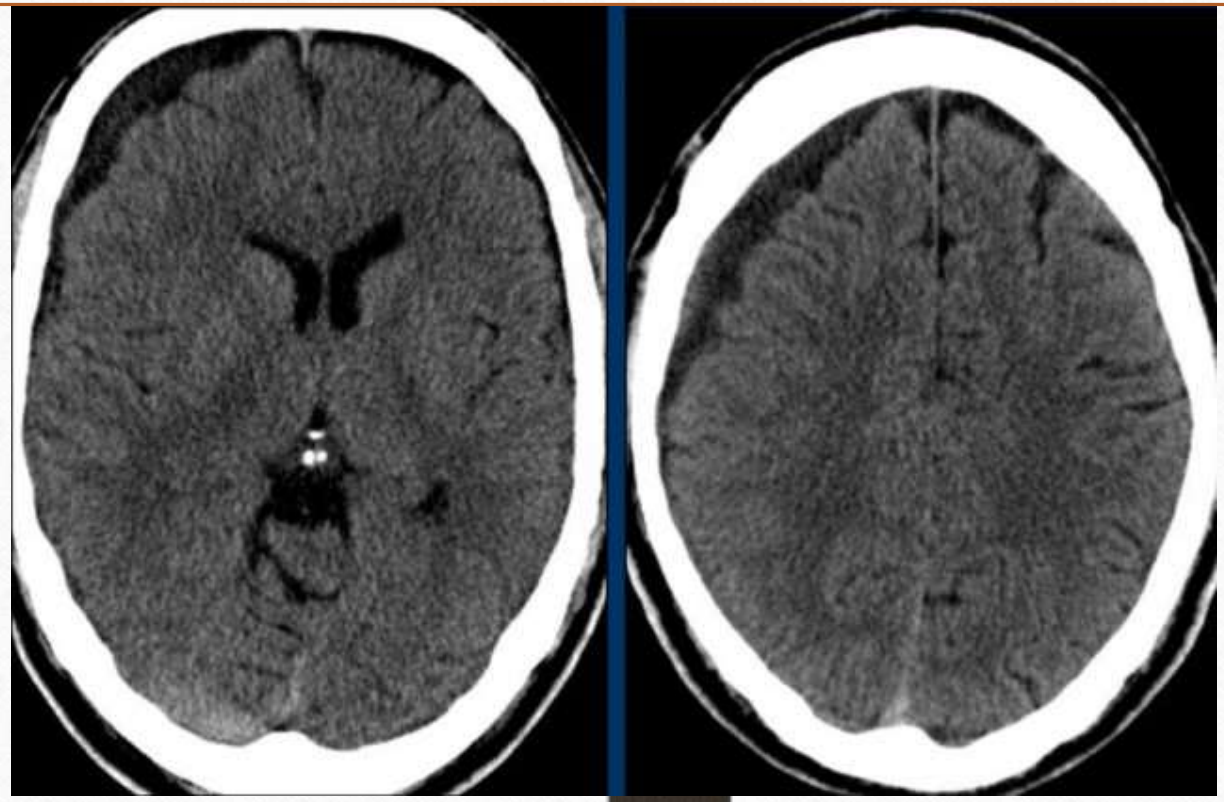
Pre and post operative….



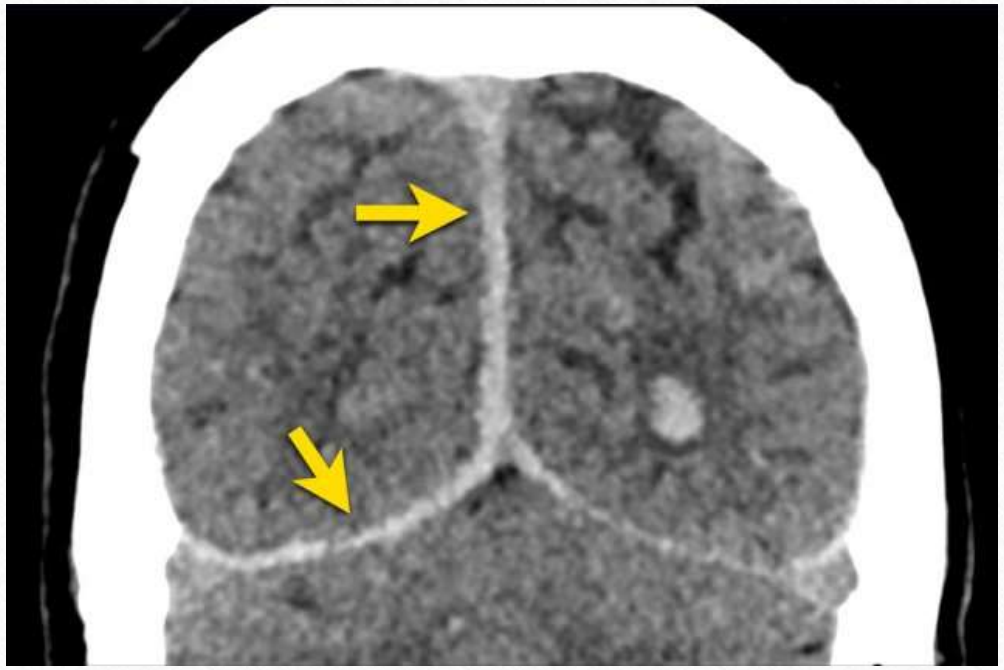
Describe….



After 21 days of trauma…..



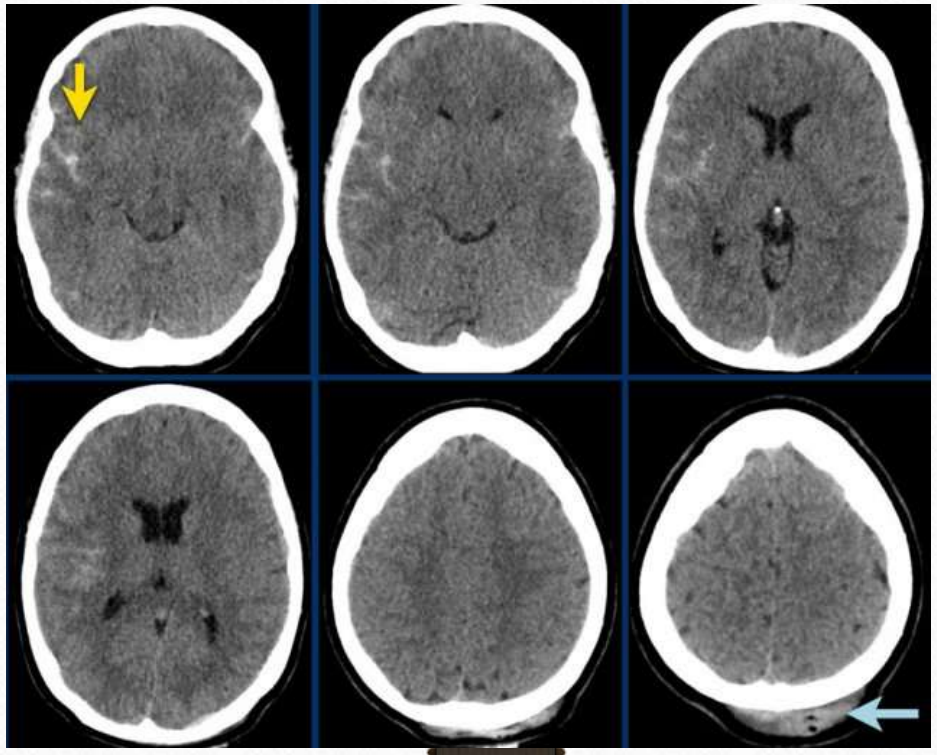
SDH



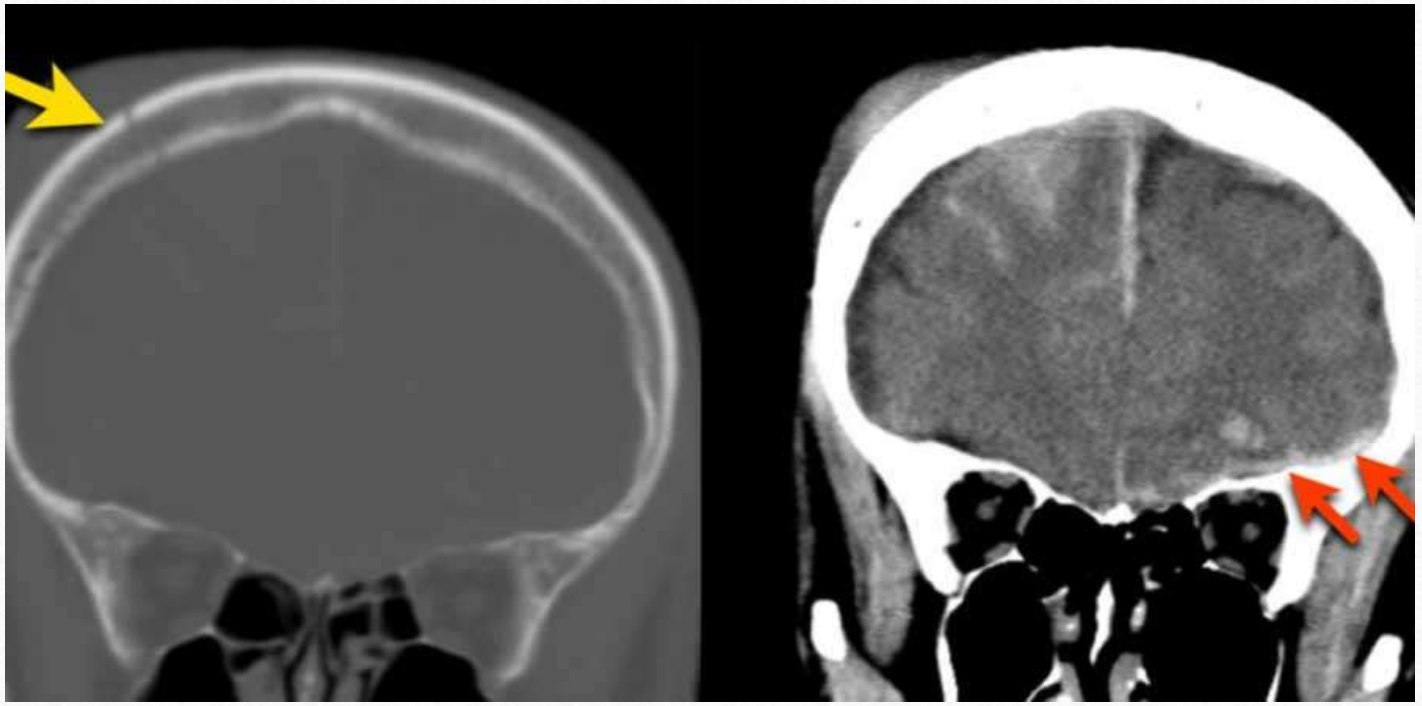
- A subdural hematoma can spread along the falx and tentorium as seen in this case.

Describe, diagnosis…

SAH with subgaleal hematoma



Coupe Contre-coupe injury



Coup-contre coup injury

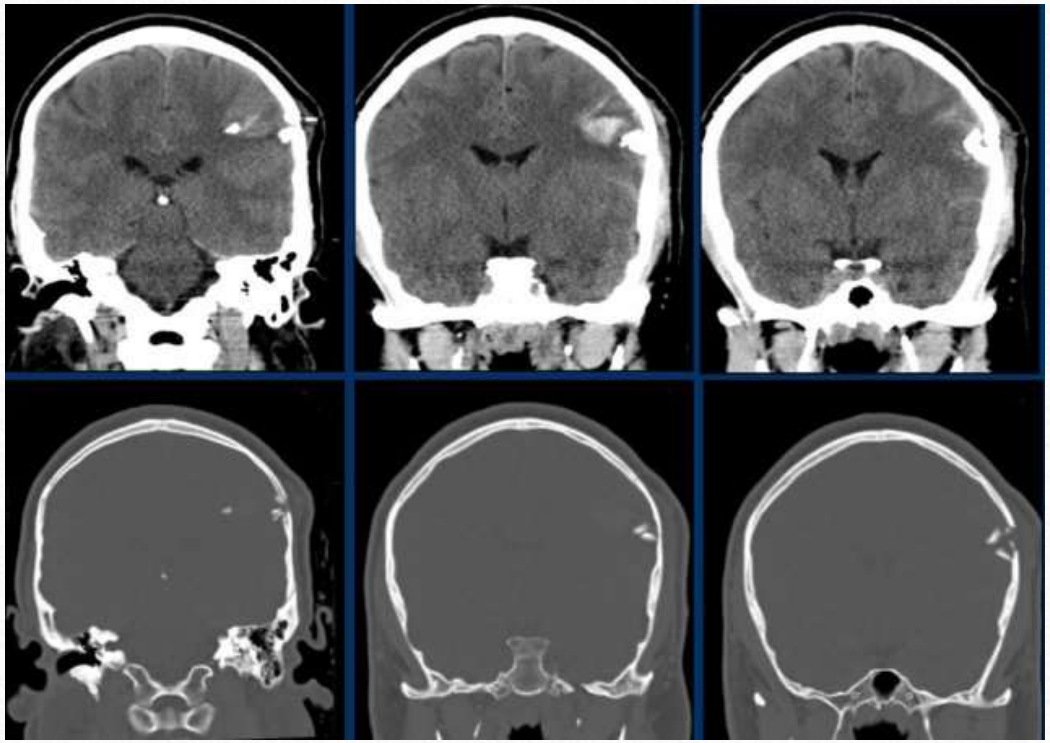
- Is a term applied to head injuries.
- Most often cerebral contusions and traumatic SAH.
- It refers to the common pattern of injury whereby damage is located both at the site of impact (often less marked) and on the opposite side of the head to the point of maximum external trauma

Coup-contre coup injury

- ✓ Areas most frequently affected are the inferior surface of the frontal lobes and temporal poles.

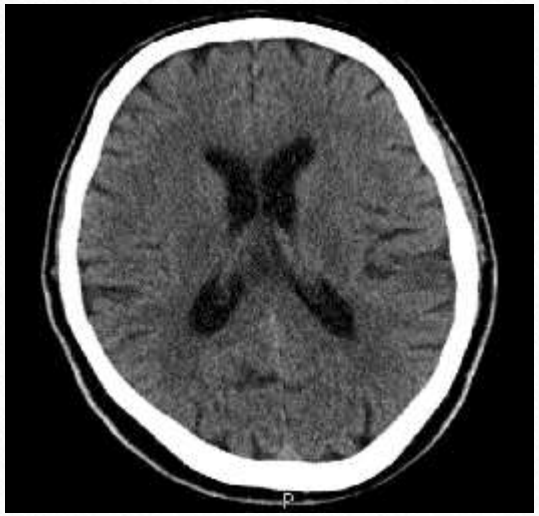
- ✓ An unusual form of contrecoup injury is traumatic lens dislocation of the eye.

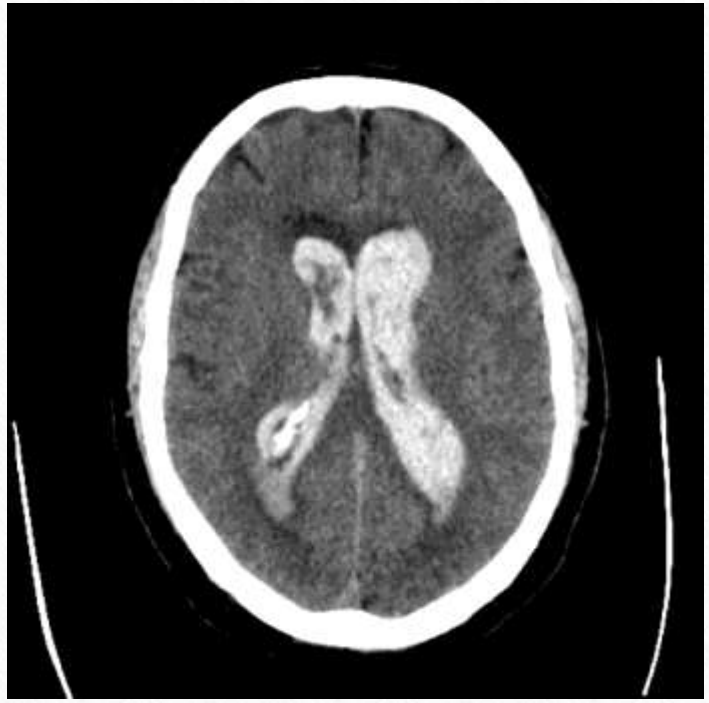
Patient with a stab wound…



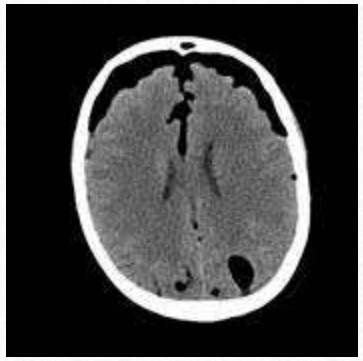
Diagnosis

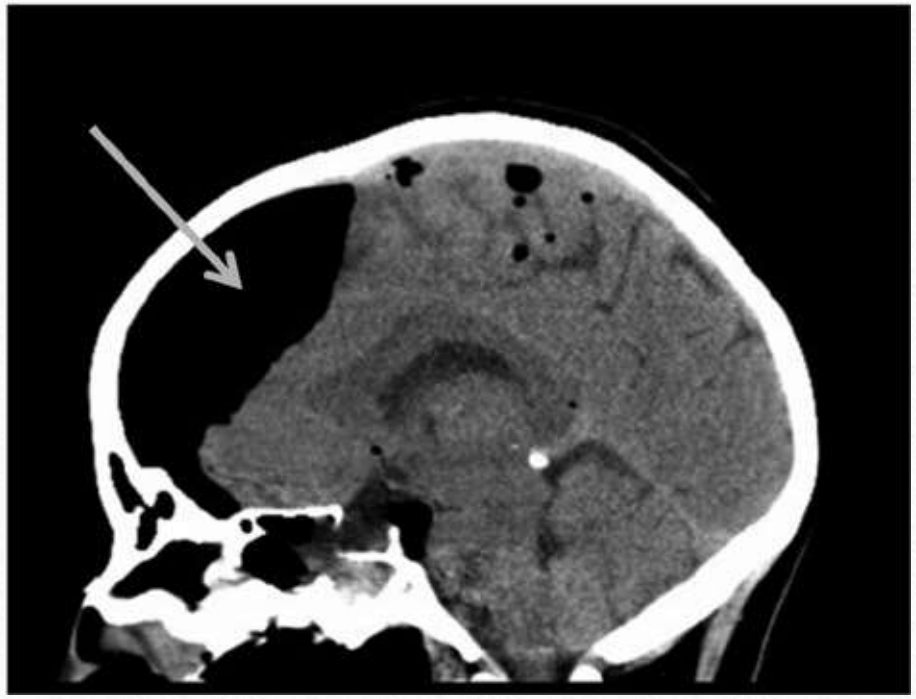
Diagnosis

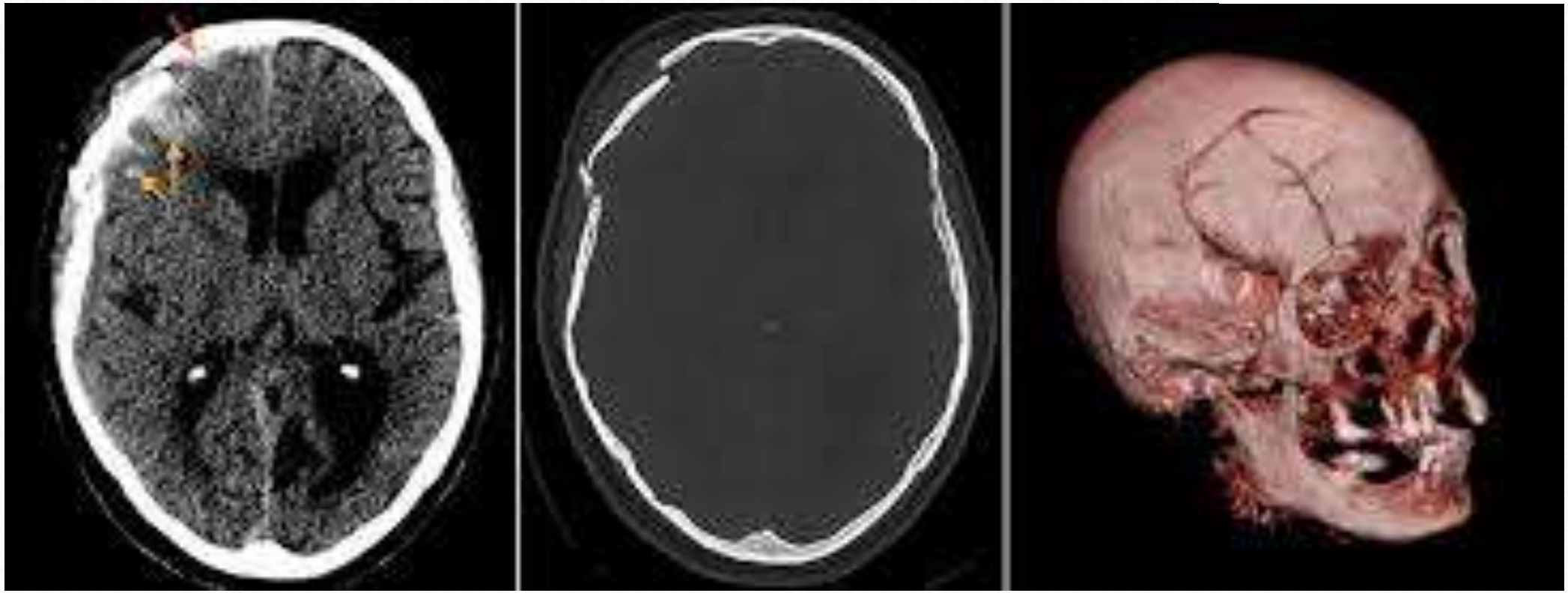




Diagnosis







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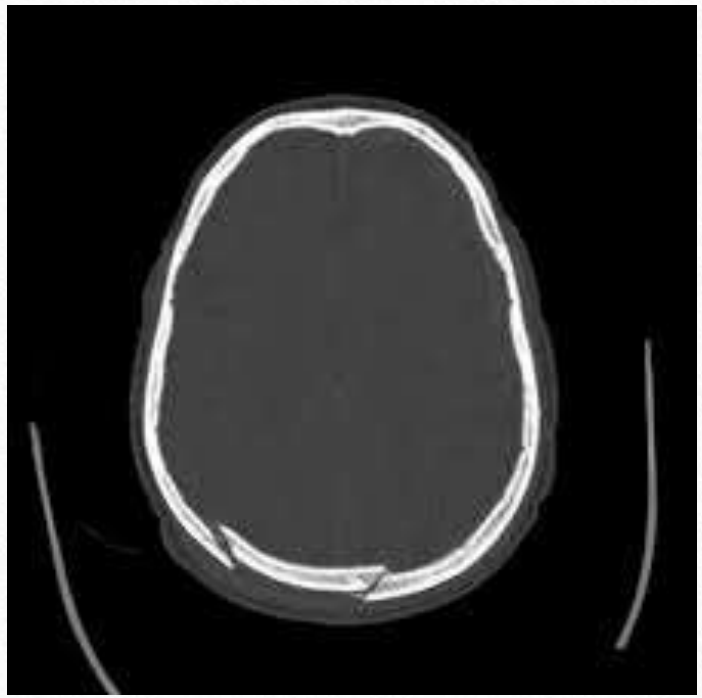

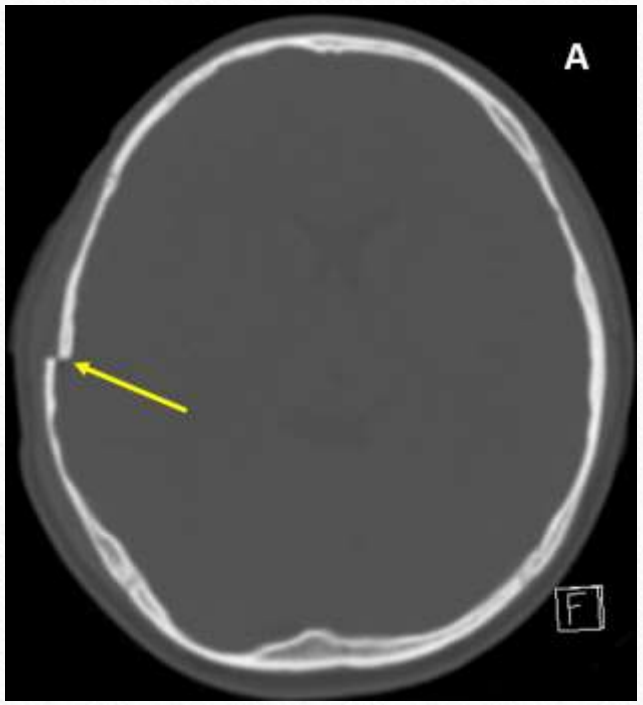

Take home message

- The mnemonic is: "Blood Can Be Very Bad".

  This stands for

B - blood
C - cisterns
B - brain
V - ventricles
B - bones


KEEP
CALM
IT'S THE END
OF OUR
SLIDESHOW