Department of Radiology
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NEURORADIOLOGY
DIL part 3

Bleeds and hemorrhages

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OVERVIEW

- Introduction to Neuroimaging - DIL part 1
- Basic Brain Anatomy - DIL part 1
- Standardized Approach to Image Interpretation - DIL part 2
- **Common Pathology**
  - **Bleeds (Hemorrhages) - DIL part 3**
  - Strokes (Infarcts) DIL part 4
  - Masses (Tumors) part 5

ICH

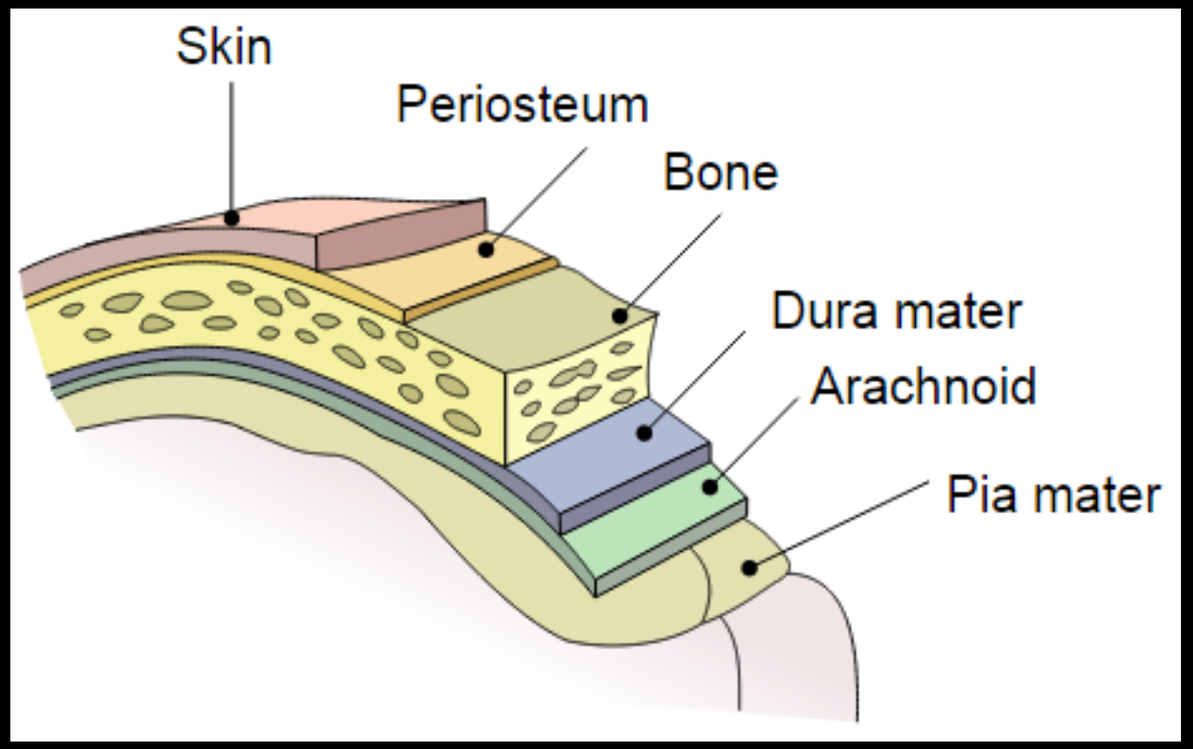
- When we say there is acute intracranial hemorrhage, what exactly are we seeing on a CT?
- Look for bright white material in spaces where it doesn't belong. Acute blood is bright white on CT. As it get's older, subacute, it becomes more grey and eventually almost black once it is liquified in it's chronic state.

TYPES OF ICH

- Intracranial hemorrhages are divided up based on their anatomic location.
- The following slides depicts the different locations.

TYPES OF ICH

- Spaces that hemorrhages can occur:
  - In the scalp (no big deal)
    - Scalp hematoma.
  - Outside of the dura
    - Epidural/Extradural
  - Between the dura and the arachnoid
    - Subdural
  - Under the arachnoid
    - Subarachnoid
  - Within the brain parenchyma
    - Intraparenchymal



http://upload.wikimedia.org/wikipedia/commons/8/8e/Meninges-en.svg

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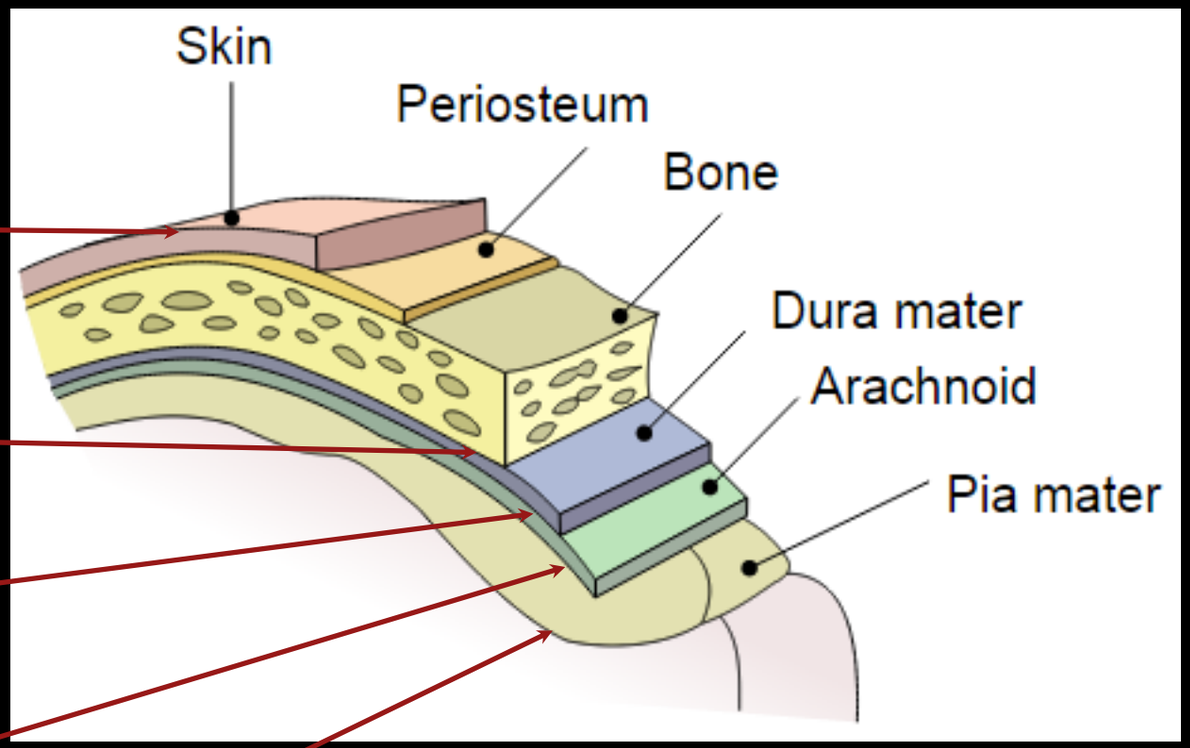

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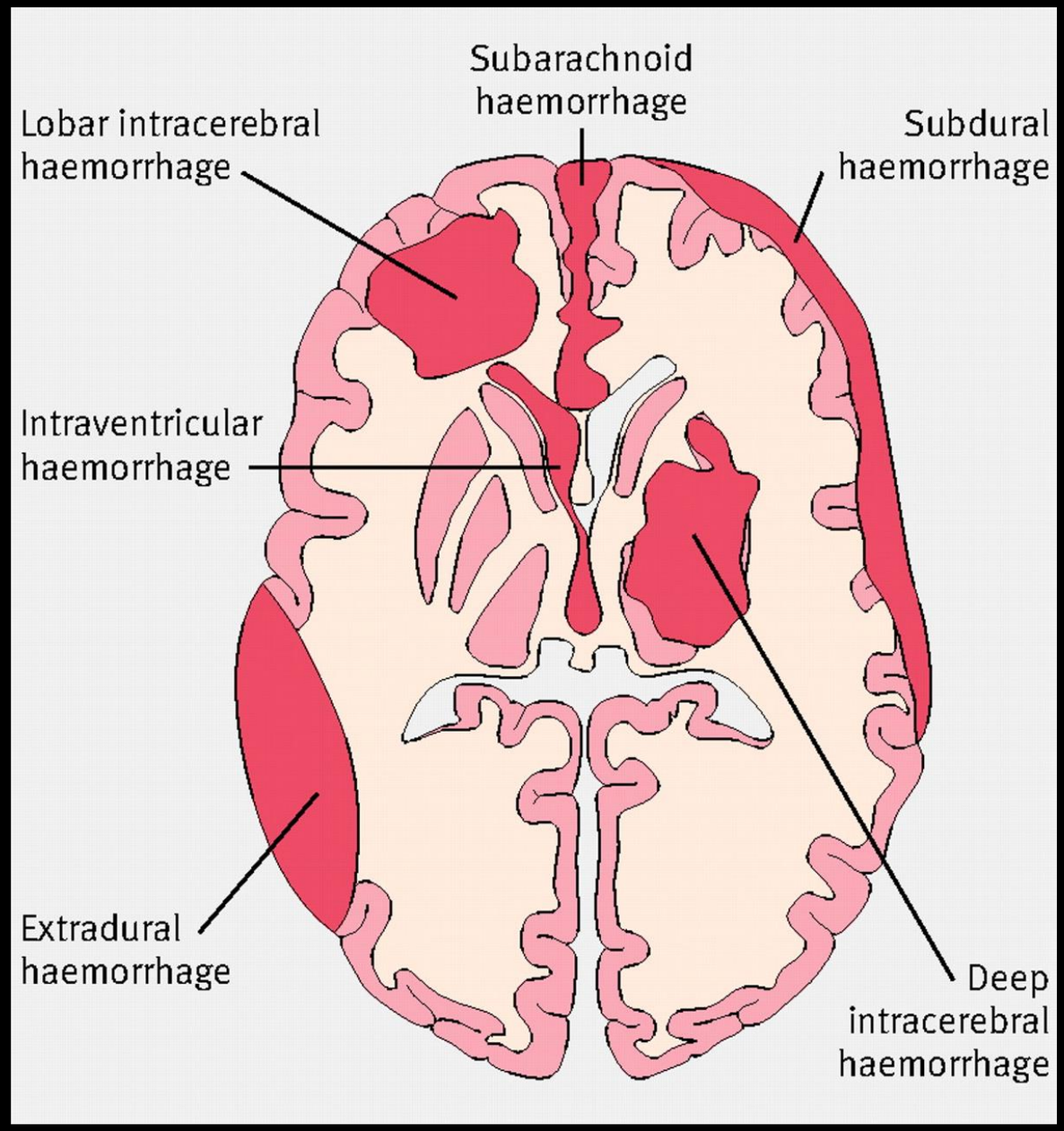
TYPES OF ICH

- Intracranial hemorrhage = **ICH**
  - Epidural/Extradural (**EDH**)
  - Subdural (**SDH**)
  - Subarachnoid (**SAH**)
  - Intraparenchymal/Intracerebral (**IPH**)
  - Intraventricular (**IVH**)



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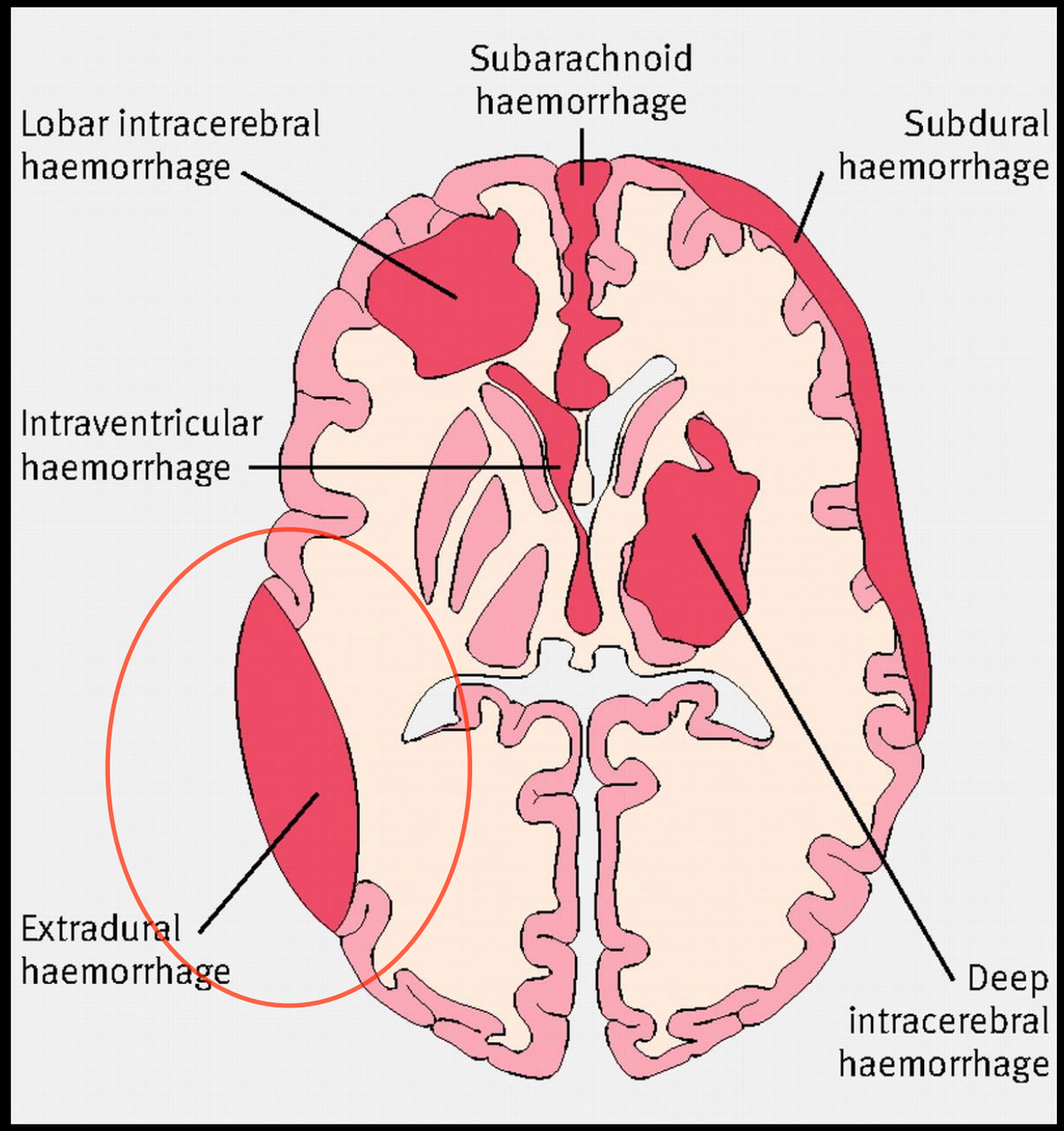
http://3.bp.blogspot.com/-1lWBJzVDmLc/TzjFMOMXanI/AAAAAAAABiE/x3t_qYe1ju0/s1600/1.jpg

TYPES OF ICH

- Now, let's go through each type of ICH with an example of each and common imaging features to look for.

EDH

- Epidural Hematoma
  - Inside the skull but outside of the dura (intracranial, extra-dural).
  - Usually caused by a trauma causing a skull fracture that ruptures an artery, usually the middle meningeal. Therefore, high pressure bleed.
  - Look for associated skull fracture.



EDH

- Recall this case from earlier.
- Imaging Features
  - Lentiform shape
  - Does not cross cranial sutures (dura fused to cranium)
  - Almost always an associated skull fracture

Axial

EDH

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- Imaging Features
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  - Does not cross cranial sutures (dura fused to cranium)
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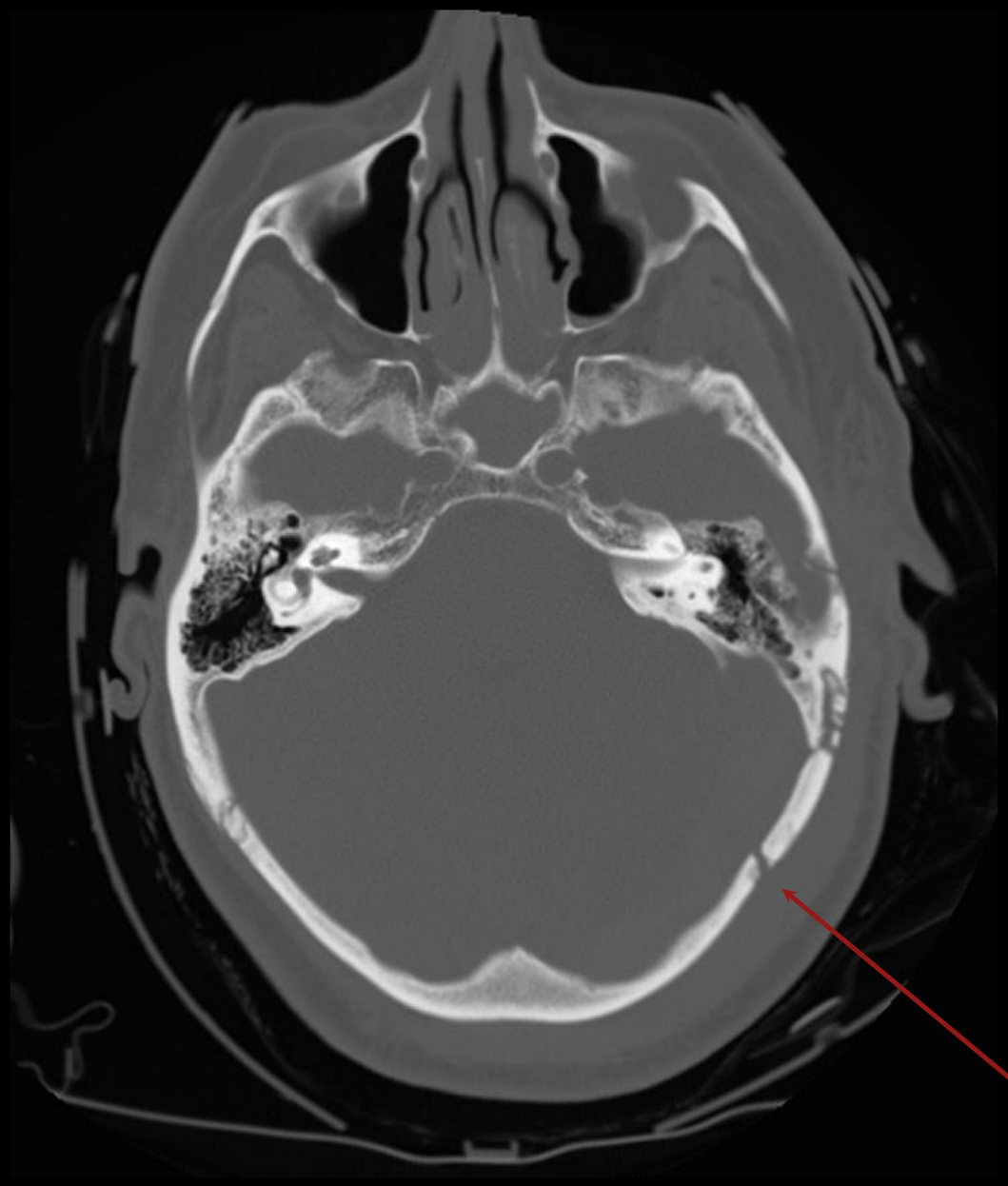
Axial

EDH

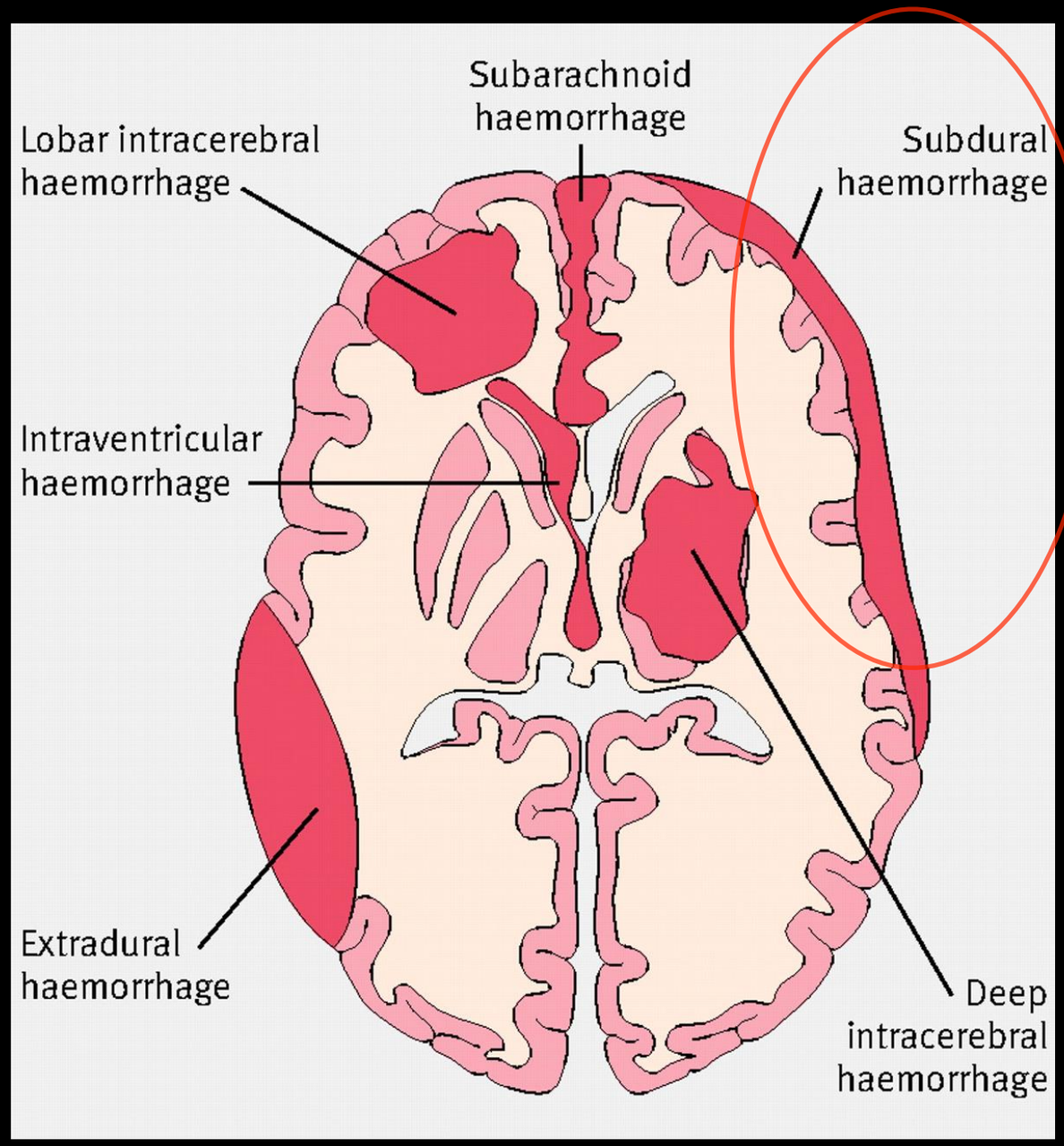


On bone windows, you can see the skull fracture.

Axial

SDH

- Subdural Hematoma
  - Inside the skull and inside of the dura (intracranial, intra-dural).
  - Usually a venous bleed. Tearing of the “bridging veins” which stretch to cross the CSF spaces from cortex to major dural veins.
  - Patients who have brain atrophy are at increased risk of SDH.



SDH

- Imaging Features
  - Crescentic shape of hematoma
  - Extra-axial, intra-dural
  - Can cross the cranial sutures
  - Cannot cross the dural folds
  - Blood layers over the brain, but does not enter it’s sulci (that would be subarachnoid space)

Axial

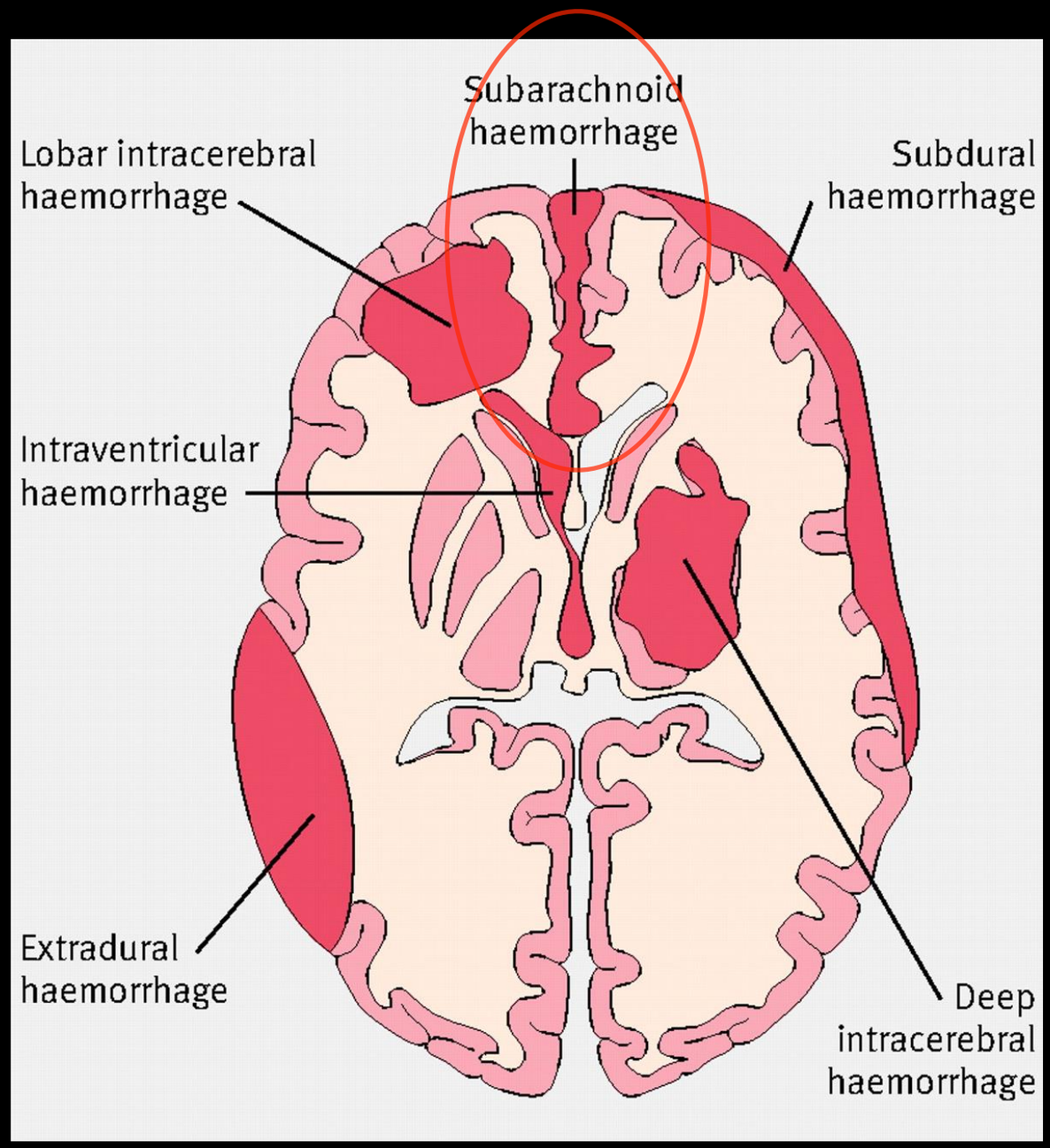
SDH

- This is an example of an acute right subdural hemorrhage.
- There is blood tracking along the right side of the brain, as well as along midline, tracking along the falx.
- Notice the mass effect this has, causing some shift of the brain tissue to the left.

Axial

SAH

- Subarachnoid Hemorrhage
  - Inside the skull, inside of the arachnoid meninges.
  - Most common cause is trauma.
  - Next most common cause is rupture of intracranial aneurysms.
  - Typical history:
    - Young person with sudden “worst headache of life.”
    - "Thunderclap headache."



SAH

- Imaging Features
  - Blood fills the gaps (sulci) between the brain cortex (gyri).
  - When due to aneurysm rupture, blood is near the aneurysm rupture site.

Axial

SAH

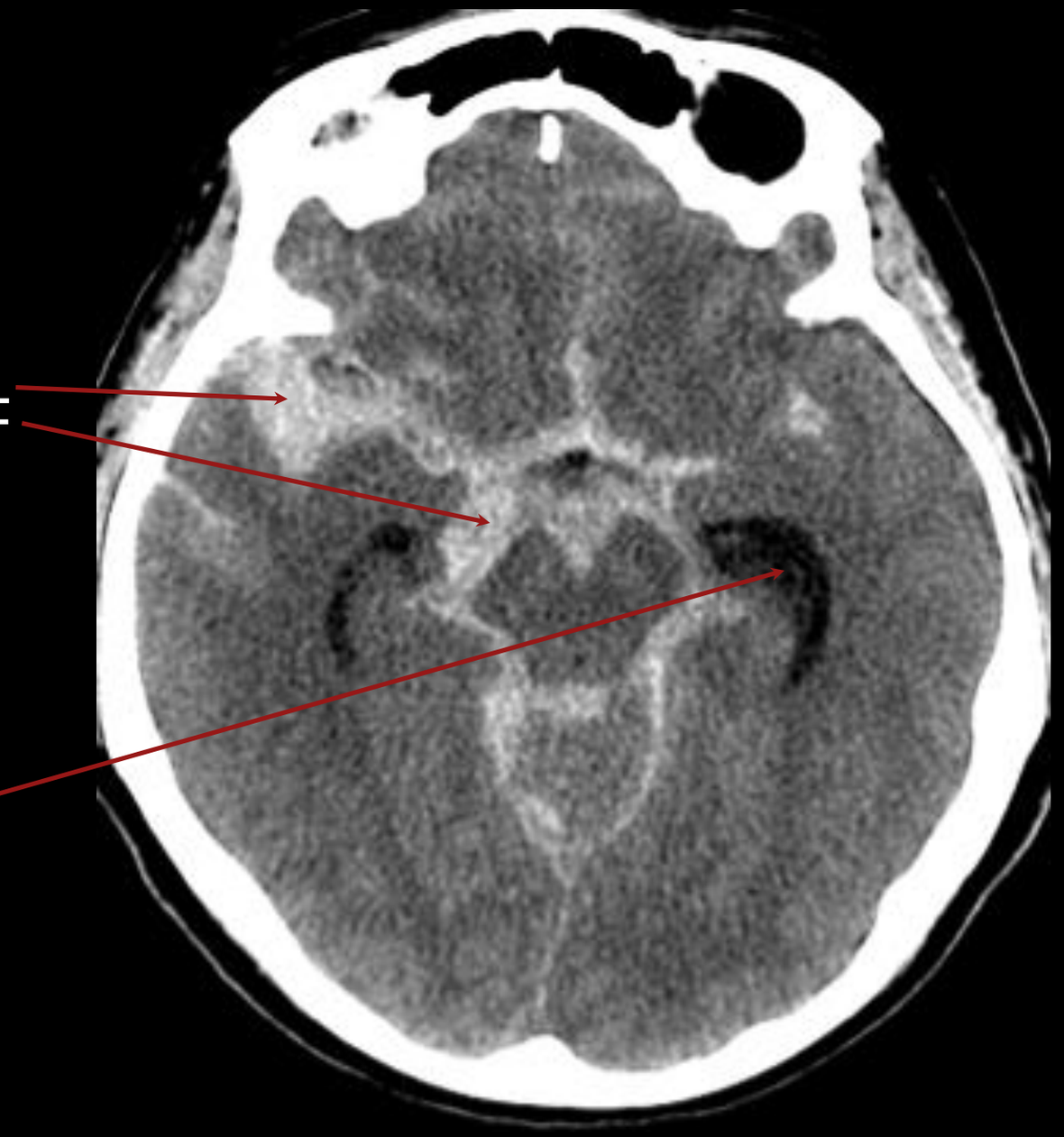
- Imaging Features
  - Blood fills the gaps (sulci) between the brain cortex (gyri).
  - When due to aneurysm rupture, blood is near the aneurysm rupture site.

The bright material in the right sylvian fissure is acute SAH. Compare to the normal left side.

Axial

SAH

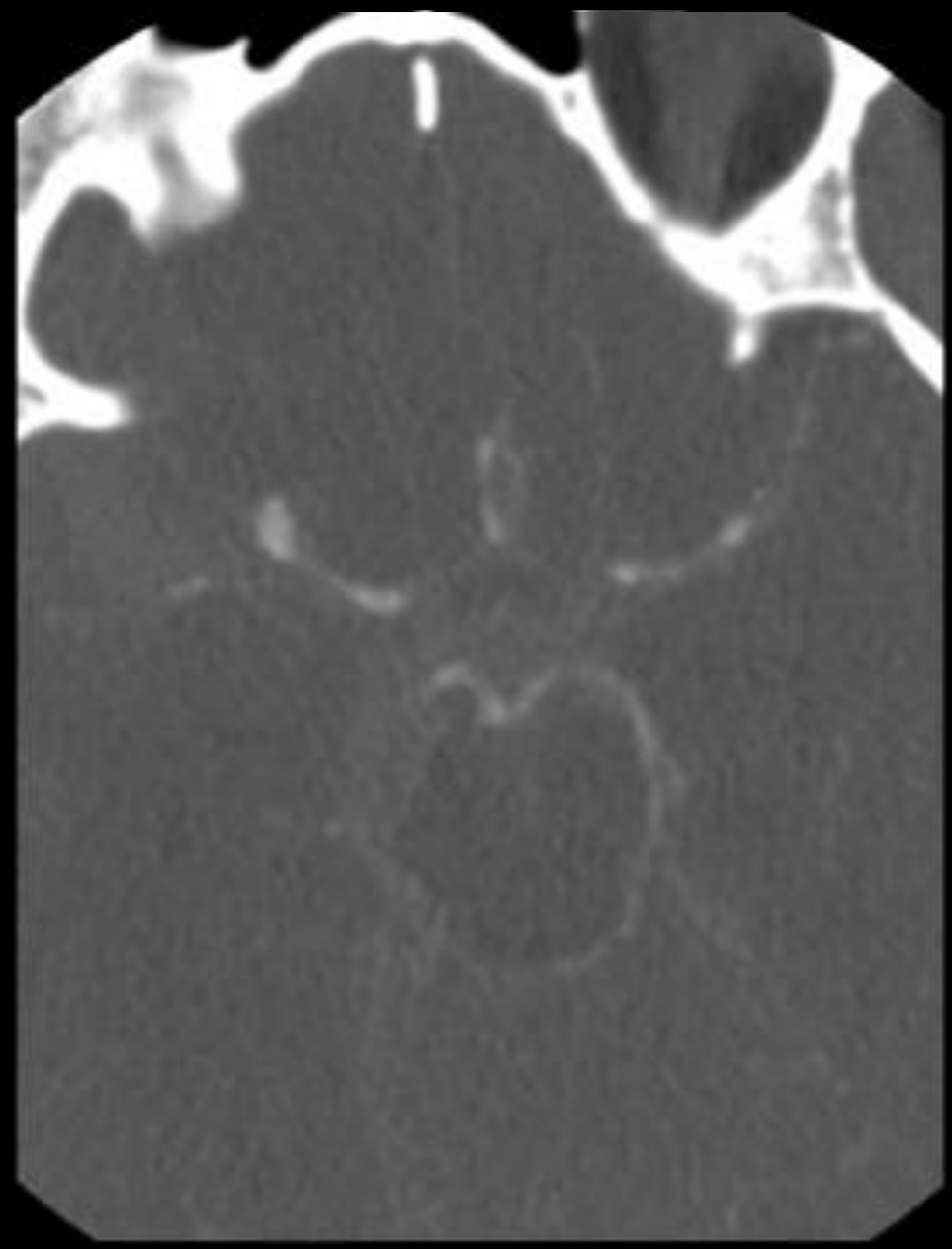
- Here there is extensive acute SAH, including around the CSF cisterns surrounding the midbrain. Usually, as you recall, these spaces should be filled with black CSF like you are seeing in the ventricles.



Axial

SAH

- This is a selected transverse axial slice of a CT angiogram.
- Recall your anatomy of the circle of willis. Given a history of acute SAH, can you spot a cause?

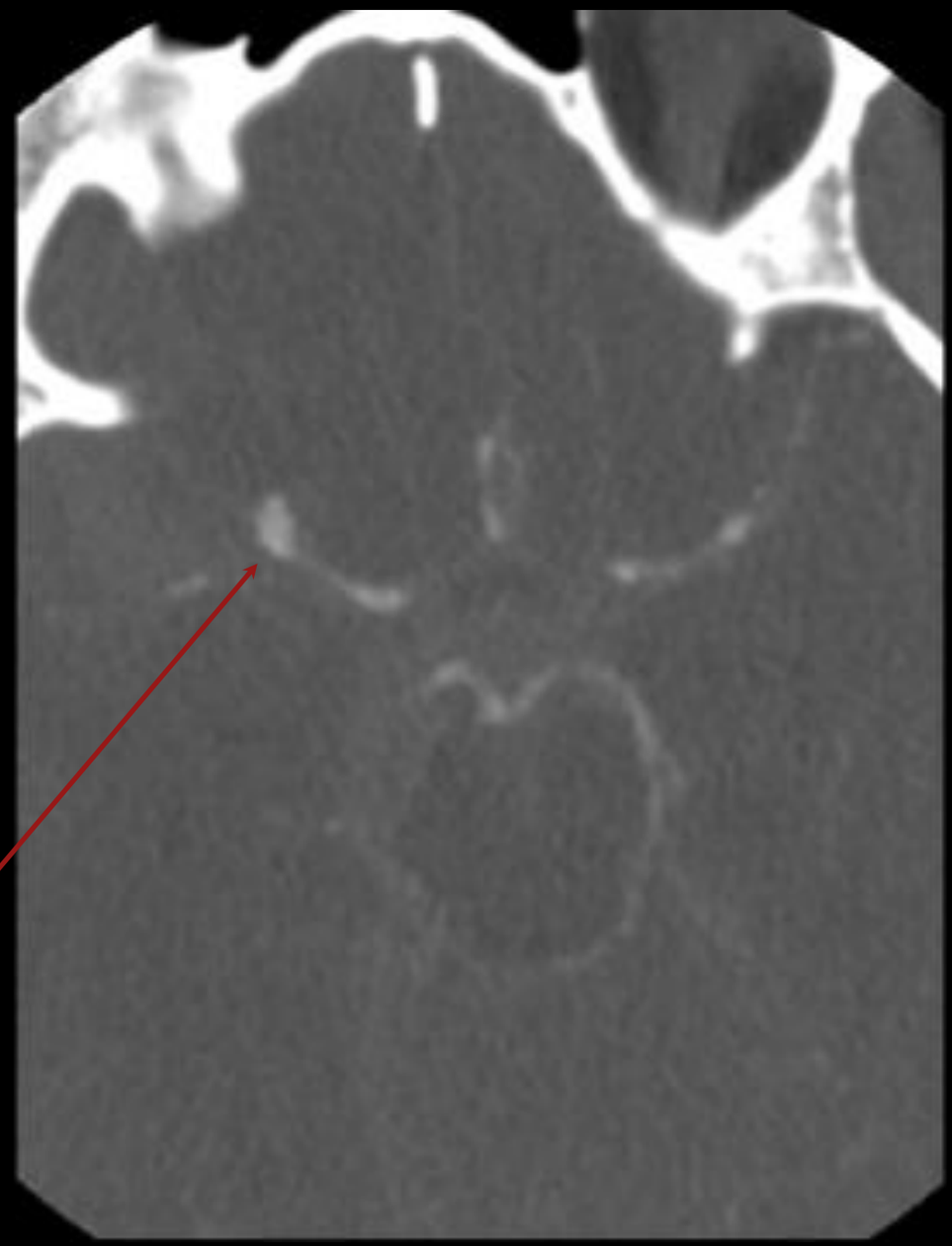


Axial

SAH

- This is a selected transverse axial slice of a CT angiogram.
- Recall your anatomy of the circle of willis. Given a history of acute SAH, can you spot a cause?

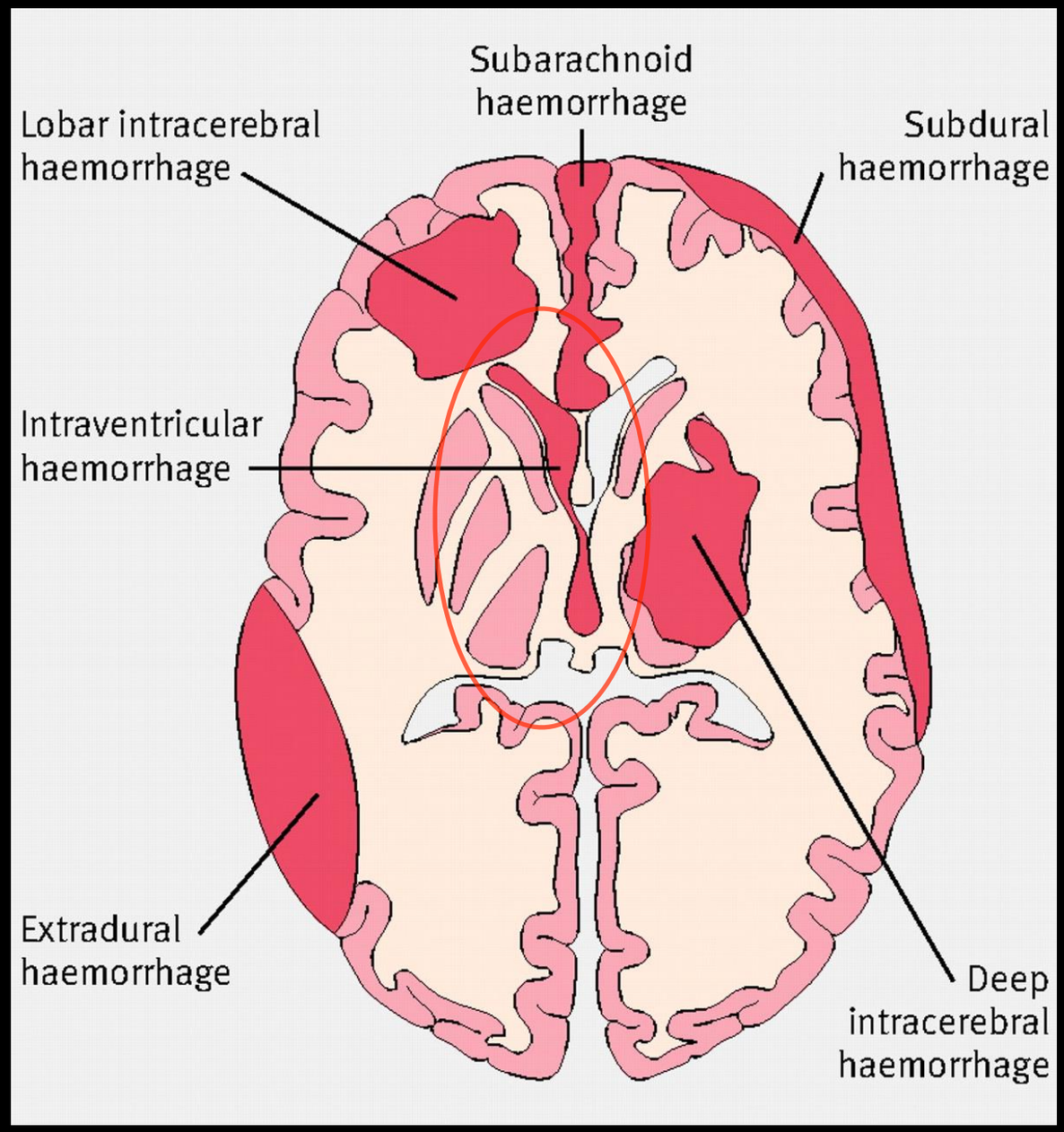
Tough to see, but there is a small anteriorly projecting aneurysm off the right MCA. Rupture of this aneurysm is the probable cause of the acute SAH.



Axial

IVH

- Intraventricular Hemorrhage
  - Common causes include trauma, hemorrhagic tumor, and direct extension from intraparenchymal hemorrhage.
  - Commonly results in acute hydrocephalus.



IVH

- Imaging Features
  - Blood within ventricular spaces. Recall your ventricular anatomy!
  - Acute blood can distend the ventricles, causing hydrocephalus.

Axial

IVH

- Imaging Features
  - Blood within ventricular spaces. Recall your ventricular anatomy!
  - Acute blood can distend the ventricles, causing hydrocephalus.

Look at the bright white material representing acute blood. It is within the bilateral lateral ventricles. There is also acute SAH on the left.

Axial

IVH

- This is the same case but a few slices lower down.
- There is also intraparenchymal blood (covered next), and further SAH.
- Notice the extent of IVH within the third ventricle, as well as within the lateral ventricles.

Axial

IVH

- Did you notice anything else about the ventricles? Do they appear bigger or smaller than the normals you have now seen?

Compare them to this contrast enhanced CT with normal sized ventricles.

Axial

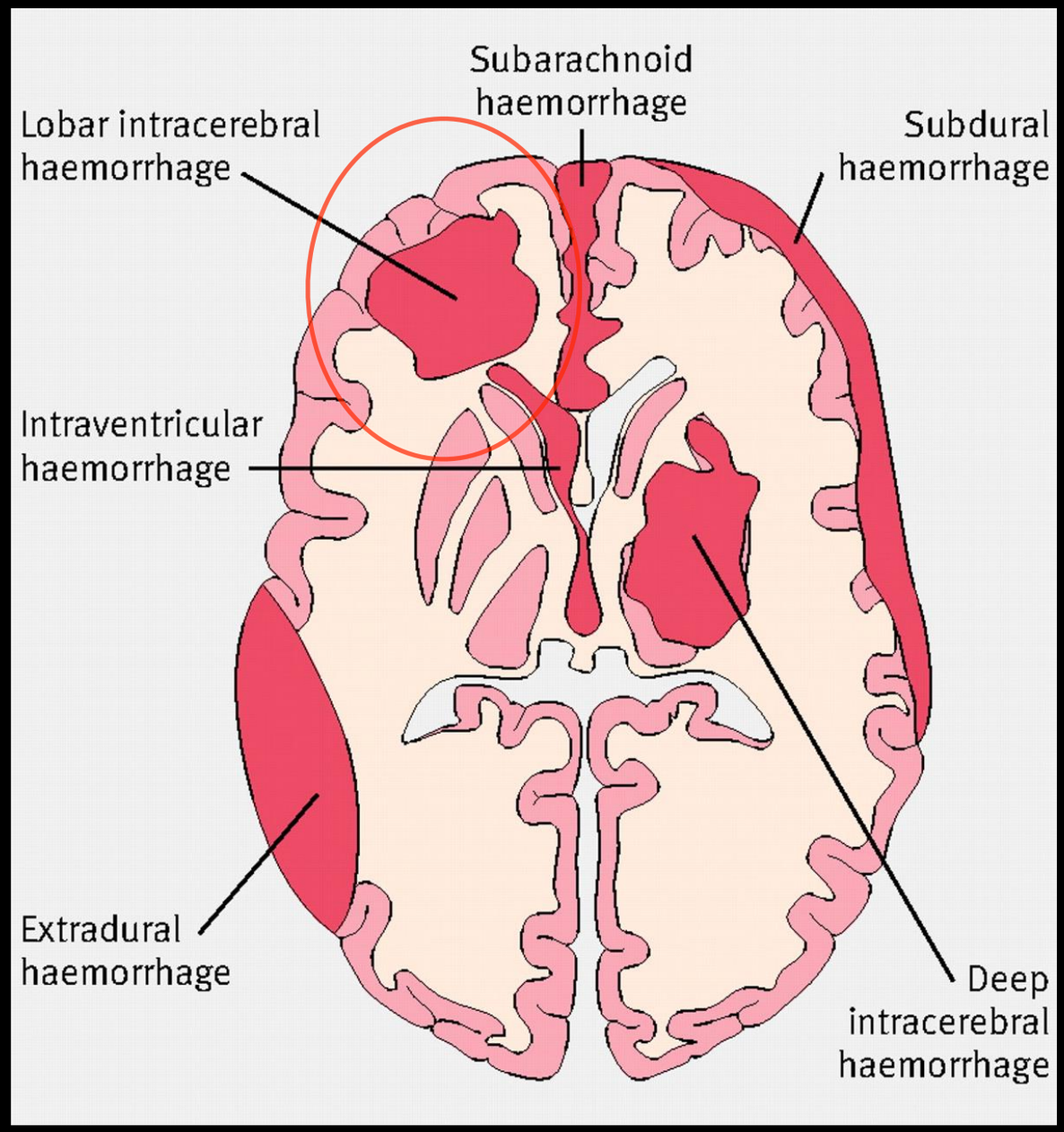
IVH

- That's right, the ventricles are huge! This is in keeping with hydrocephalus.
- The summary for this case would be:
  - Acute IPH, SAH and IVH with resultant hydrocephalus.

Axial

IPH

- Intraparenchymal Hemorrhage
  - Common causes include trauma, tumor, hypertension, hemorrhagic conversion of a stroke, and direct extension from other sources of bleeding.



IPH

- Imaging Features
  - Blood within brain parenchyma.
  - Extension to intraventricular or subarachnoid spaces is common.
  - Look for underlying lesion such as tumor or aneurysm.

Axial

IPH

- Imaging Features
  - Blood within brain parenchyma.
  - Extension to intraventricular or subarachnoid spaces is common
  - Look for underlying lesion such as tumor or aneurysm.

Acute IPH within the right parietal lobe. The surrounding darker grey around the white blood is edema of the white matter.

Axial

End of module 3

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