

Head Trauma

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Clinical Assistant Professor

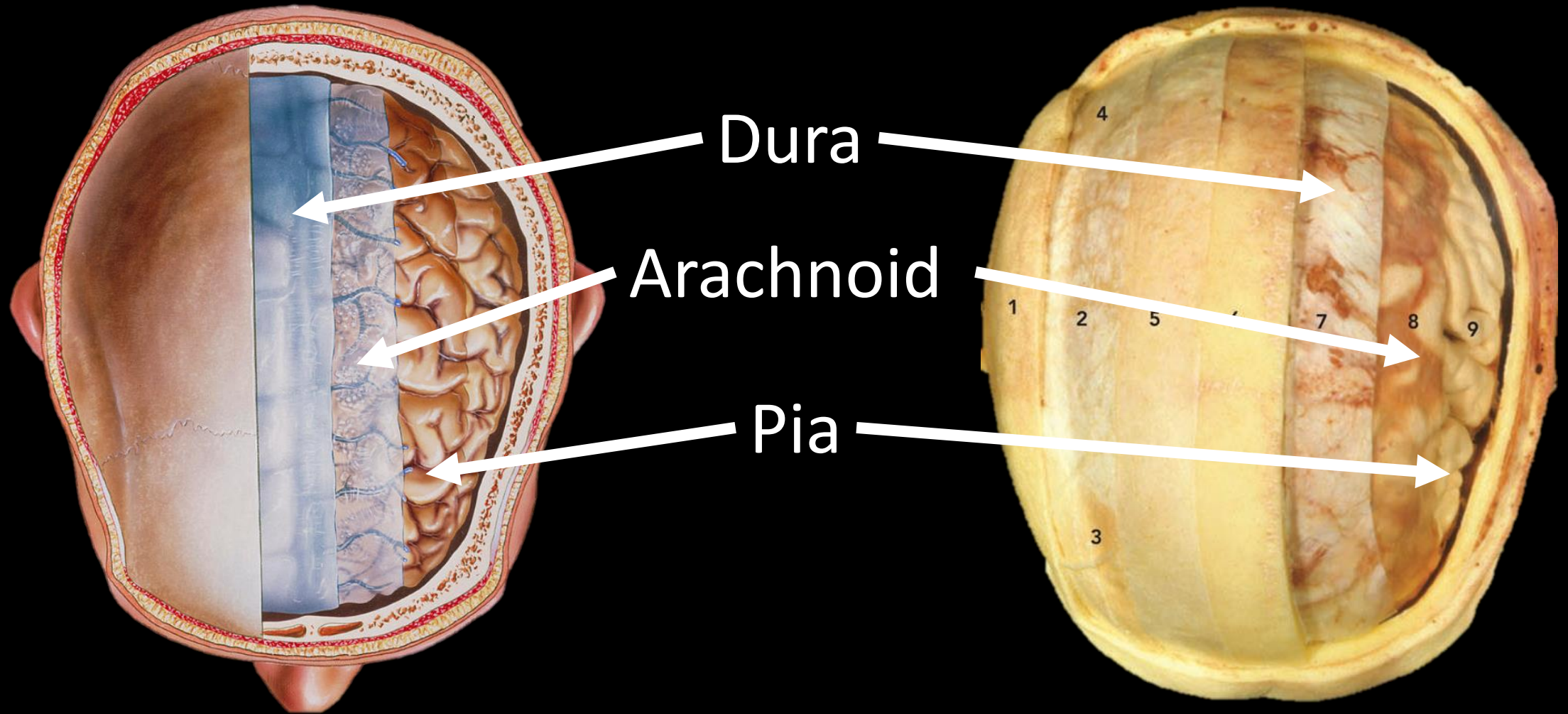
NYU Grossman School of Medicine

New York, NY

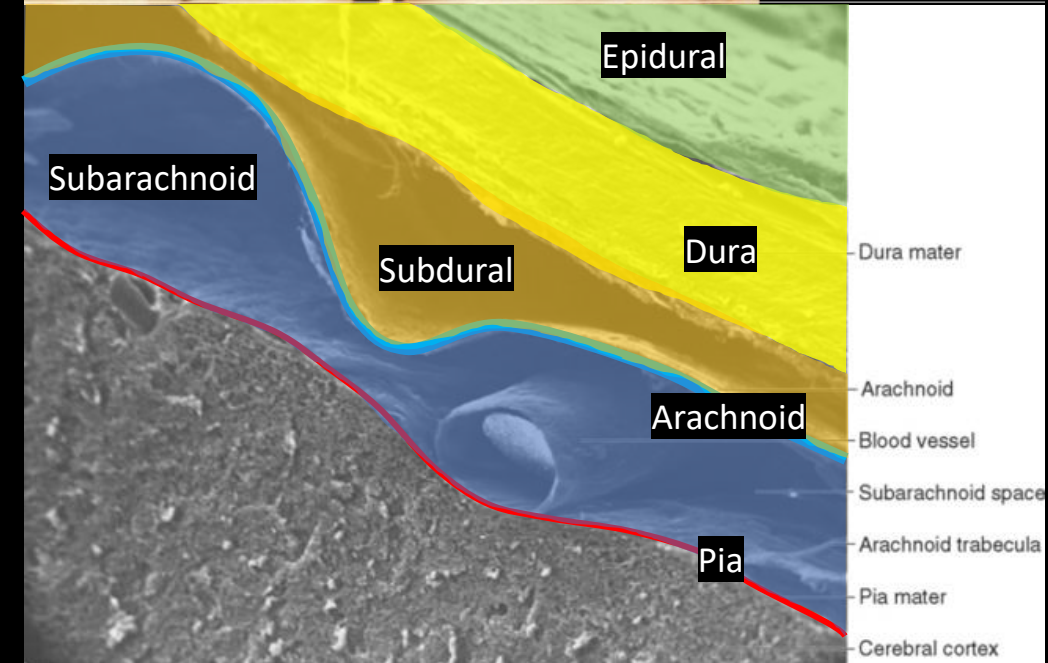
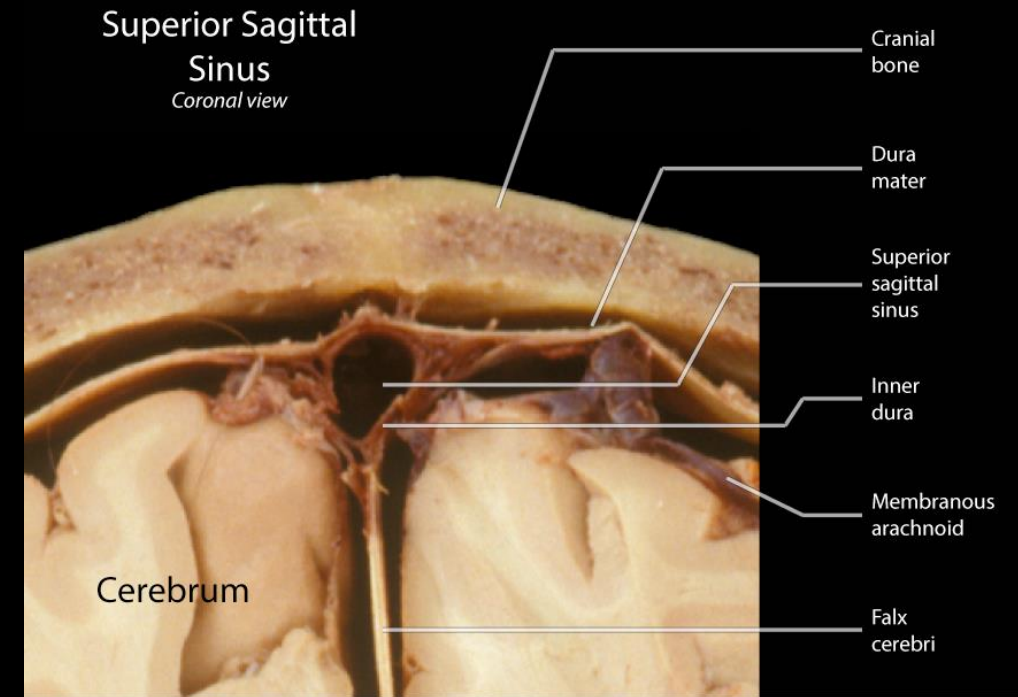
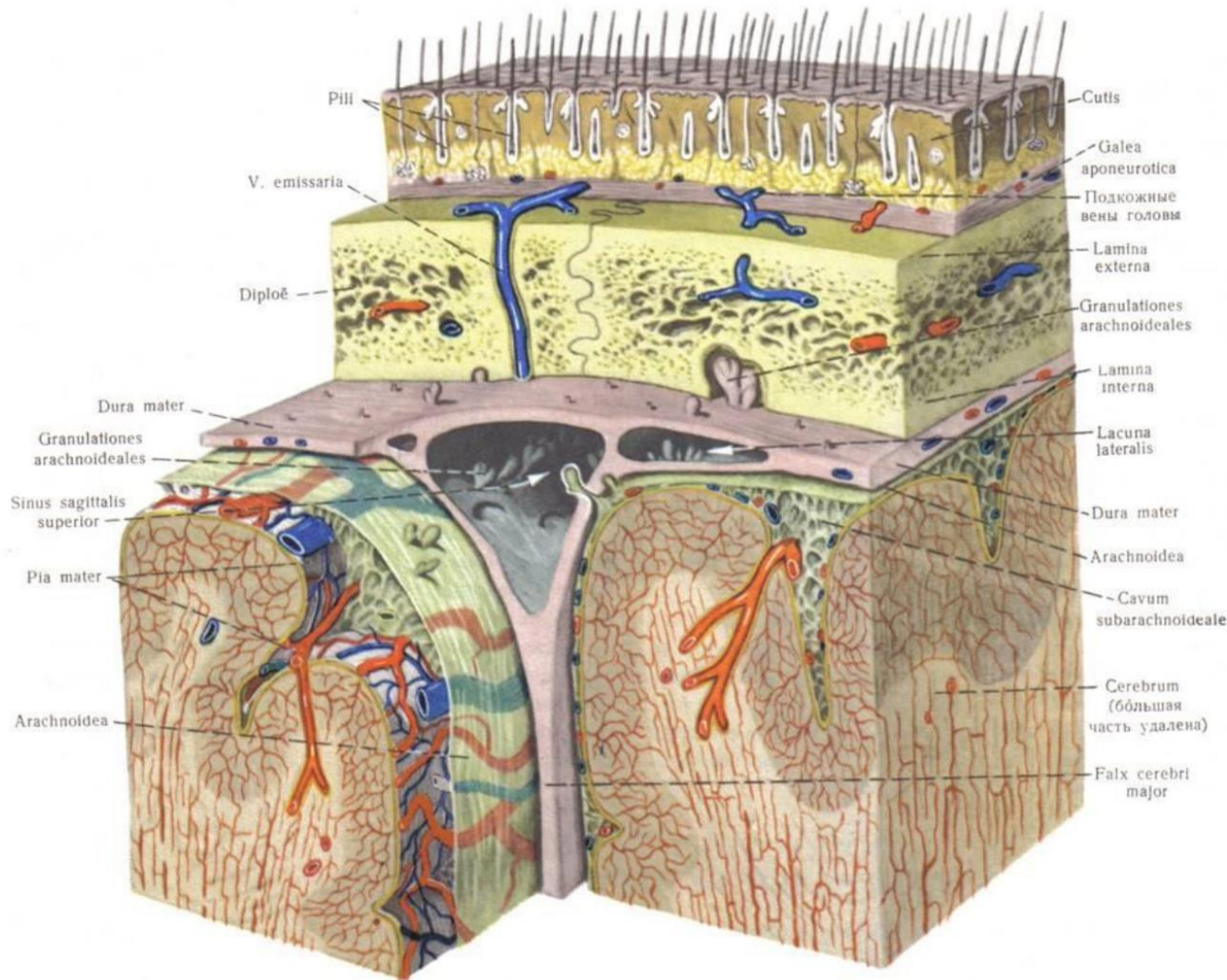
Objectives

- Case based CT review of intracranial hemorrhage
- Review meningeal anatomy
- Discuss pitfalls

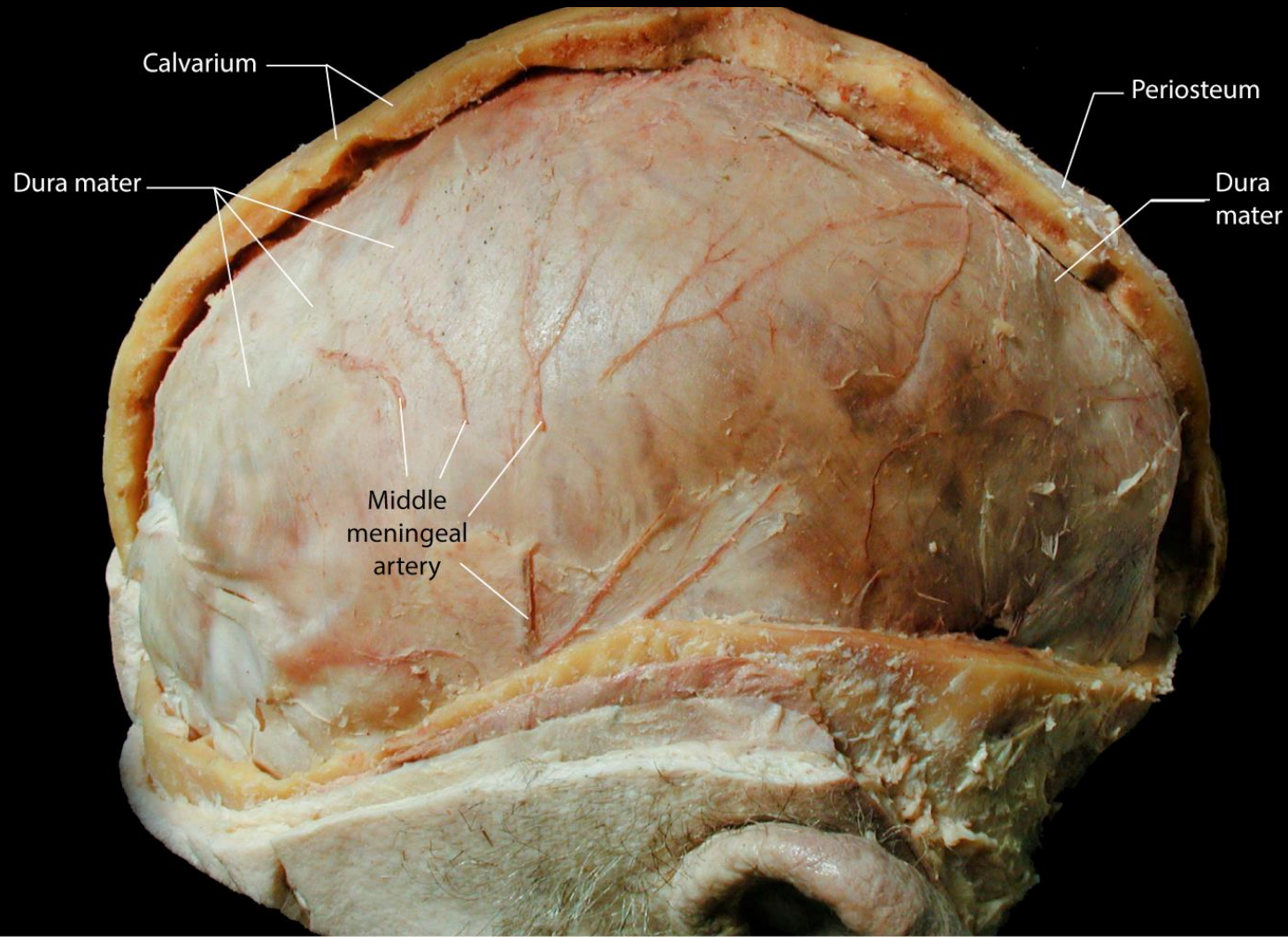
Meninges



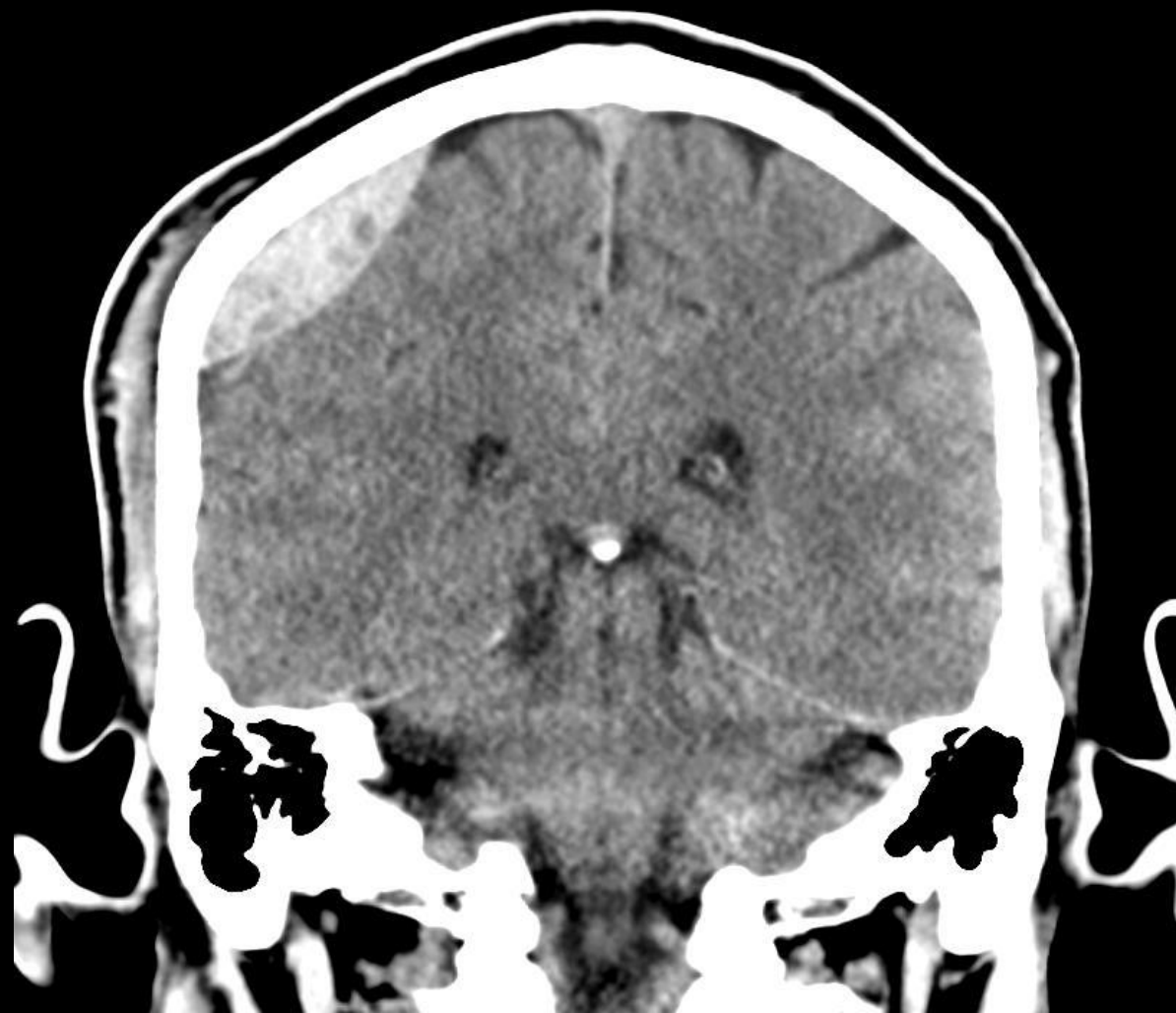
Meninges

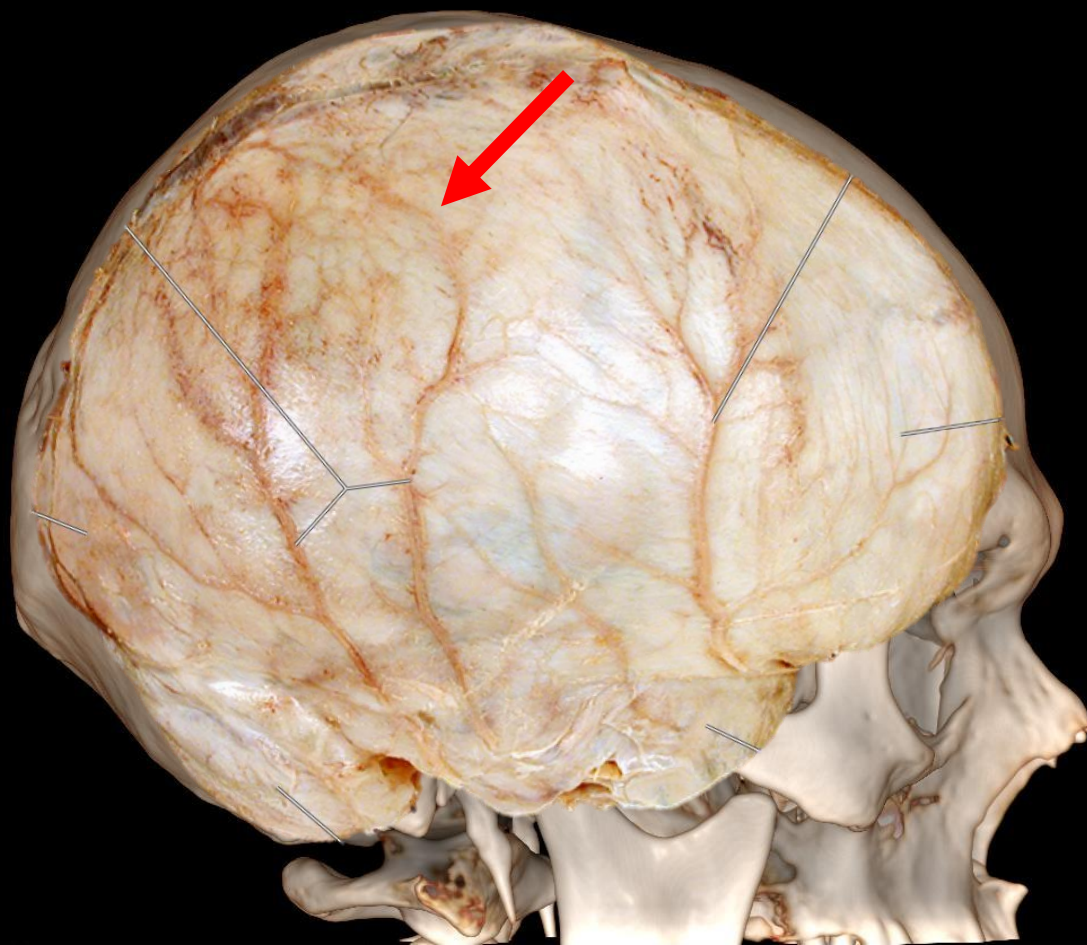


Epidural space

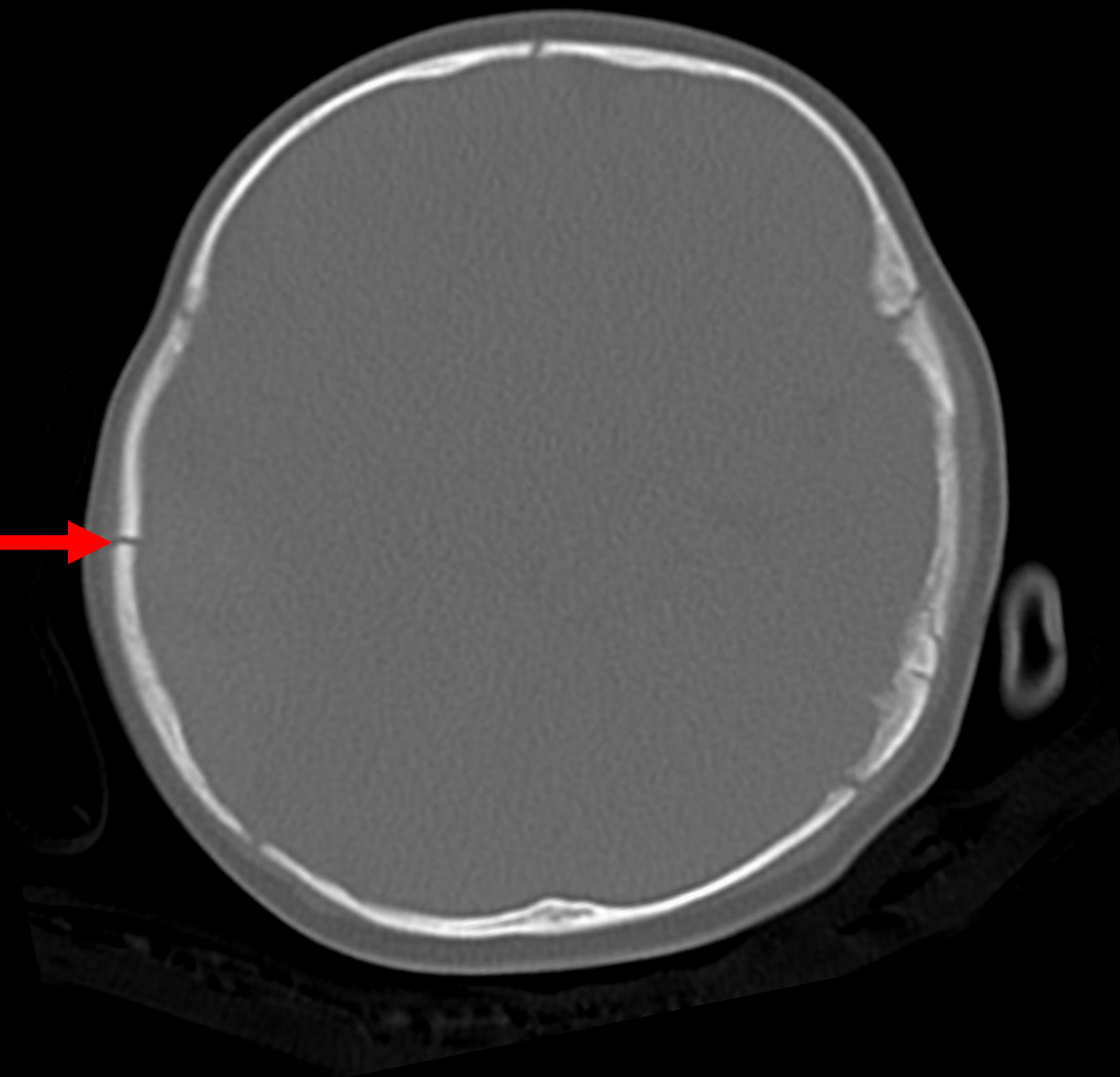


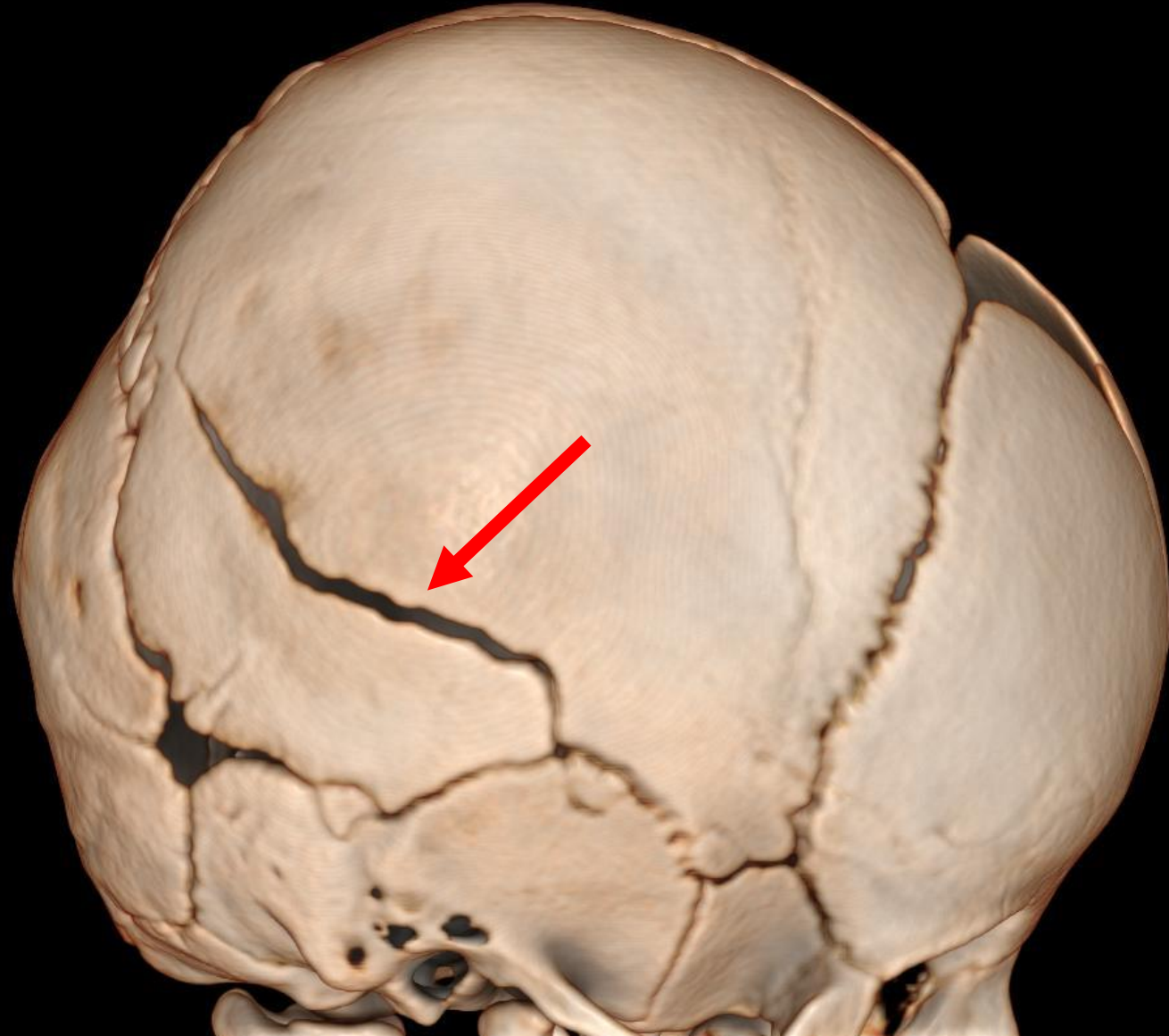
Classically an arterial bleed (MMA), bound by sutures



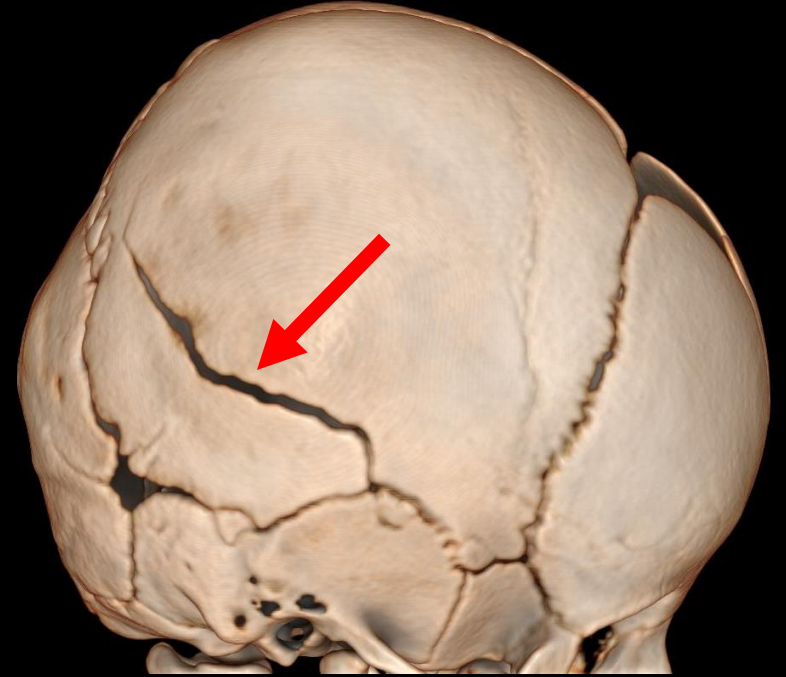
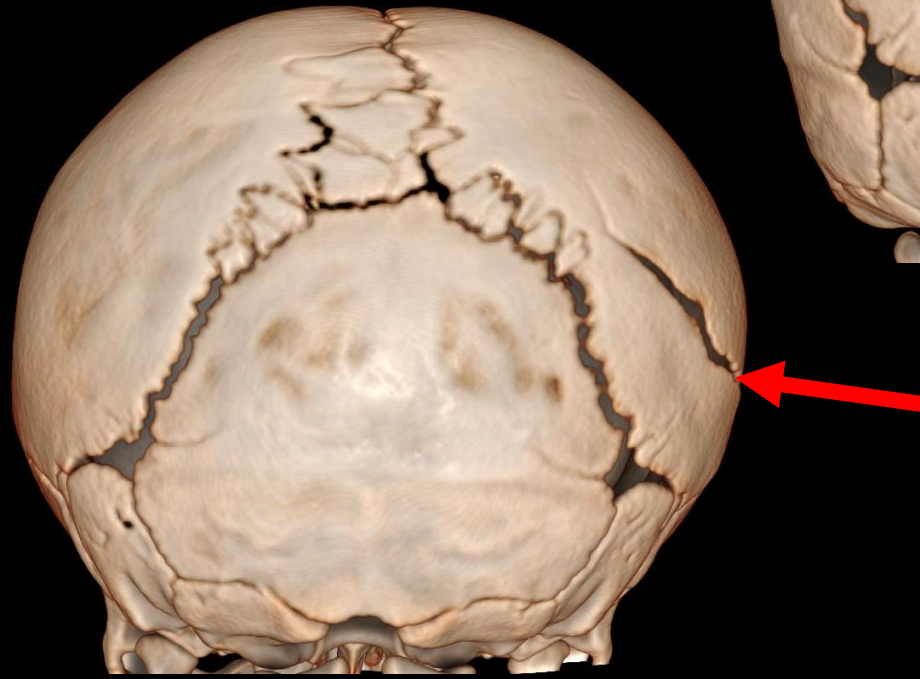


Can be large...

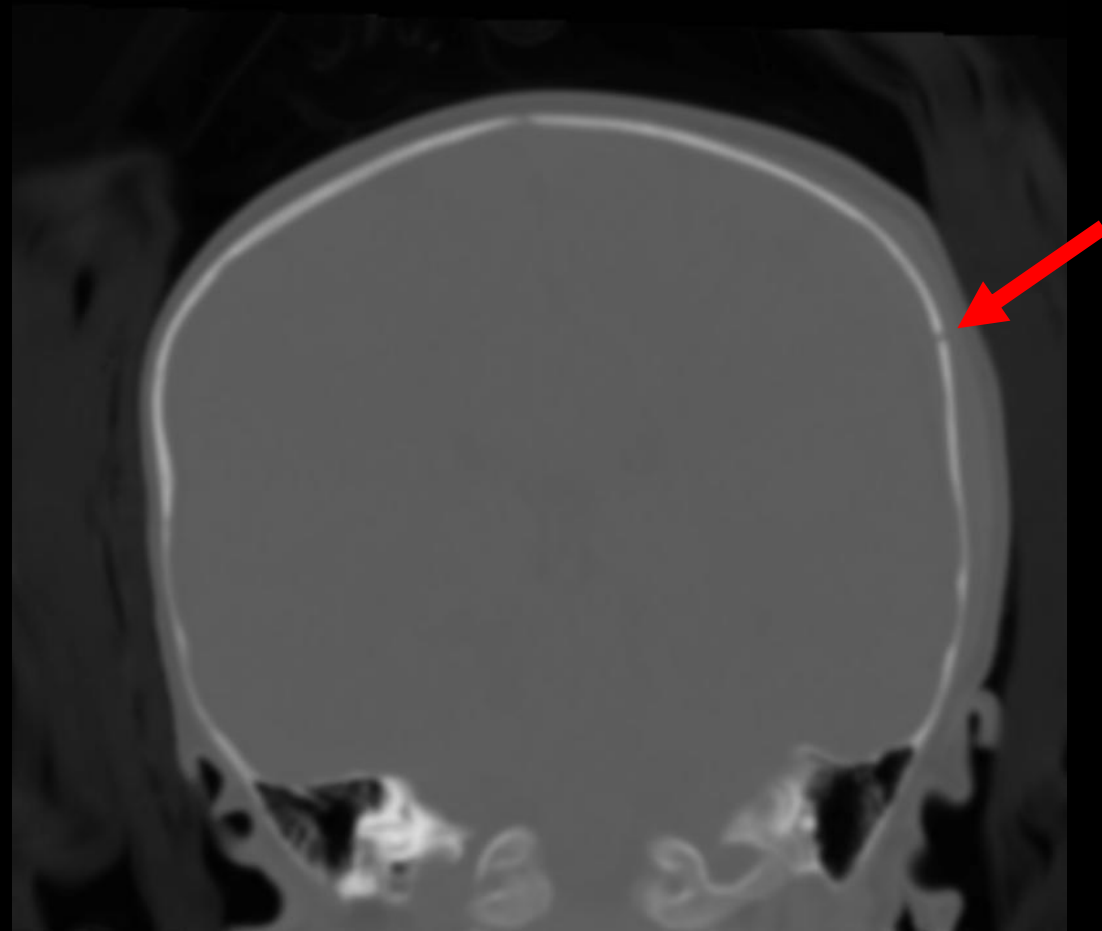


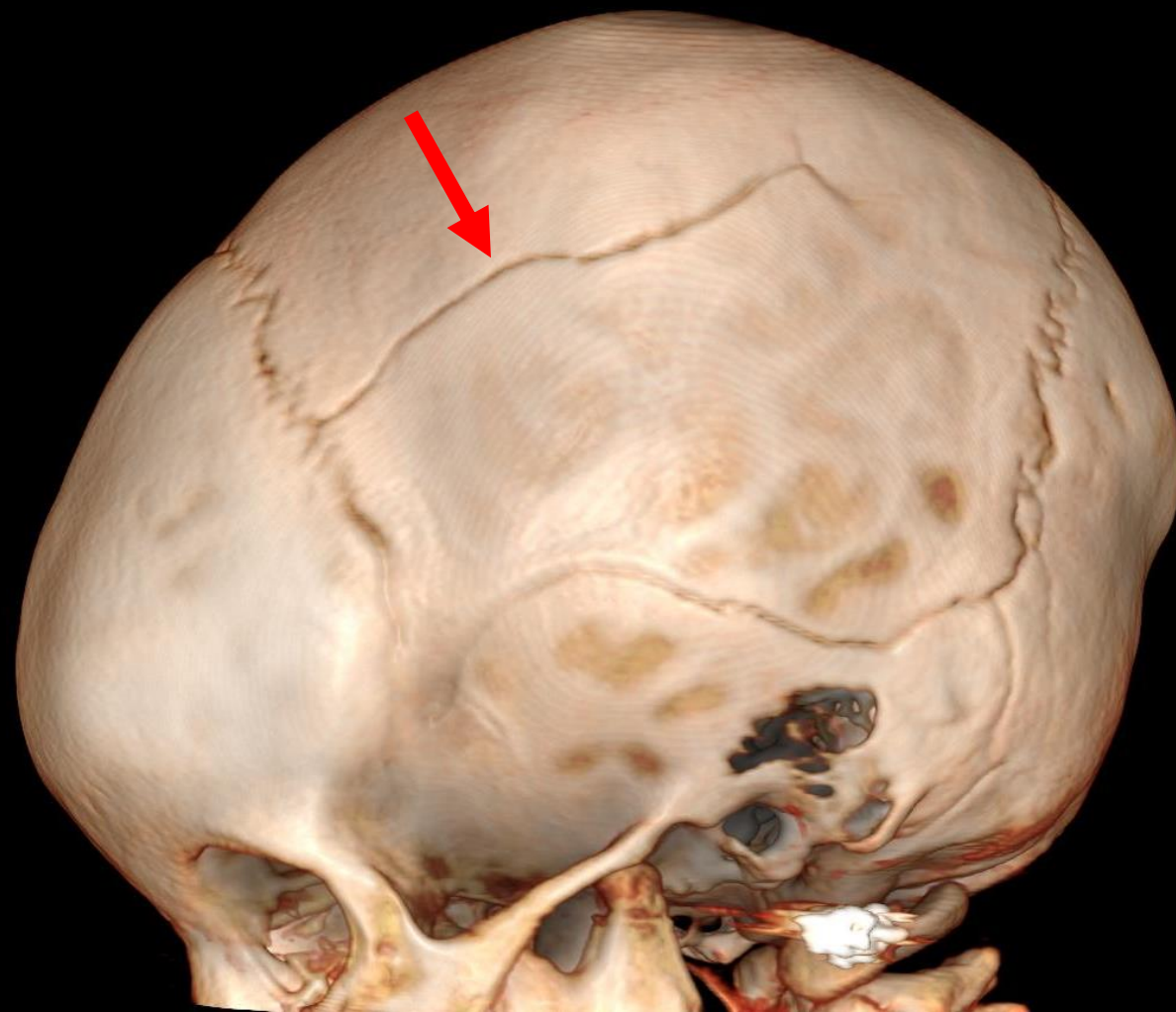


Use 3D to check suture vs. fracture!

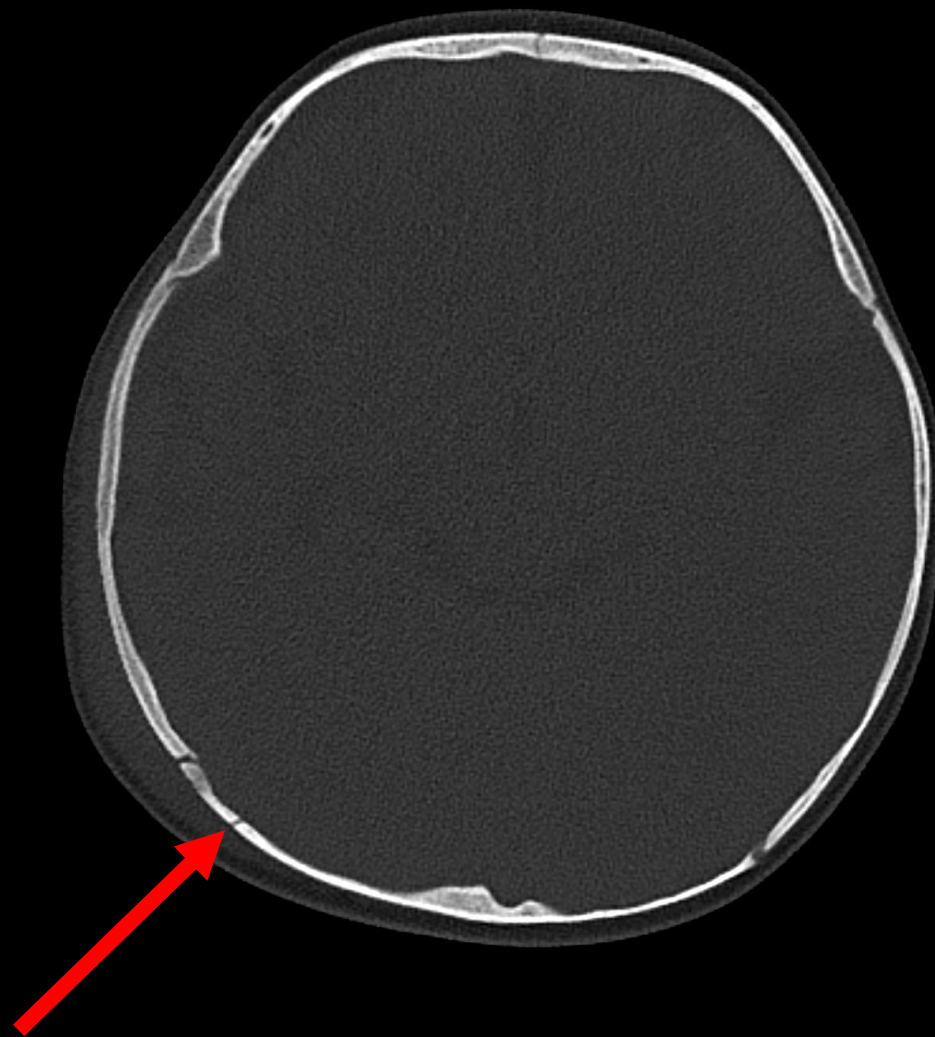
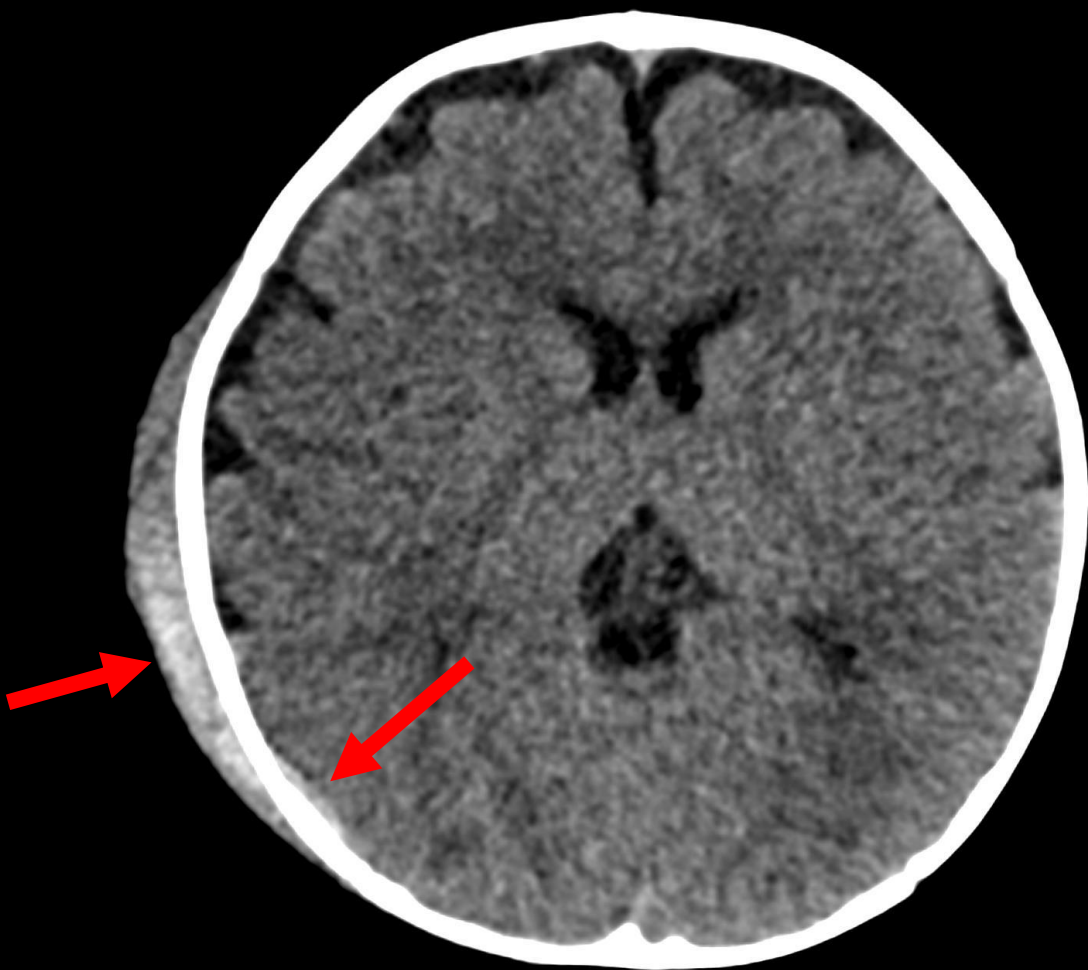


Can be small...

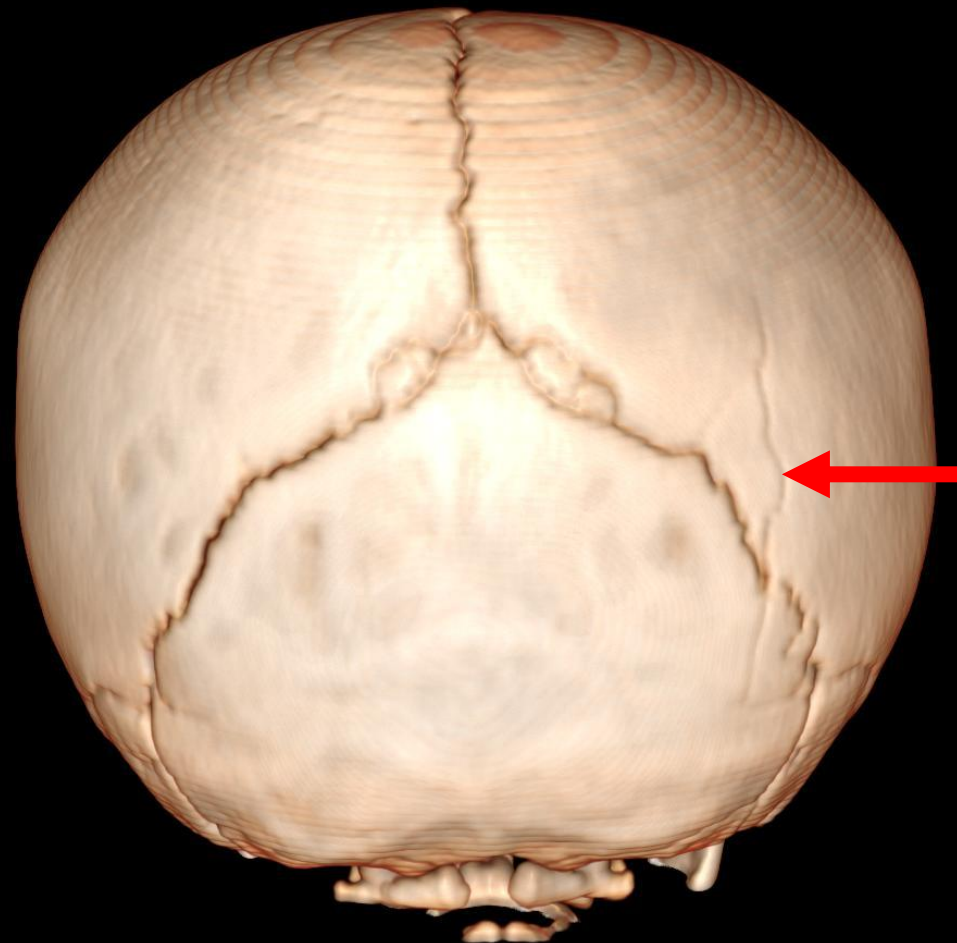




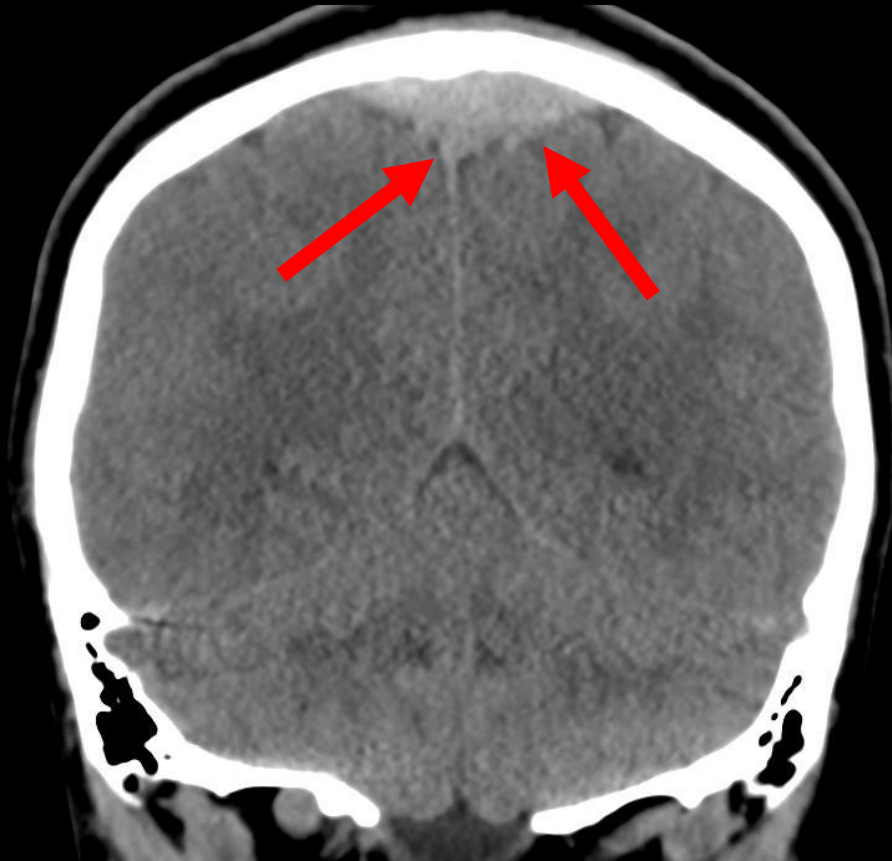
Can be VERY small...

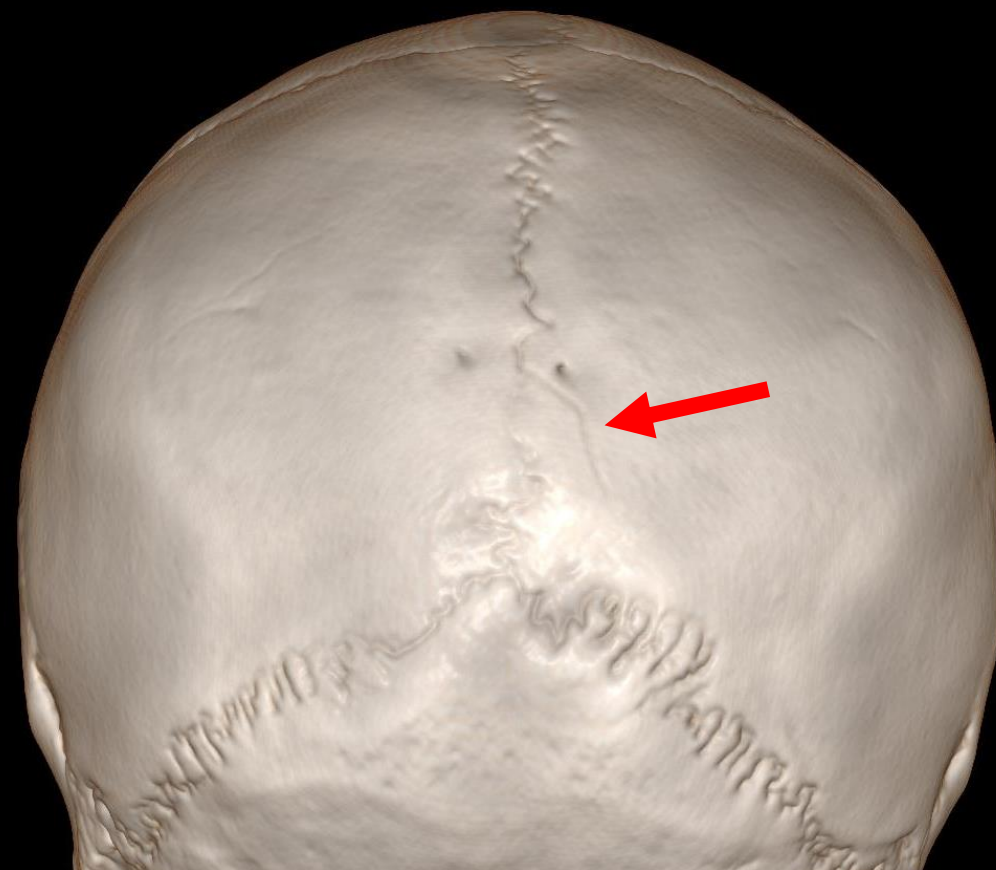
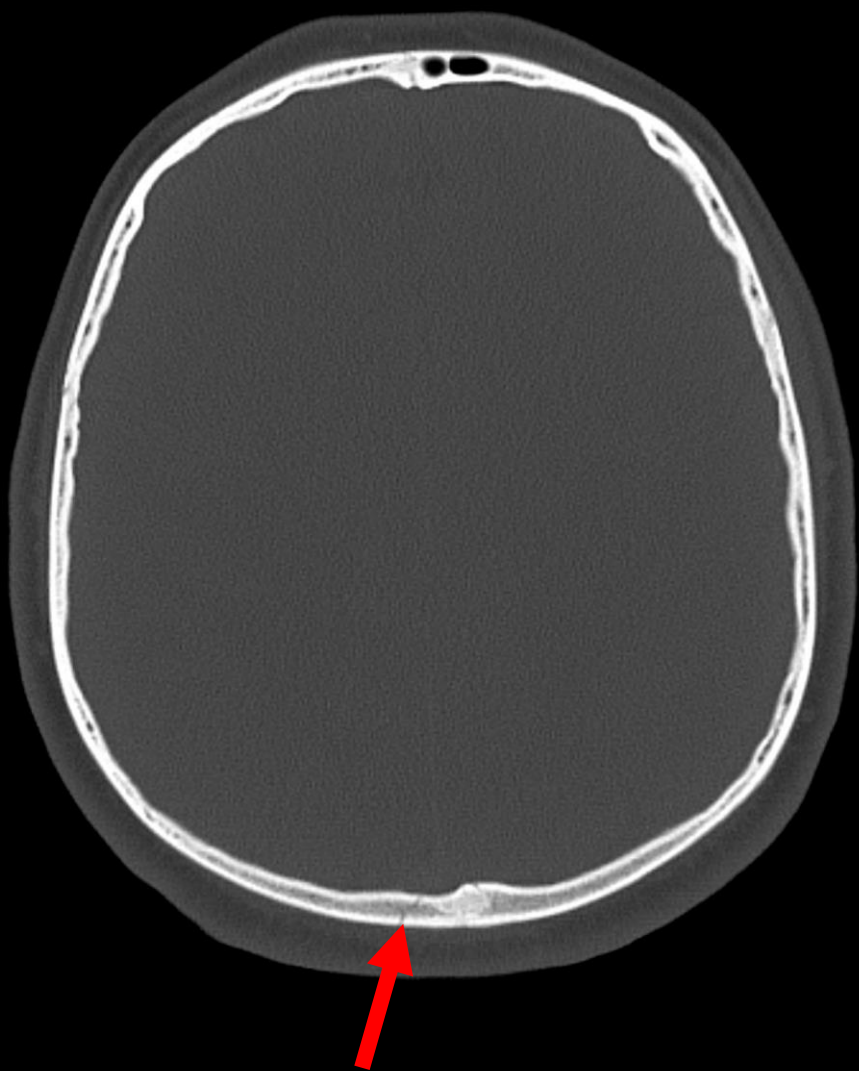


Can be VERY small...

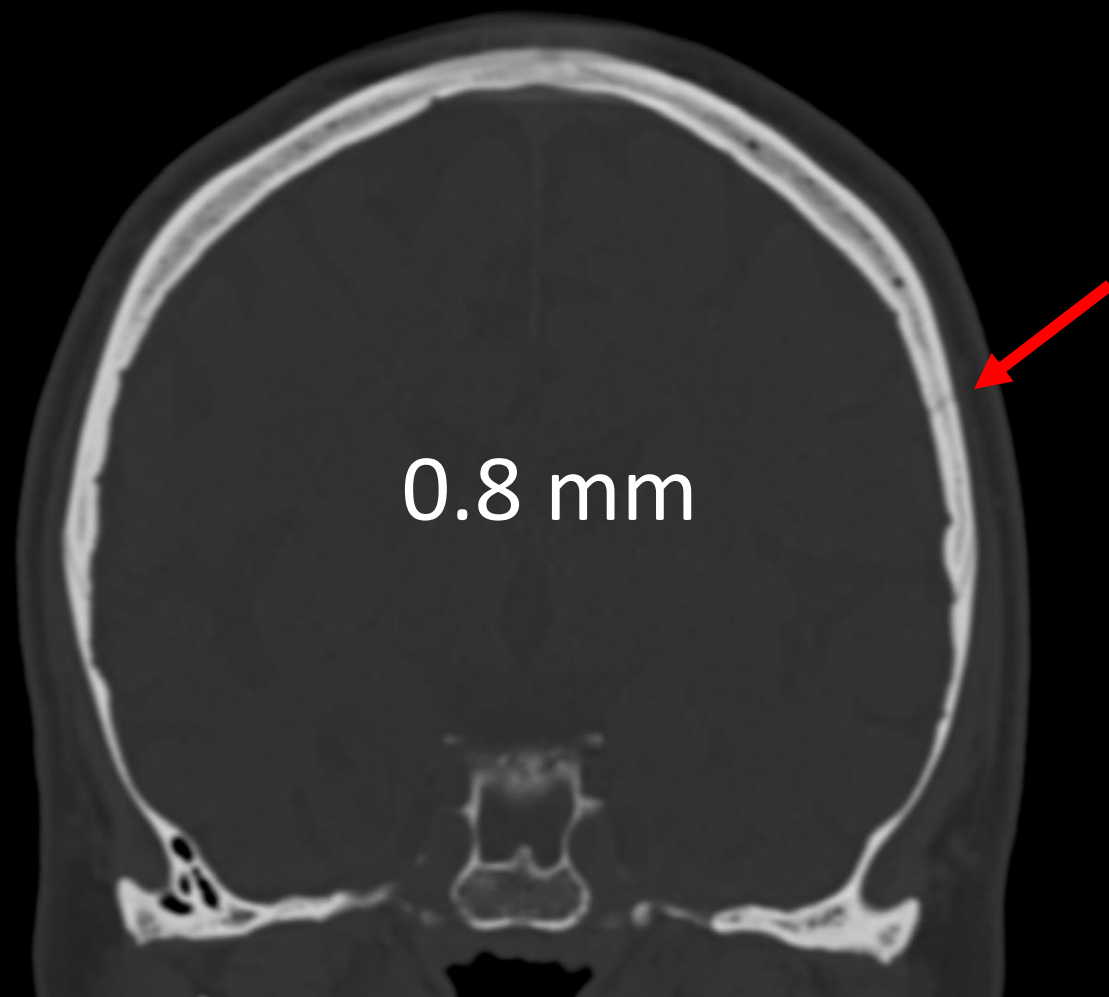
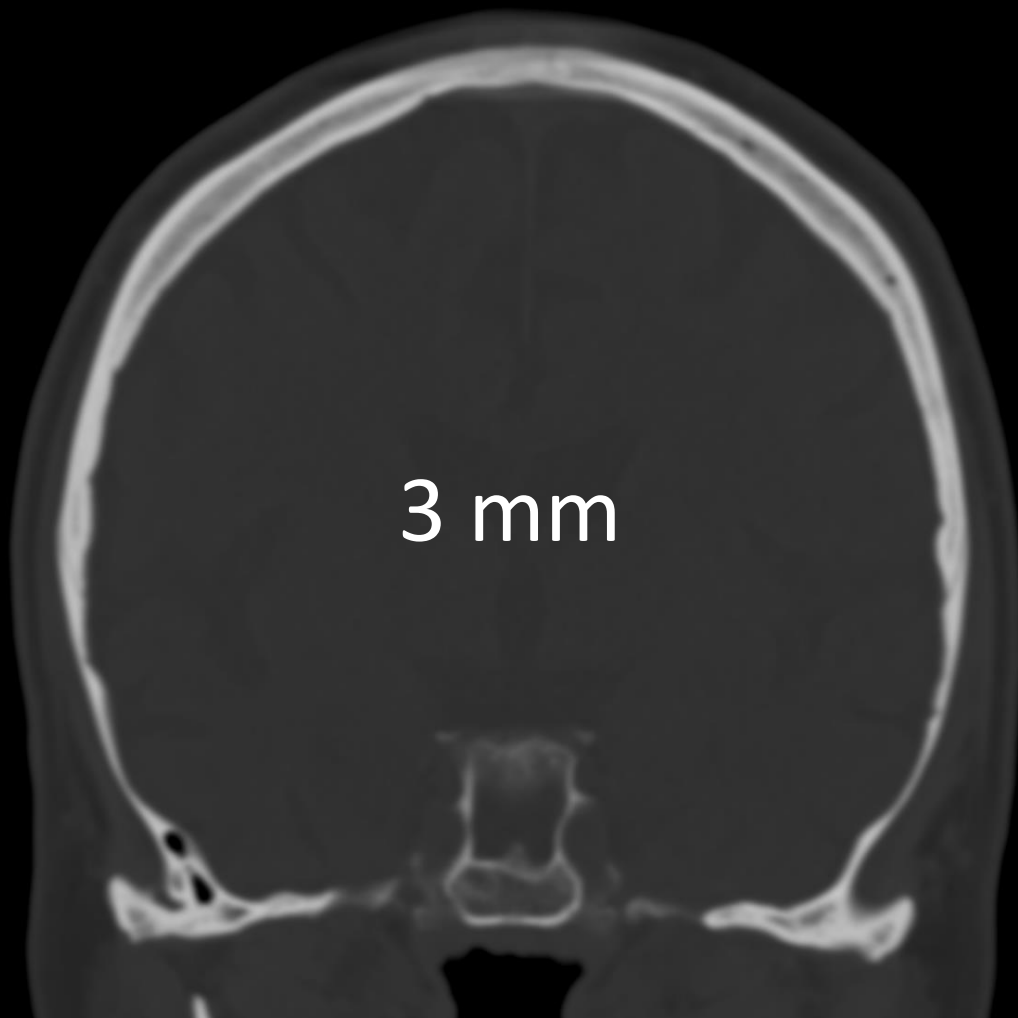


Can also be venous... especially if fracture traverses a sinus/suture

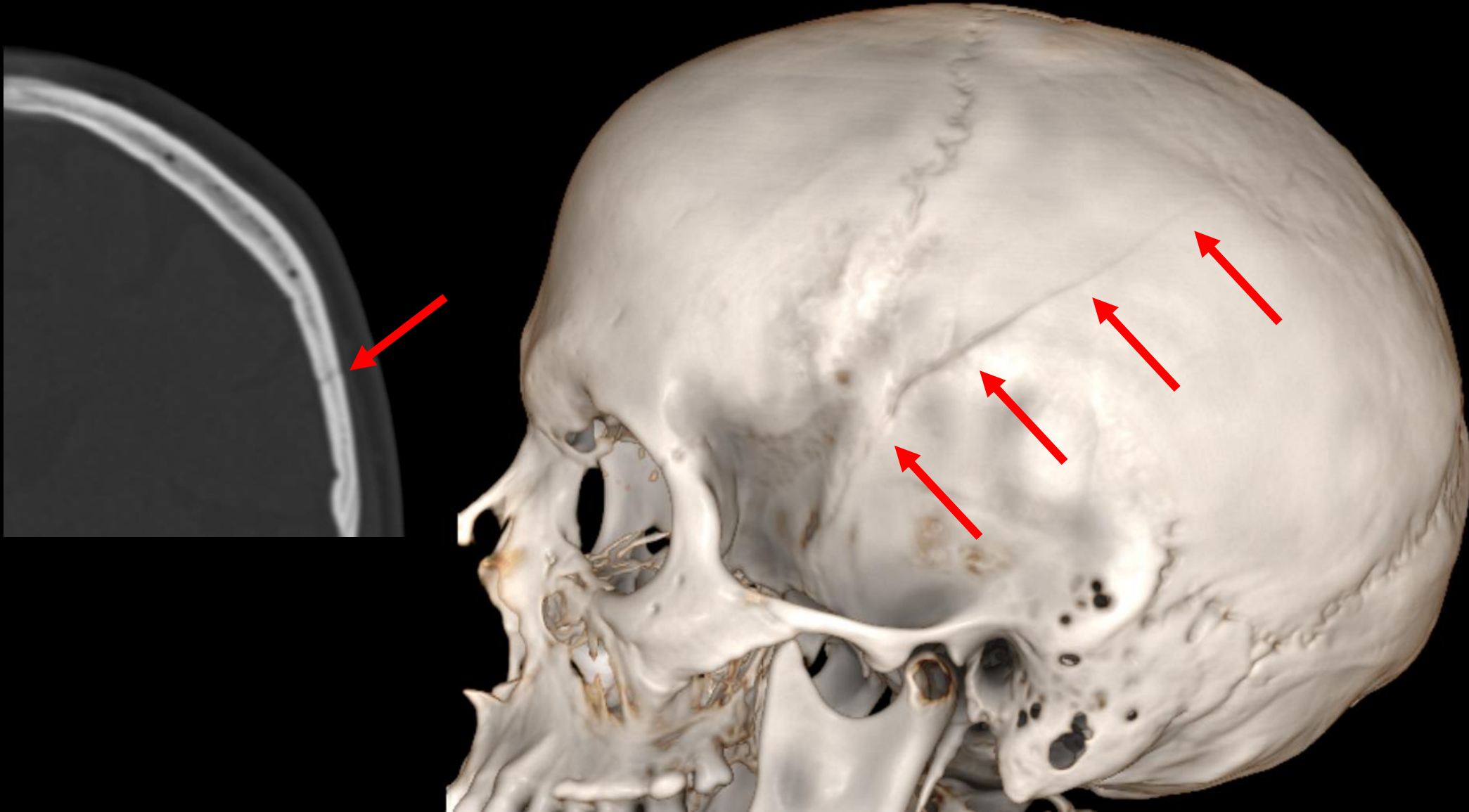




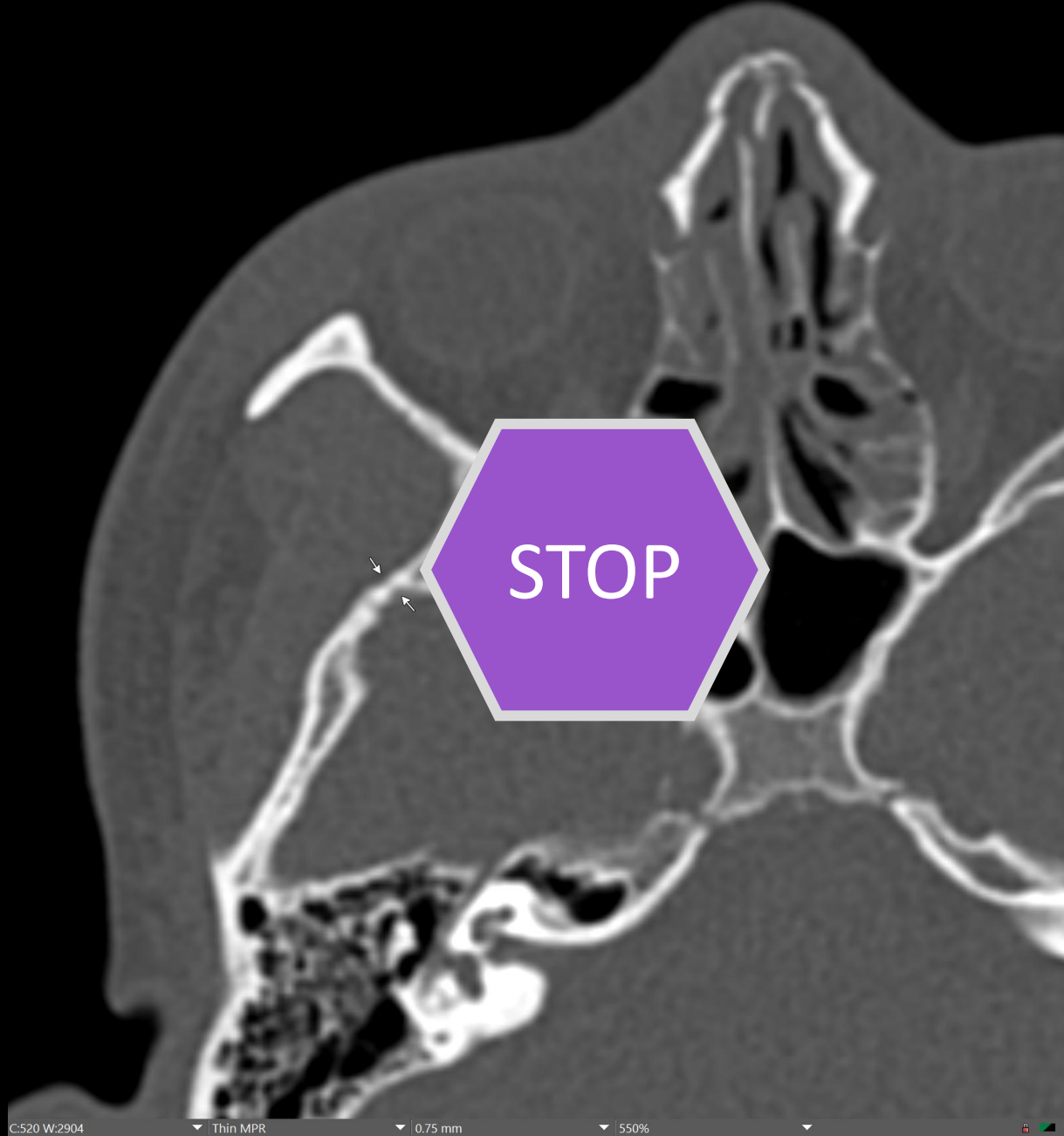
Use thin slices



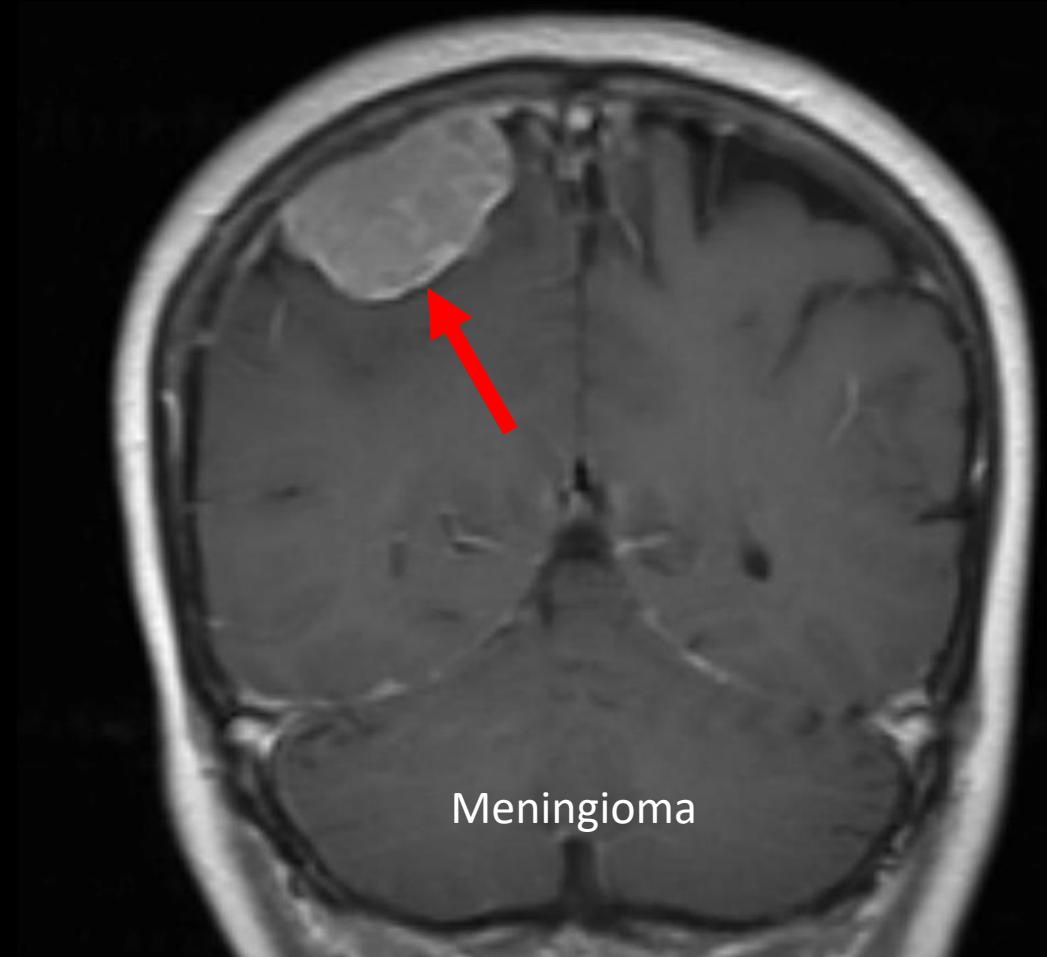
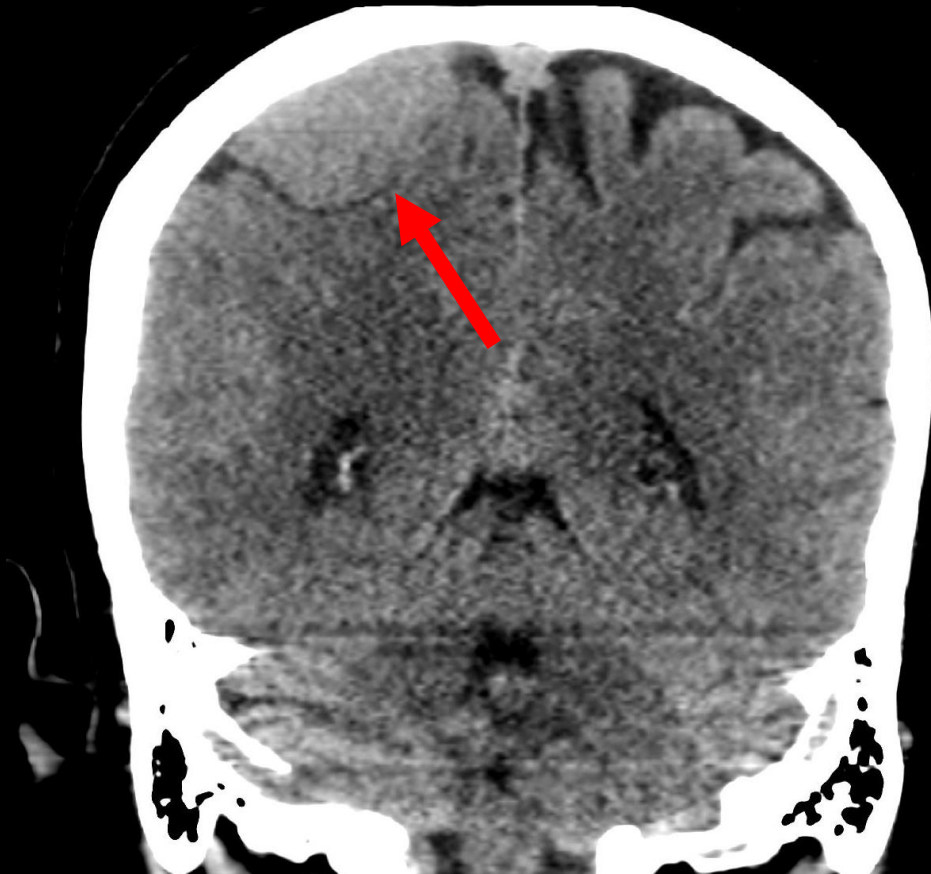
Calvarial fractures more obvious on 3D



Nondisplaced fractures are usually better seen while scrolling



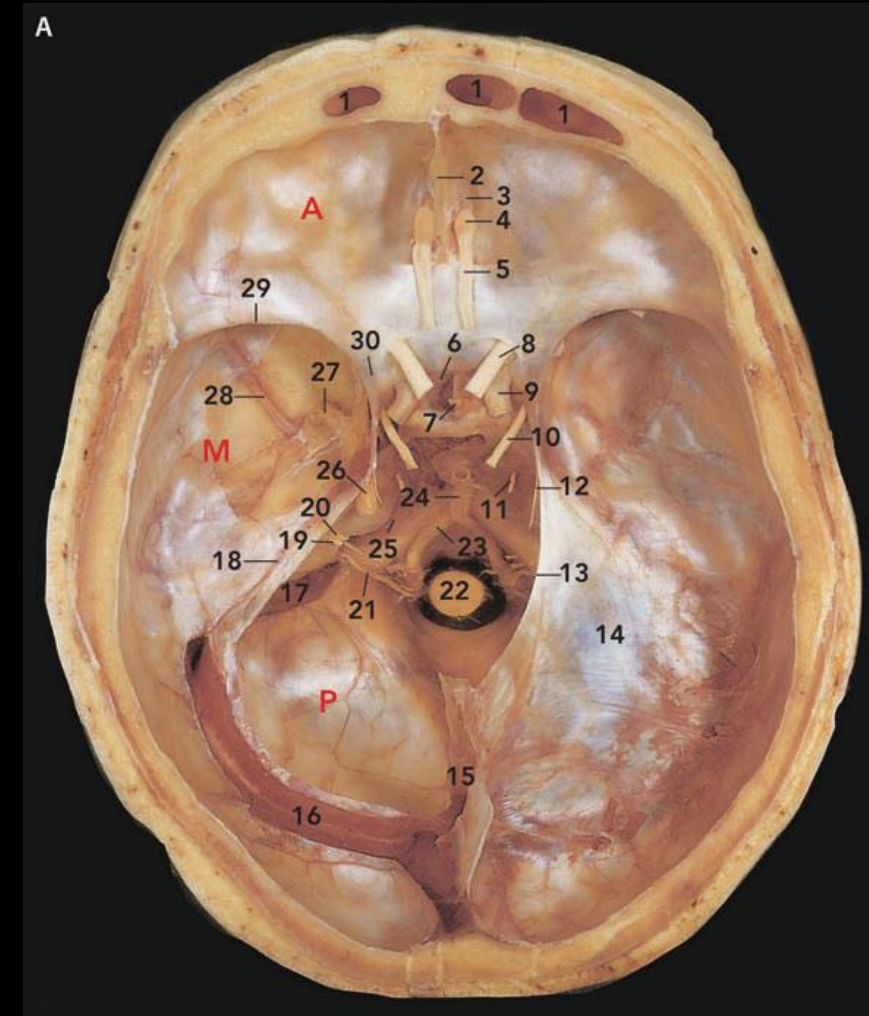
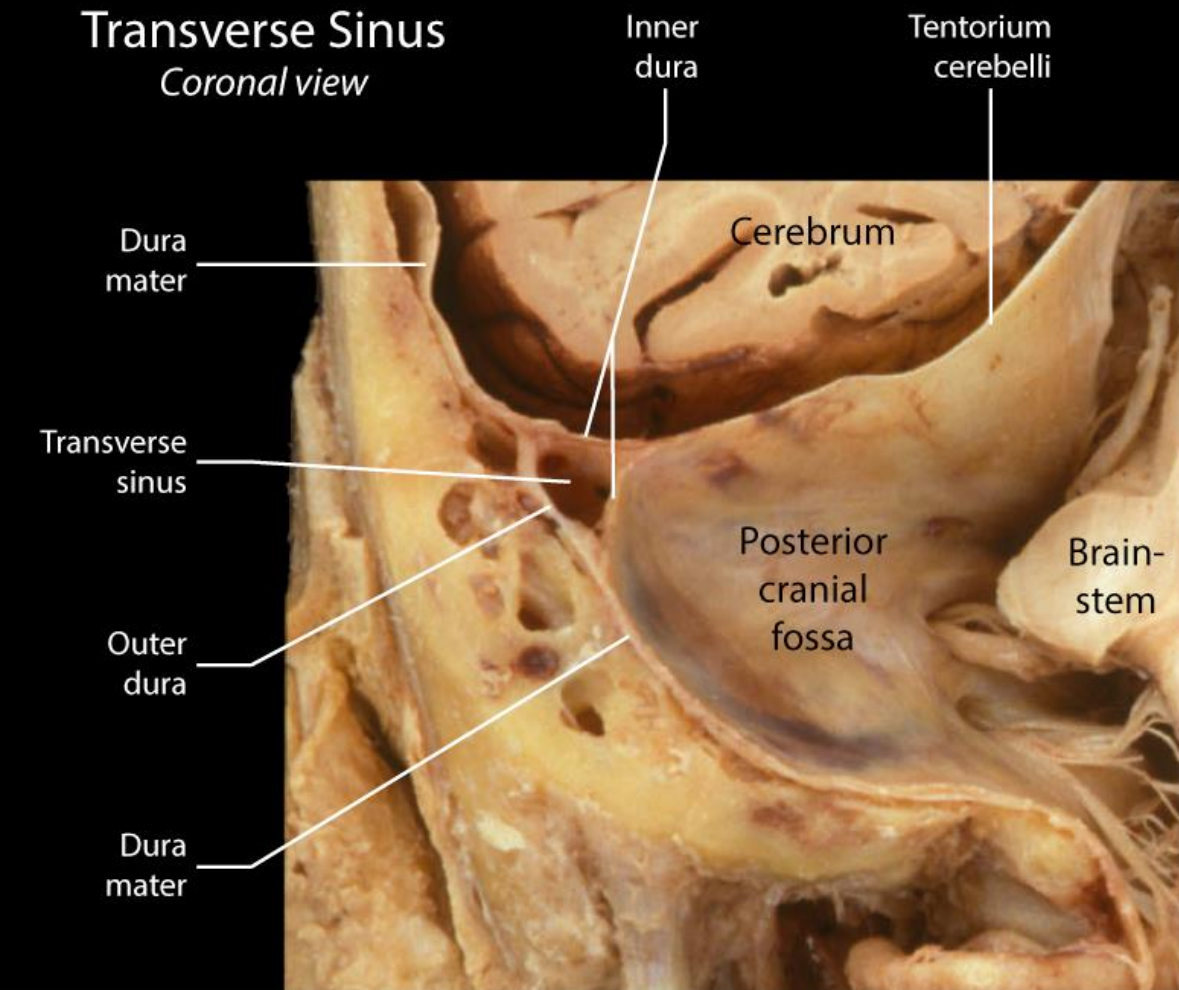
History: "Trauma" – no skull fracture



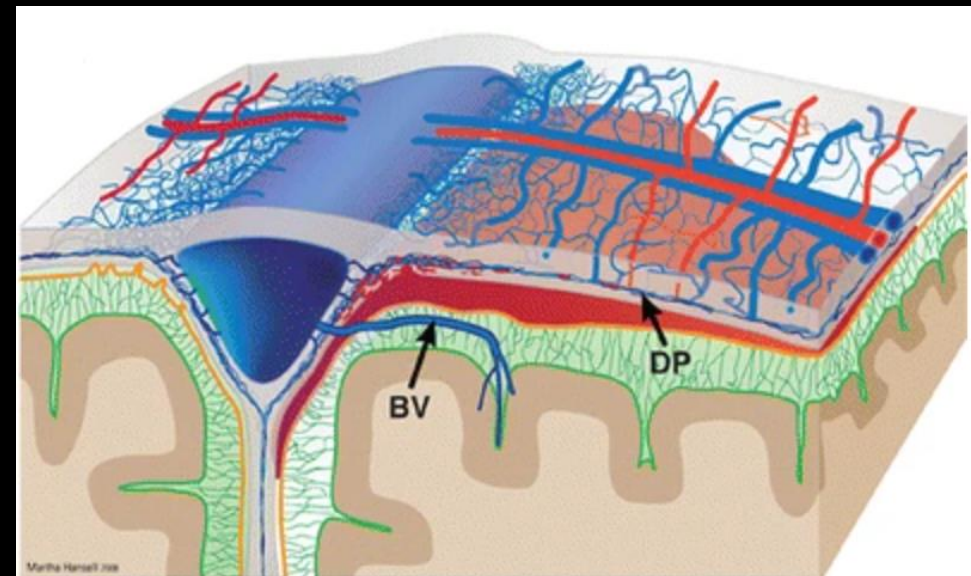
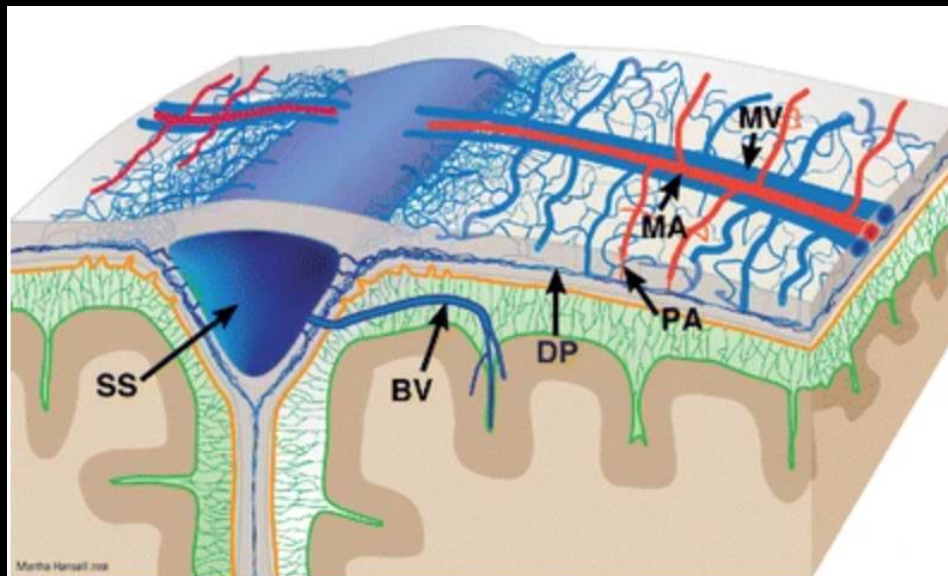
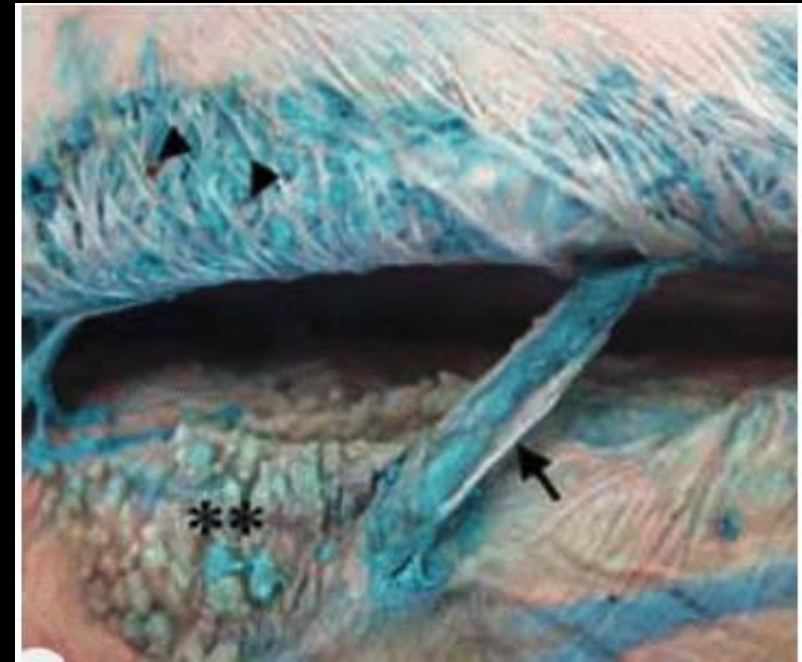
Epidural mimics

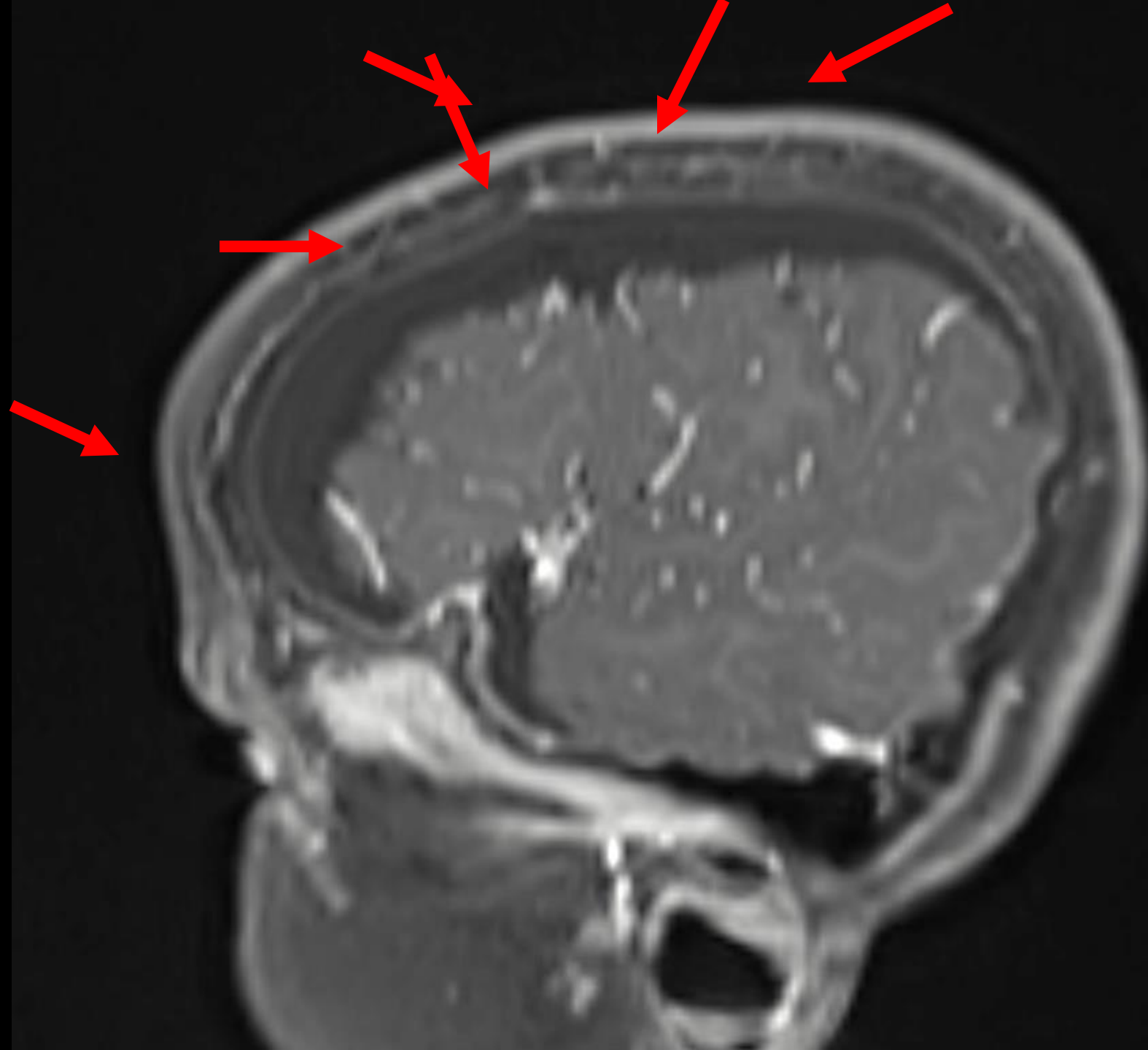
- Meningioma
- Subdural hematoma
- Dural/bone mets

Subdural space (a potential space)

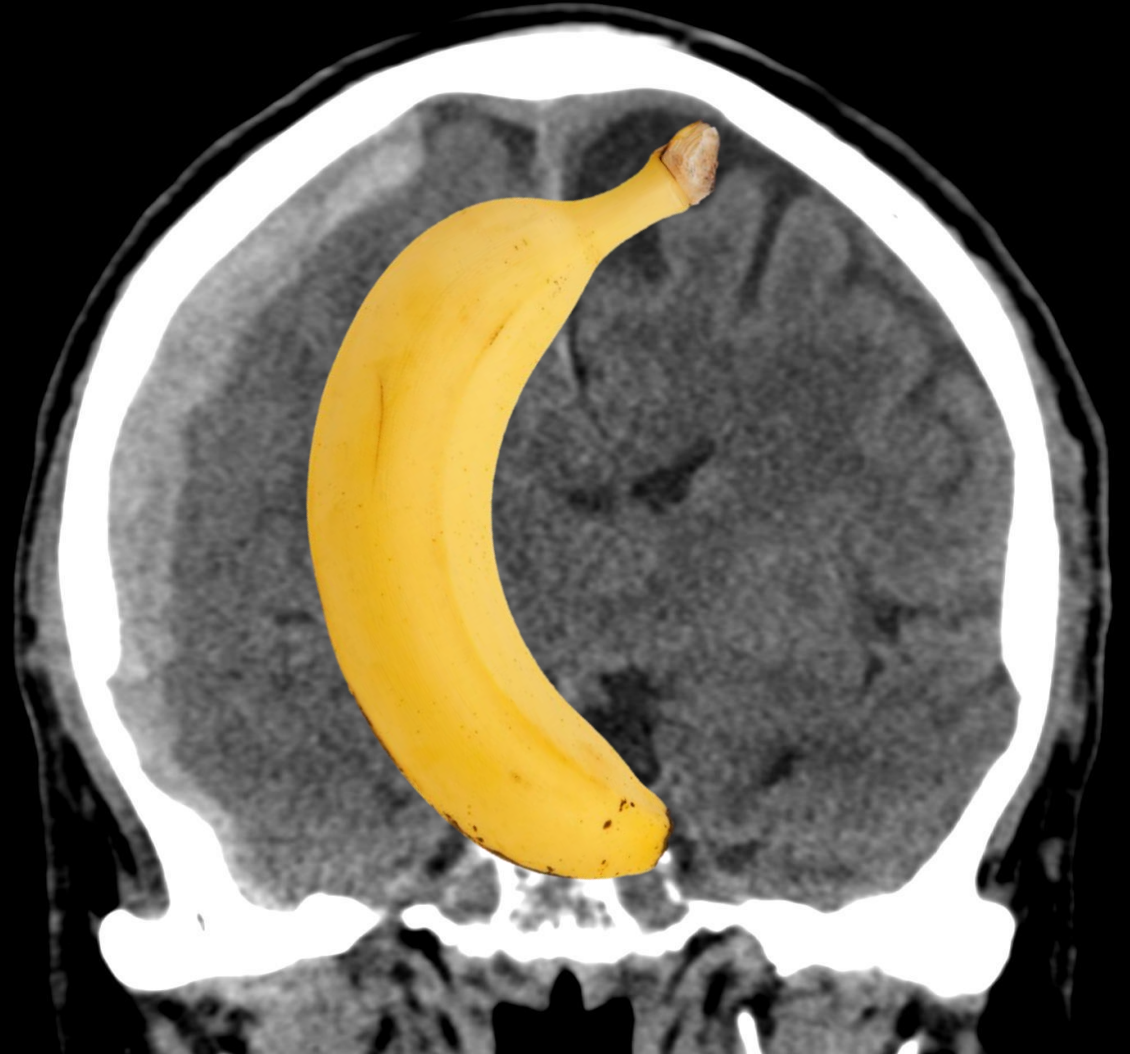


Tearing of bridging veins

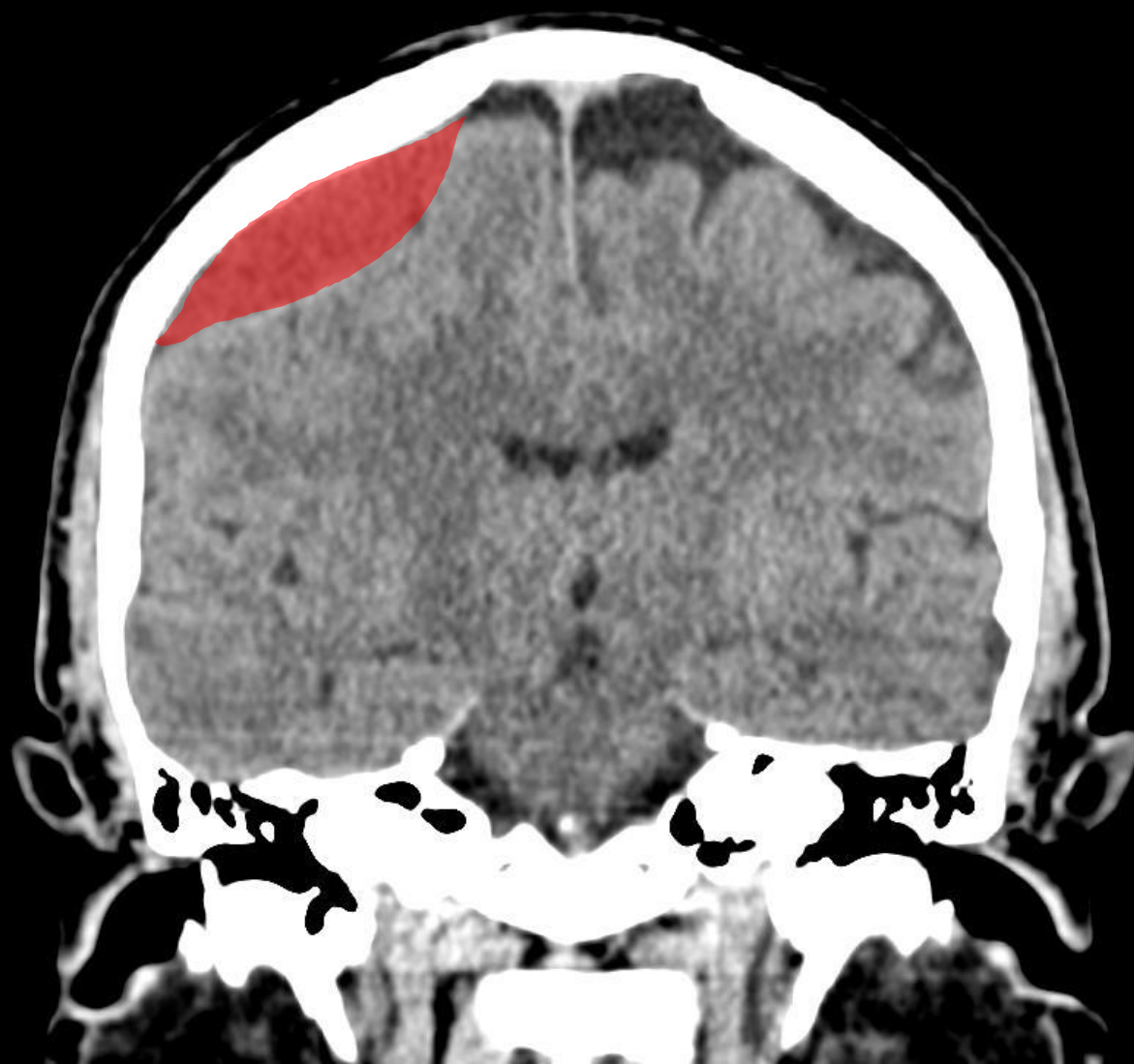




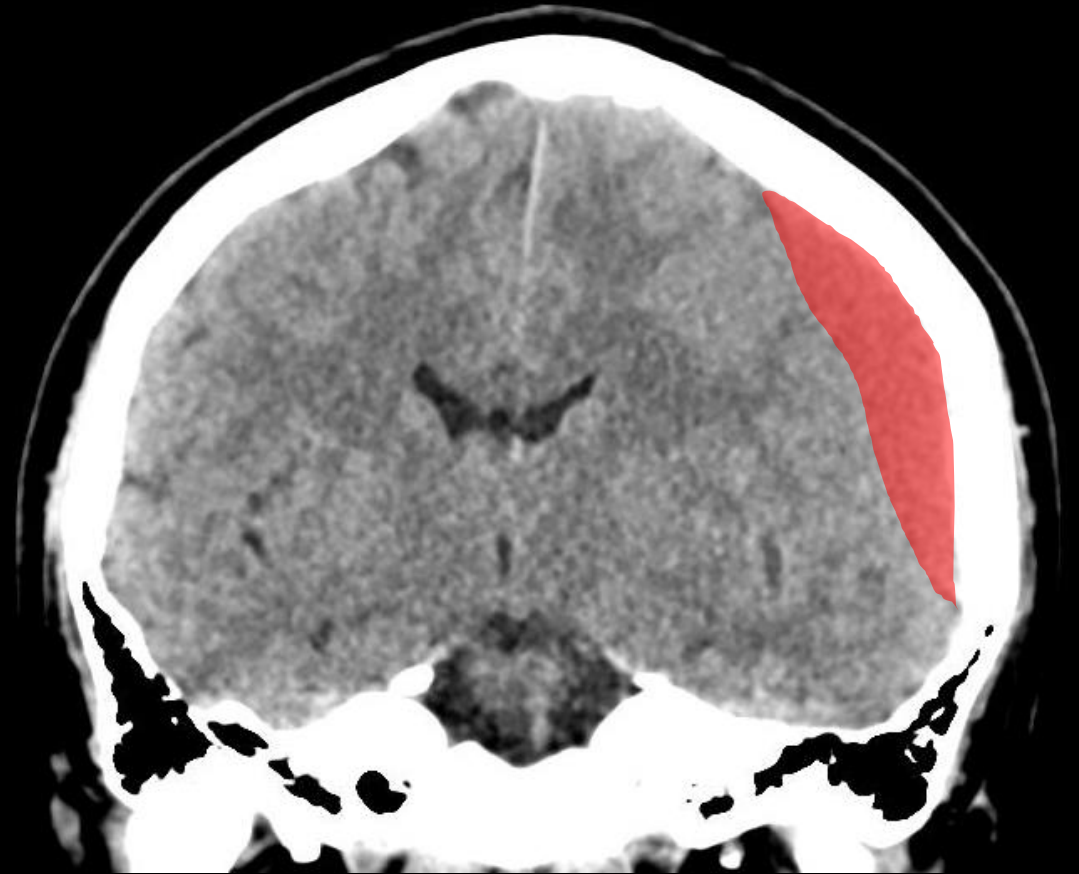
Bound by dural reflections (falx, tentorium)



Density varies – acute blood generally brighter

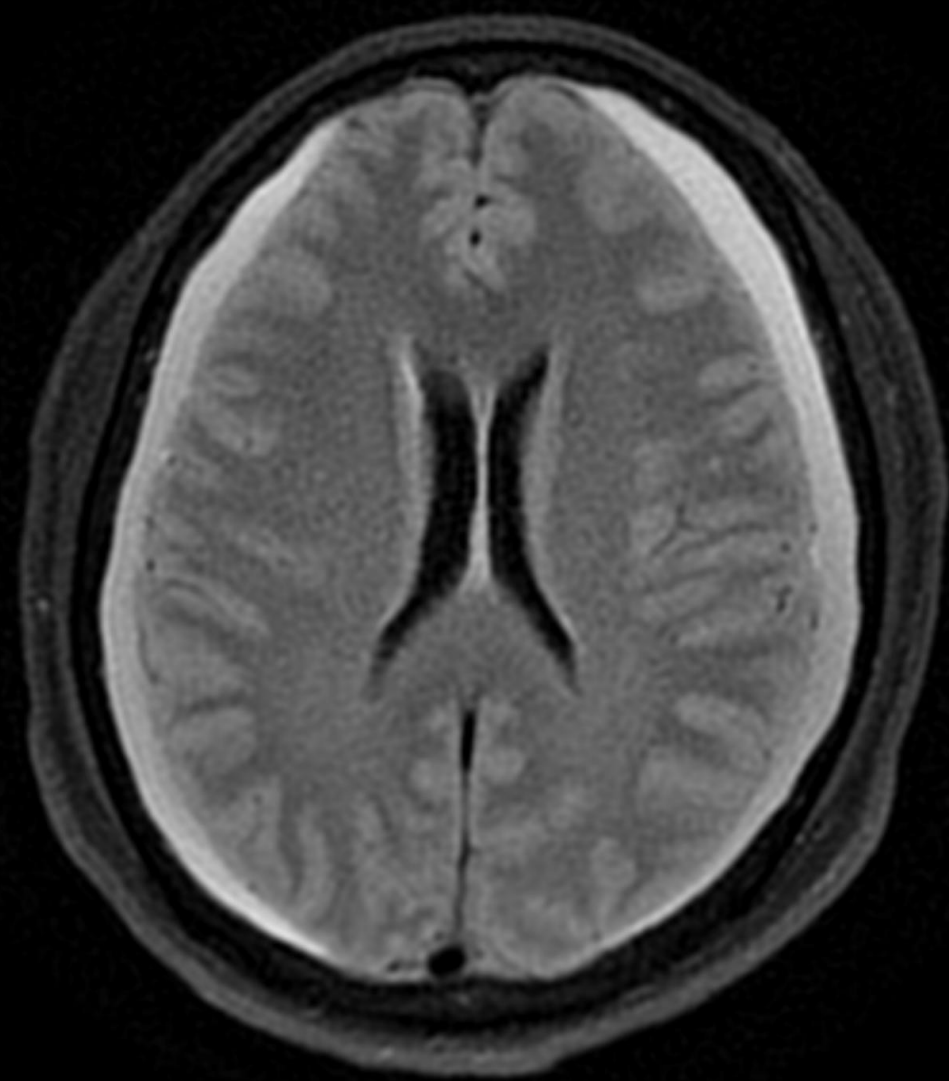


Another subtle isodense subdural



Beware the bilateral subdurals!





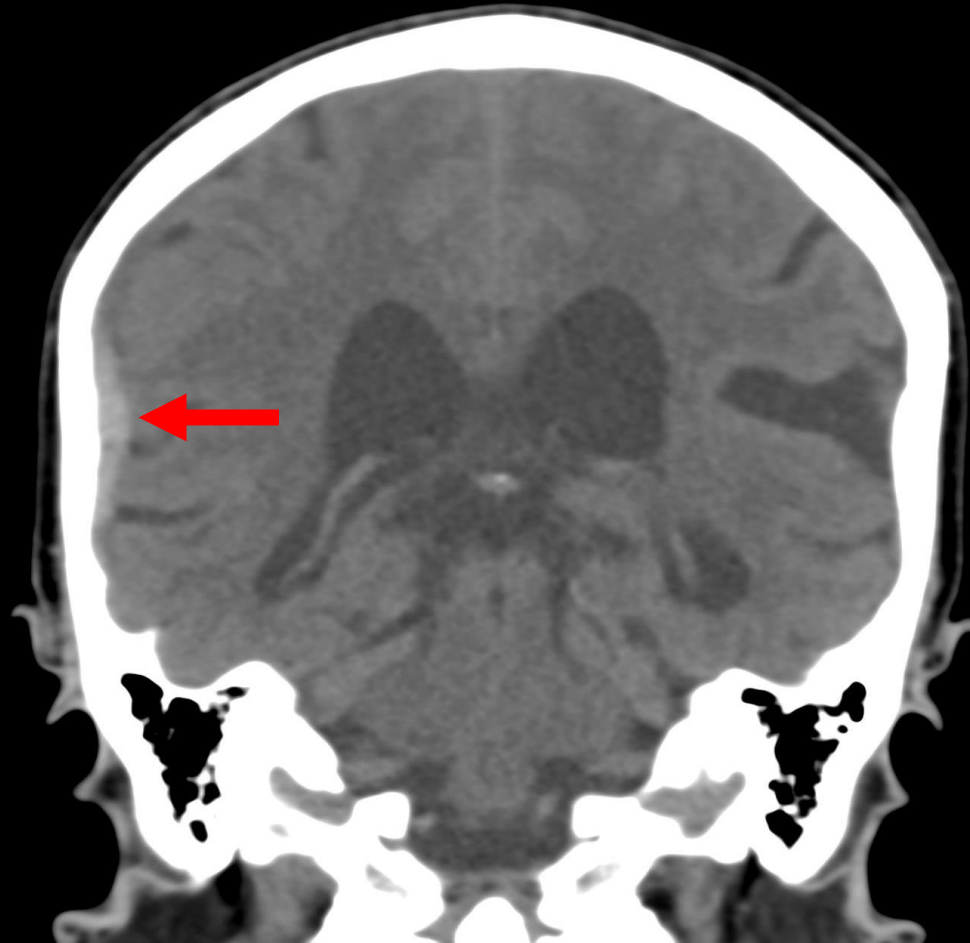
Check the thickness of the falx



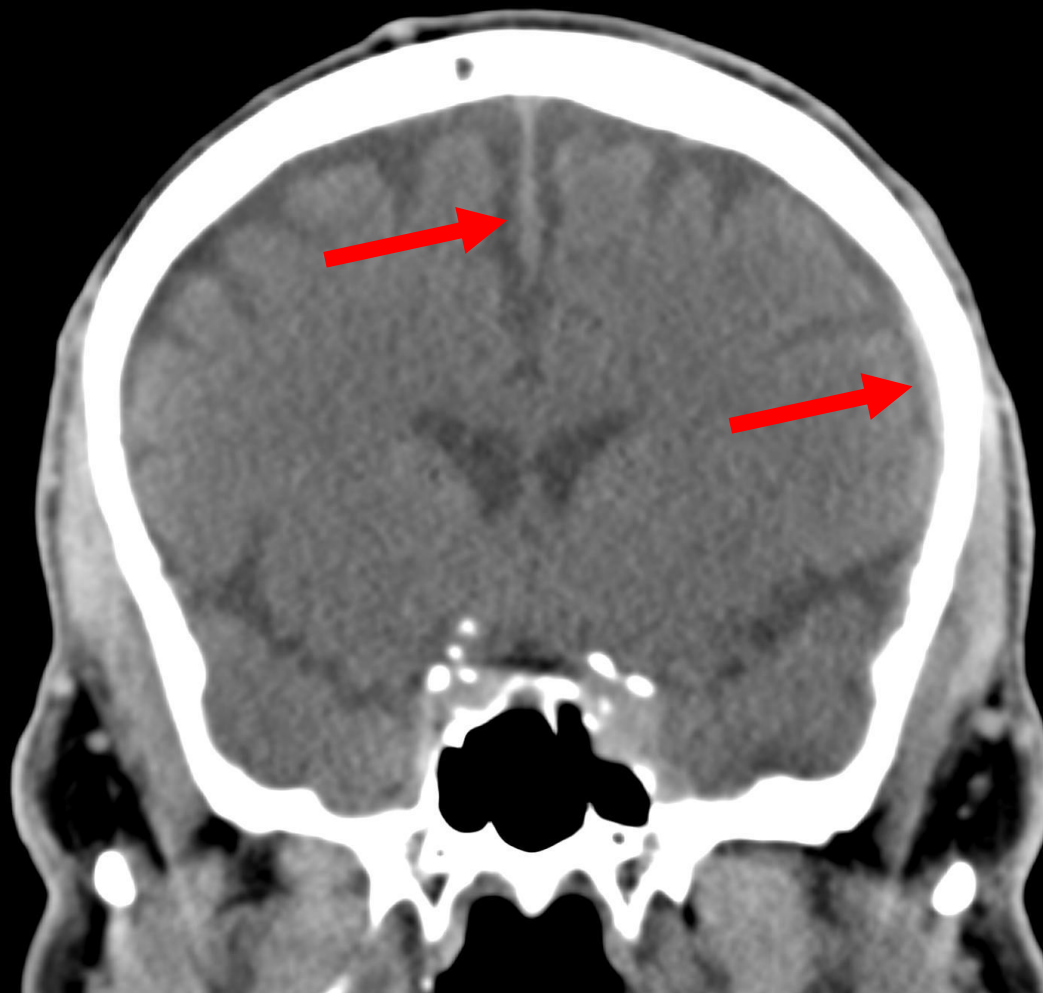
Check the thickness of the tentoria

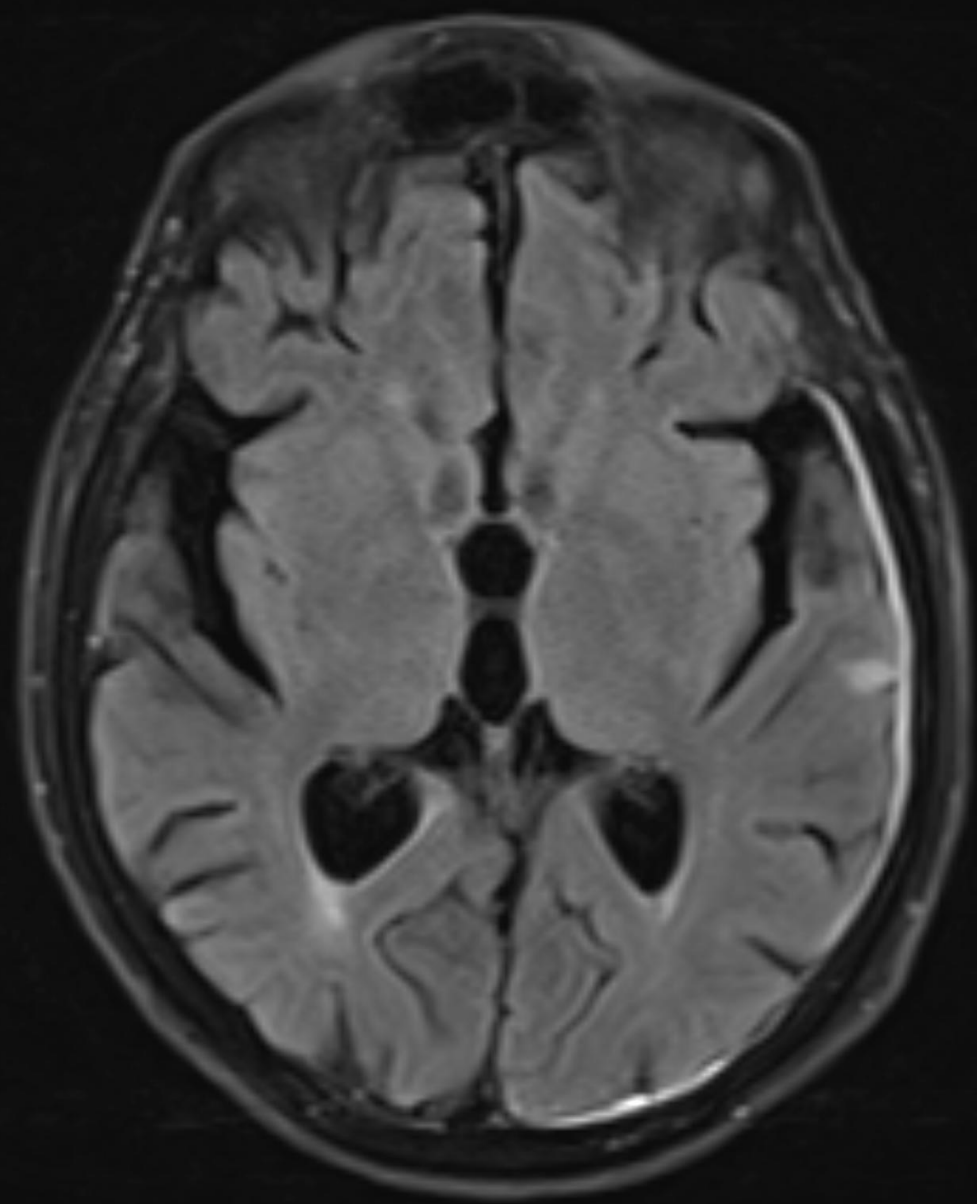


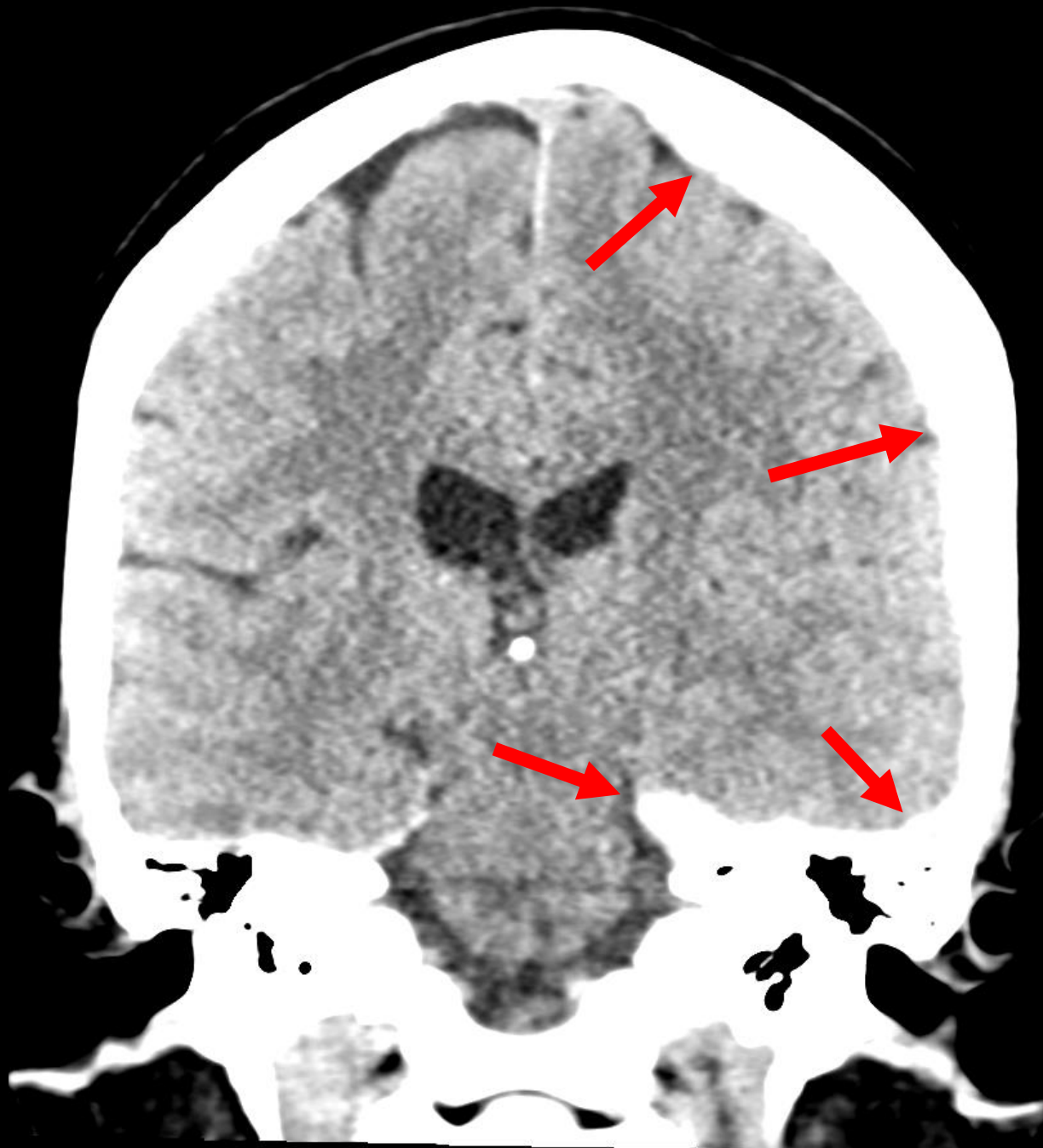
Use your subdural windows!

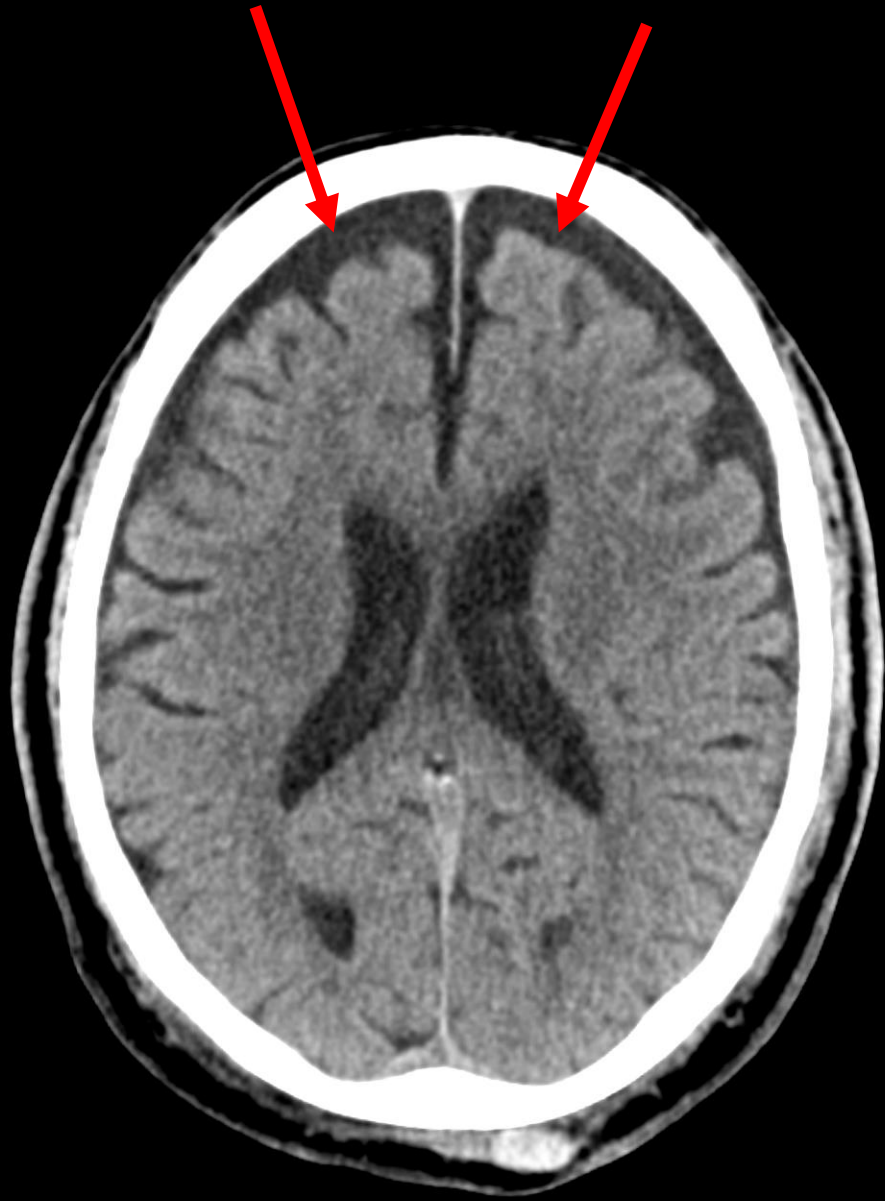


Use your subdural windows!

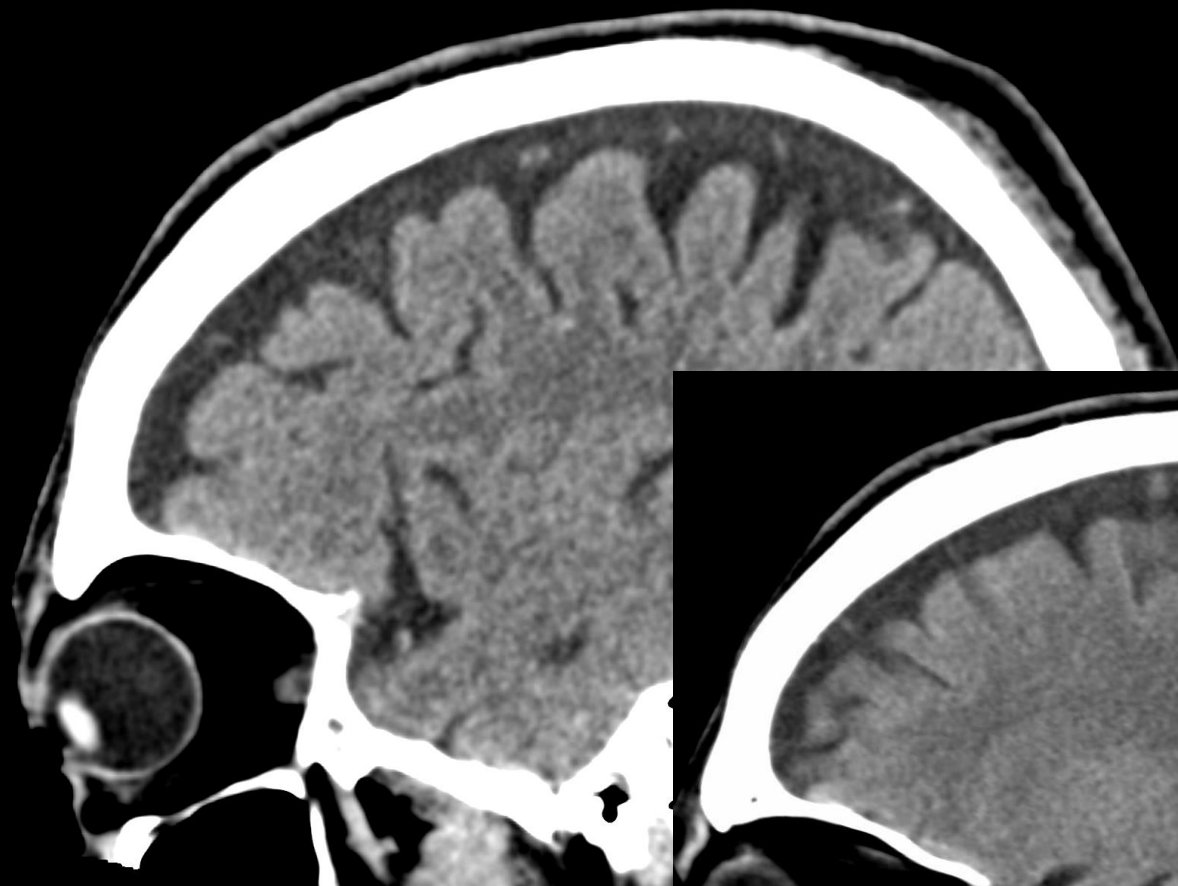




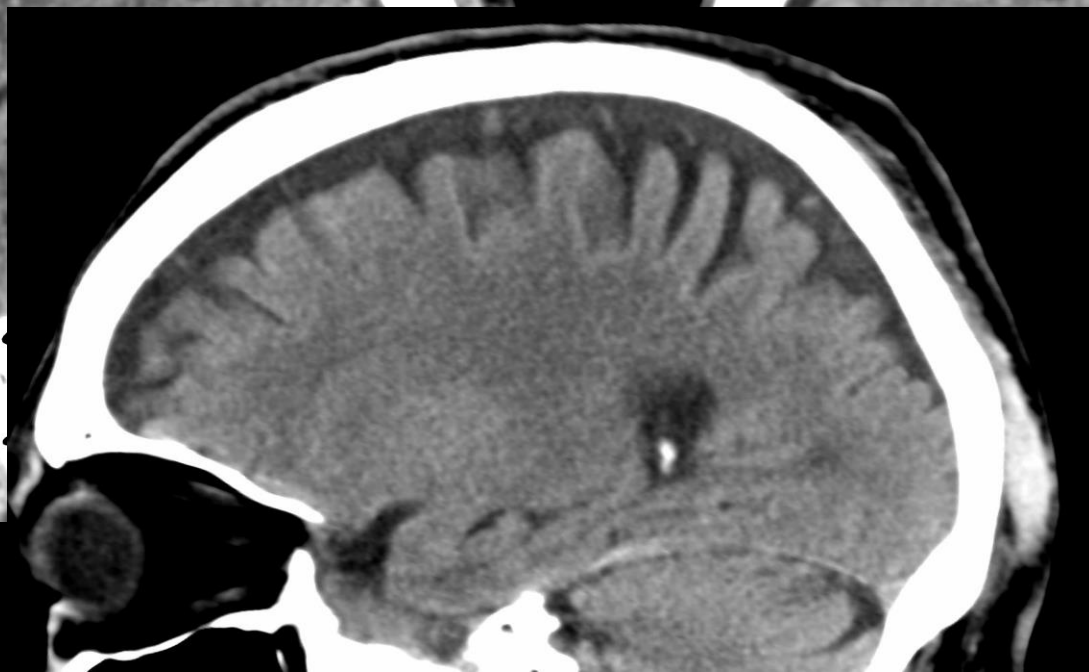
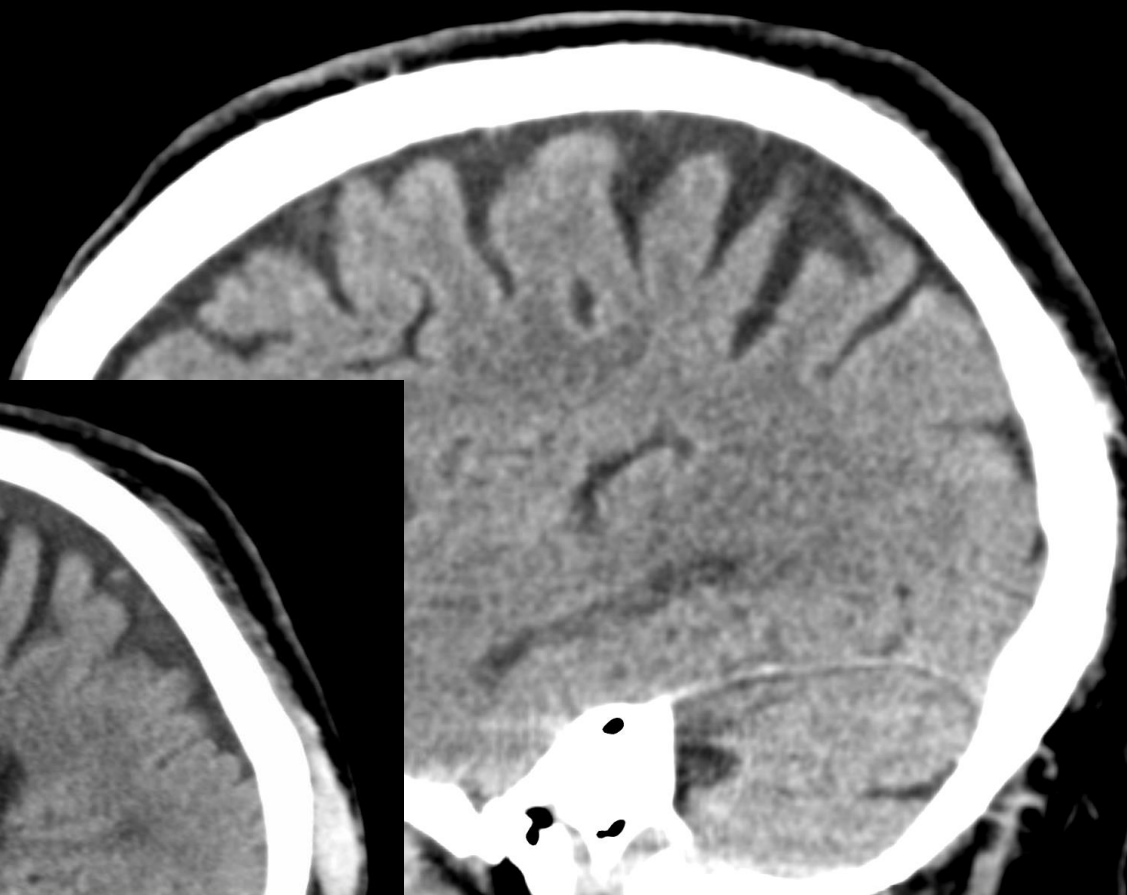


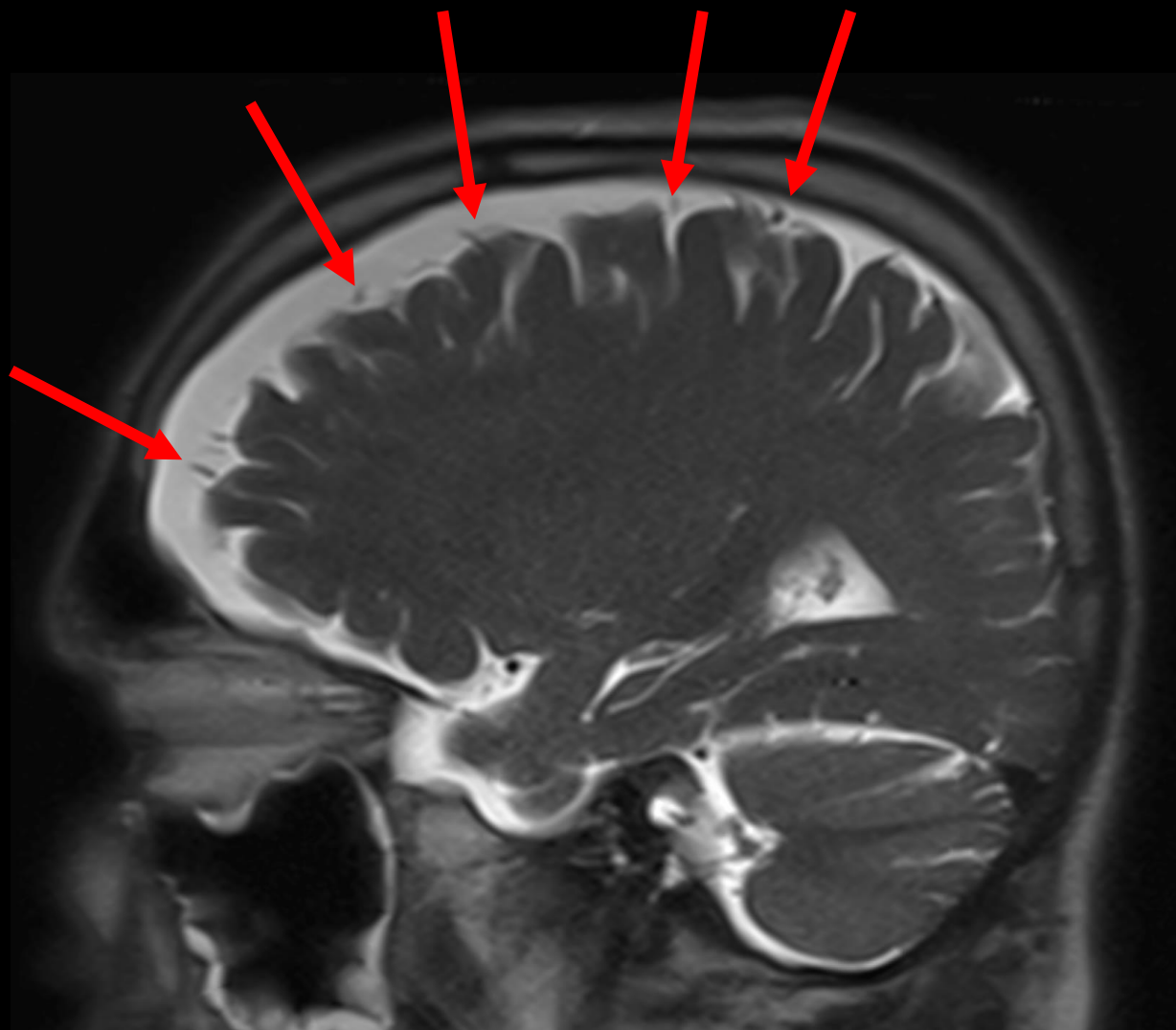
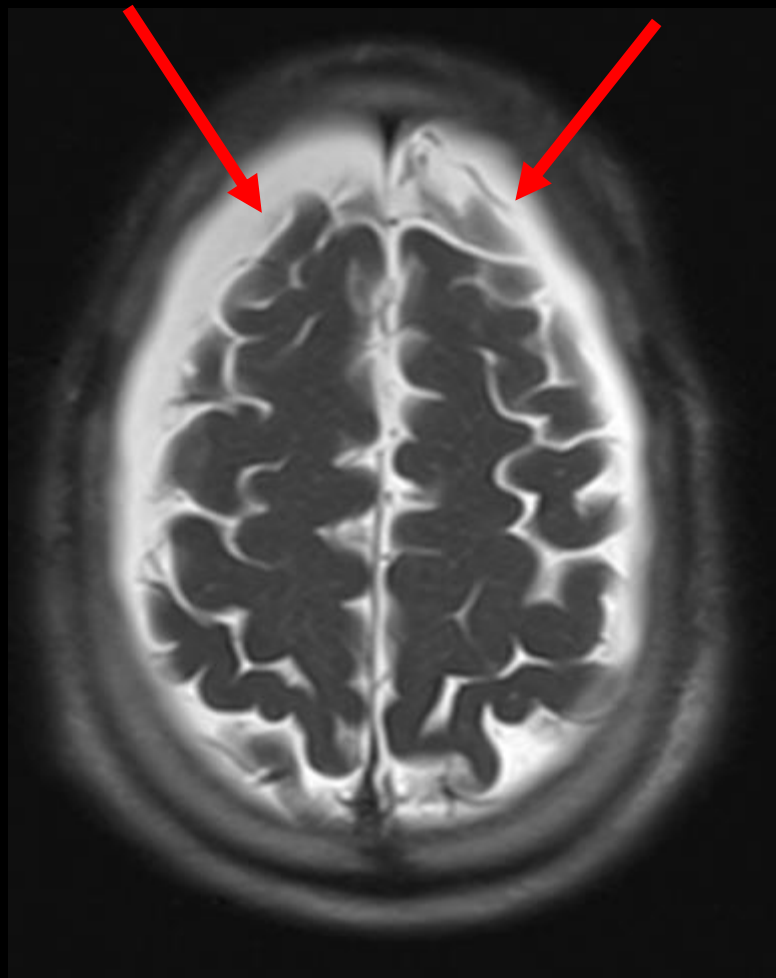


Current

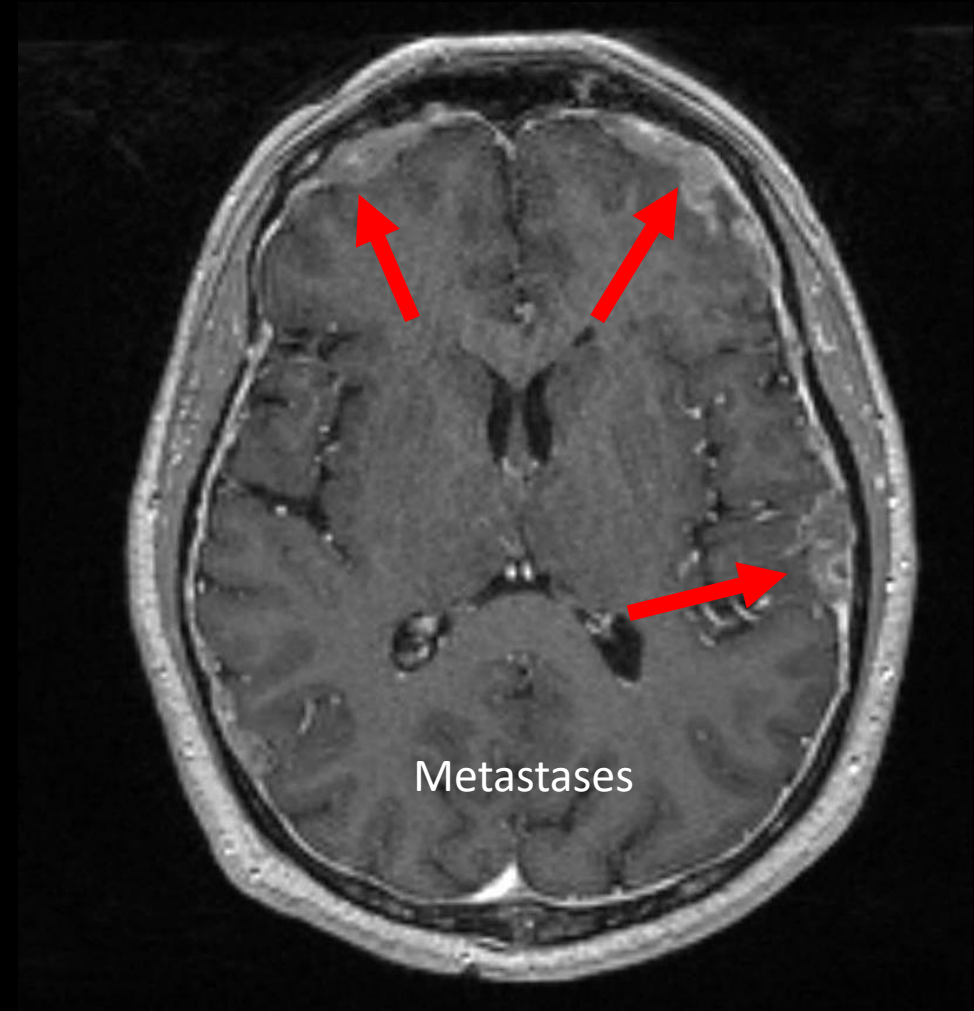
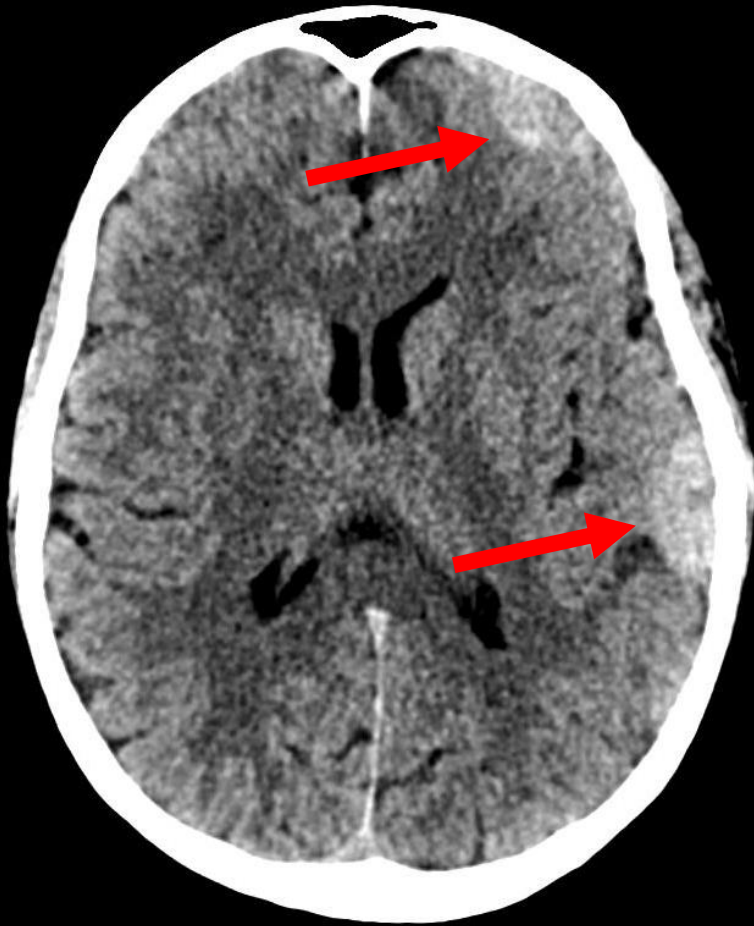


Prior





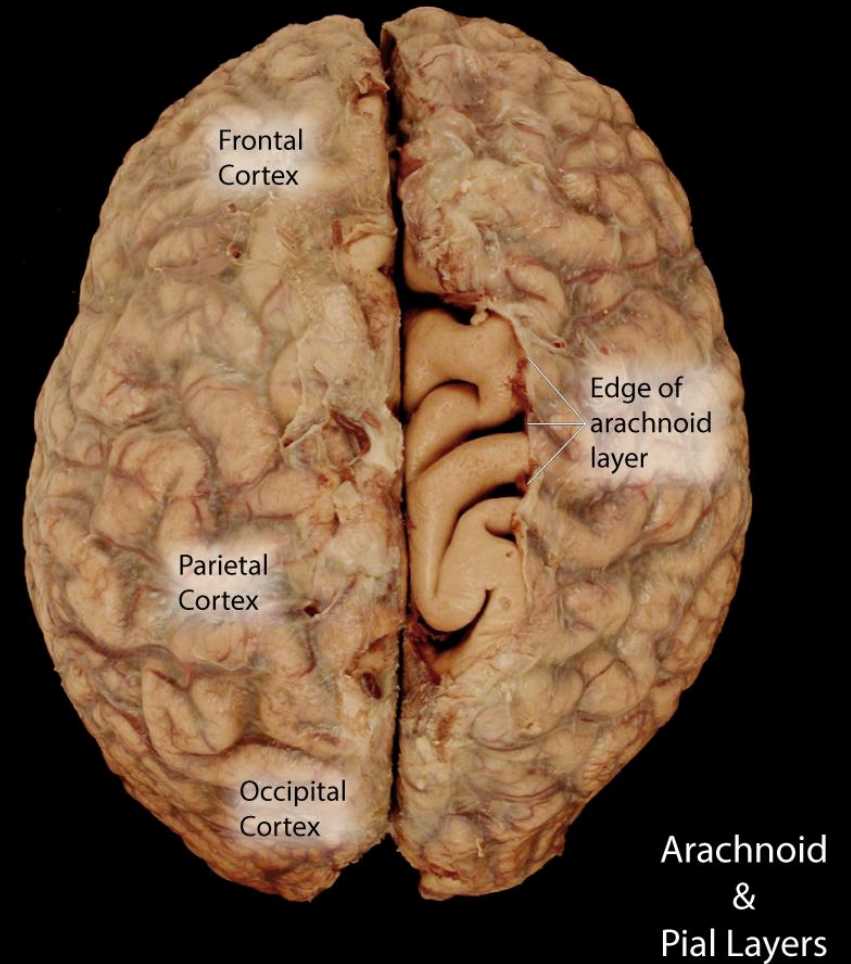
History: Prostate cancer



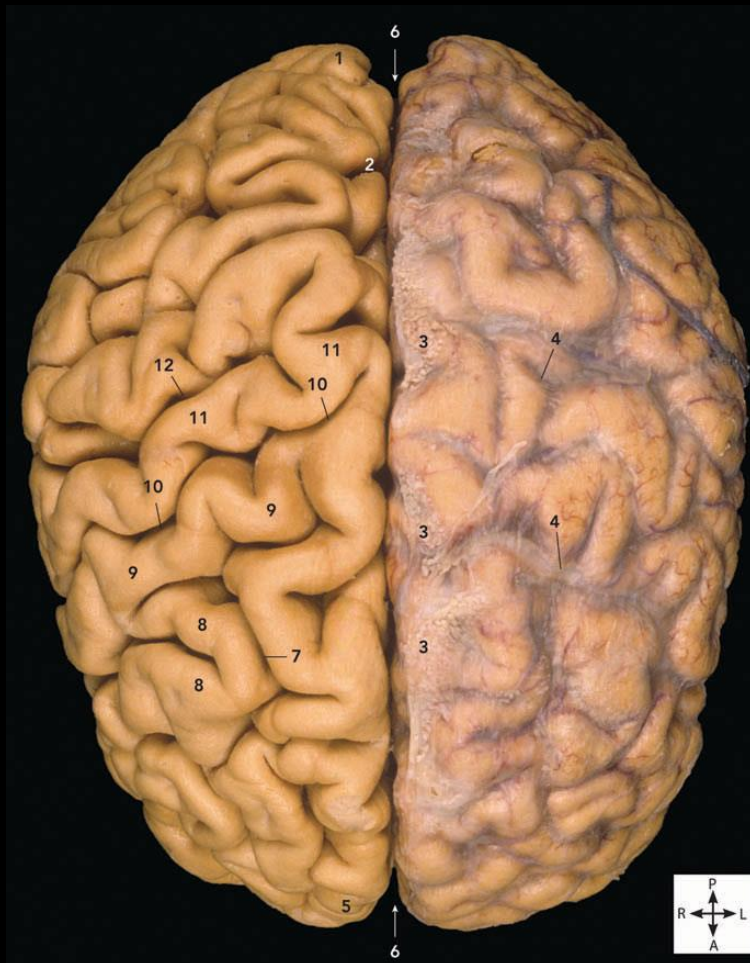
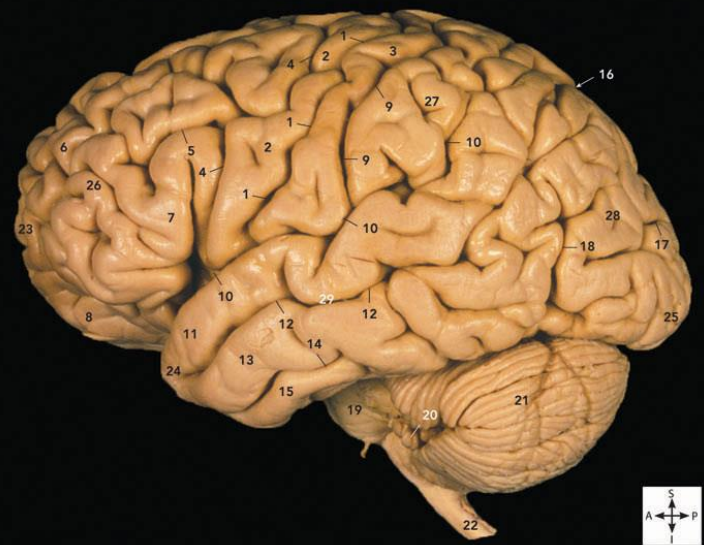
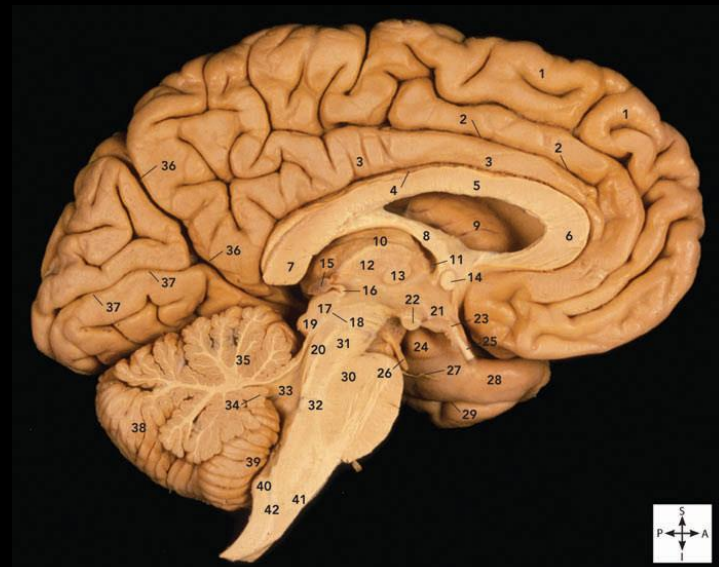
Subdural mimics

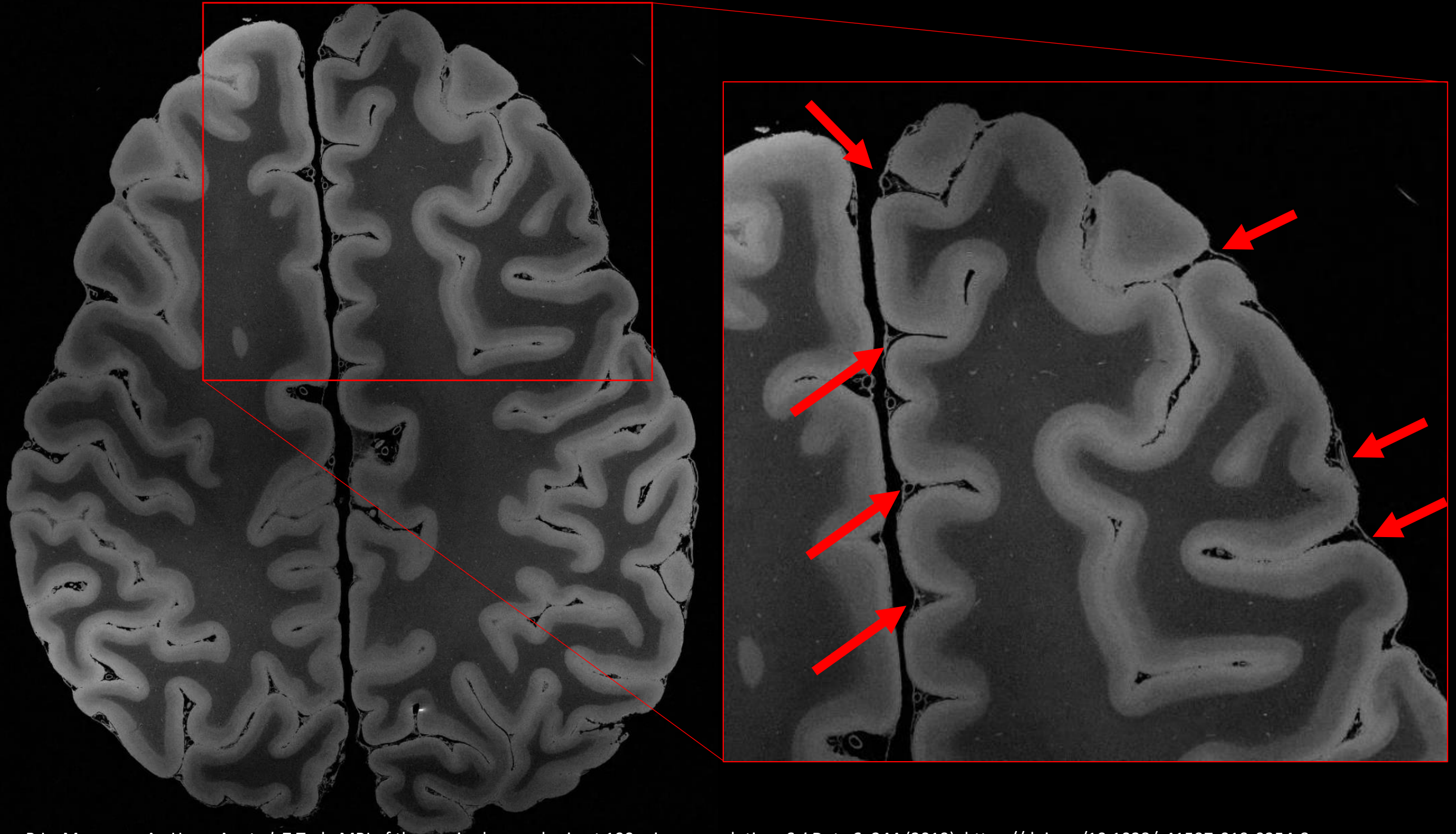
- Hygroma
- Intracranial hypotension
- Dural/bone metastasis
- Meningioma
- Pachymeningitis (idiopathic, ANCA associated)

Subarachnoid space

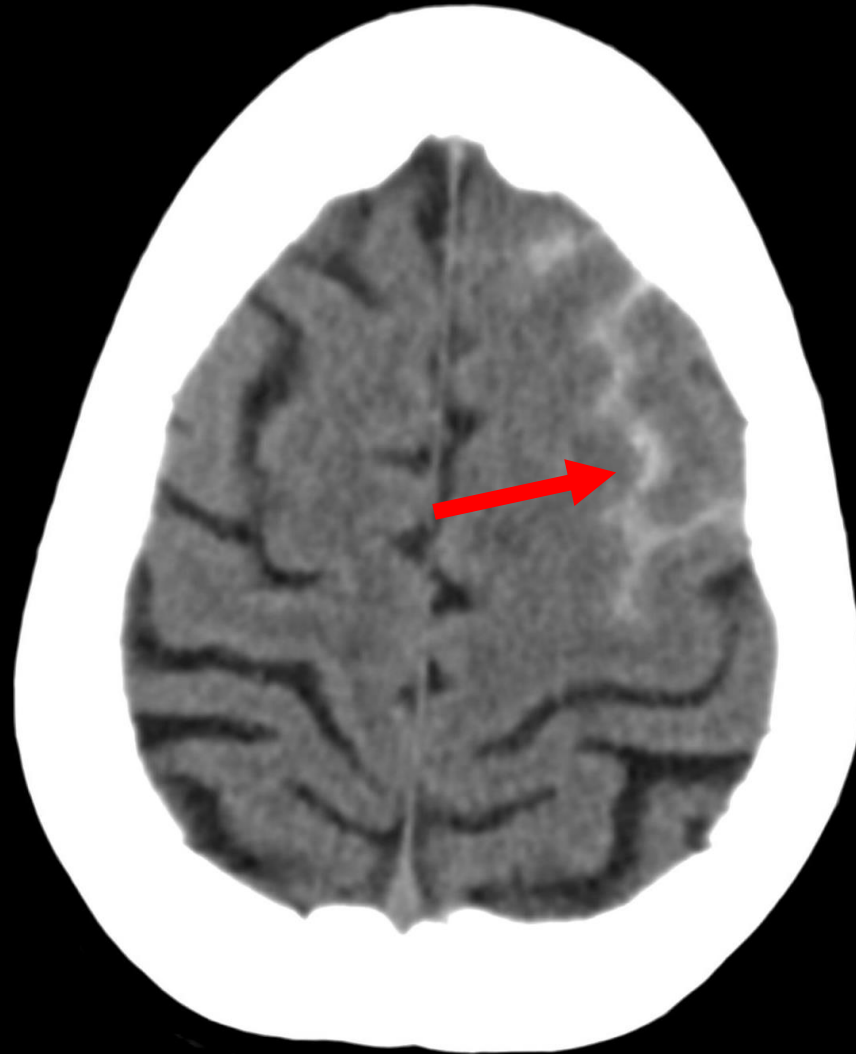


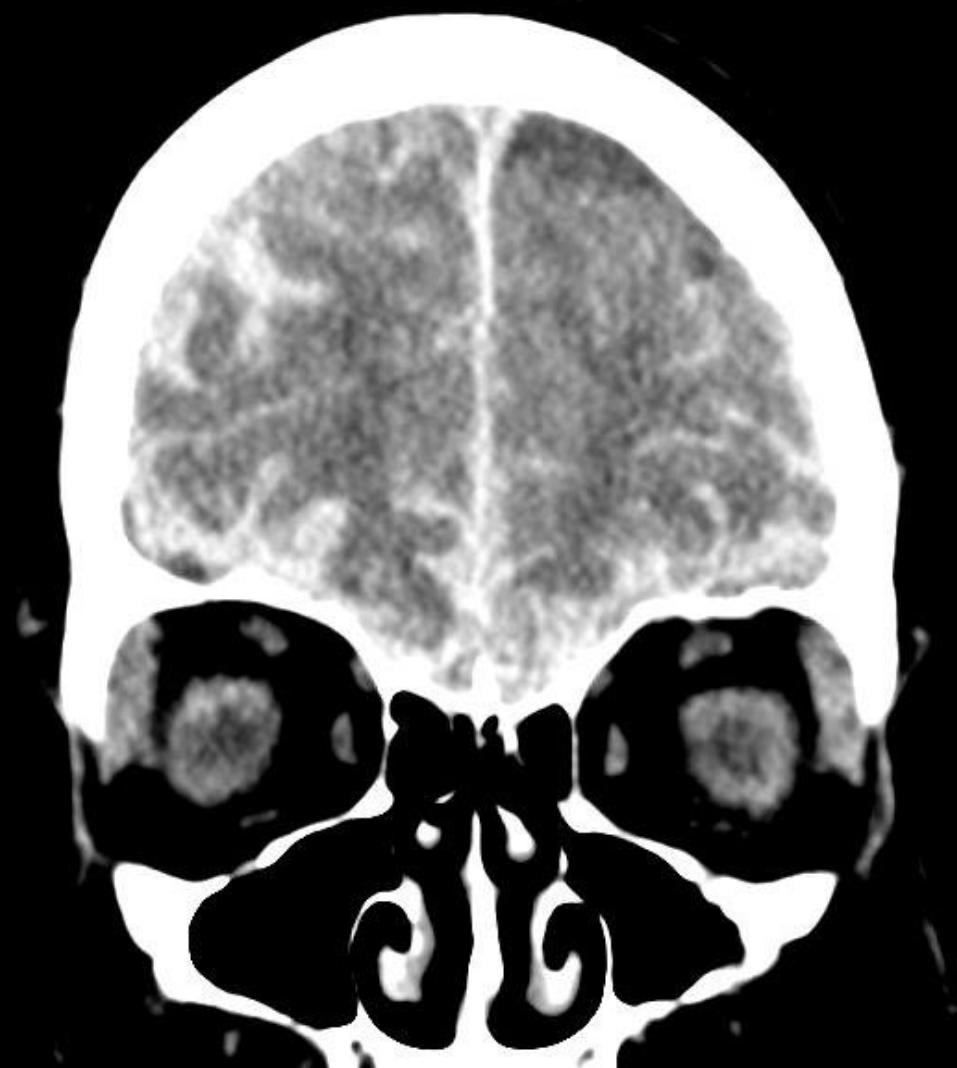
Subarachnoid space





Trauma is most common cause

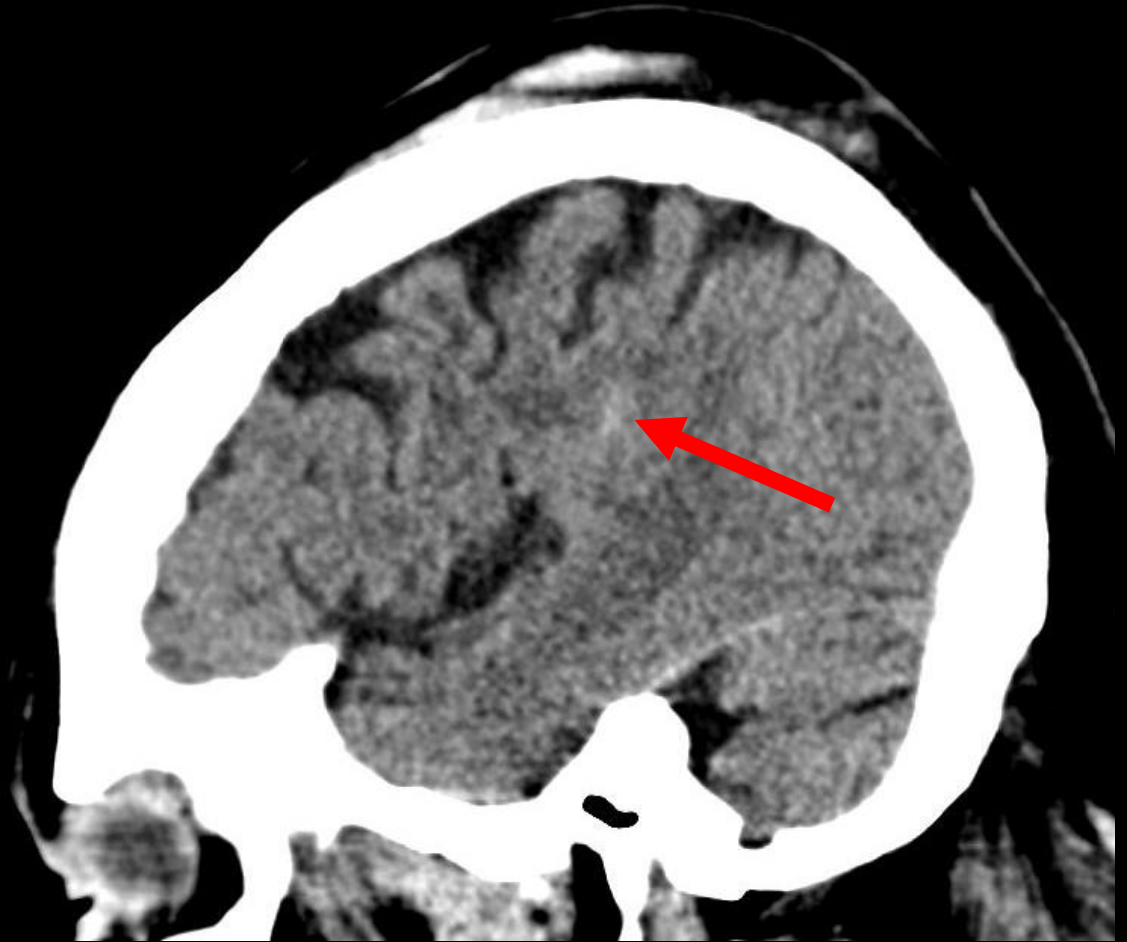




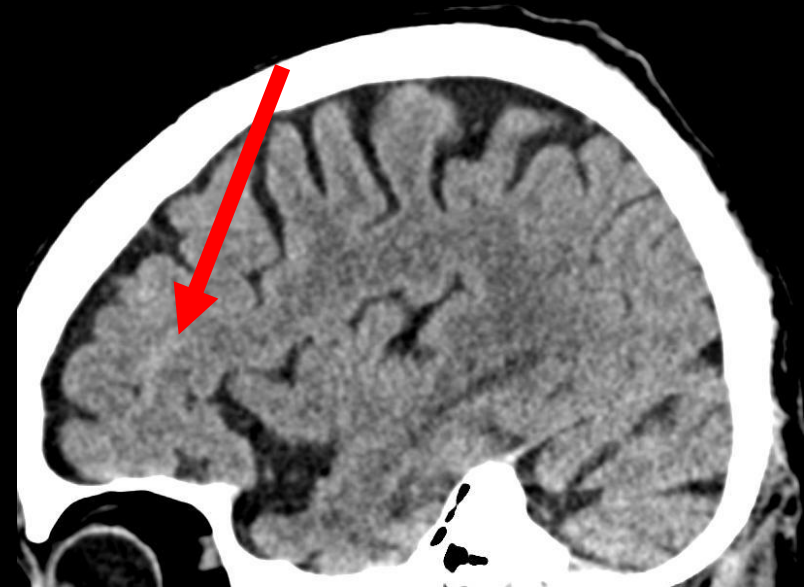
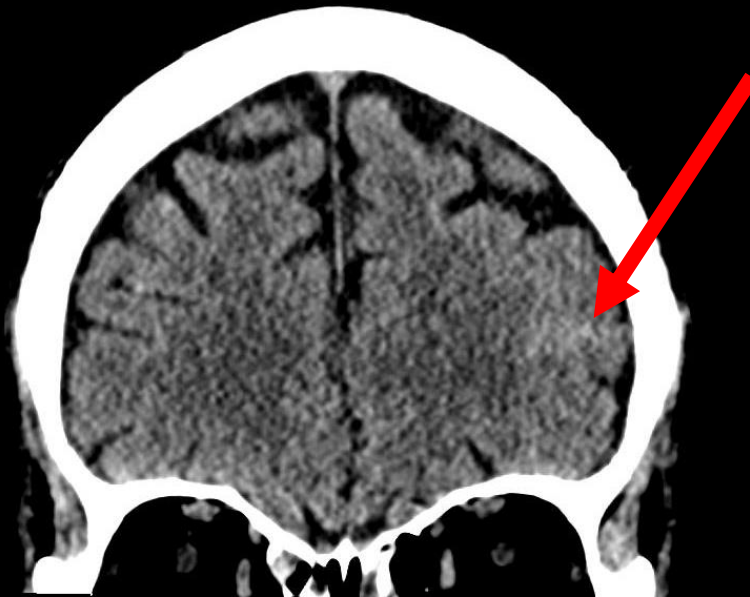
May be multifocal...



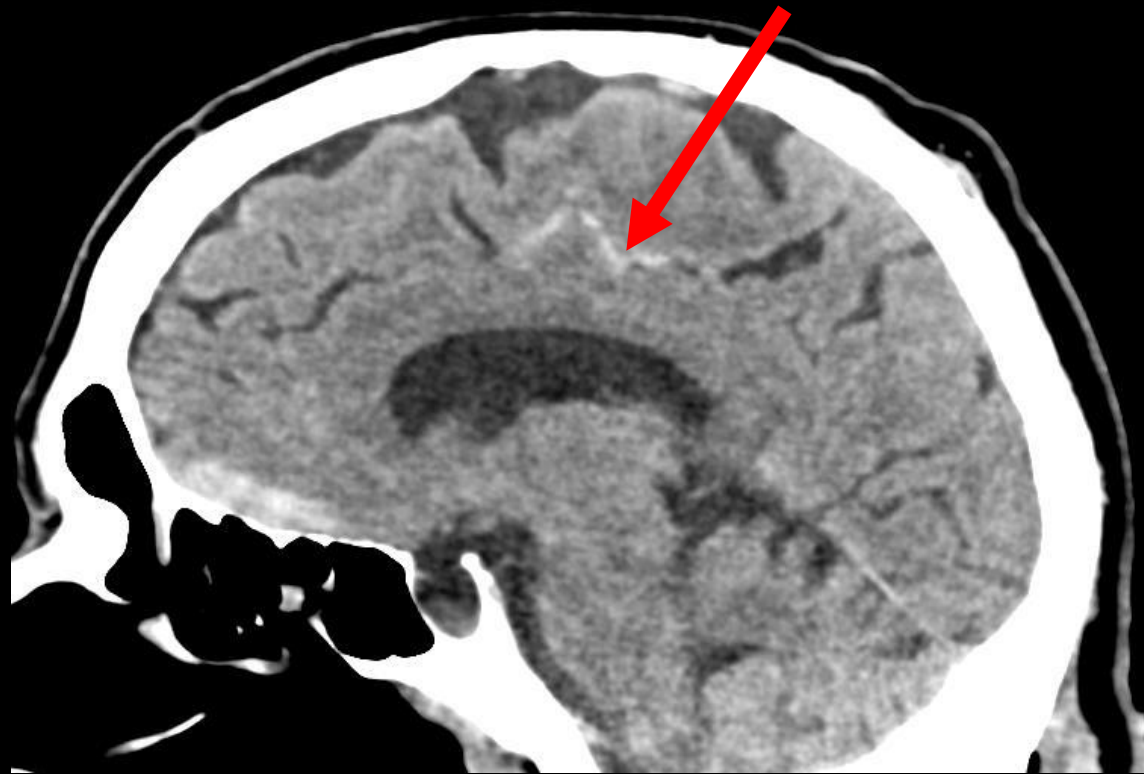
May be small and subtle...



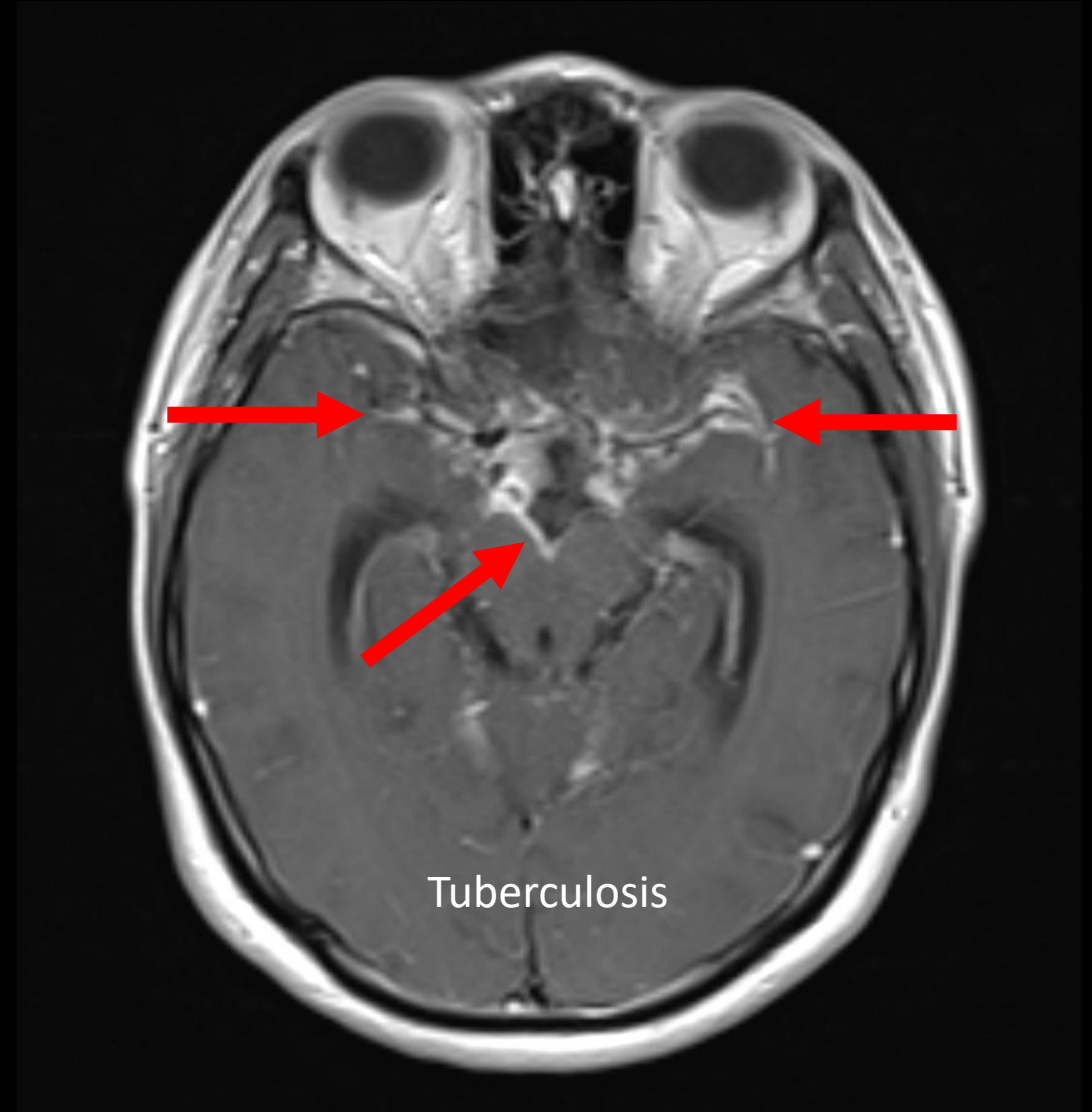
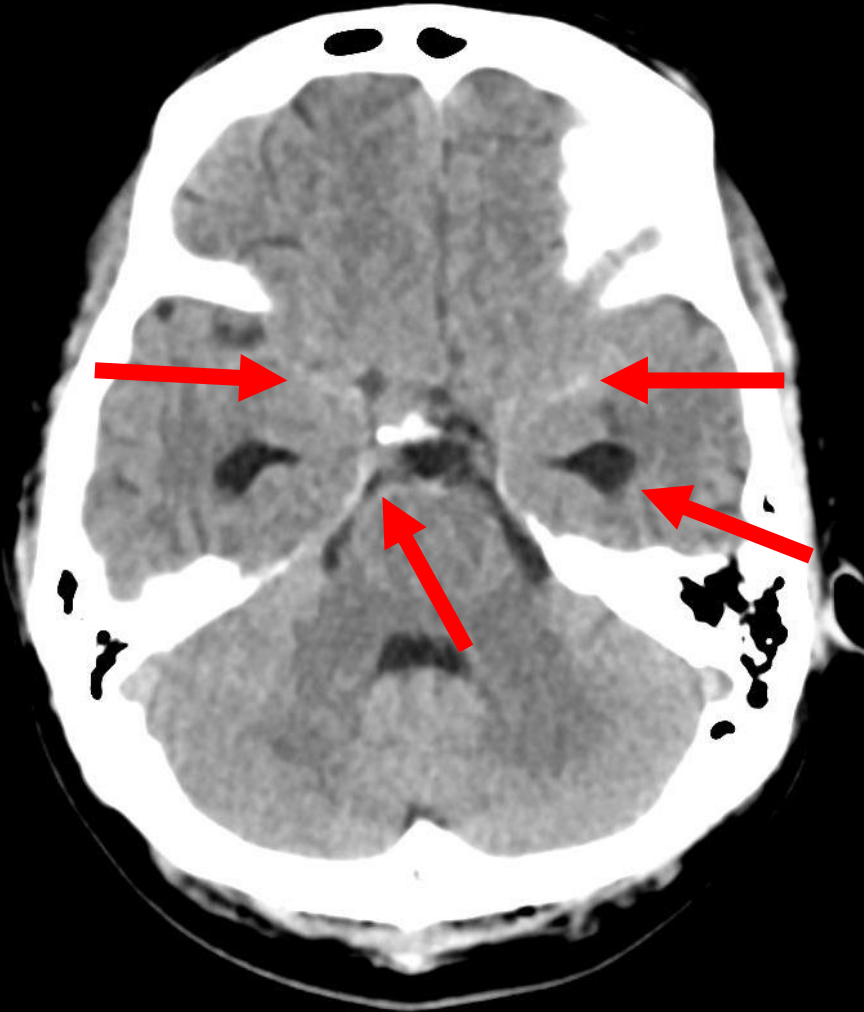
May be small and very subtle...



May be confusing on only one plane...



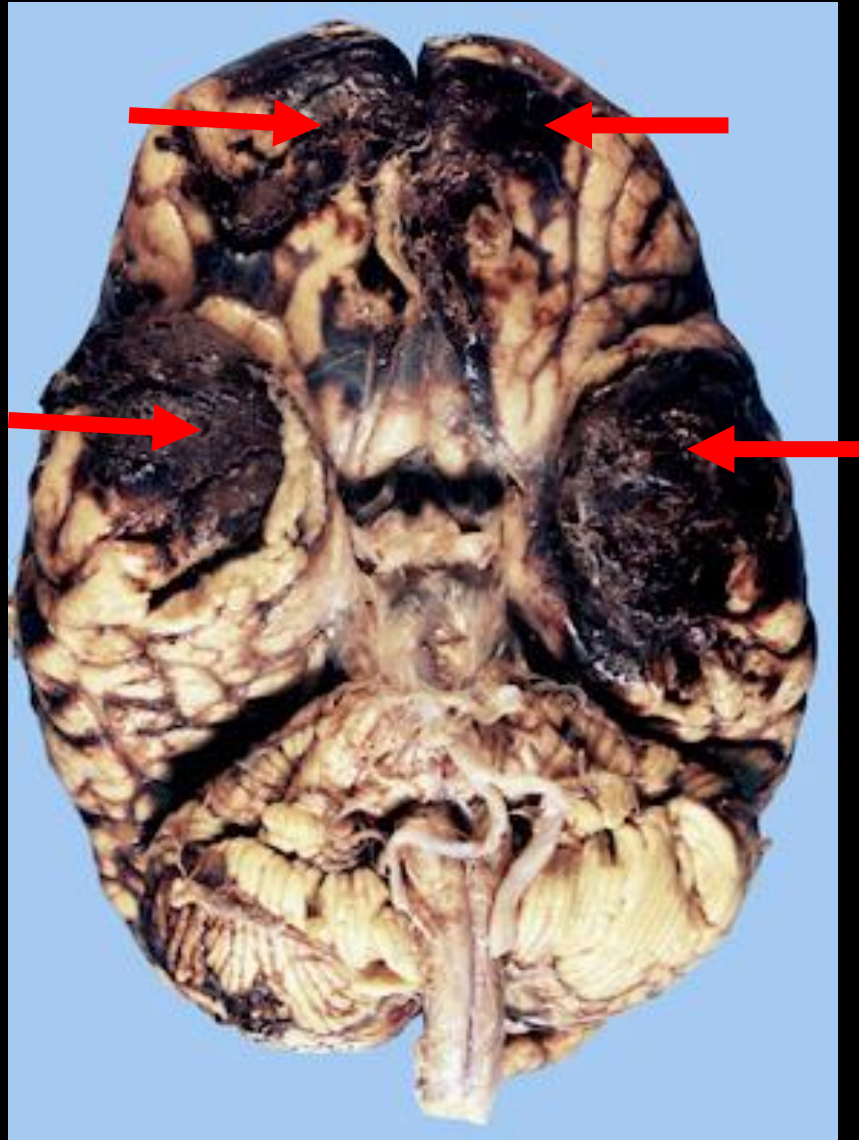
History: "Trauma"



Sulcal hyperattenuation

- Hemorrhage
 - Traumatic (usually small volume)
 - Aneurysmal (larger volume, focally prominent area near aneurysm)
 - Reversible cerebral vasoconstriction syndrome (RCVS)
 - Vascular malformation
 - Surgery
- Non-hemorrhage
 - Infection/pus
 - Leptomeningeal mets/malignancy
 - Thrombosed sulcal vein
- Pseudo-subarachnoid hemorrhage (diffuse cerebral edema)

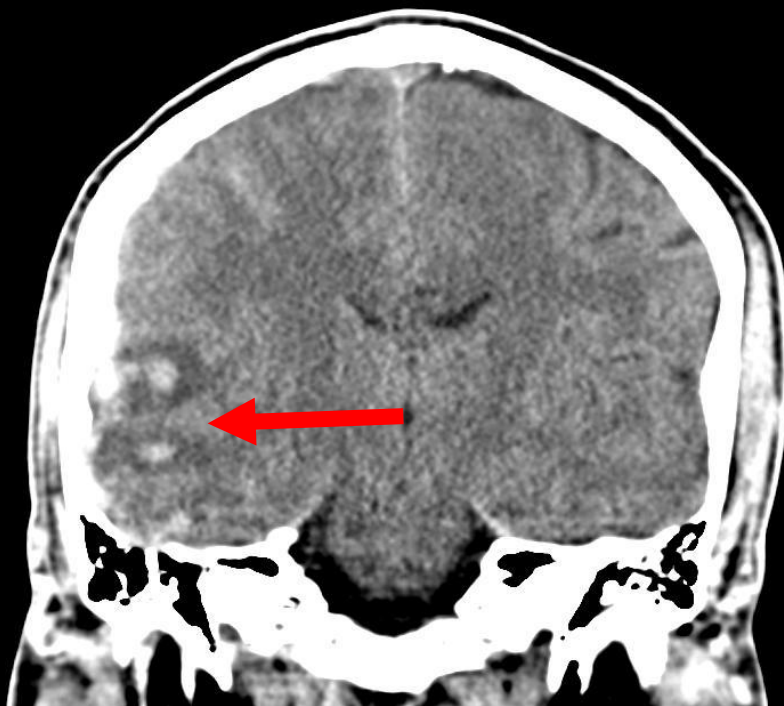
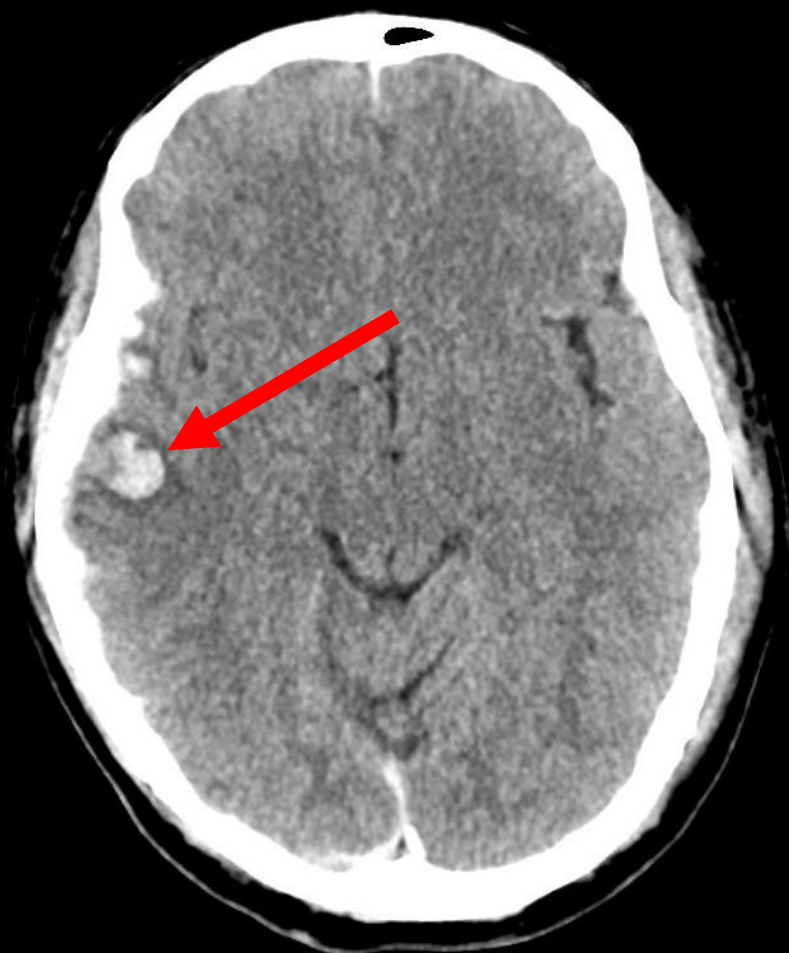
Parenchymal contusions and shear injuries



Frontal poles commonly affected



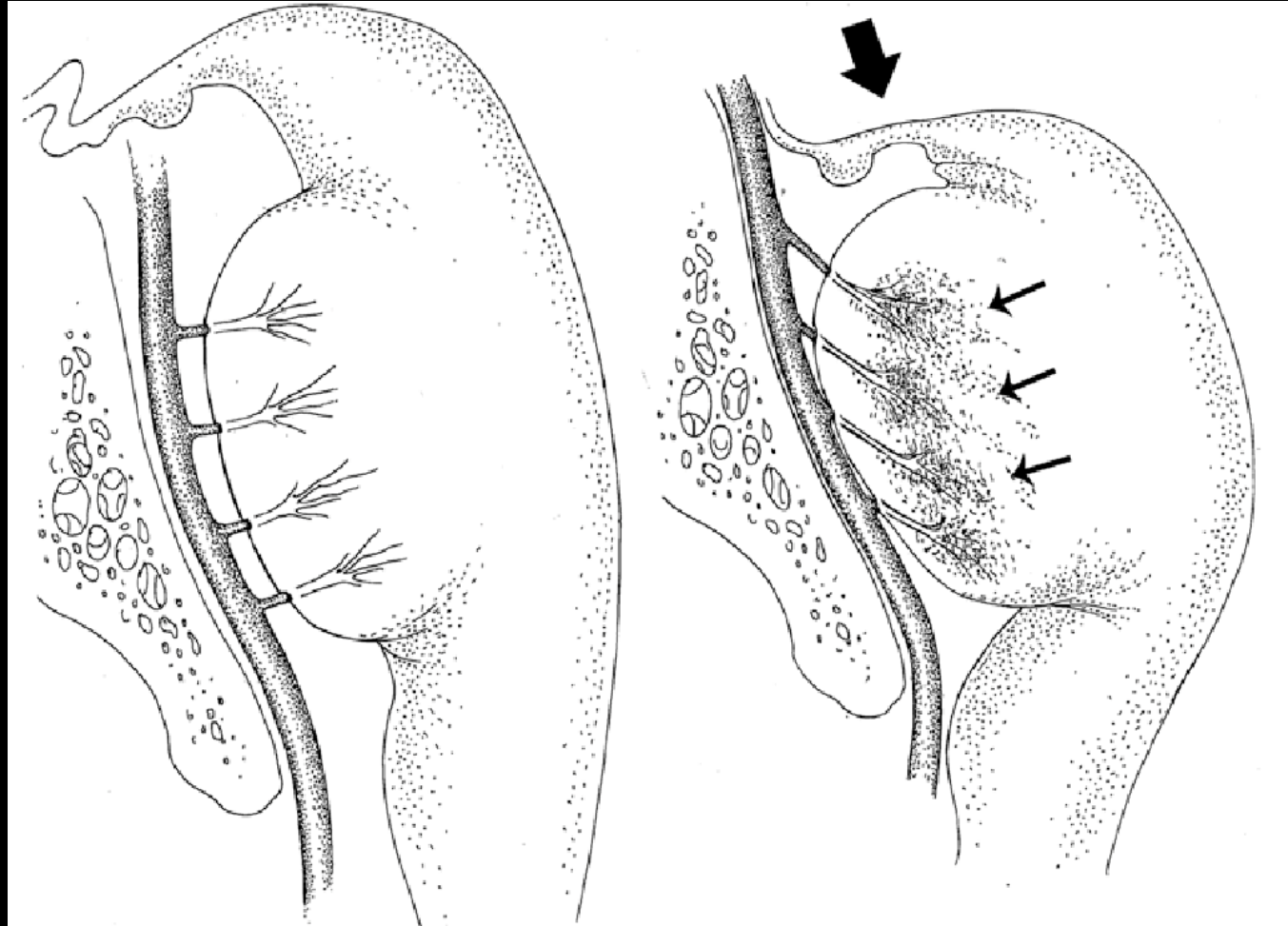
Temporal poles commonly affected



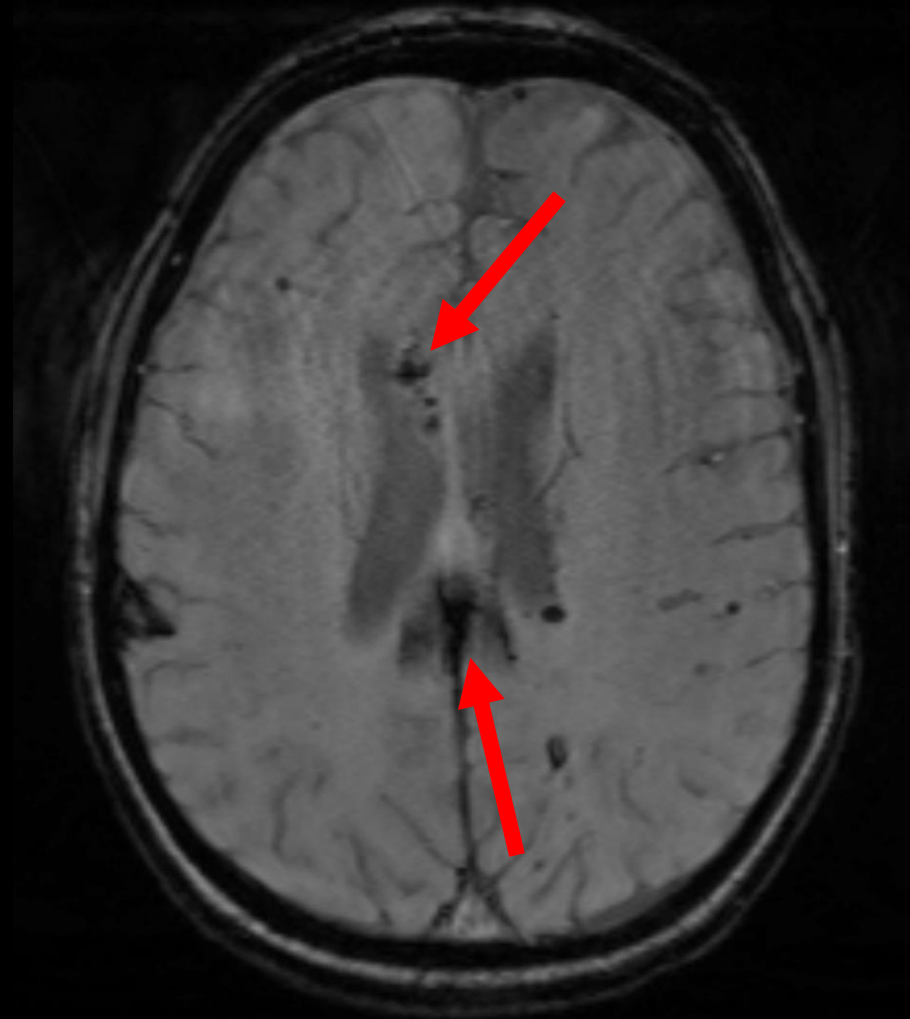
Herniation



Duret hemorrhage



Trauma with acute loss of consciousness



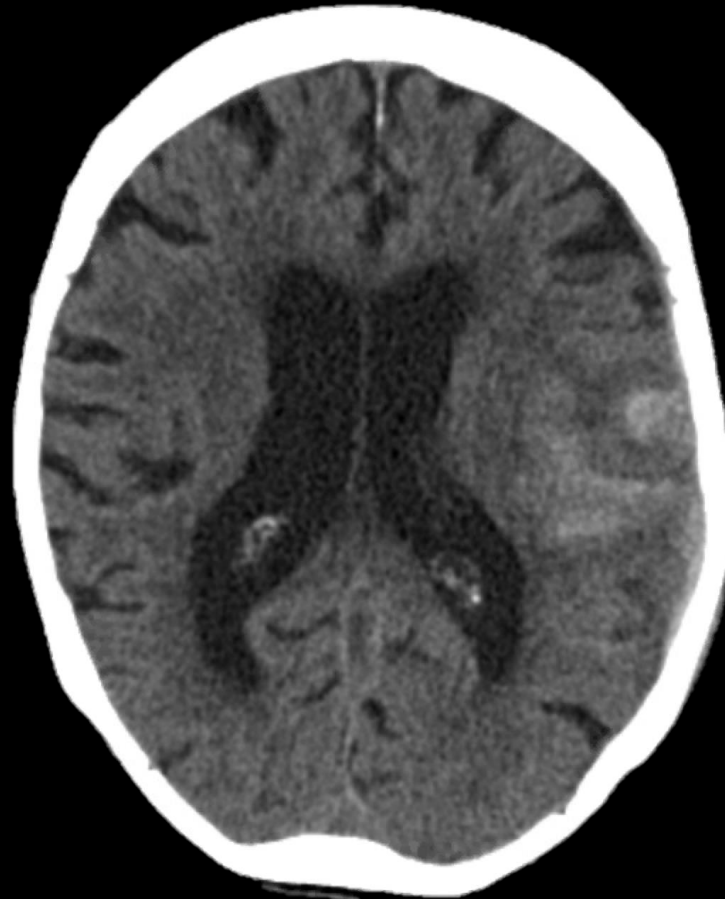
Diffuse axonal injury (DAI)

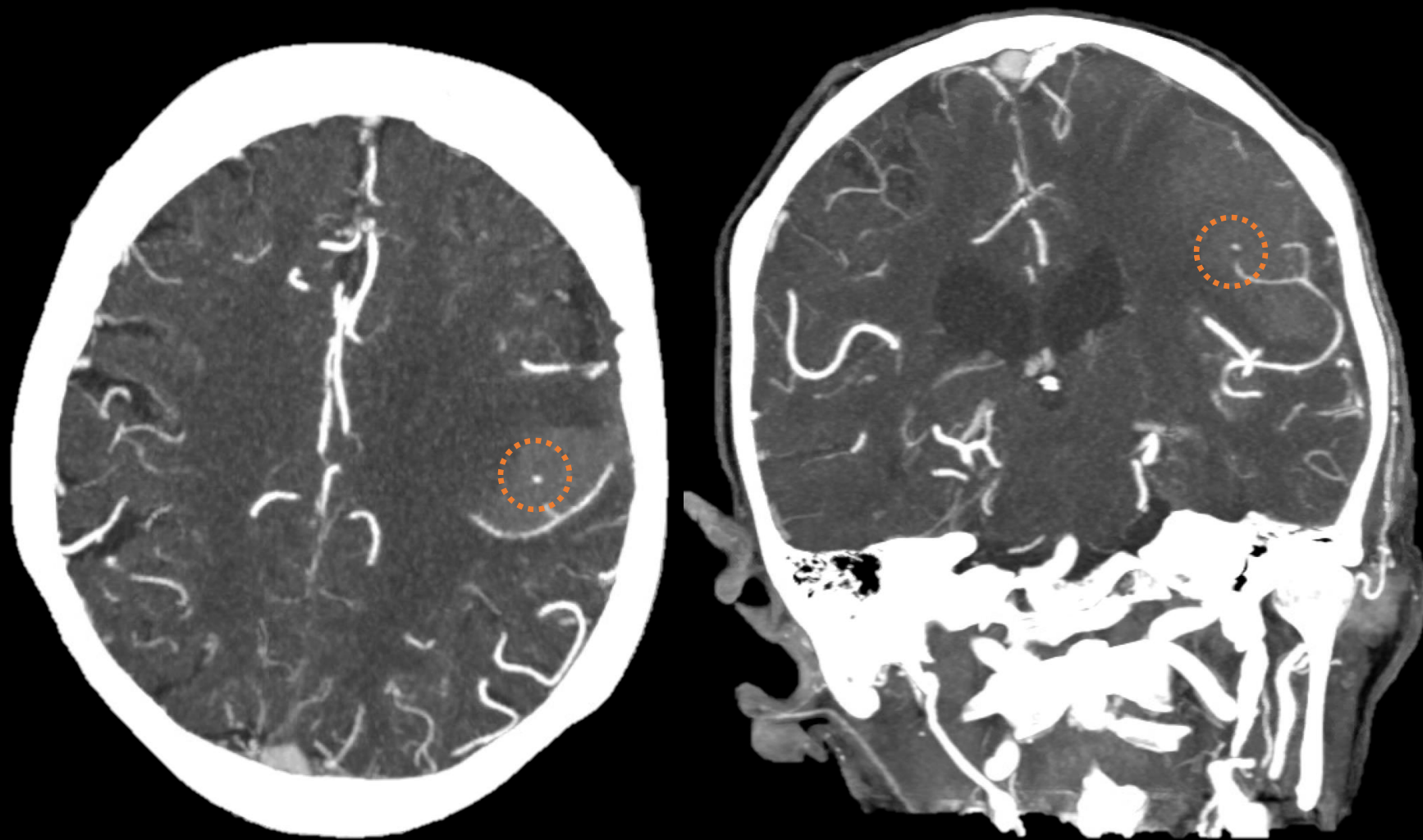
- Corpus callosum (esp splenium)
- Grey-white interface
- Brainstem

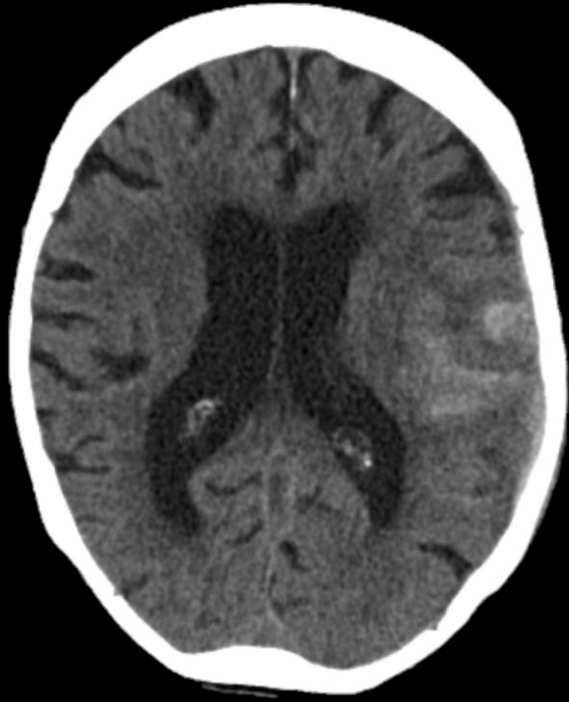
CT may only show tip of the iceberg – MRI will reveal full extent of injury



Bike accident with head trauma







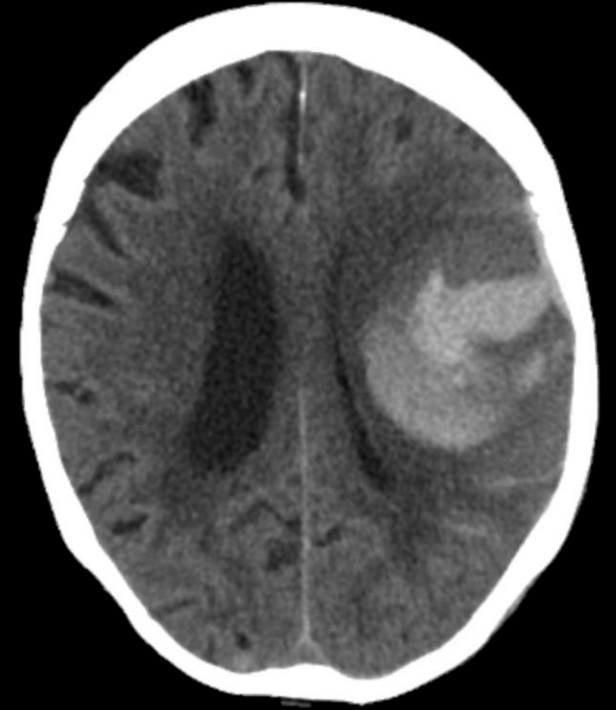
Initial head CT



1 hour later



6 hours later

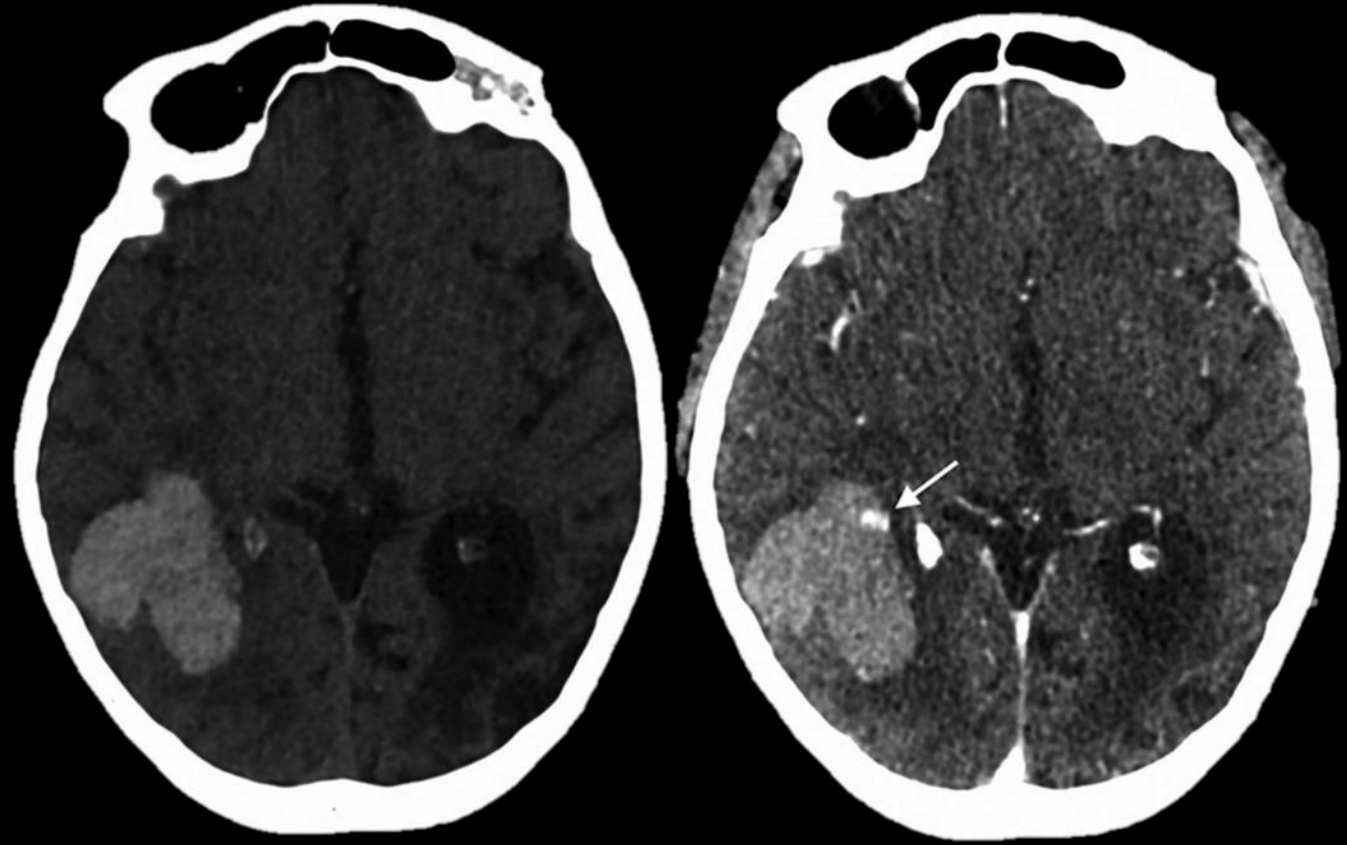


12 hours later

CTA Spot Sign

Implies active contrast extravasation

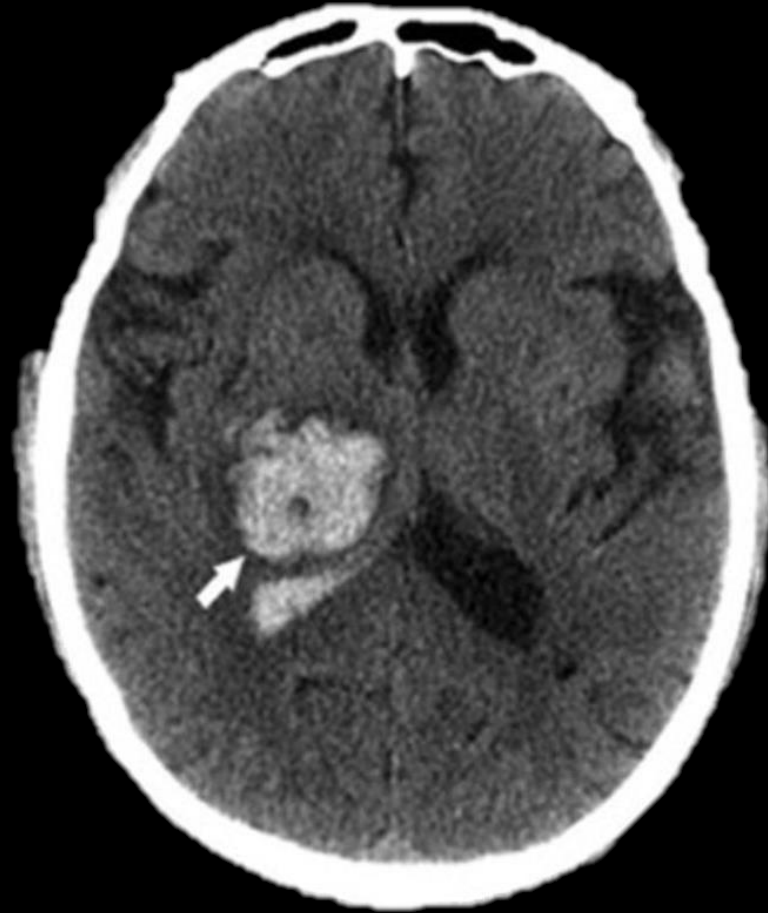
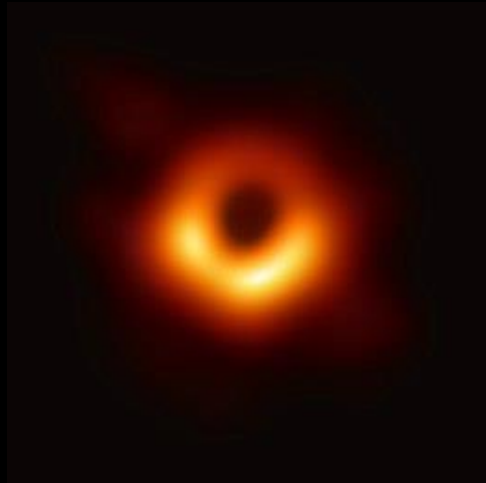
Strong predictor of early hematoma expansion



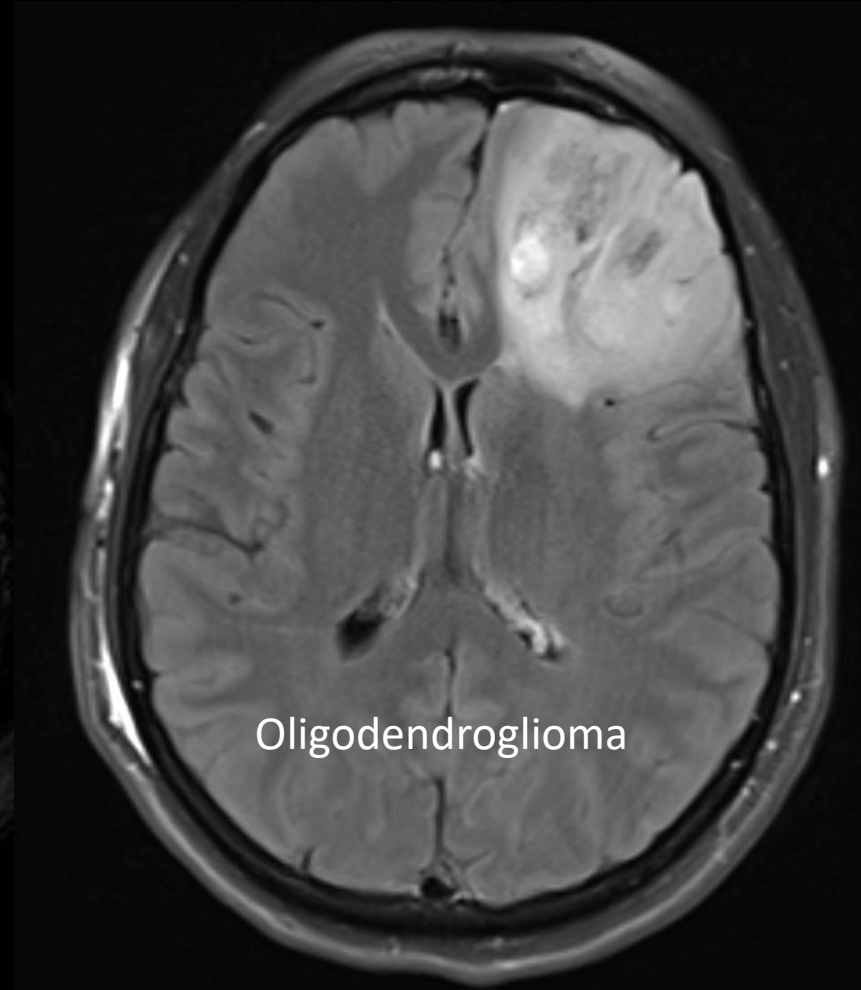
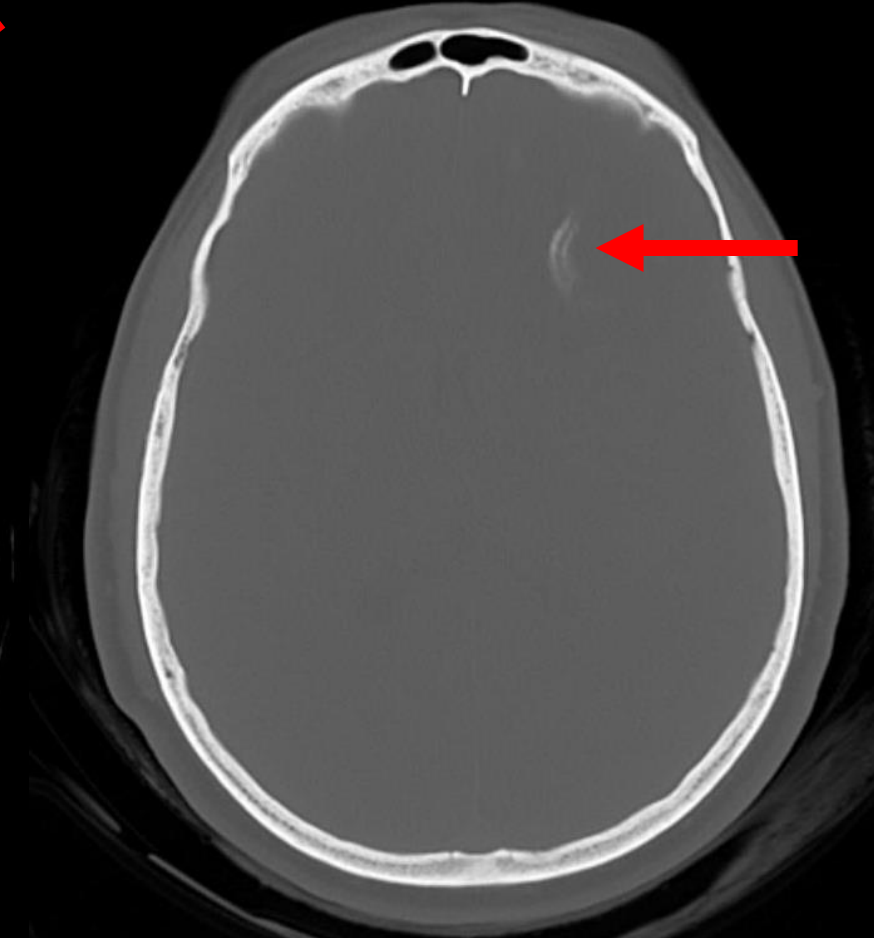
Black hole sign

Noncontrast version of the spot sign

Another predictor of hematoma expansion



History: "Trauma"



“Multicompartment” bleeds

Outside in:

- Left scalp soft tissue swelling
- Left parietotemporal calvarial fracture
- Left epidural hematoma
- Right subdural and parafalcine hematoma
- Right frontal subarachnoid blood
- ?Right frontal contusion



Take home points

- Use soft tissue swelling to hone in, look for coup and contrecoup.
- Use 3D images to look at the calvarium, ESPECIALLY in ped cases.
- Look at all three planes!
- Use your subdural windows!
- Beware “non-trauma” cases presenting as trauma (often from a minor fall).
- MRI is much more sensitive than CT for diffuse axonal injury.
- In complex cases with multiple hemorrhages, list them systematically in your report to stay organized (outside in, for example).