

Imaging Of Traumatic Brain Injury

Learning Objectives

- To learn mechanisms of various TBI
- To identify common TBI
- To identify complications of TBI

Epidemiology

- 10 million people suffer from TBI every year globally
- 10% are fatal
- 5-10% sustain chronic disabilities
- 20-25% have moderate disabilities

Modes of injury

- Missile / Penetrating injury
- Non missile injury – road traffic accidents, falls.
- Ground level falls in children and elderly adults

Classification

Primary injury

- occurs at the time of injury
- Fractures
- Intracranial hematoma
- Contusions
- Lacerations
- DAI

Secondary injury

- Due to mass effect
- Herniations
- Edema
- Ischemia
- Vascular injuries

Modalities

- Radiographs / X-rays

Can only identify fractures

Intracranial injuries can not be detected

- NCCT

Preferred screening tool

Bone injuries

Parenchymal injuries

- **CT Angiogram**

Penetrating injuries

Dissection

Cervical spine fractures – vertebral artery injuries

- **MRI**

DAI

Normal CT with non explainable neurological deficits

Guidelines for NCCT

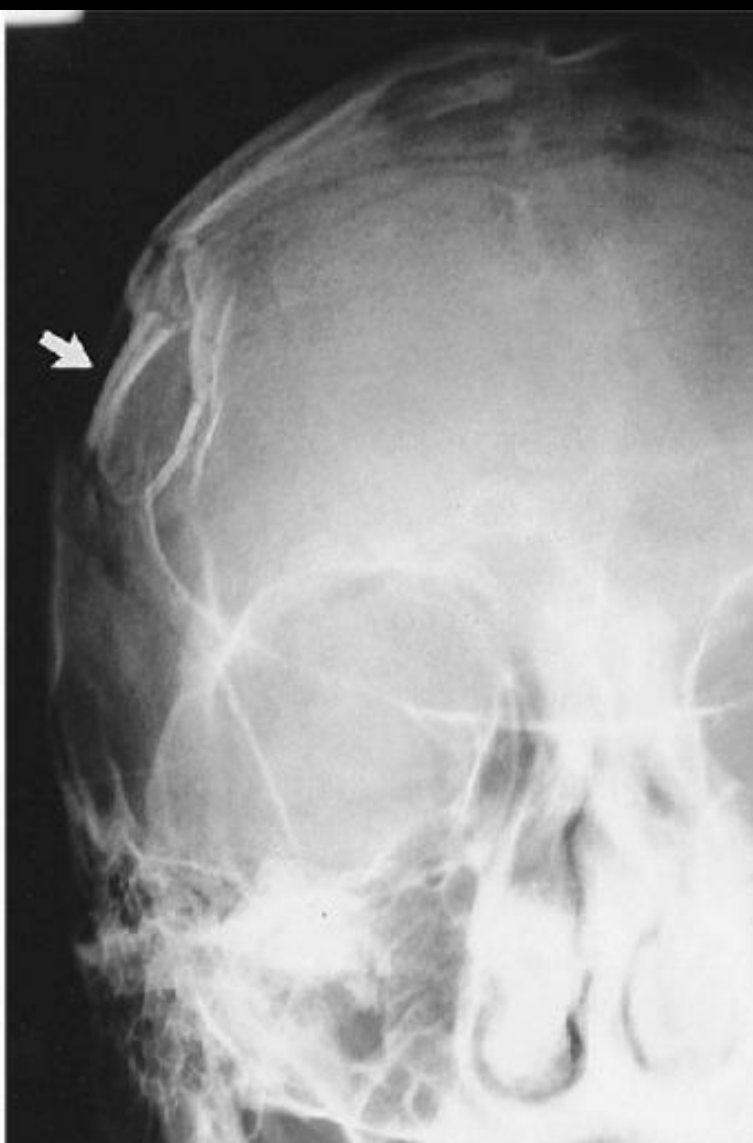
GCS 3-8

- get CT as soon as possible
- Initial scan is normal then get a repeat CT if patient deteriorates neurologically
- If initial scan is abnormal and patient is stable, get a repeat CT 24-36 hours to check

For rest

- fall in GCS
- Depressed / open fractures
- >2 episodes of vomiting
- Skull base fractures
- Dangerous mechanism

Skull Fractures

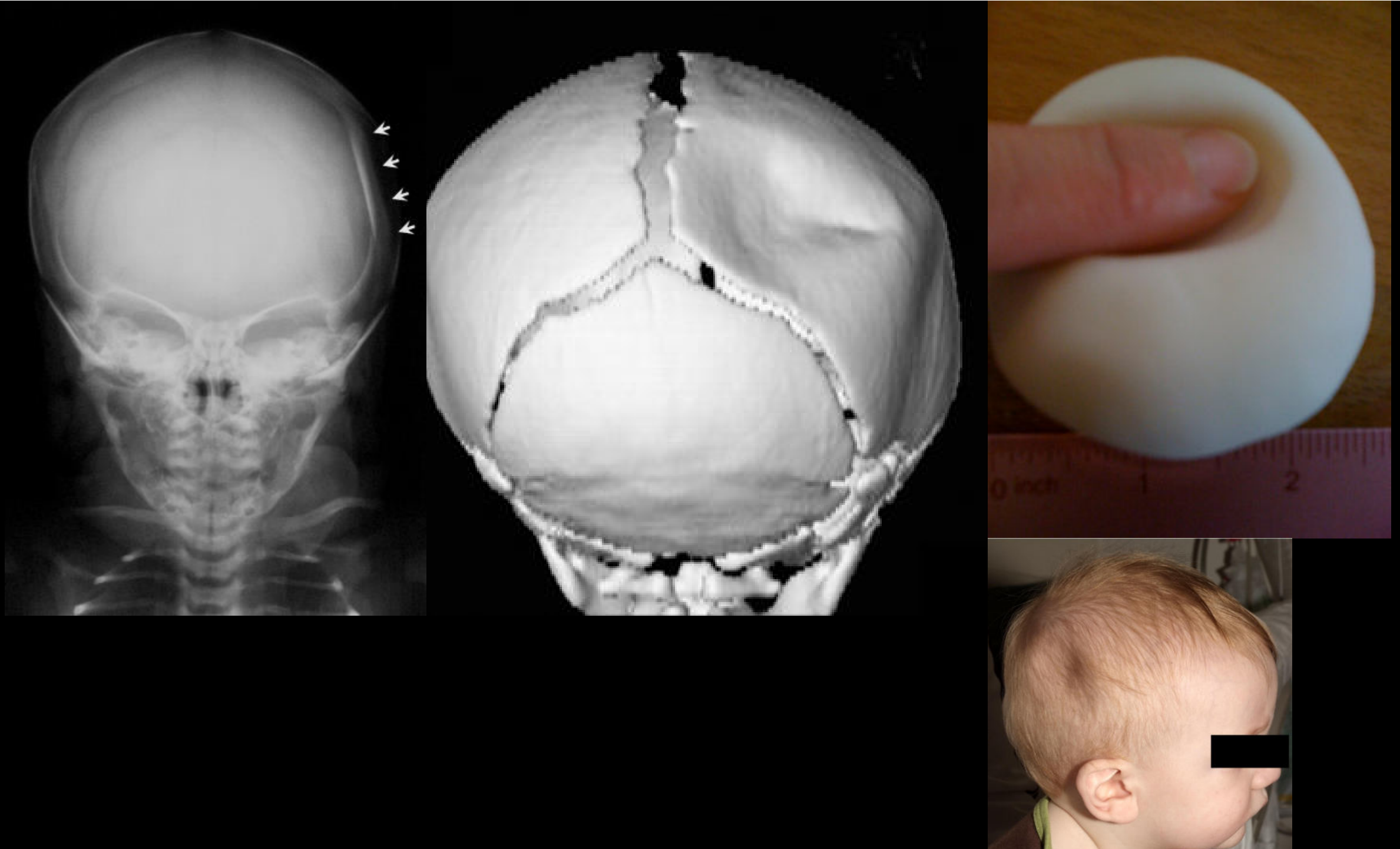


Depressed comminuted fracture with marked inward displacement of fragments

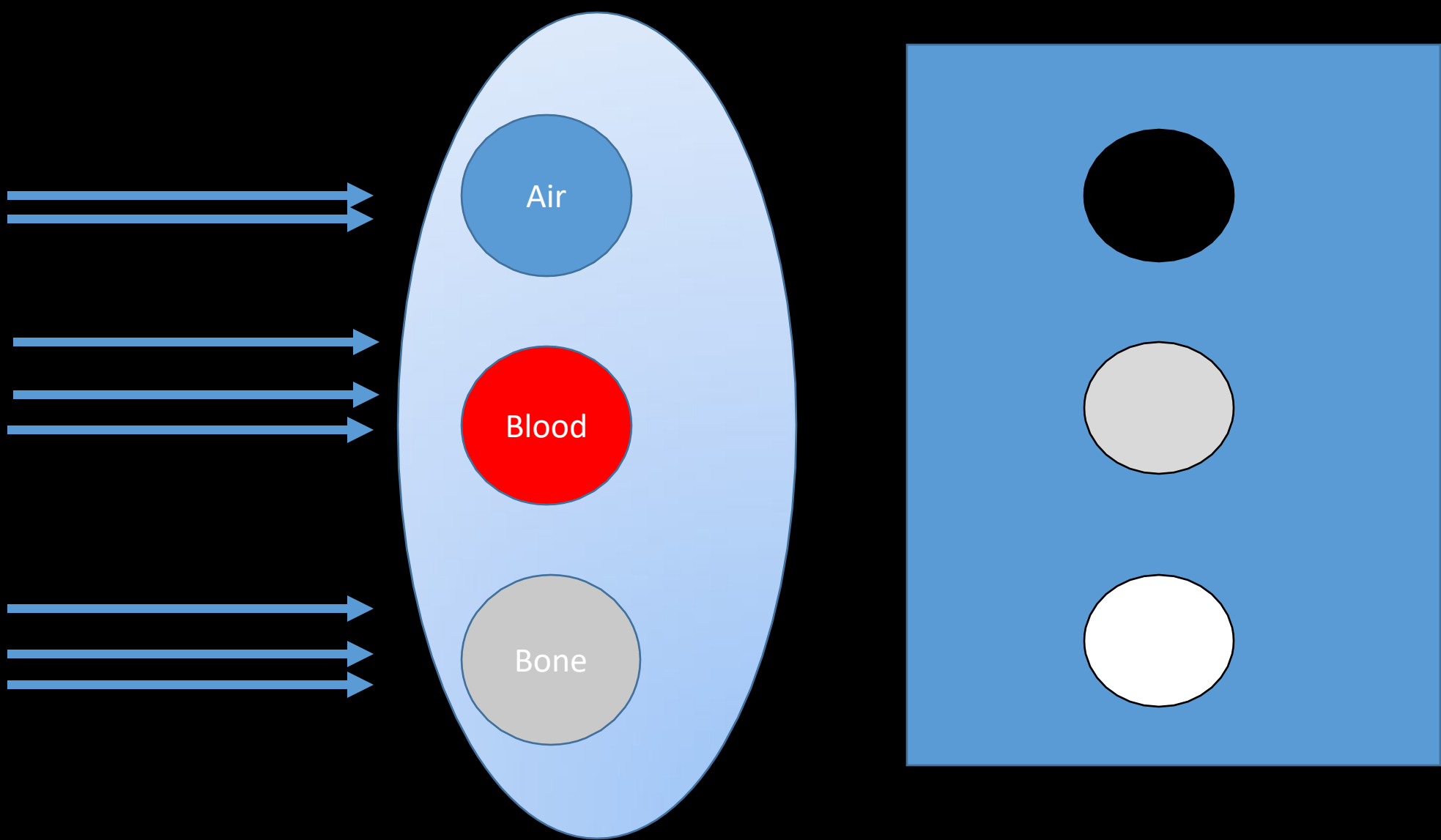


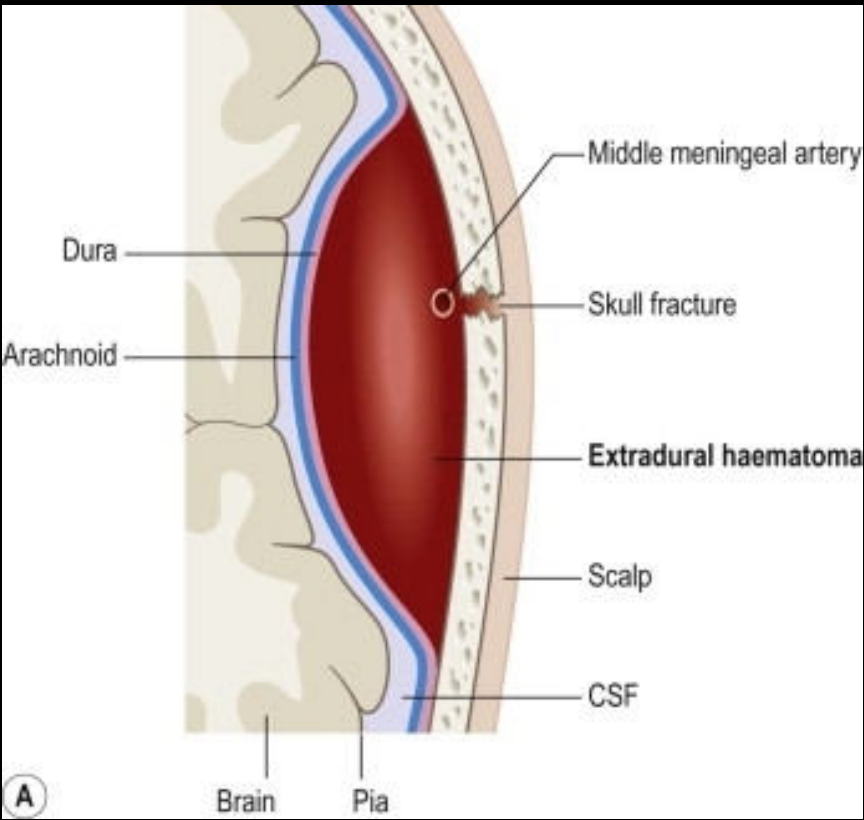
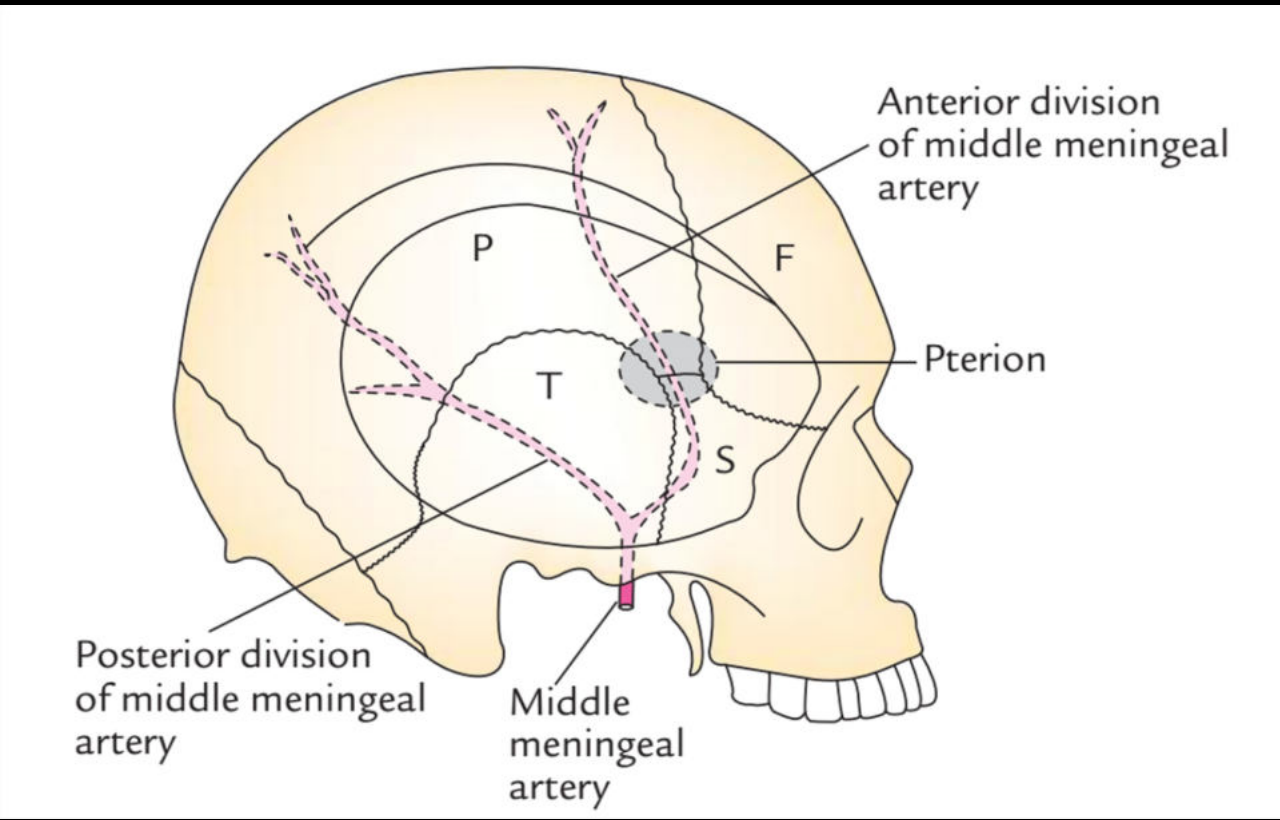
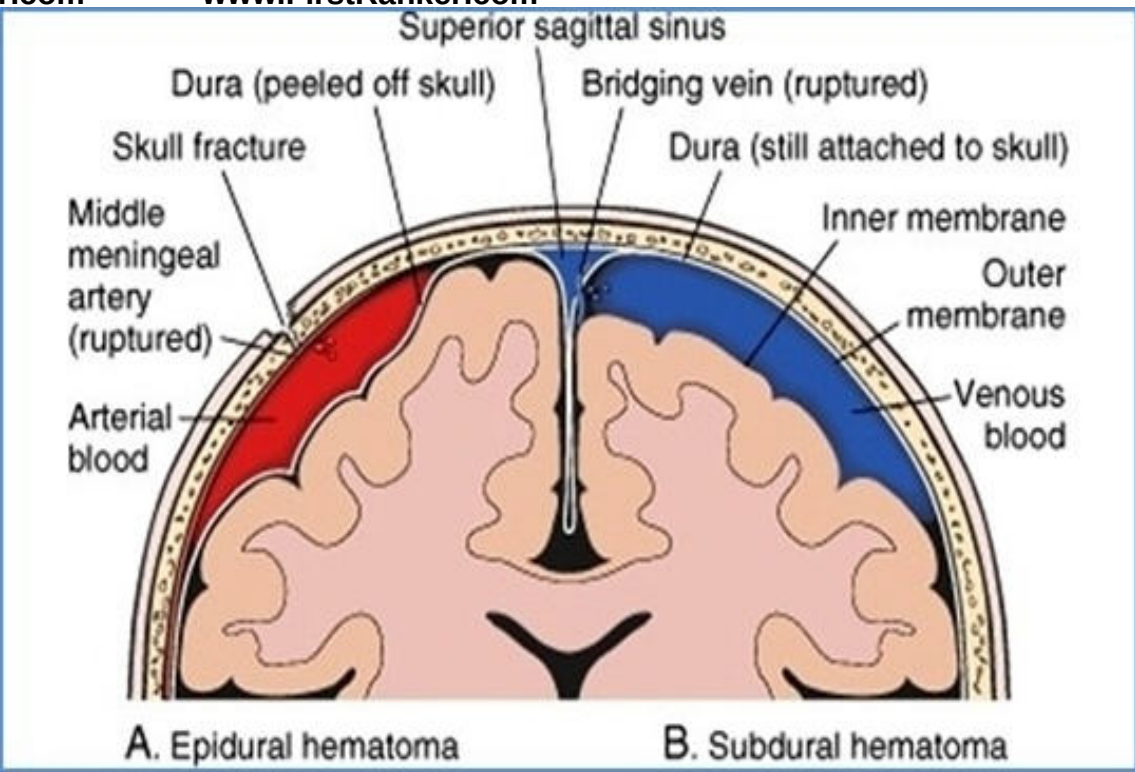
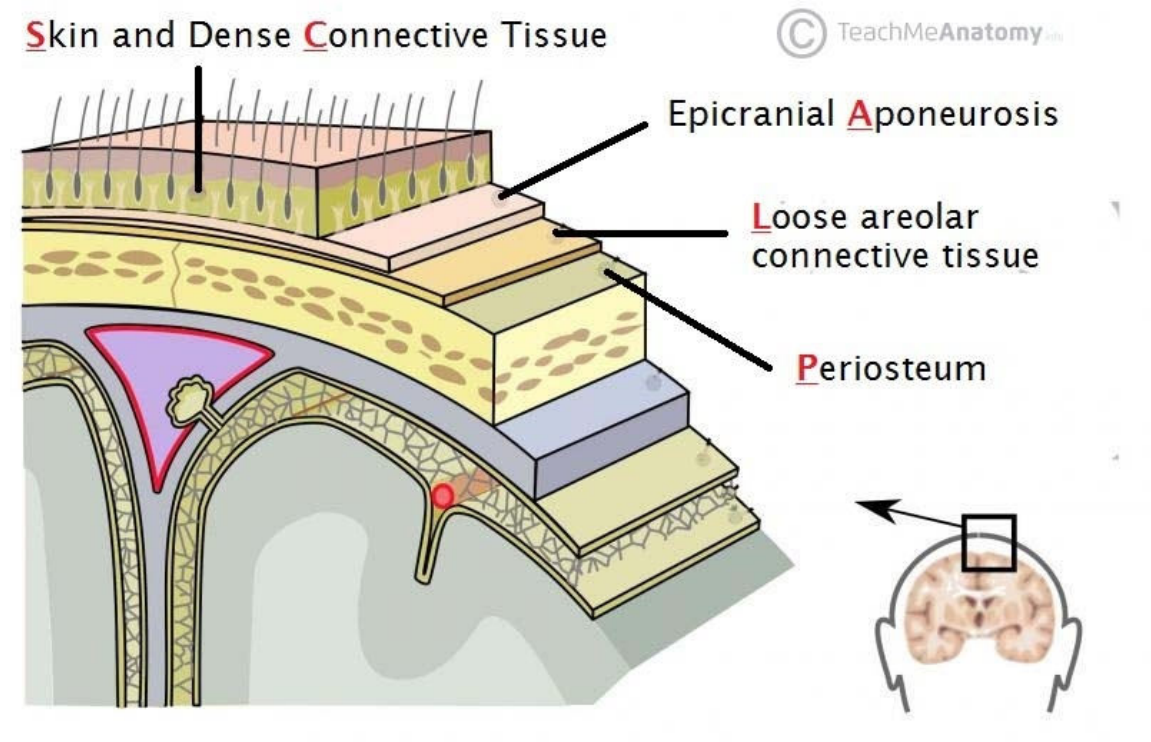
Depressed fracture of frontal bone associated with haemorrhage in frontal sinus

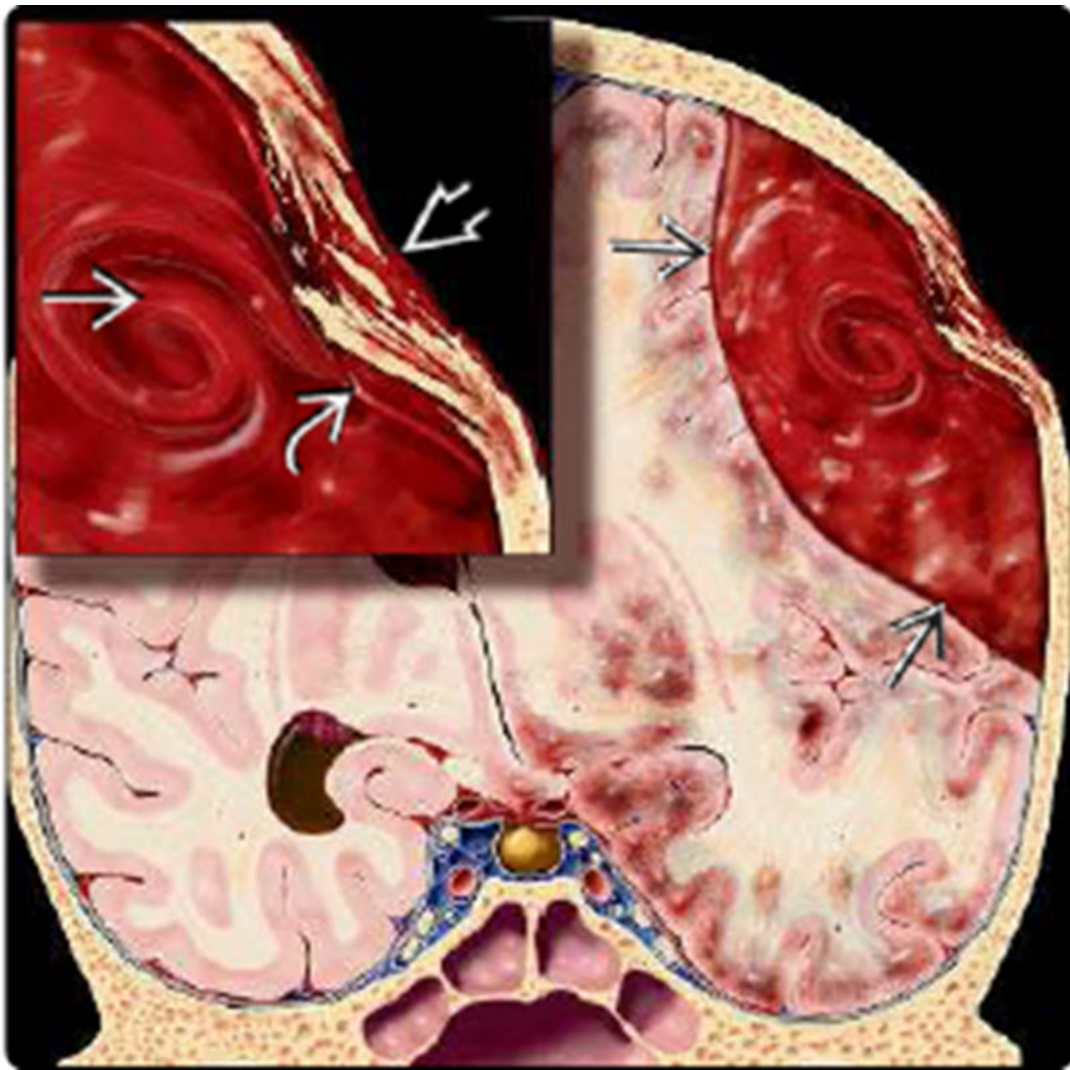


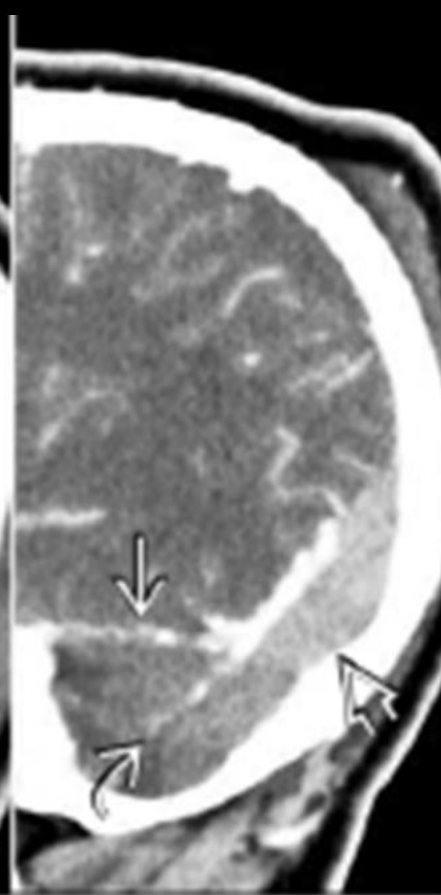
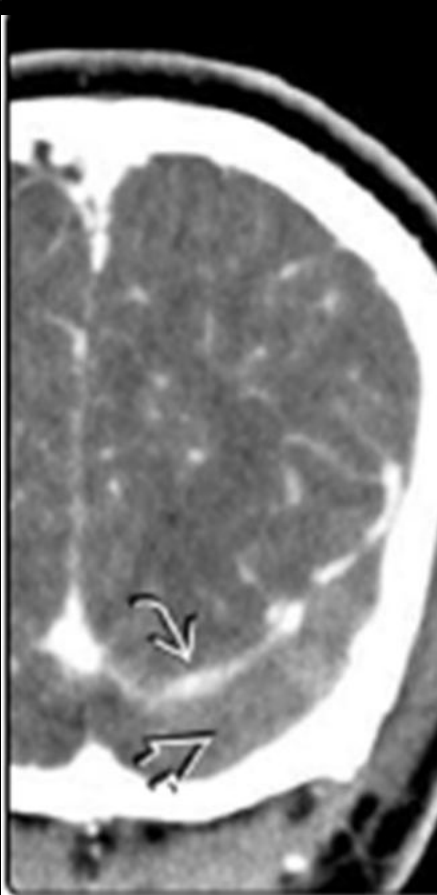
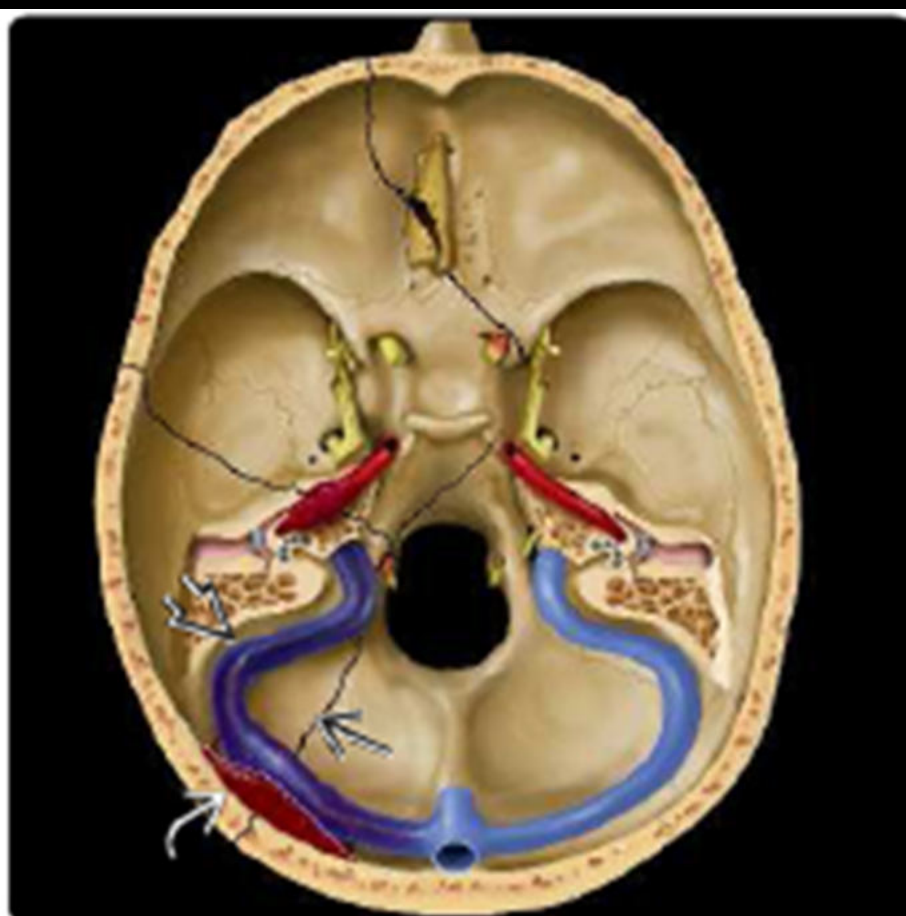
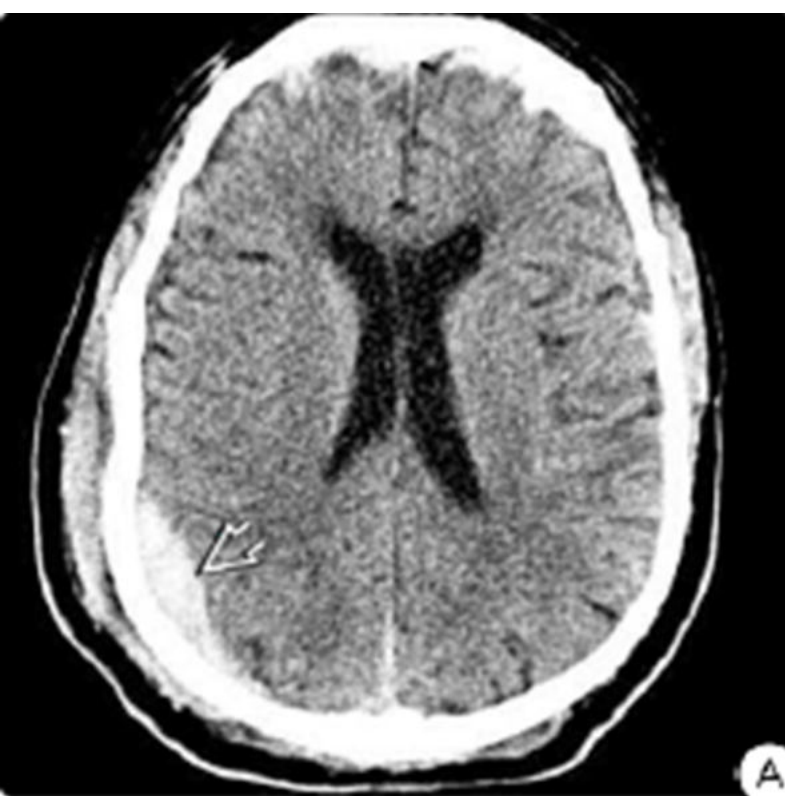


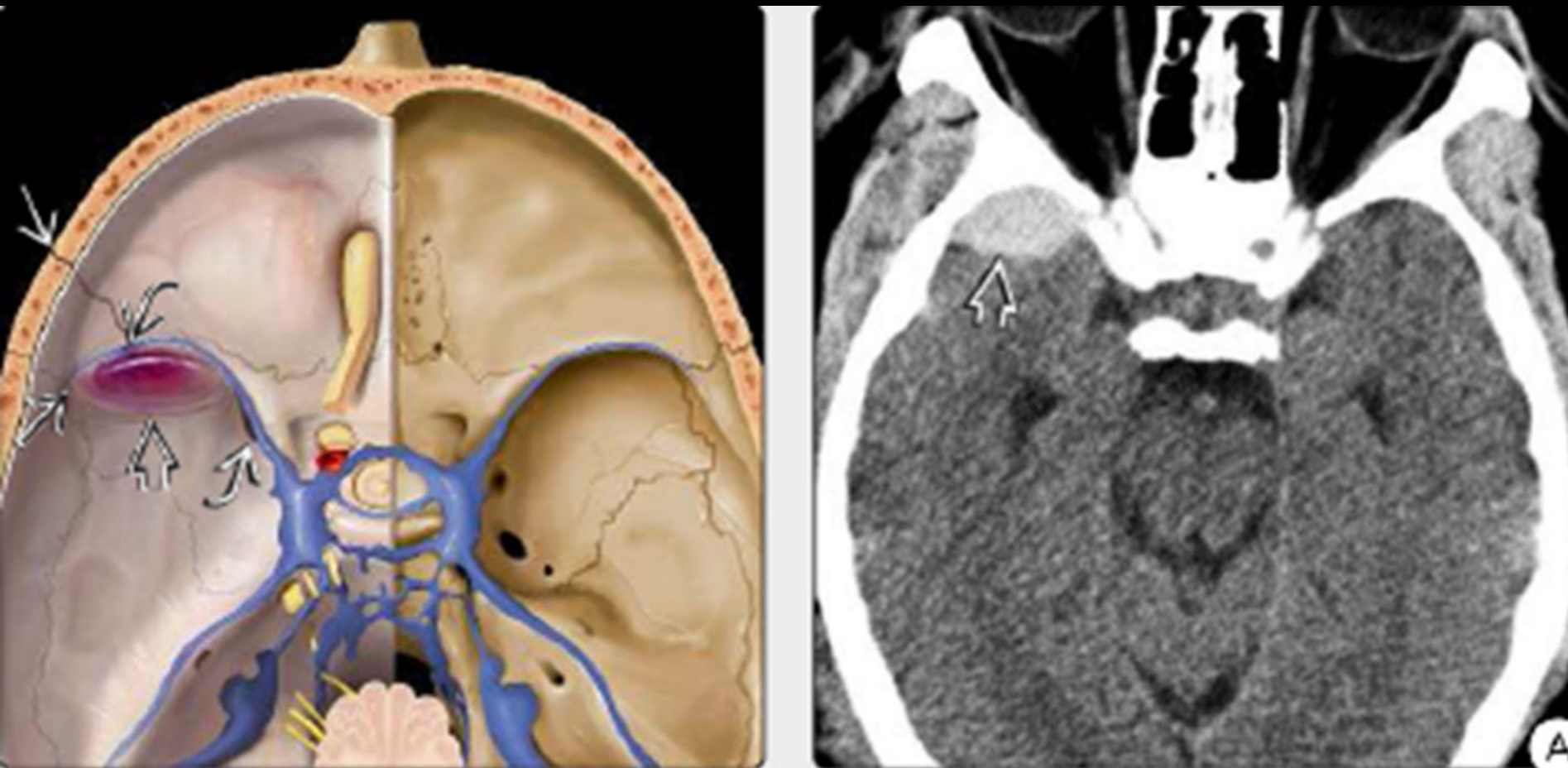
Intracranial Injuries

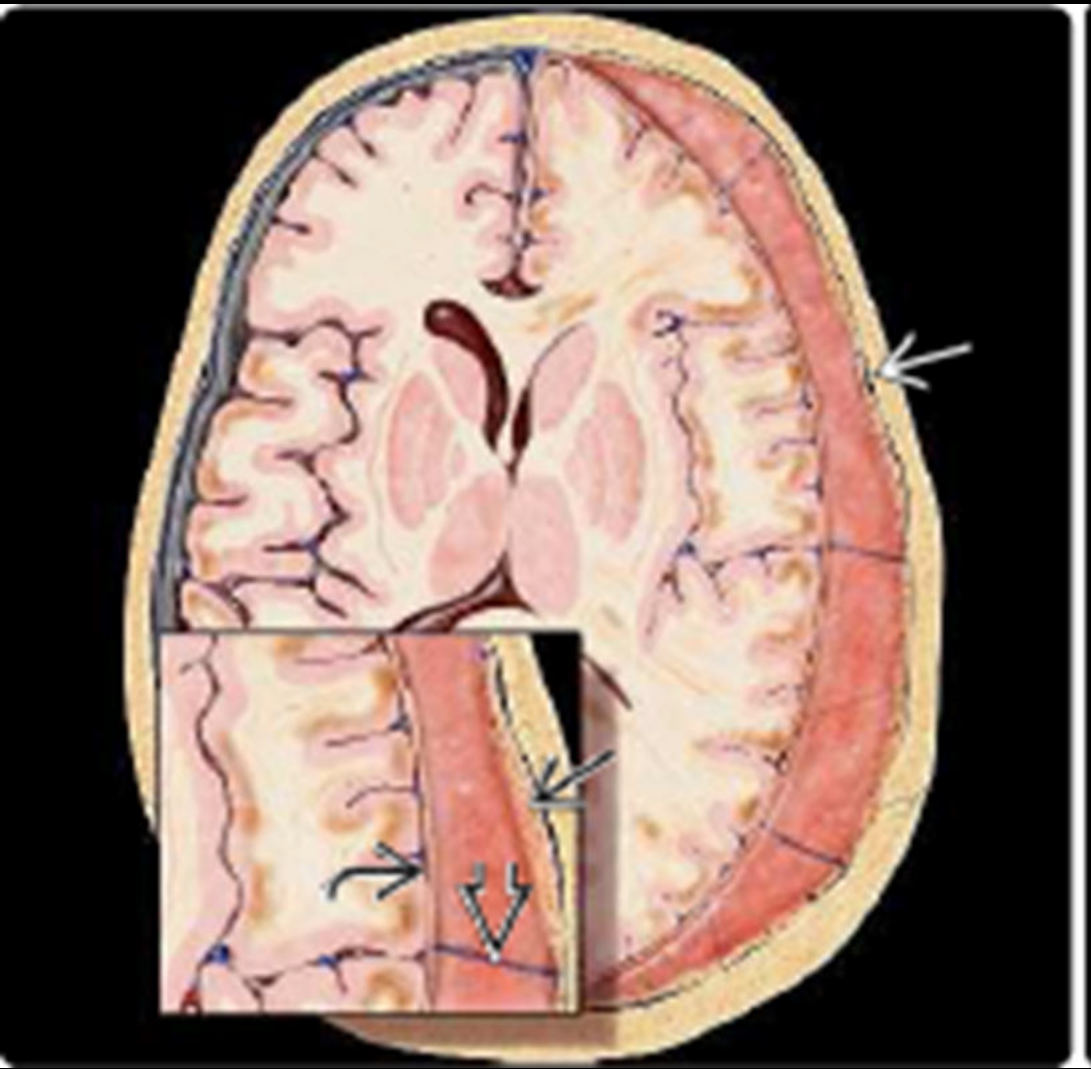
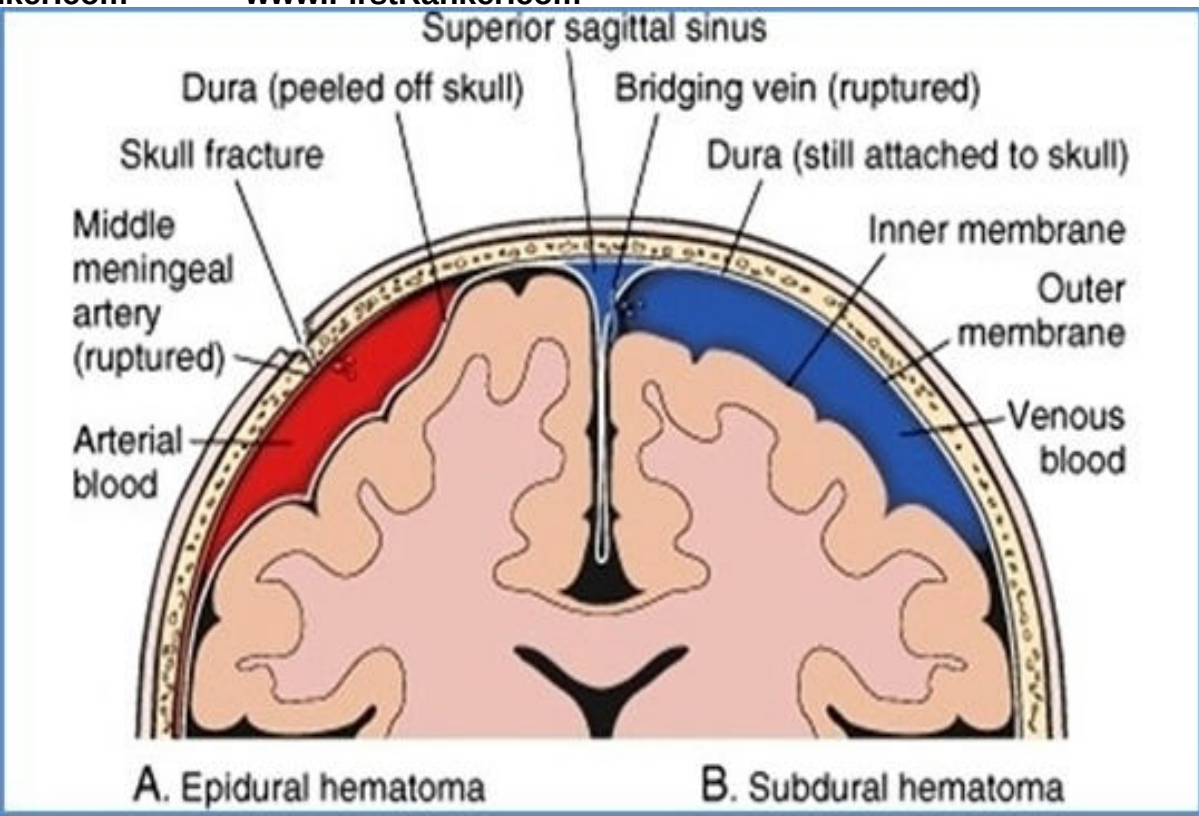
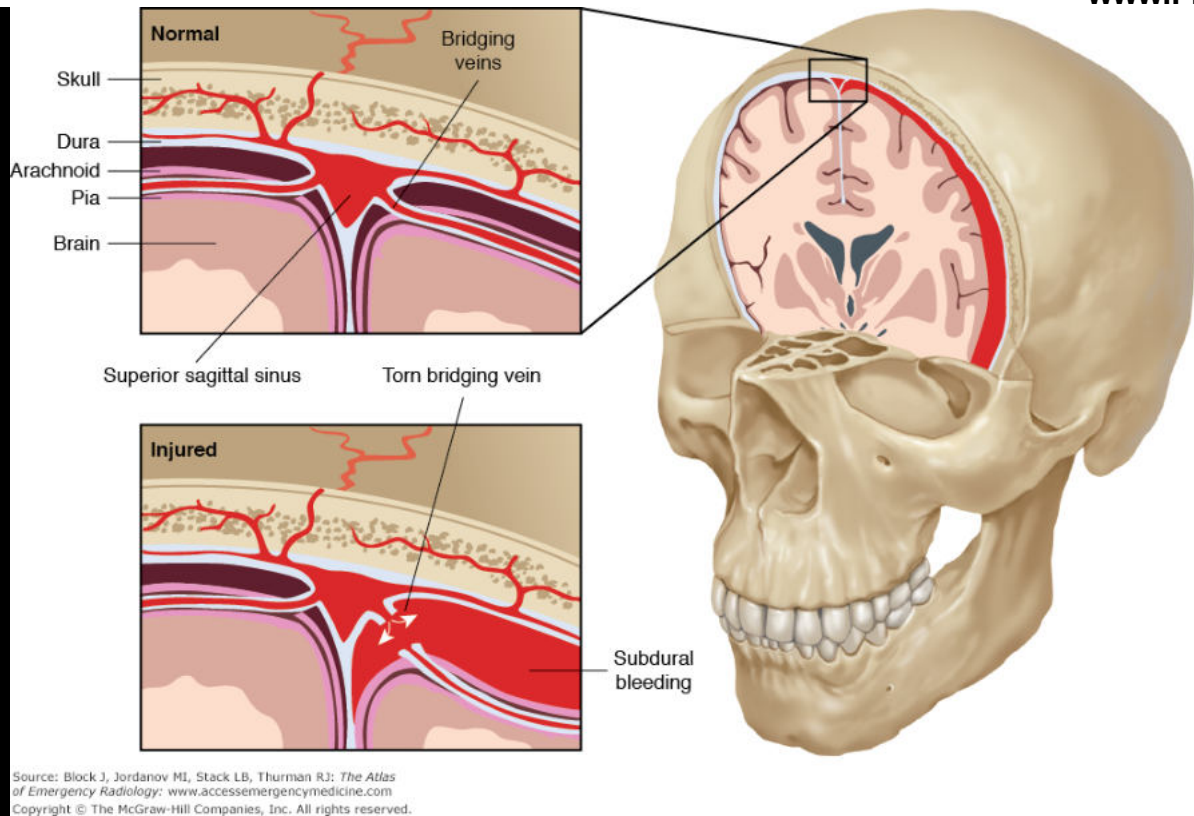


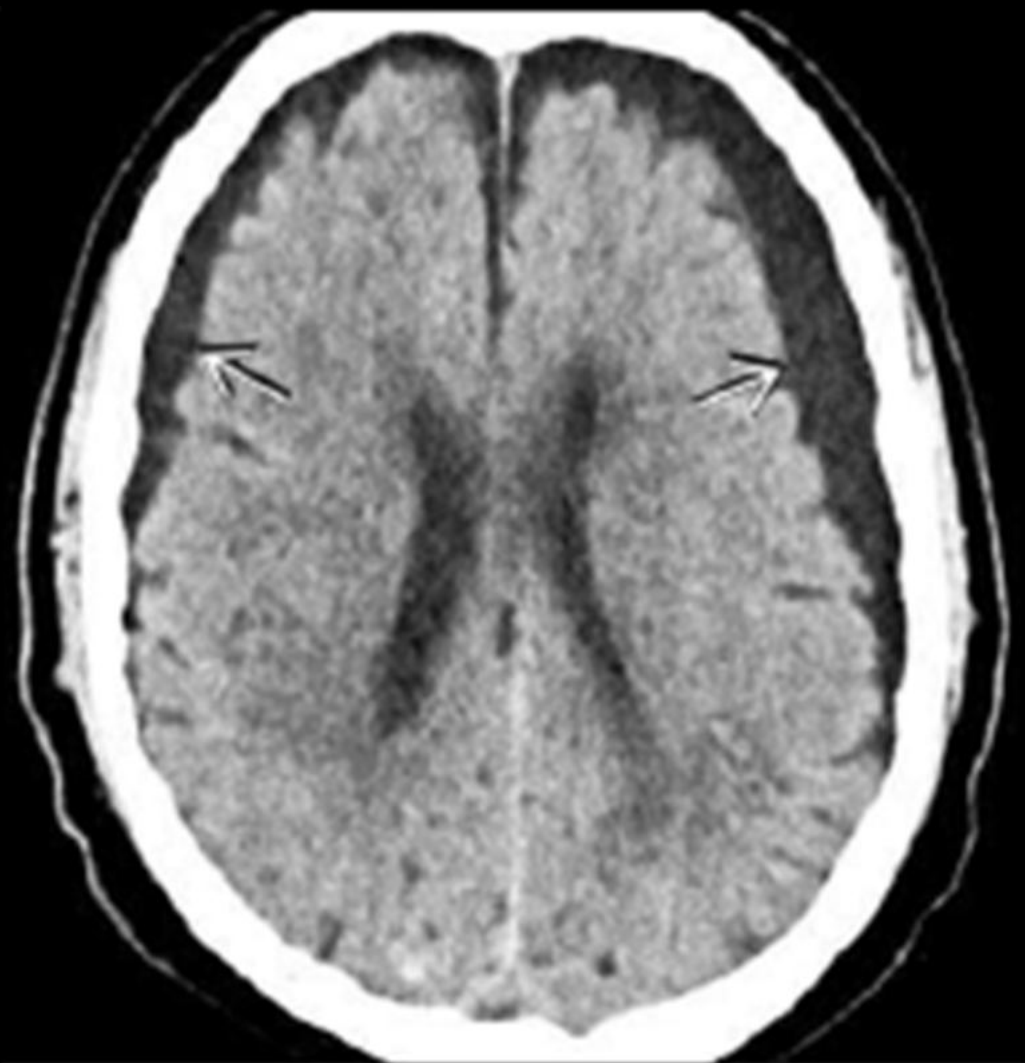
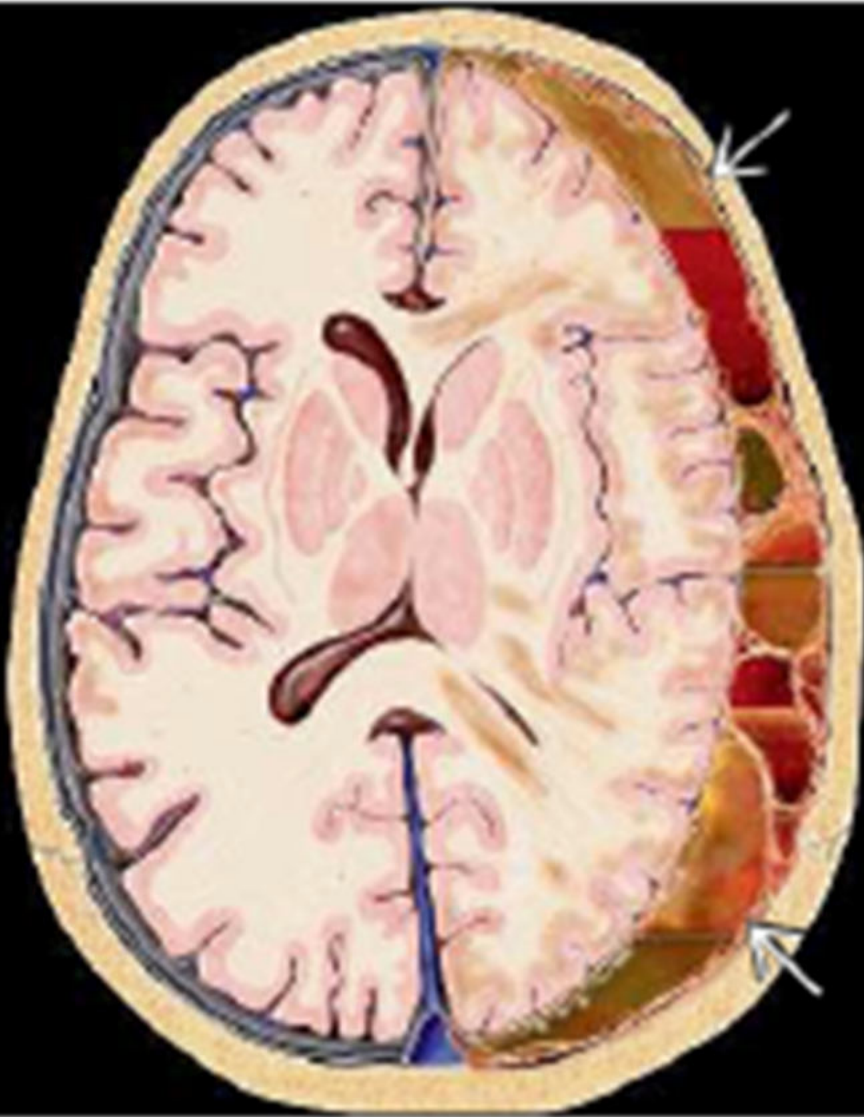


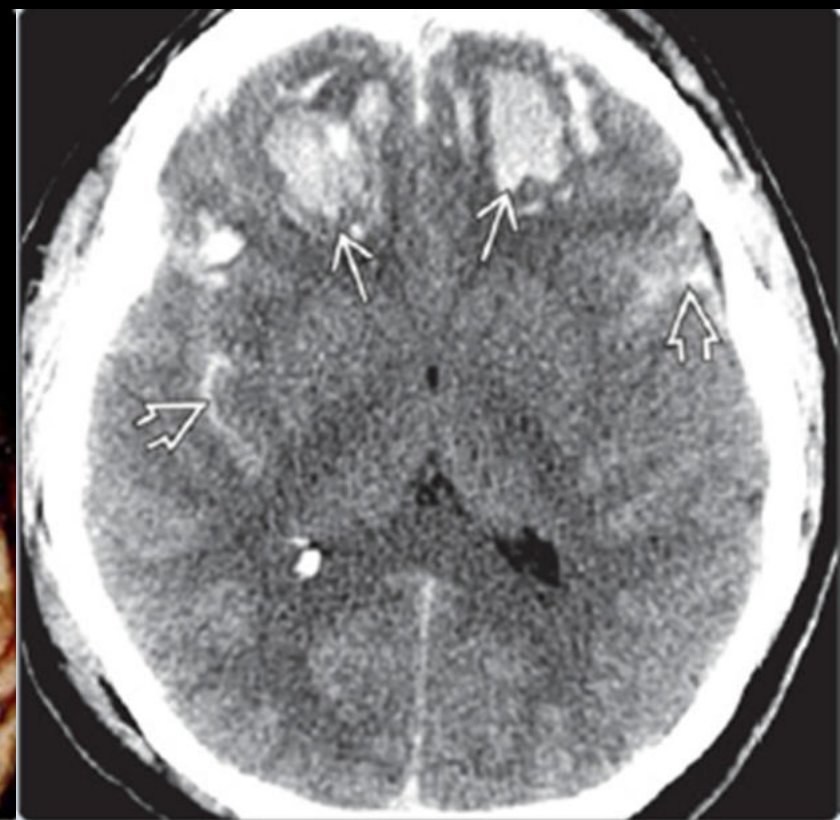
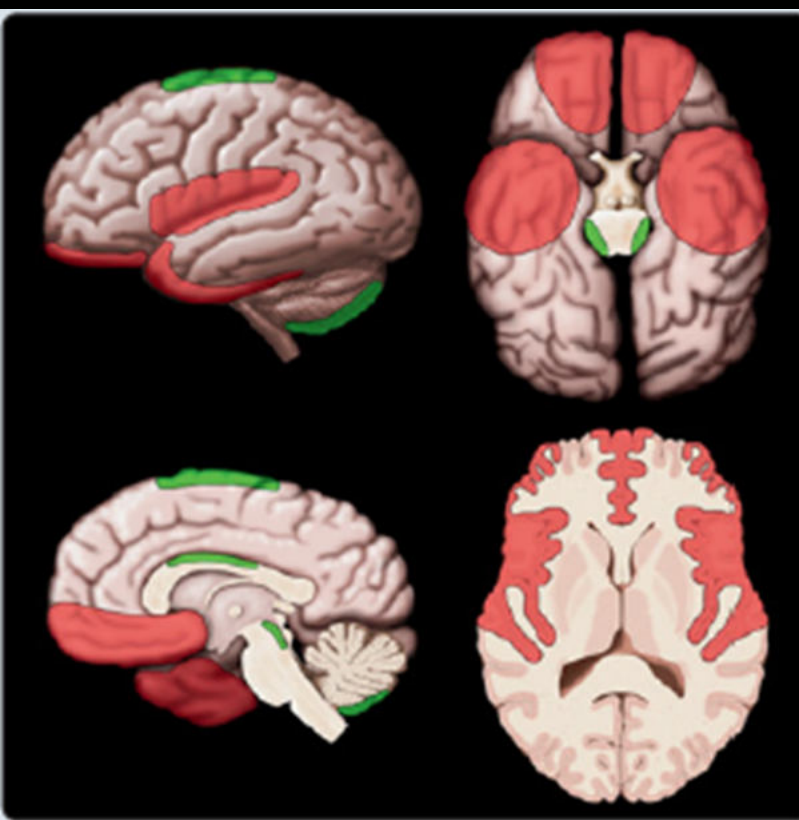
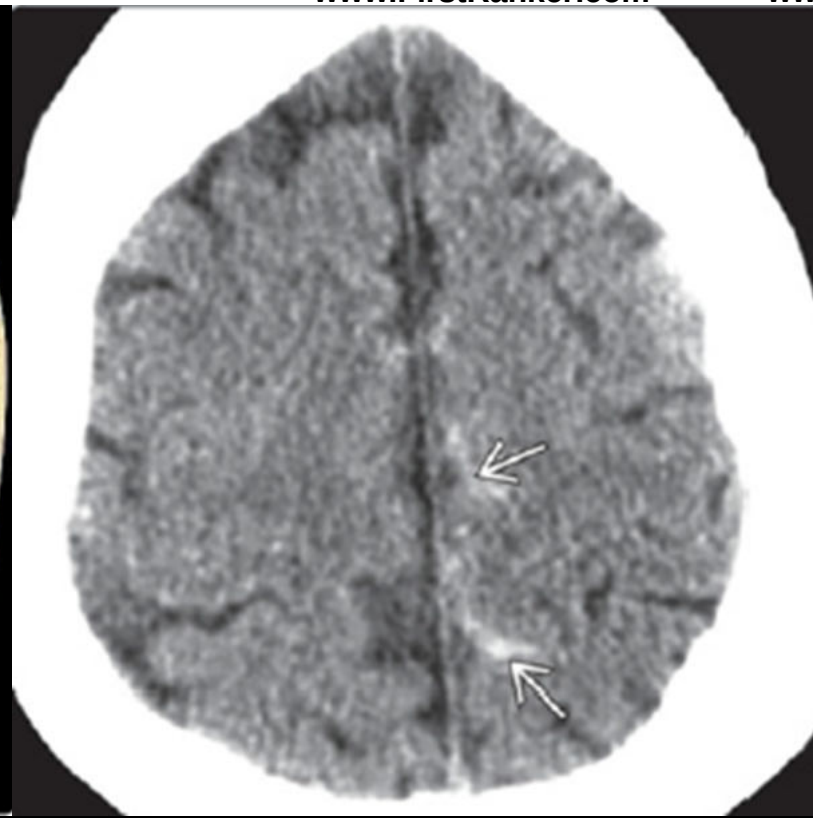
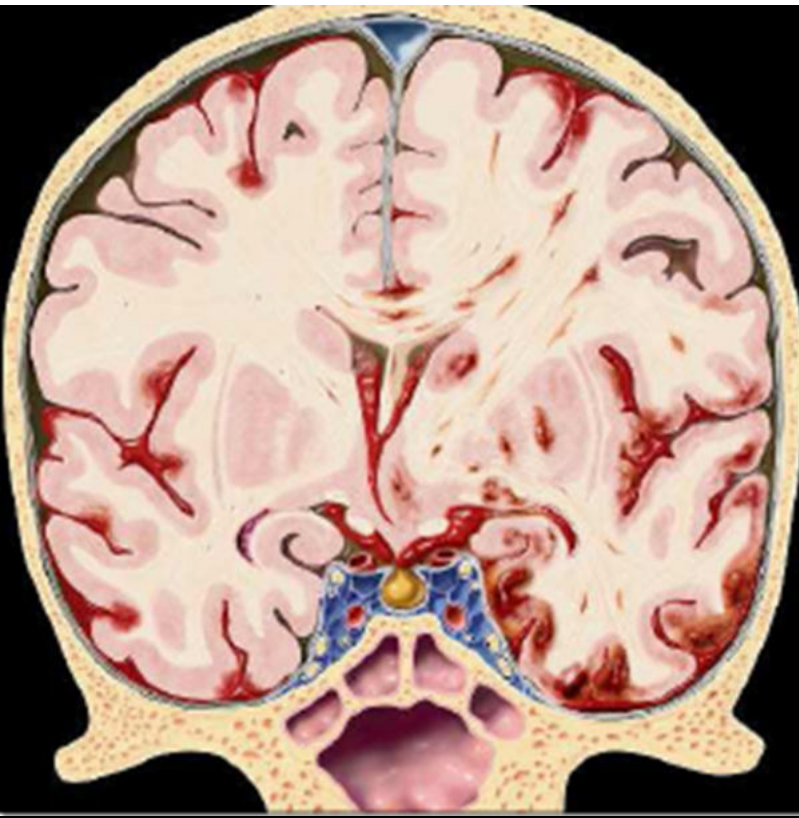




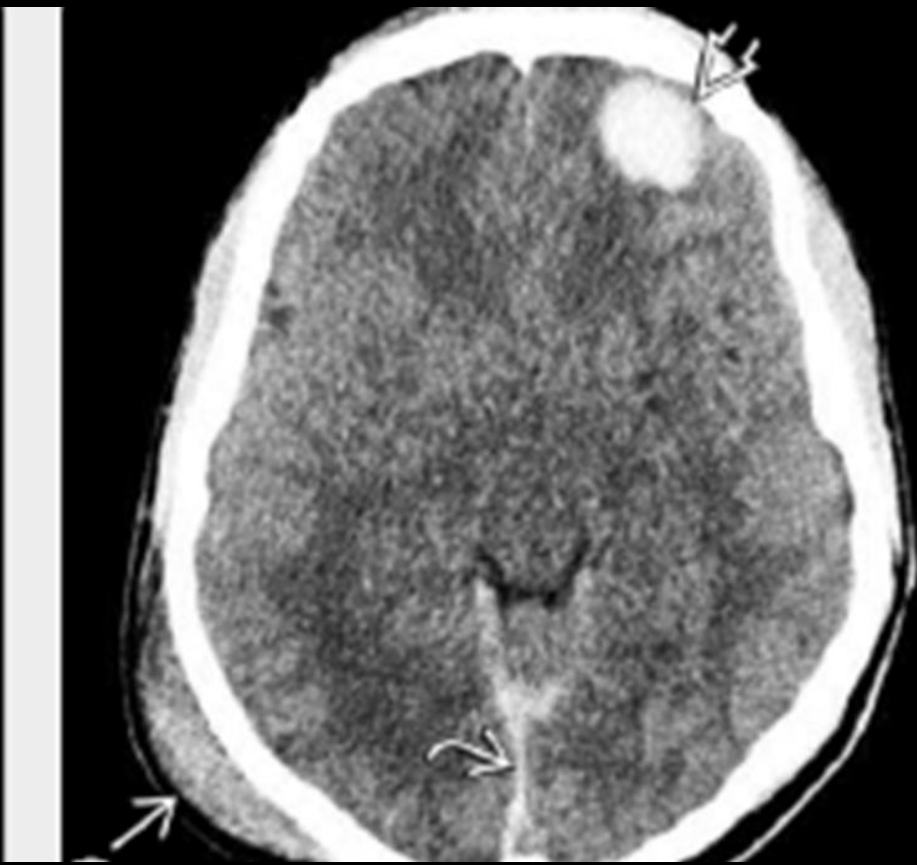
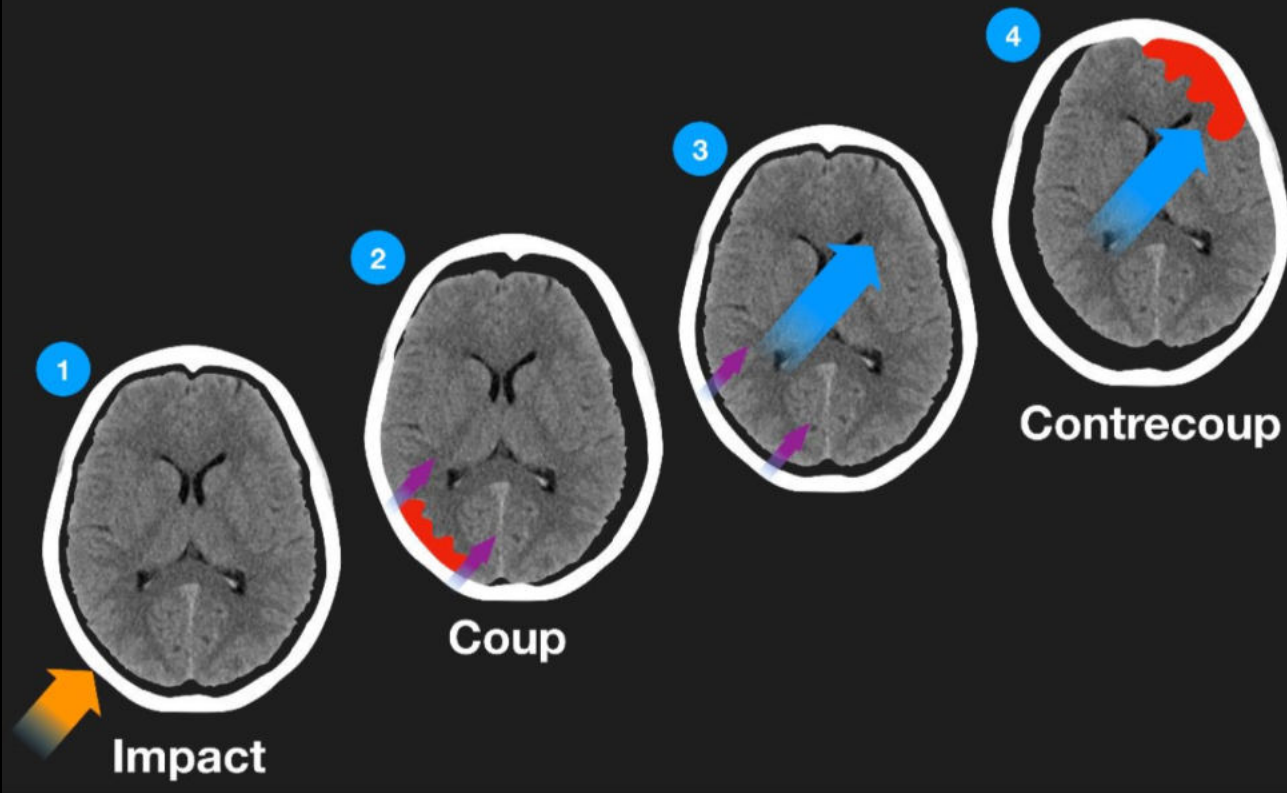
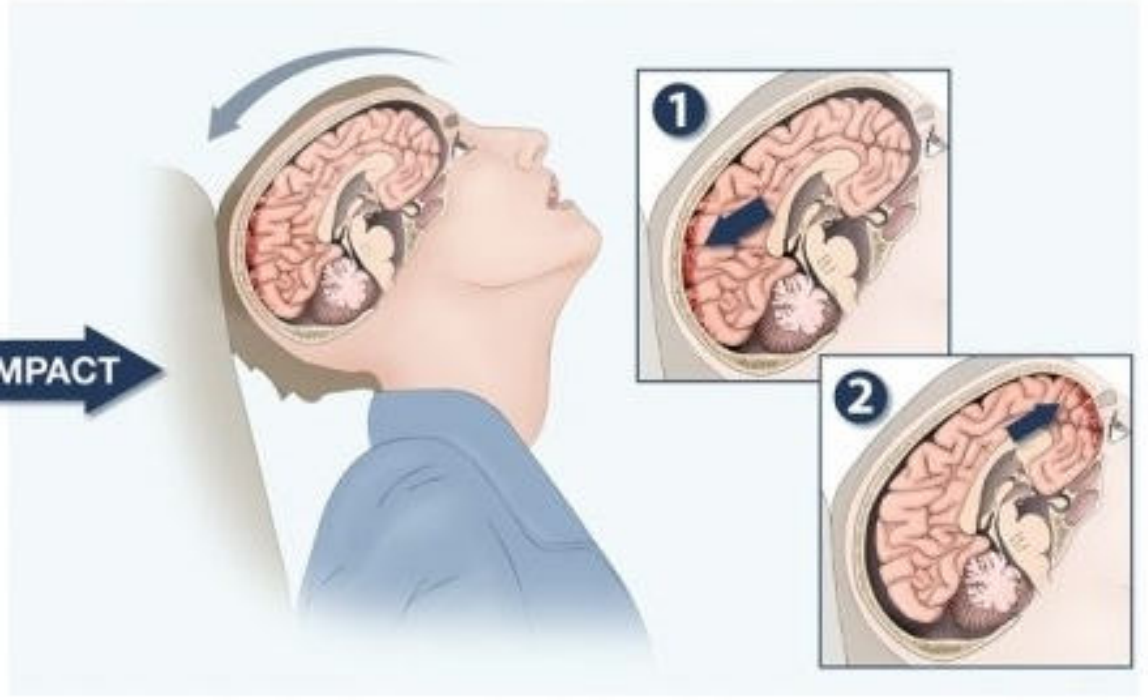








CONCEPT OF COUP-CONTRECOUP INJURY



CONCEPT OF DIFFUSE AXONAL INJURY (DAI)

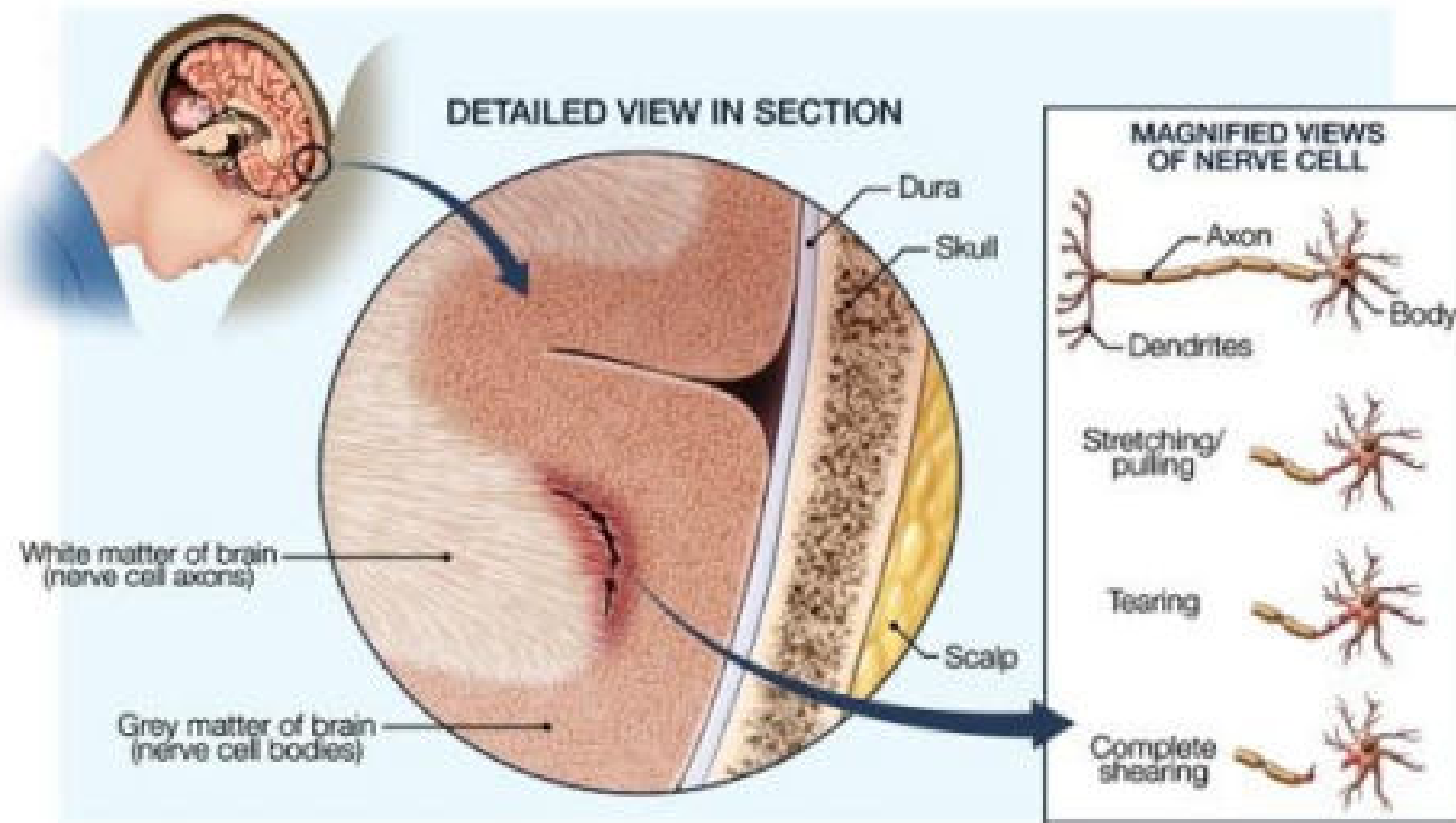
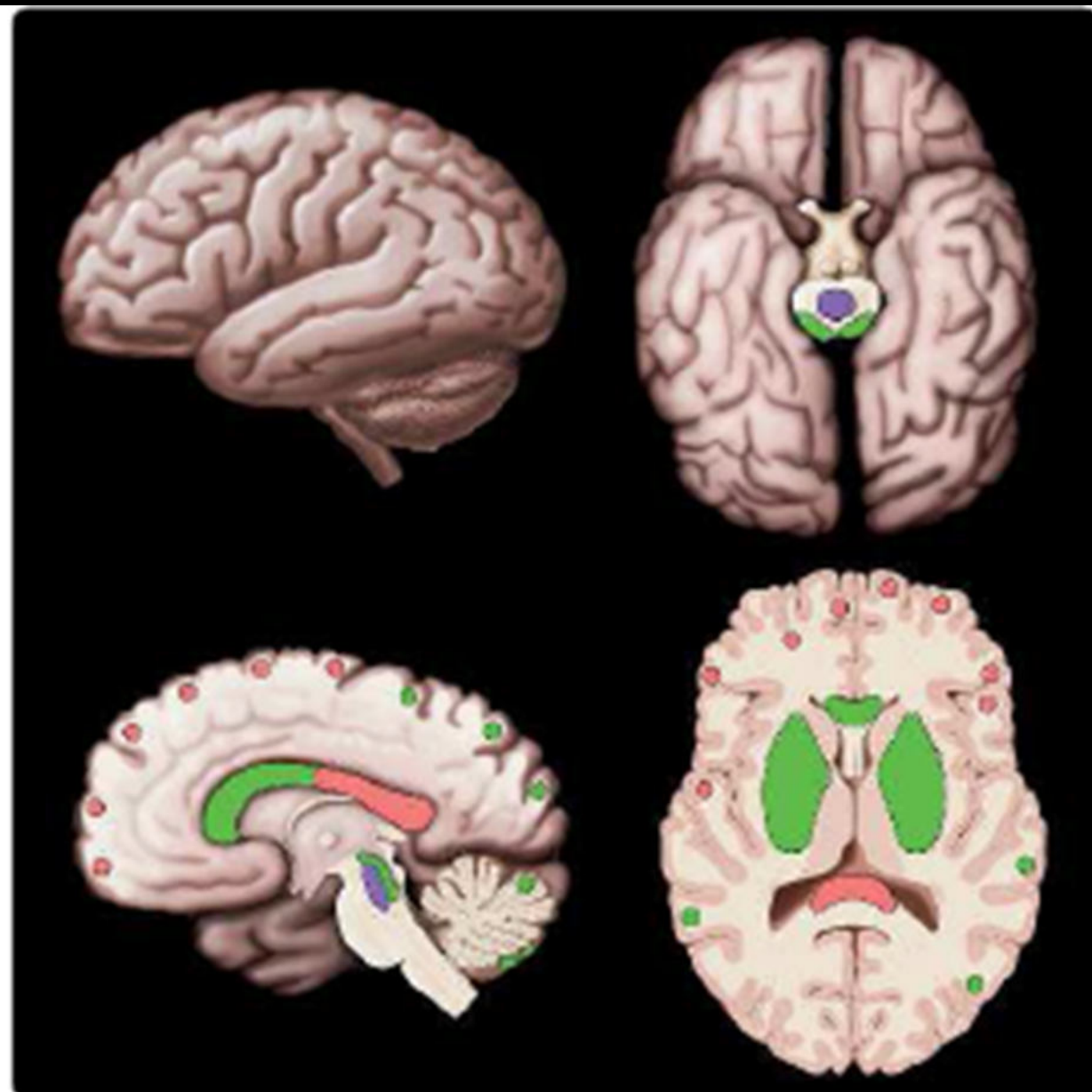
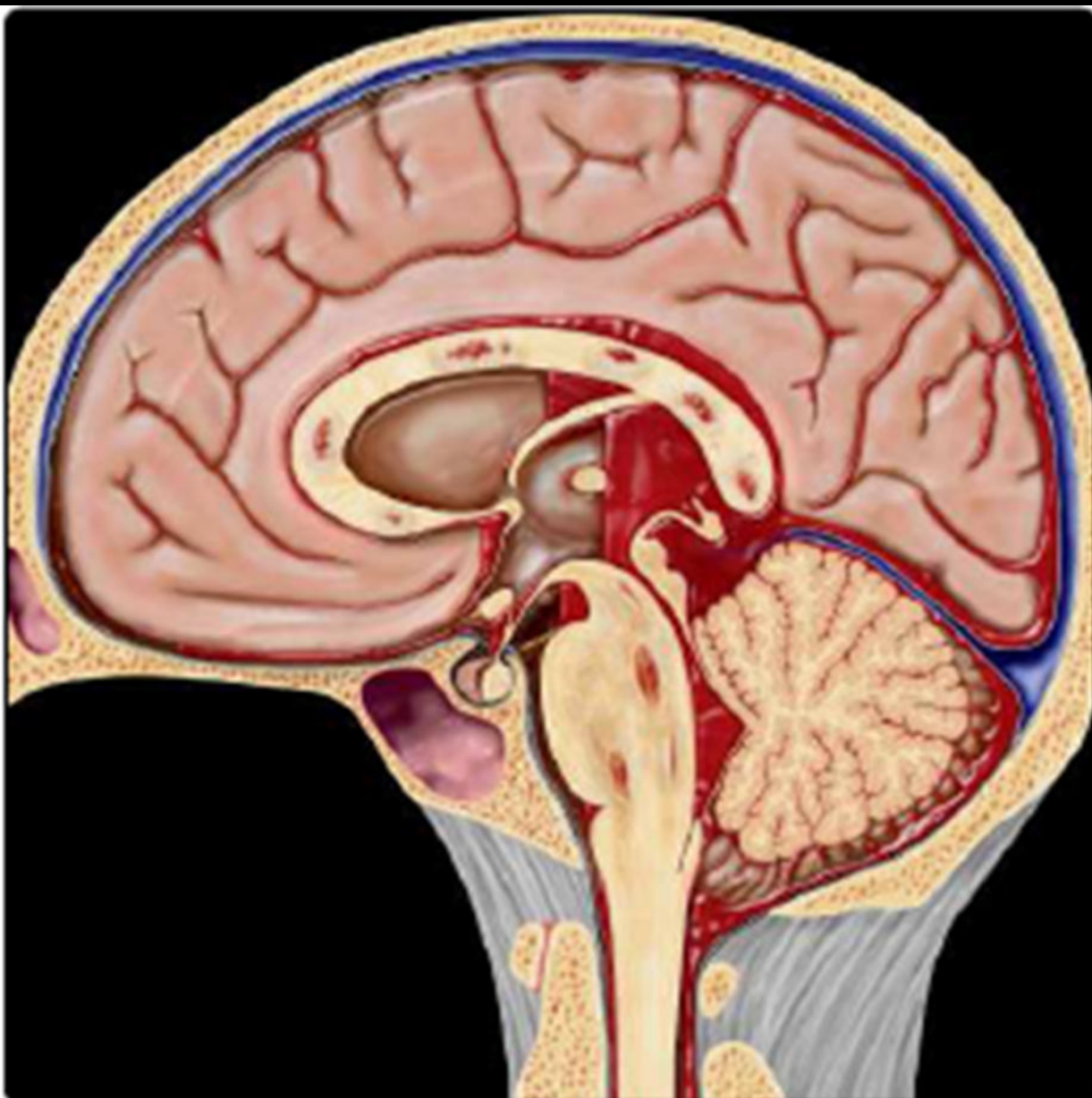
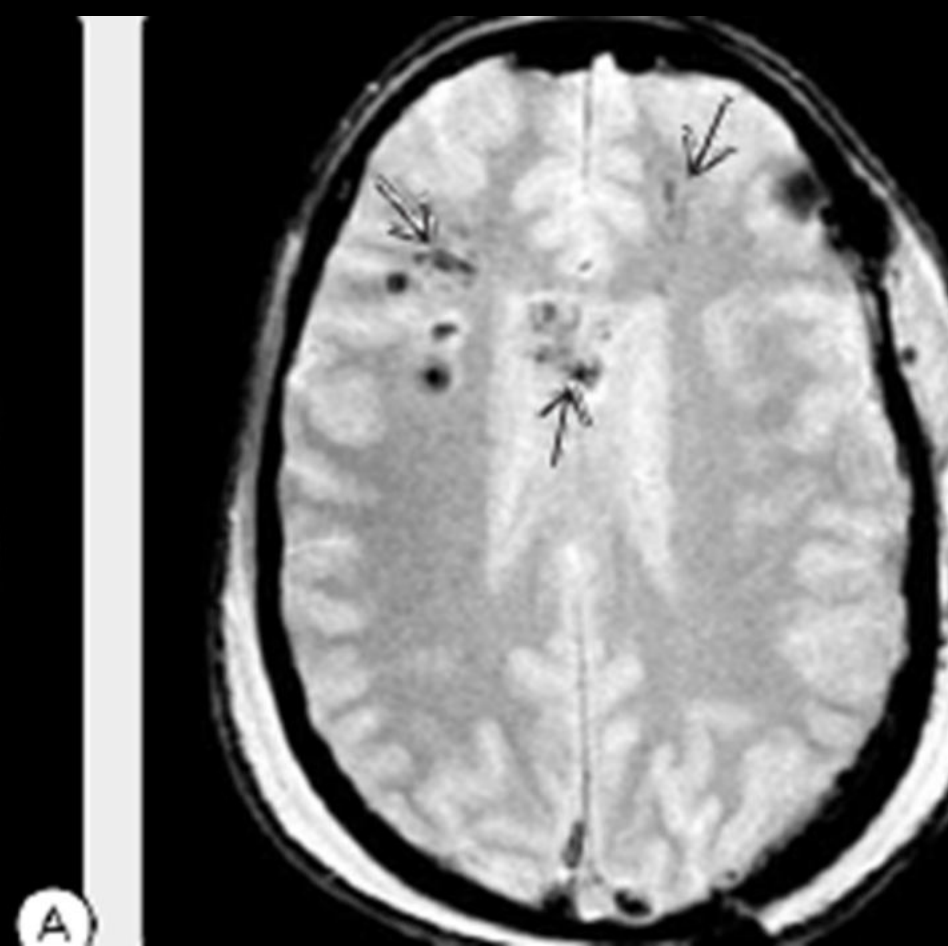
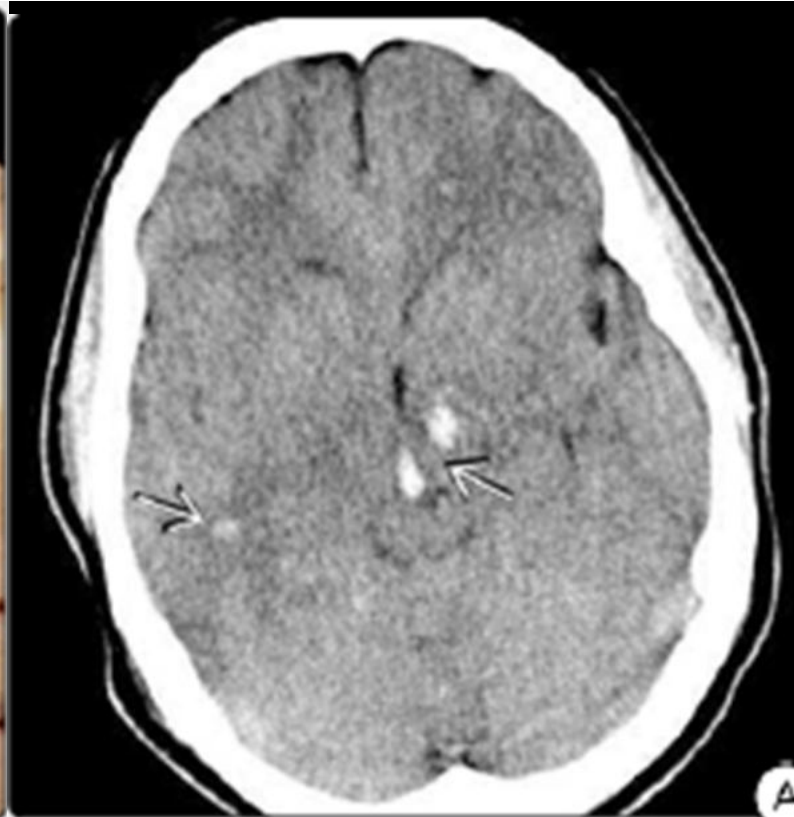
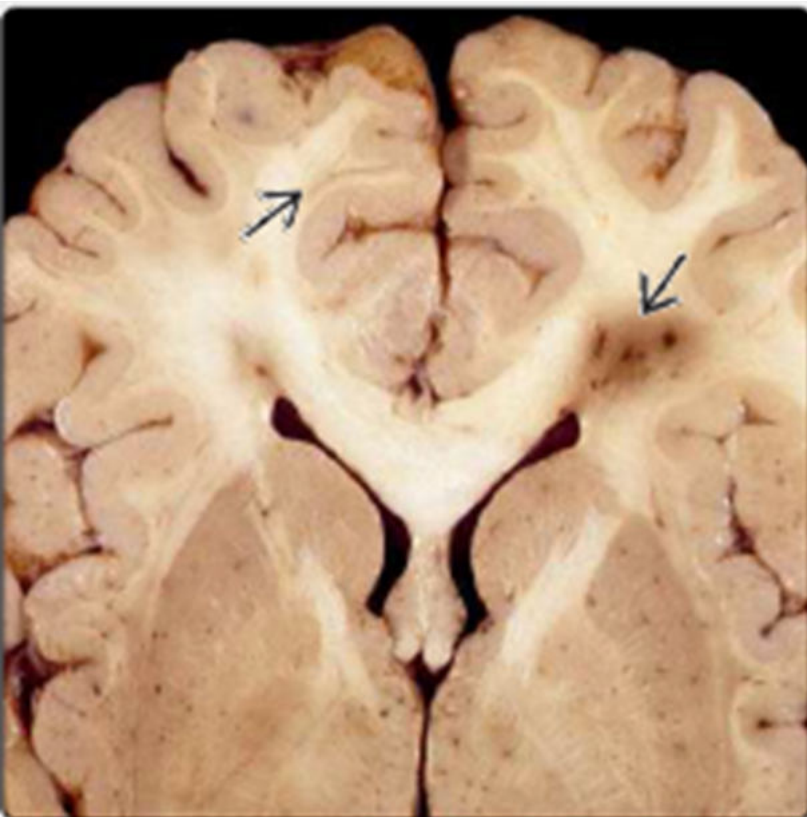
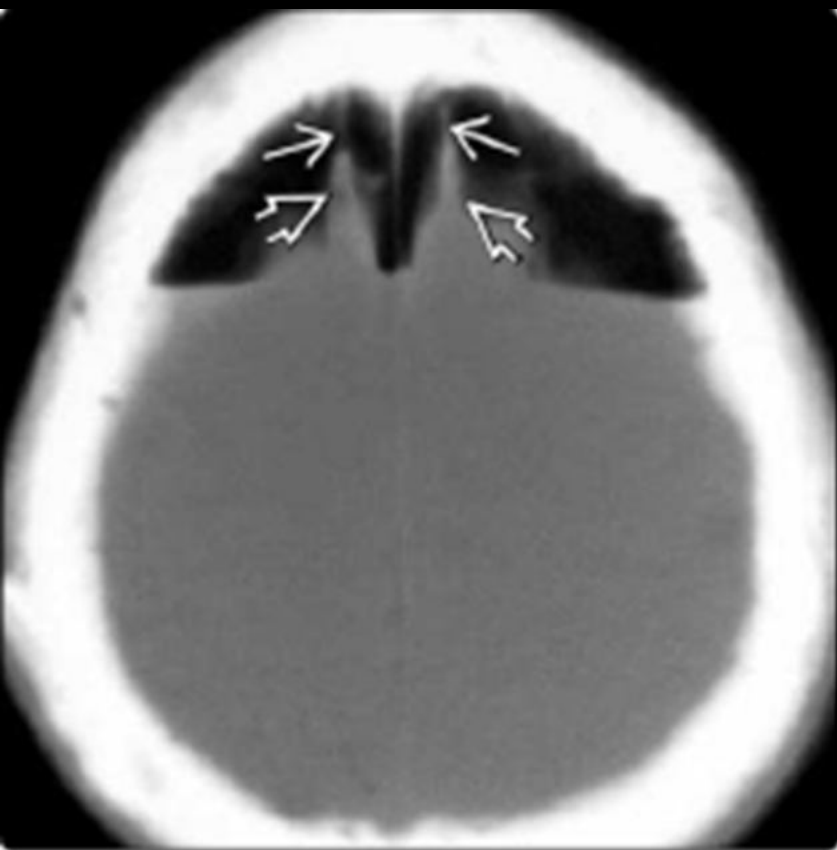
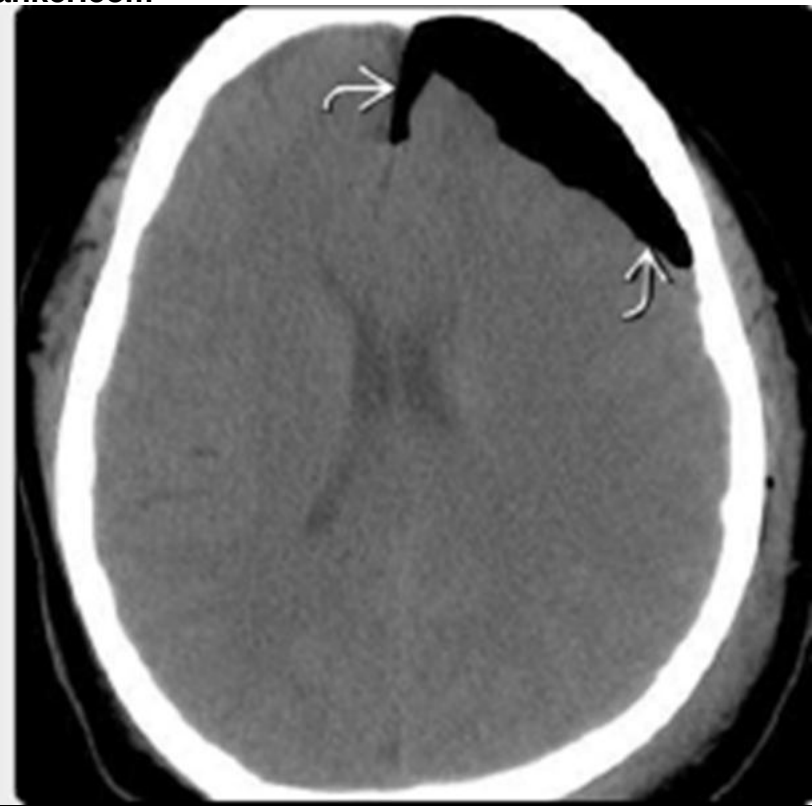


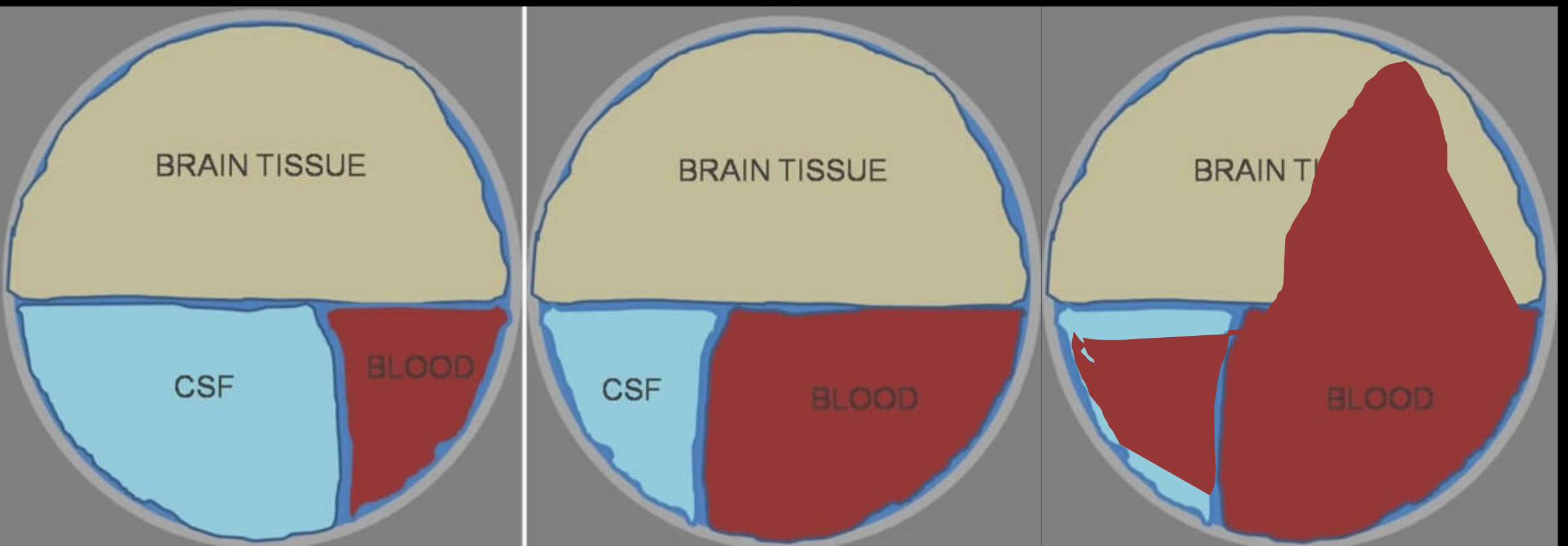
Figure: Showing Concepts of Diffuse Axonal Injury

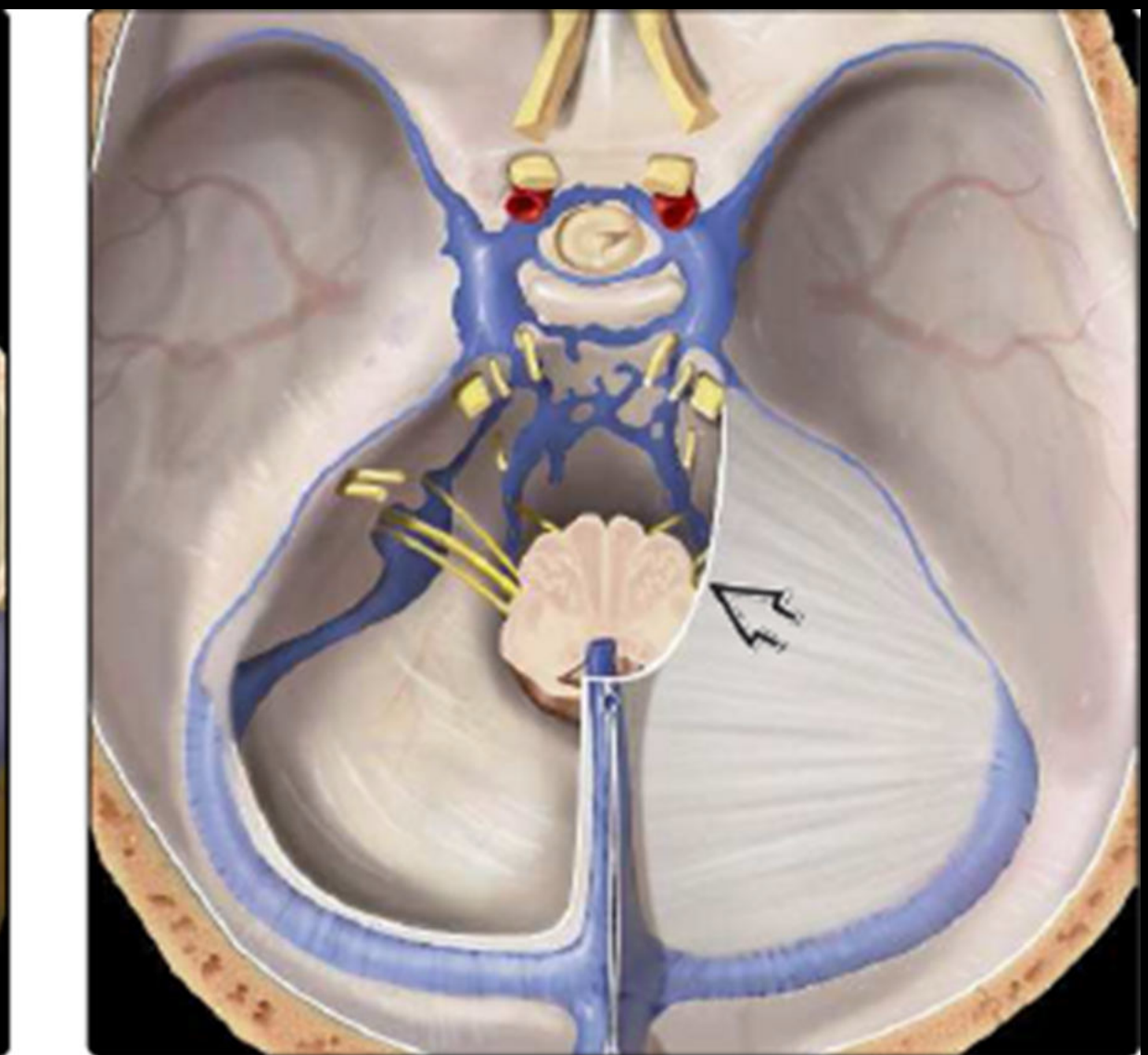
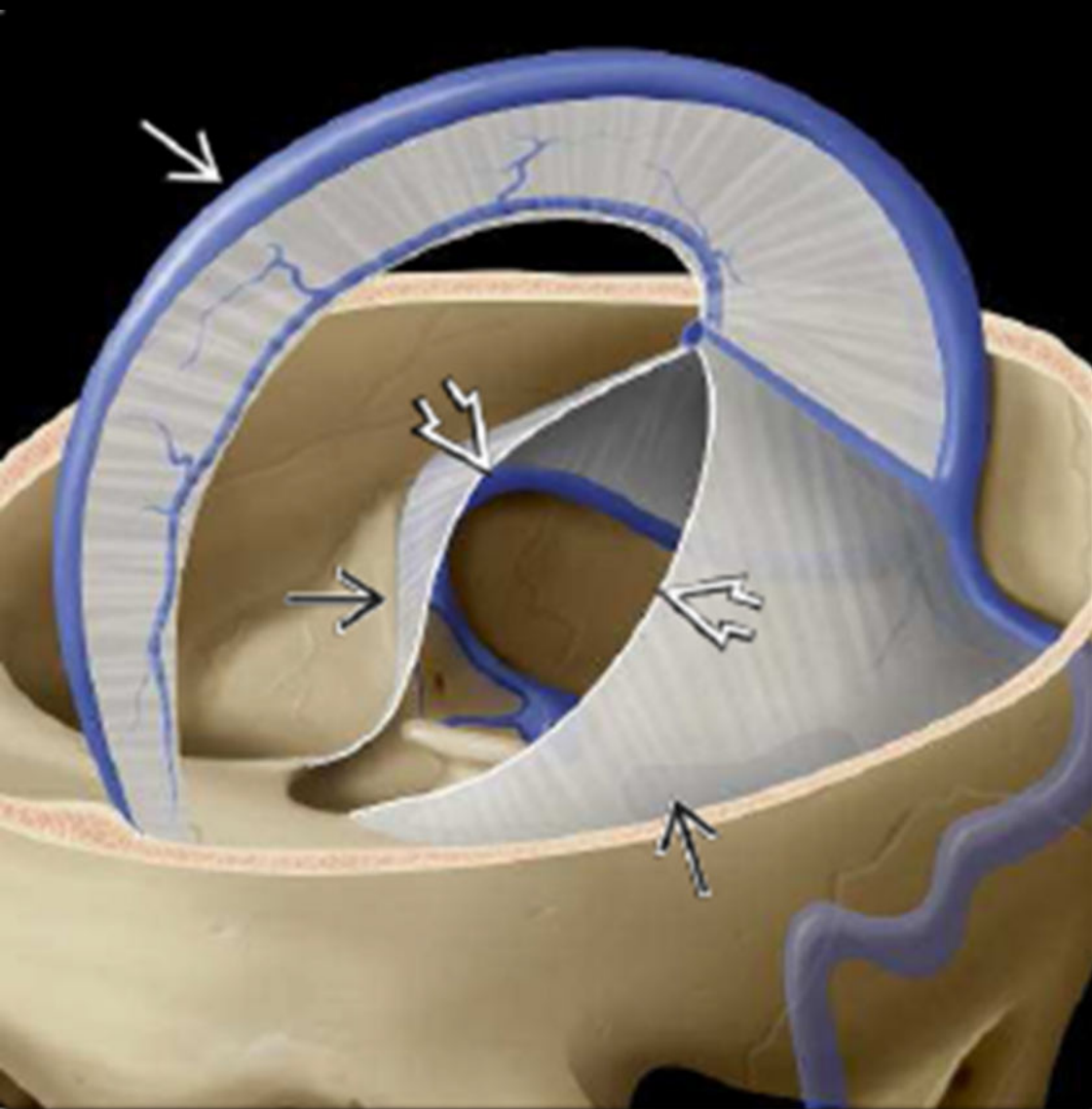
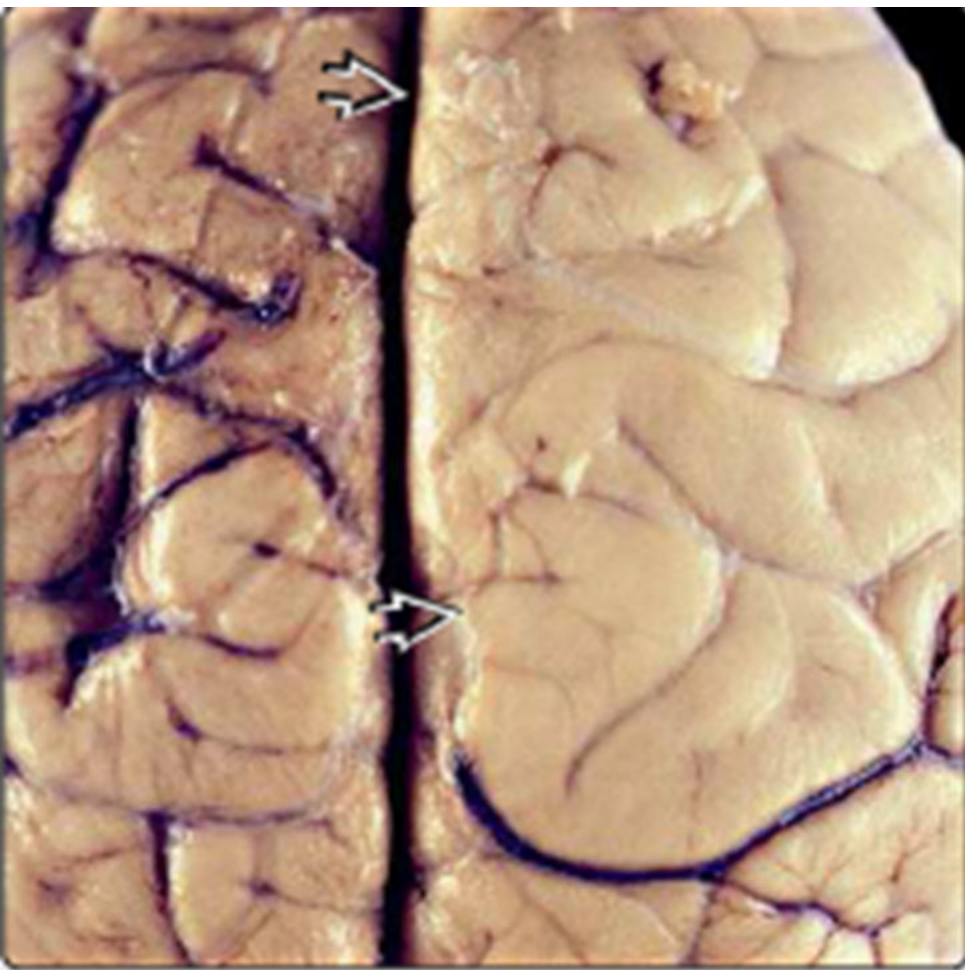


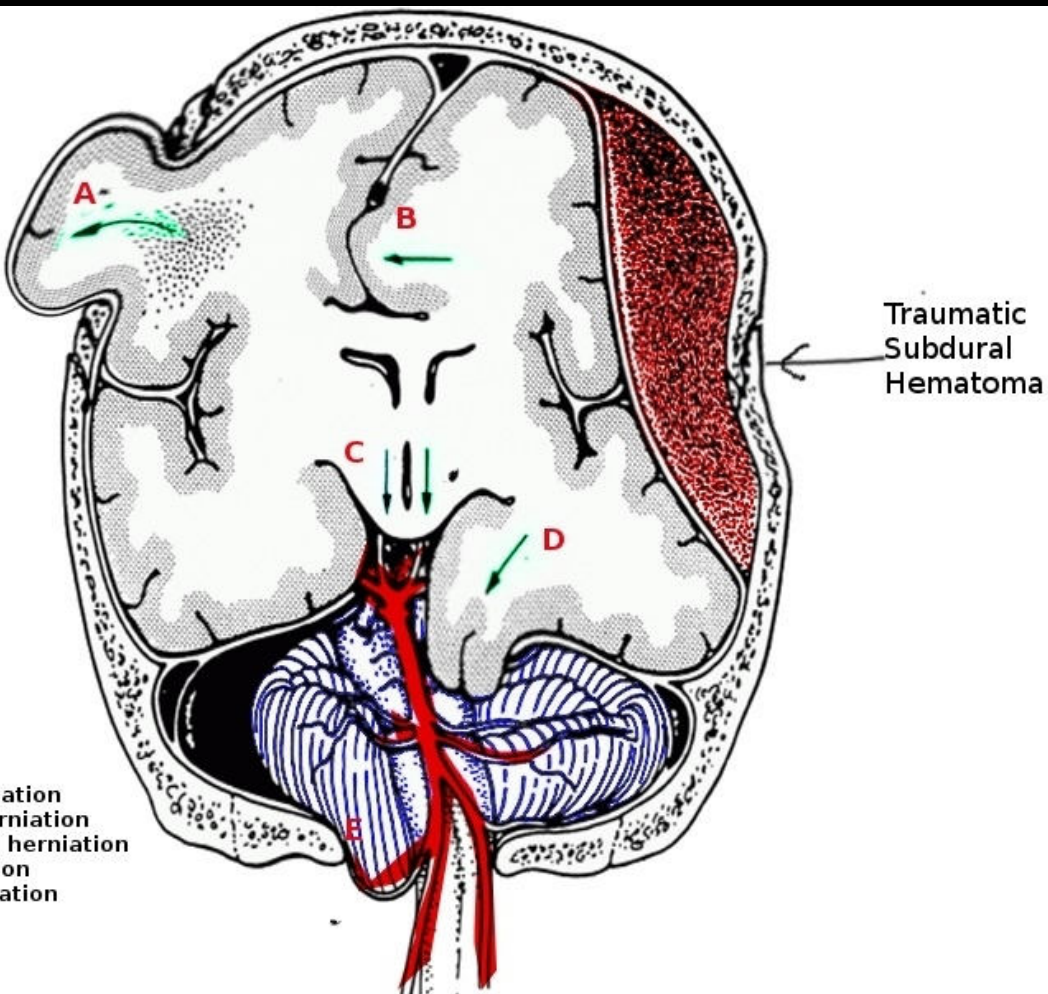
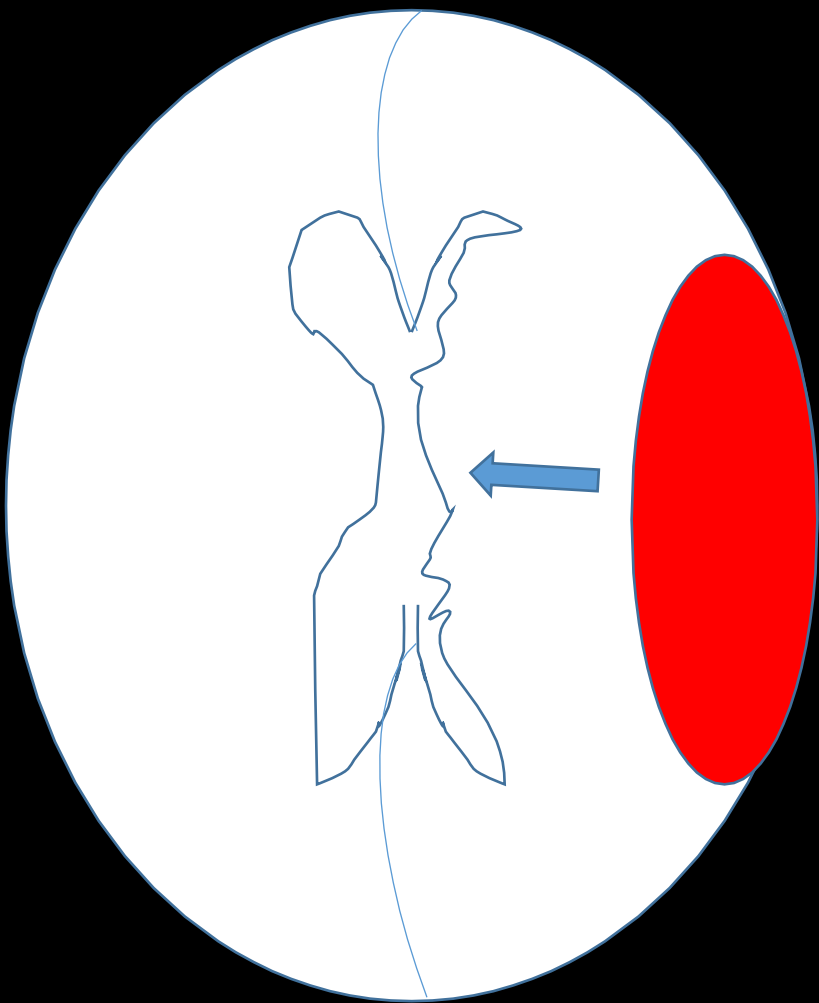
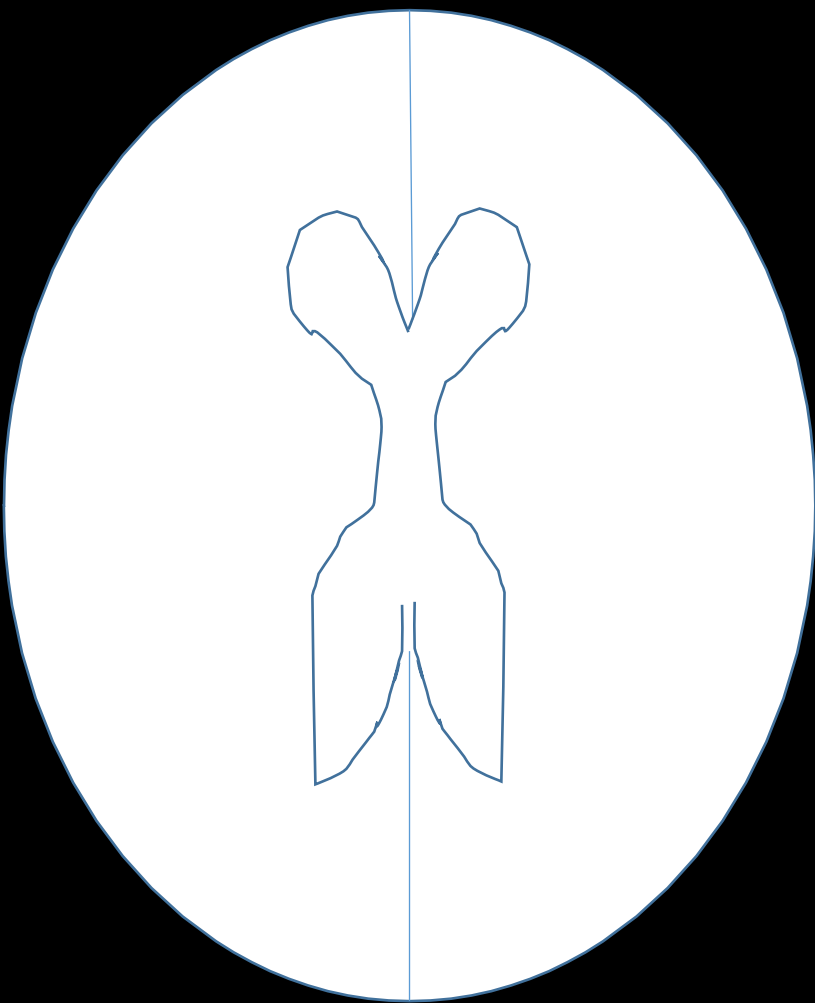




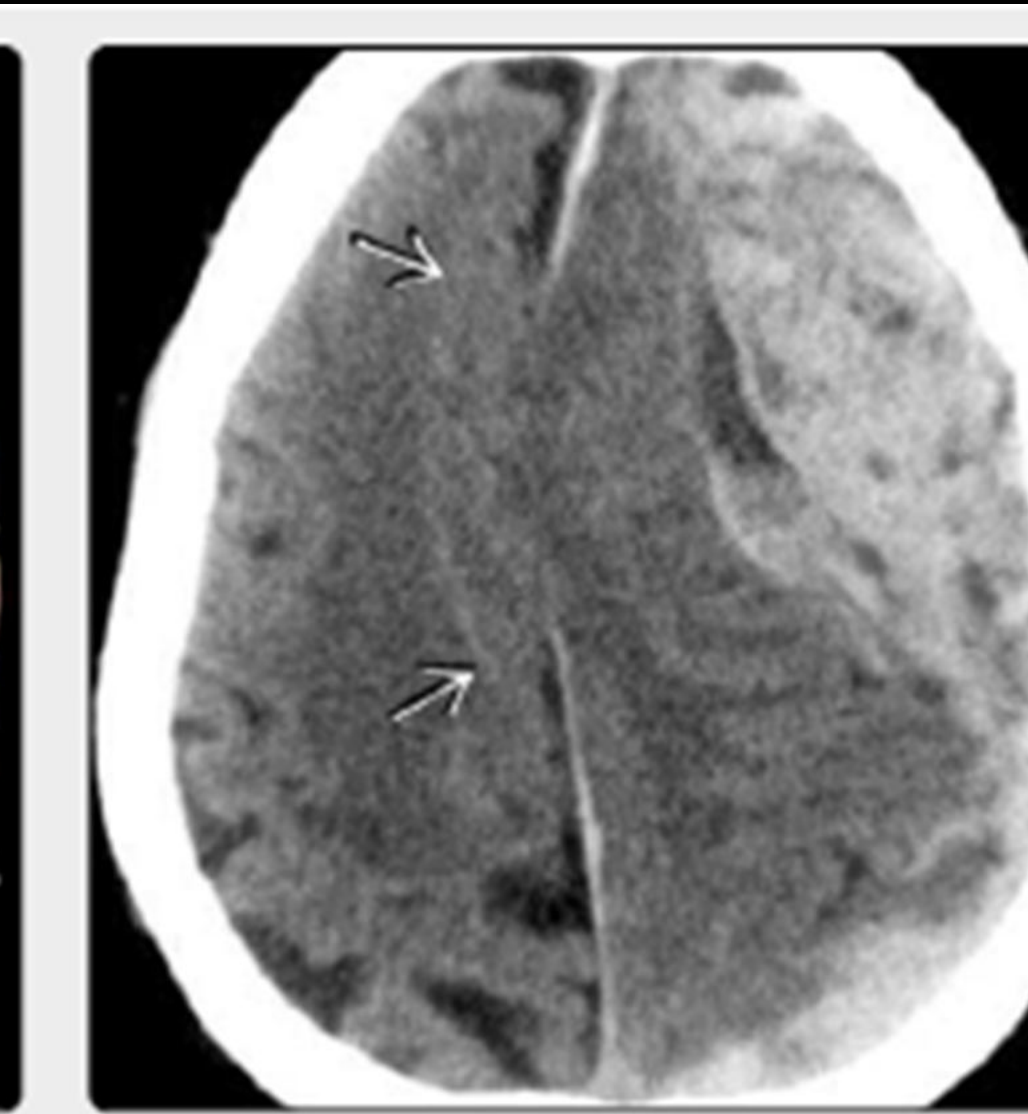
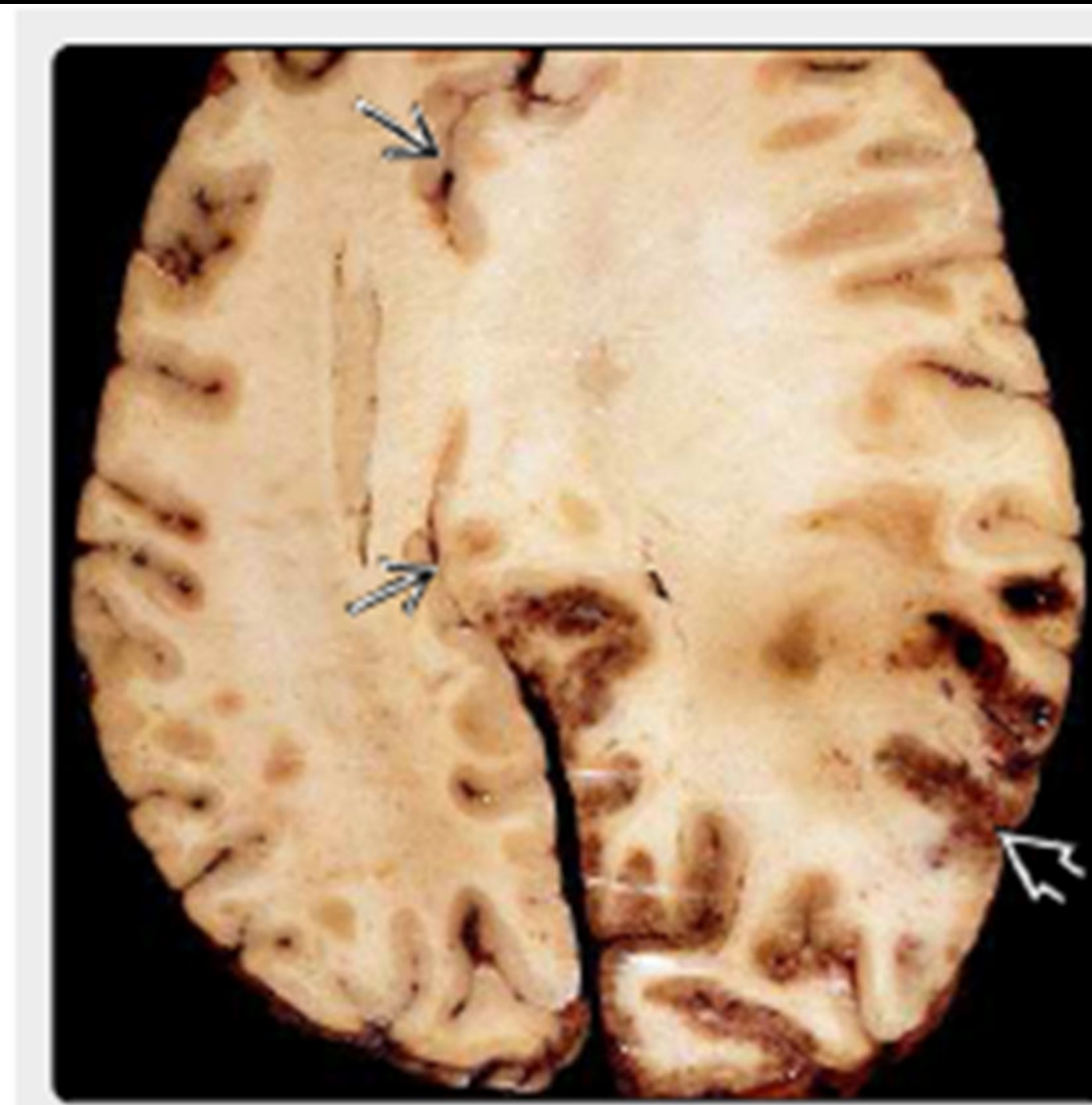
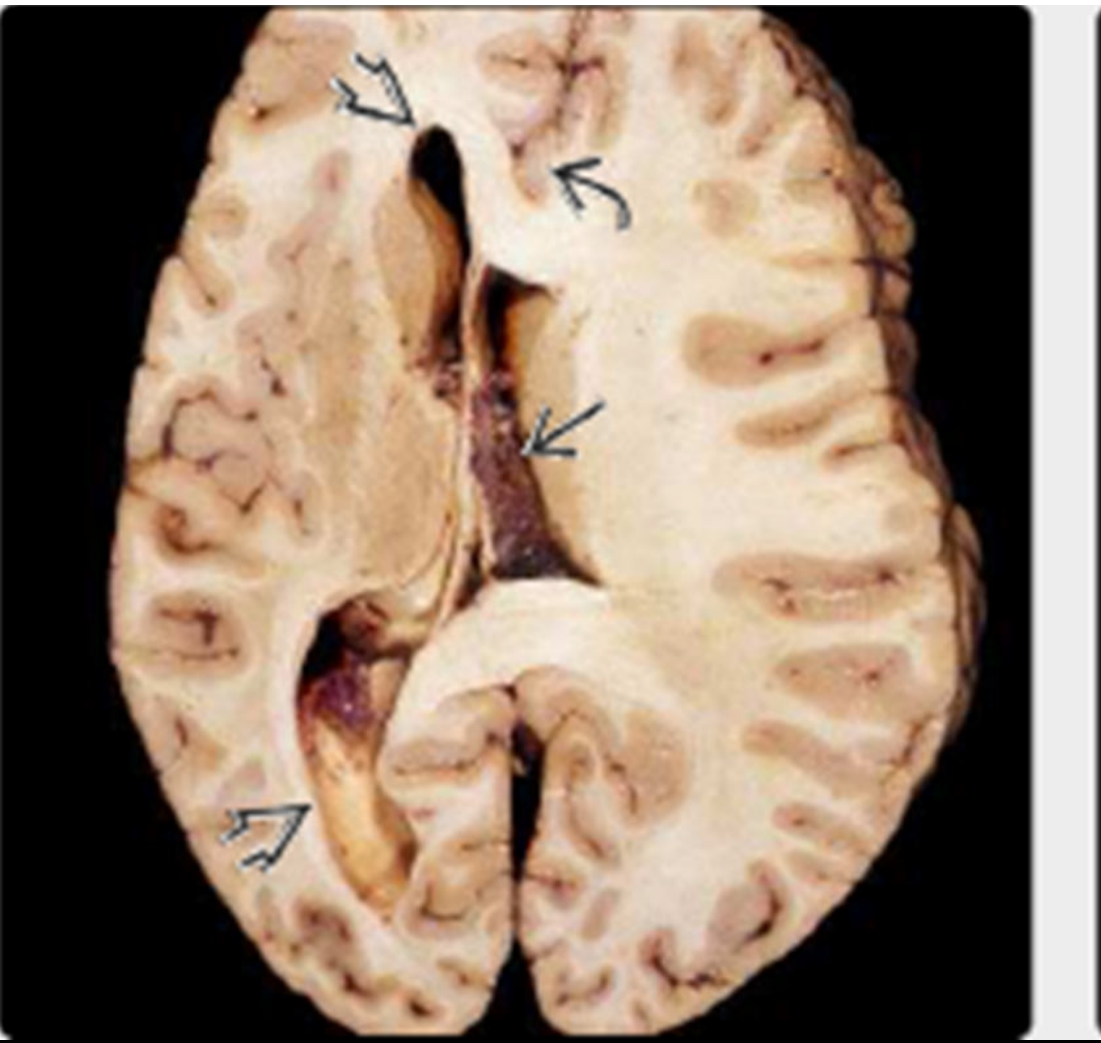
Secondary effects

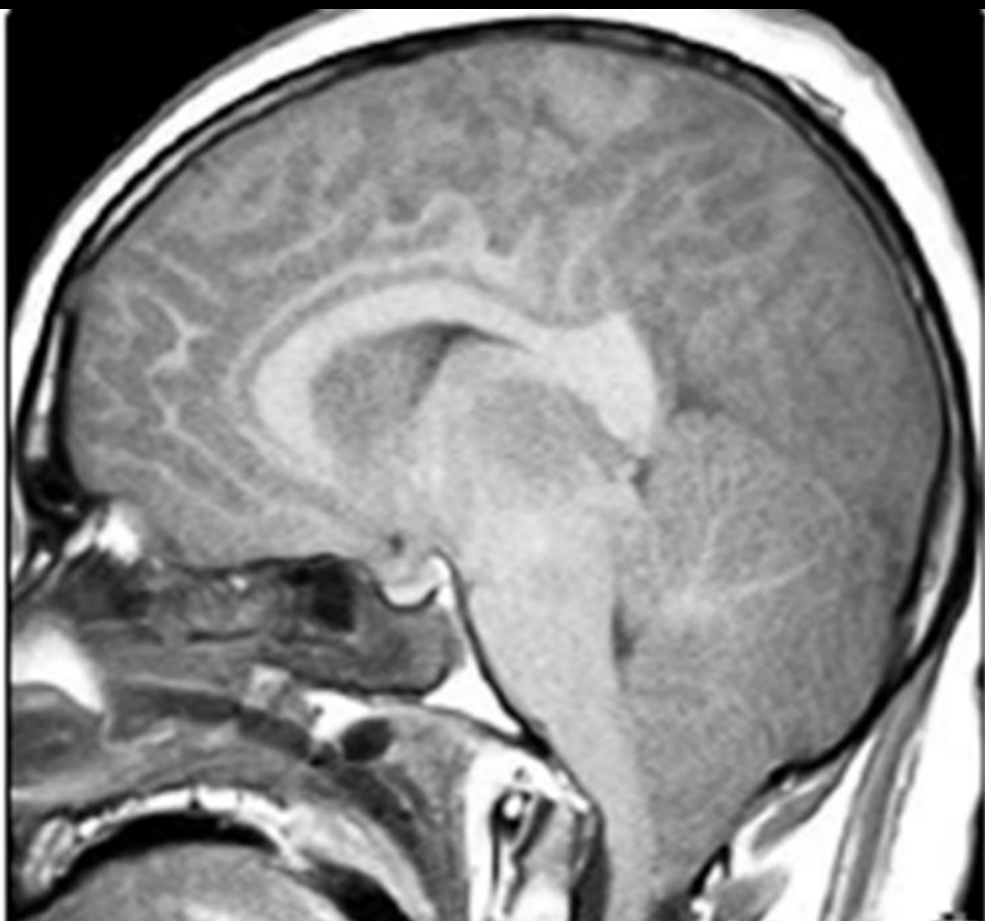
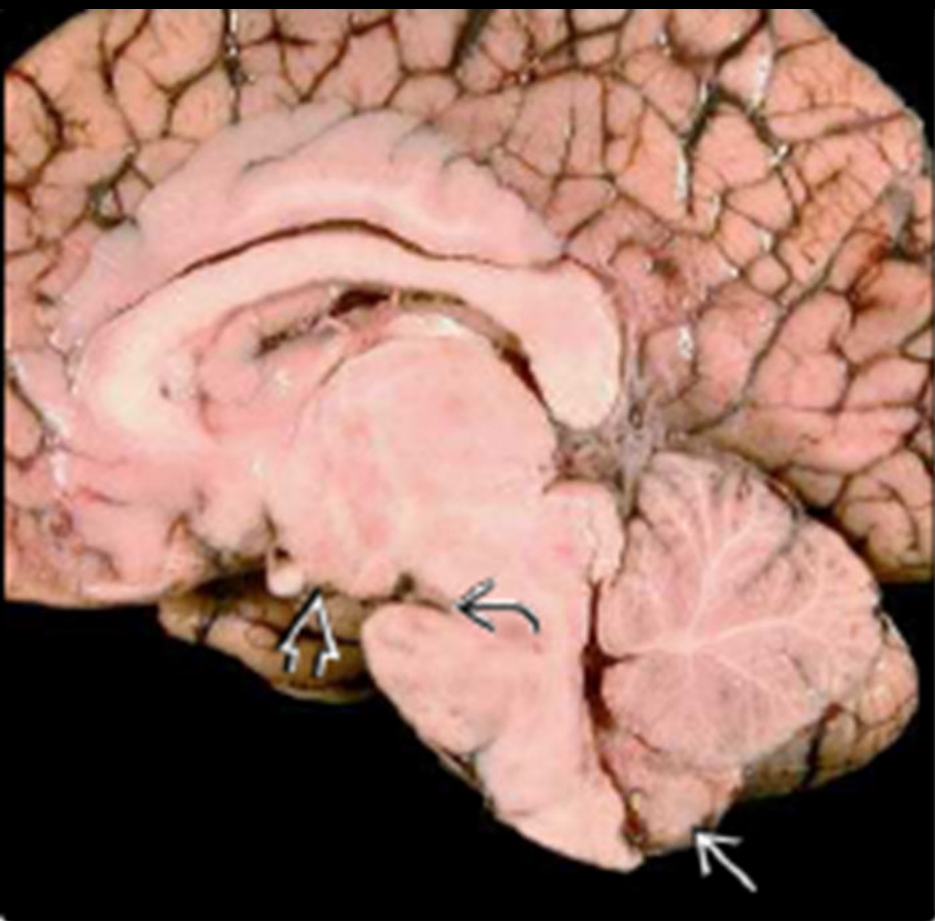
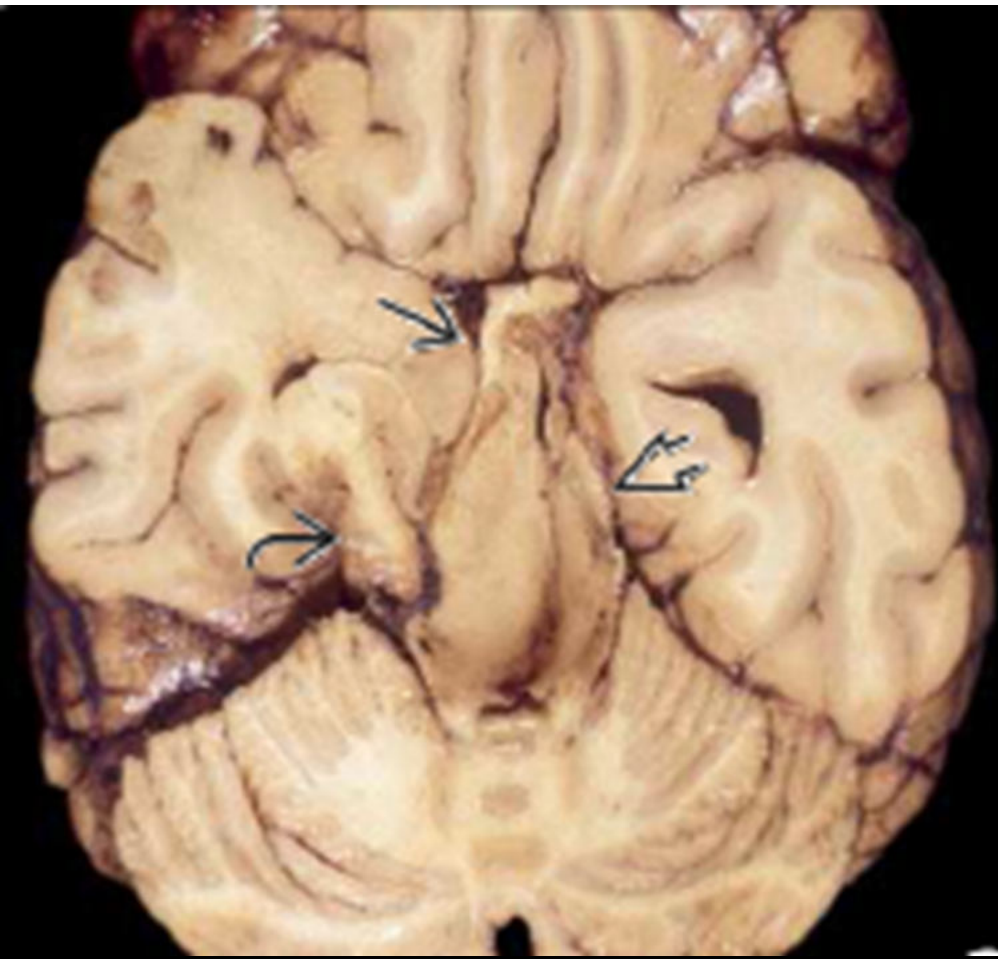


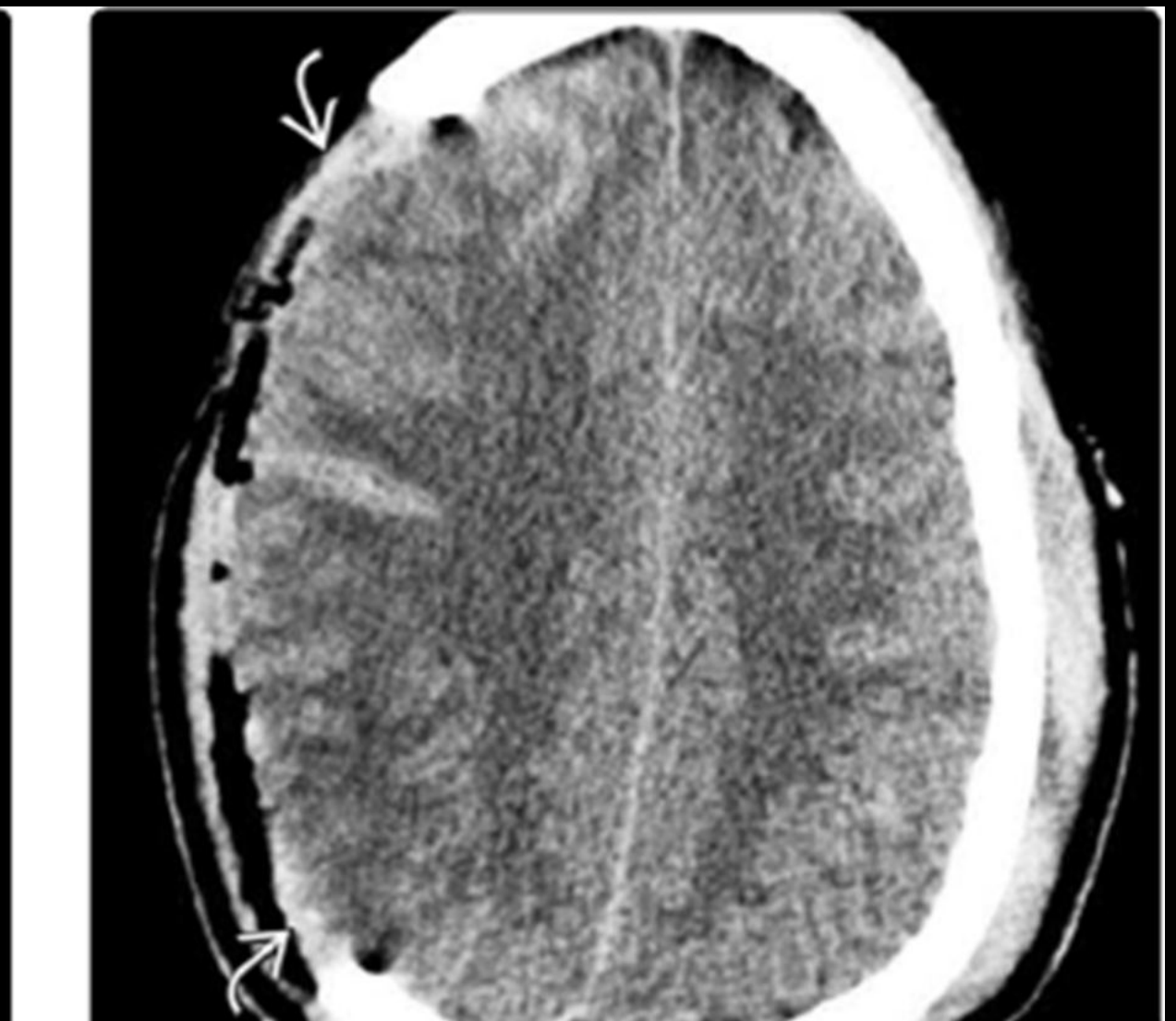
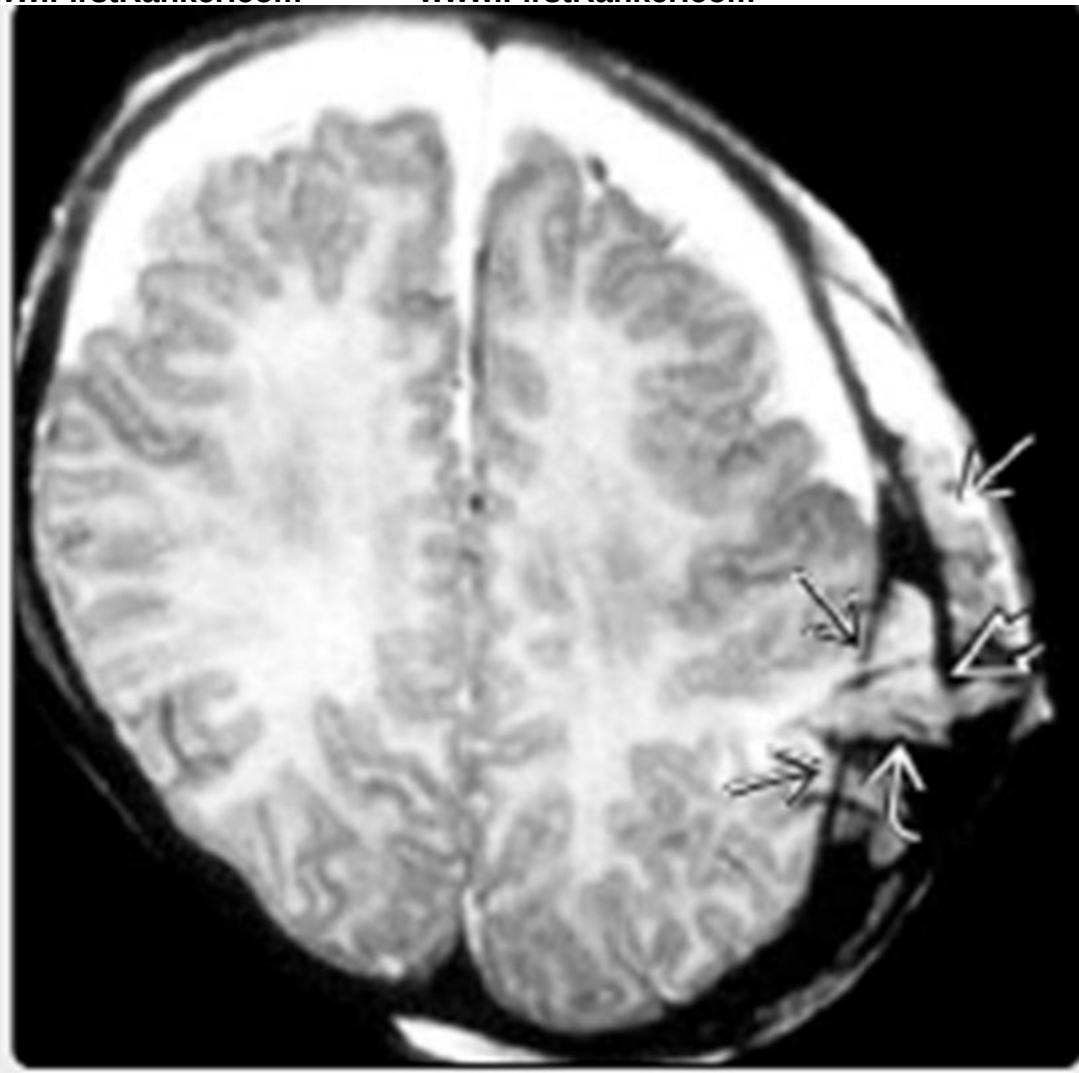
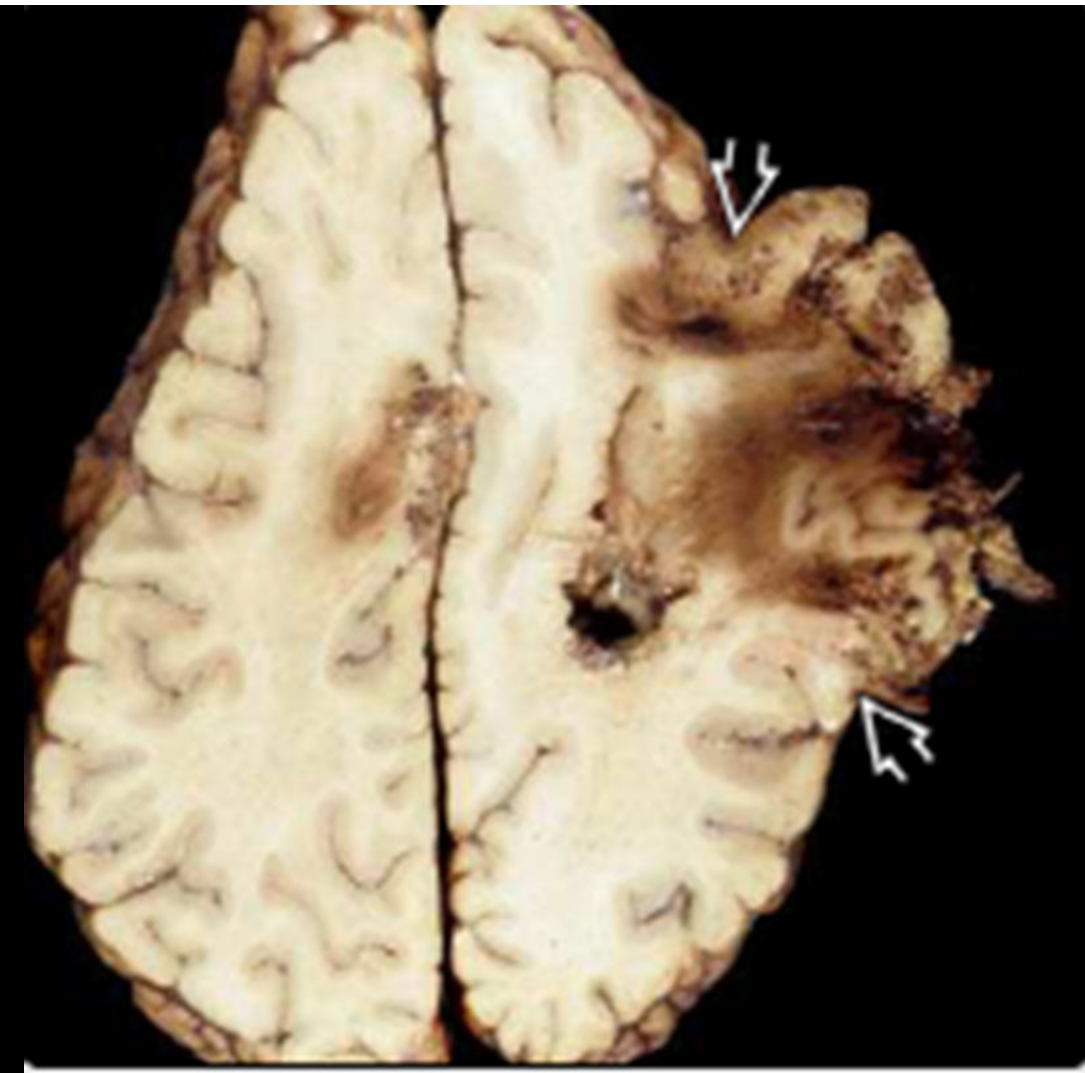




- A: External herniation
- B: Subfalcine herniation
- C: Transtentorial herniation
- D: Uncal herniation
- E: Tonsillar herniation







Take Home Points

- Identify the mode of injury
- Identify the pattern of injury
- Look for primary injury
- Secondary injury
- Actionable findings

Thank you