Department of Radiology
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NEURORADIOLOGY
DIL part 2

An approach to head CT interpretation

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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

APPROACH TO CT

- The most important thing is to use the same approach every time! We will go through an example approach.
- Use different window settings (ie brain vs bone windows).
- Use different planes (axials, coronals and sagittals).

EXAMPLE APPROACH

- Extra-axial space
- Intra-axial space
- Bones

EXTRA-AXIAL

Do the gyri abut the skull?

If not, is there something in that space that shouldn't be there (ie a bleed or a mass)?

Axial

EXTRA-AXIAL

Do the gyri abut the skull?

If not, is there something in that space that shouldn't be there (ie a bleed or a mass)?

Here, the gyri nicely abut the skull.

There is nothing abnormal in the extra-axial space.

Axial

EXTRA-AXIAL

- Compare this CT to the prior one you just looked at.
- We will cover this topic later on, but this is an example of an acute epidural hemorrhage.
- This a bleed in the extra-axial space.

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Axial

EXTRA-AXIAL

- Ventricles:
  - Are they symmetric?
  - Are they enlarged/dilated? This can suggest hydrocephalus.
  - Is there bright white material in the ventricles? This can represent intraventricular hemorrhage.

Axial

EXTRA-AXIAL

- Ventricles:
  - Are they symmetric?
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- Is there bright white material in the ventricles? This can represent intraventricular hemorrhage.

Notice in this example that the ventricles are symmetric and nondilated.

Axial

EXTRA-AXIAL

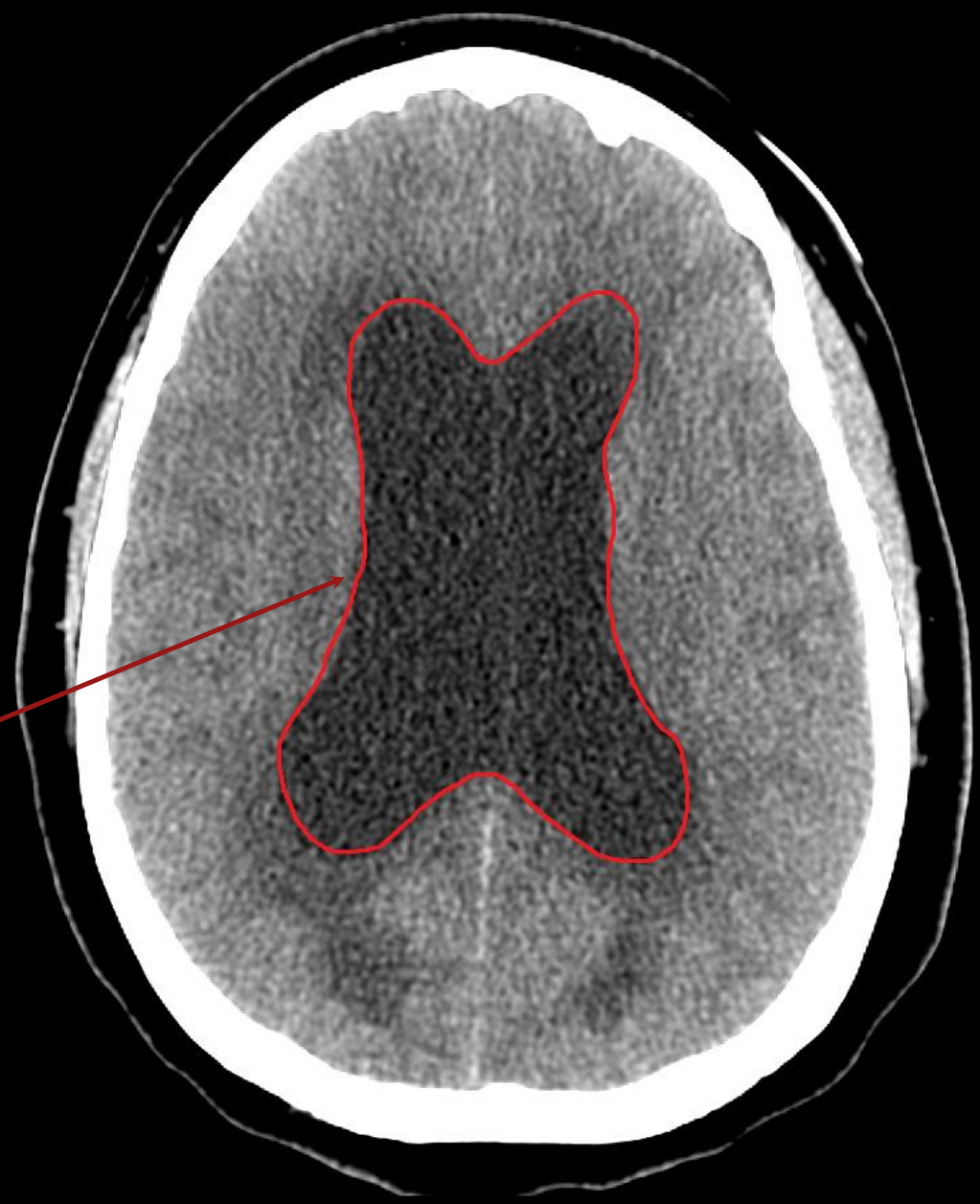
- What do you think about the ventricles in this example?
- How do they compare in size compared to the normal you just looked at?

Axial

EXTRA-AXIAL

- What do you think about the ventricles in this example?
- How do they compare in size compared to the normal you just looked at?

This is an example of acute hydrocephalus. The bilateral lateral ventricles are markedly dilated. This case was due to an obstructing mass in the third ventricle (not shown).



Axial

EXTRA-AXIAL

- Vessels
    - Follow the course of the major intracranial arteries, looking for increased vessel density.
    - A "hyperdense vessel" suggests possible thrombus in the vessel.

Axial

EXTRA-AXIAL

- Vessels
    - Follow the course of the major intracranial arteries, looking for increased vessel density.
    - A "hyperdense vessel" suggests possible thrombus in the vessel.

- In this example, the course of the bilateral MCA's can be seen, and there is no hyperdense vessel.

Axial

EXTRA-AXIAL

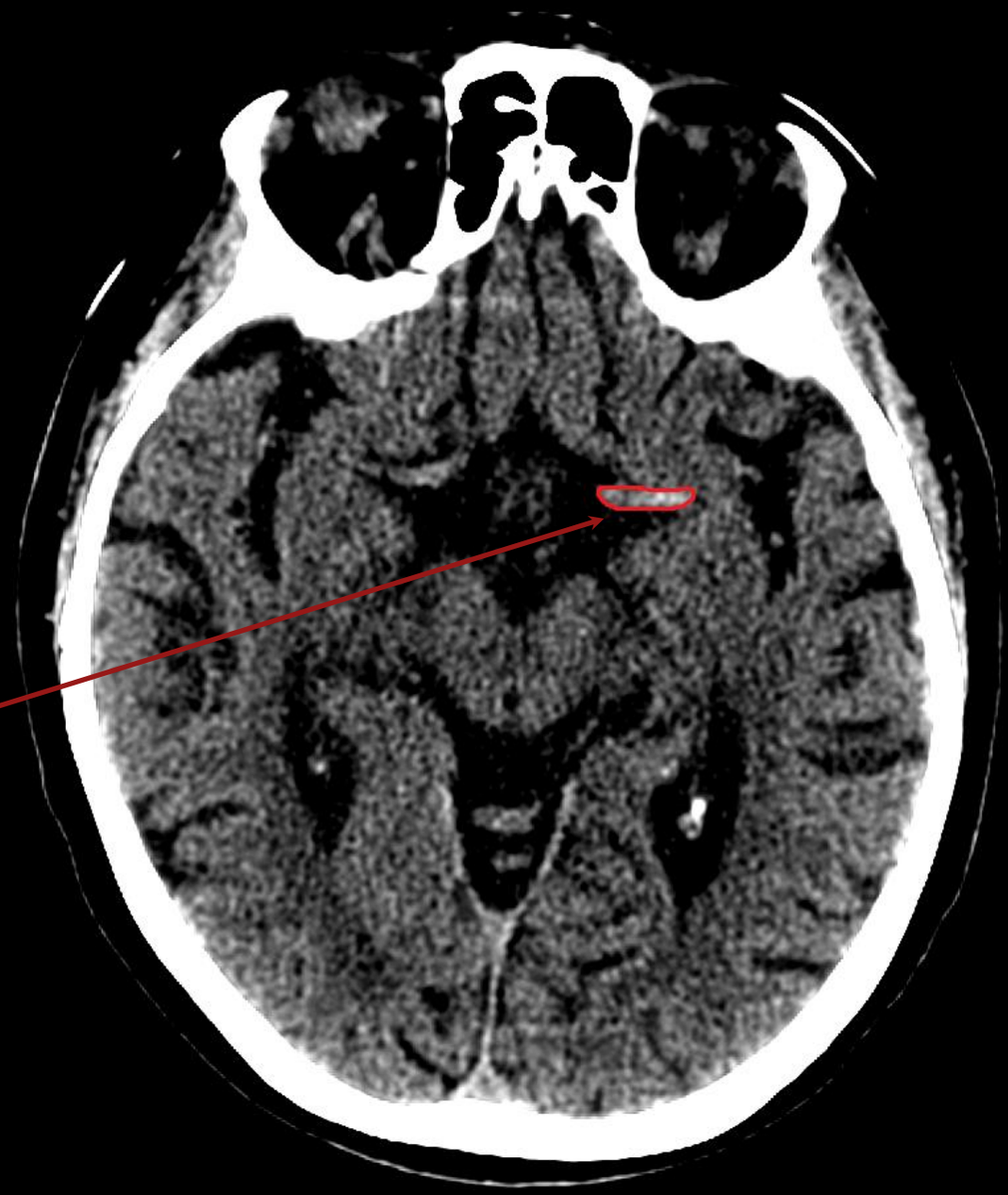
- Follow the vessels in this example.
- Do you see anything that looks hyperdense to suggest a thrombus?

Axial

EXTRA-AXIAL

- Follow the vessels in this example.
- Do you see anything that looks hyperdense to suggest a thrombus?

This is an example of a hyperdense left middle cerebral artery. This patient had an acute thrombus and resultant cerebral infarct (stroke).



Axial

INTRA-AXIAL

- Are the midline structures present and normal appearing?
- Are there any masses?
- Is there mass effect?
  - Is there "effacement" of cortical sulci?
  - Is there any brain herniation? We will cover this in a minute.
- Are the basal ganglia present and symmetric?

INTRA-AXIAL

- Is there any loss of "grey-white differentiation?"
    - Recall your anatomy of grey and white matter.
    - Usually the grey matter and white matter are different densities and can be distiguished from each other.
    - If there is loss of this distinction, it can be an early indication of acute cortical ischemia in strokes.

Axial

INTRA-AXIAL

- The grey-white differentiaion is preserved in this image.
- Note the nice cortical ribbon of grey matter.
- The deep grey matter structures are also preseverd in density.

Axial

INTRA-AXIAL

- This is an example of an acute cortical infarct.
- Notice the loss of grey-white differentiation.

Axial

INTRA-AXIAL

- This is an example of an acute cortical infarct.
- Notice the loss of grey-white differentiation.

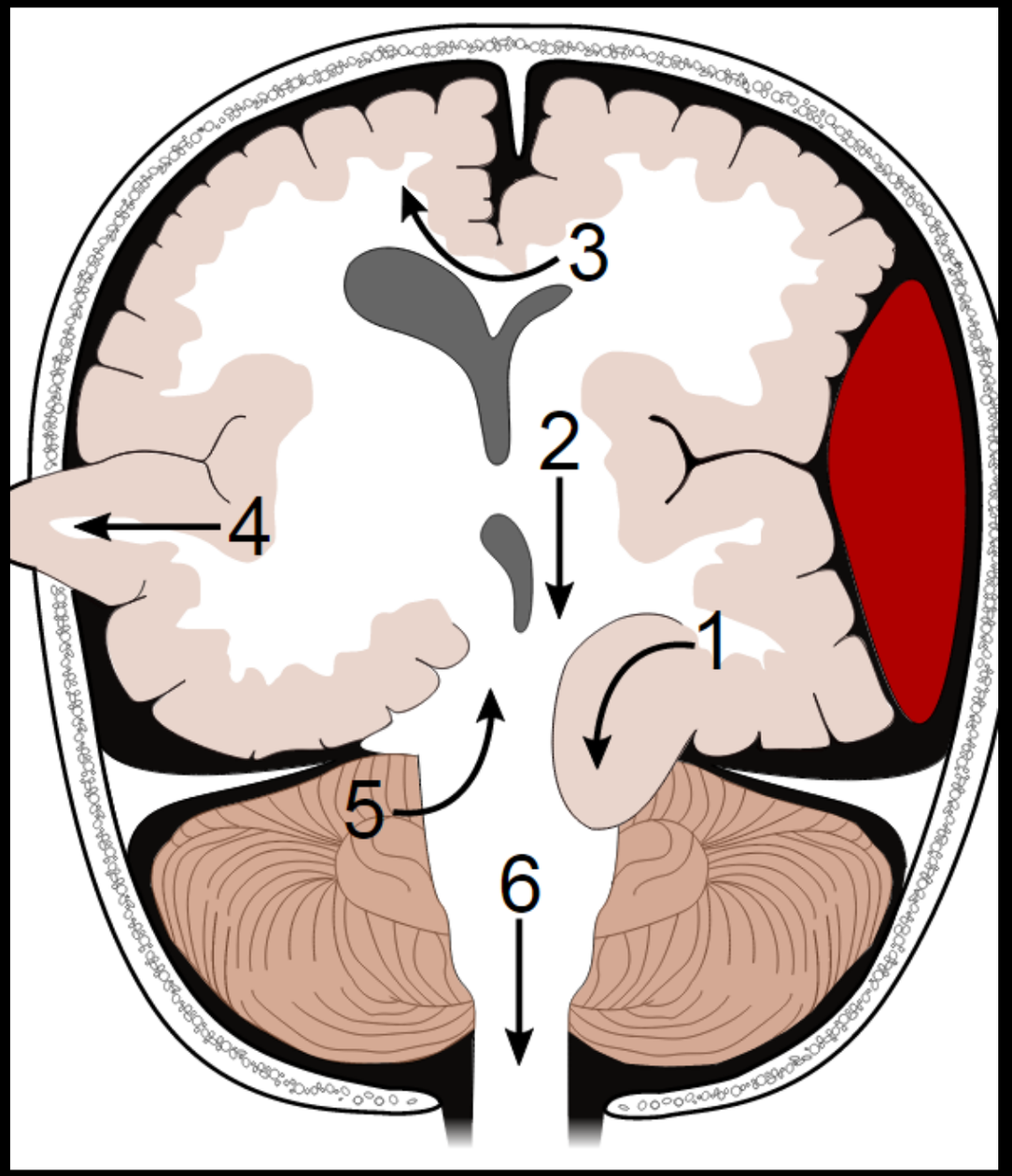
Axial

HERNIATION

- The volume of the intracranial space is fixed. It contains brain tissue, CSF and blood vessels.
- In pathologic states, if there is an intracranial space occupying lesion (eg. bleed, tumor, edema), mass effect can result. This can displace brain tissue under/over/through fixed structures. This process is called herniation.
- The following slide demonstrates some of the common herniation syndromes.

HERNIATION

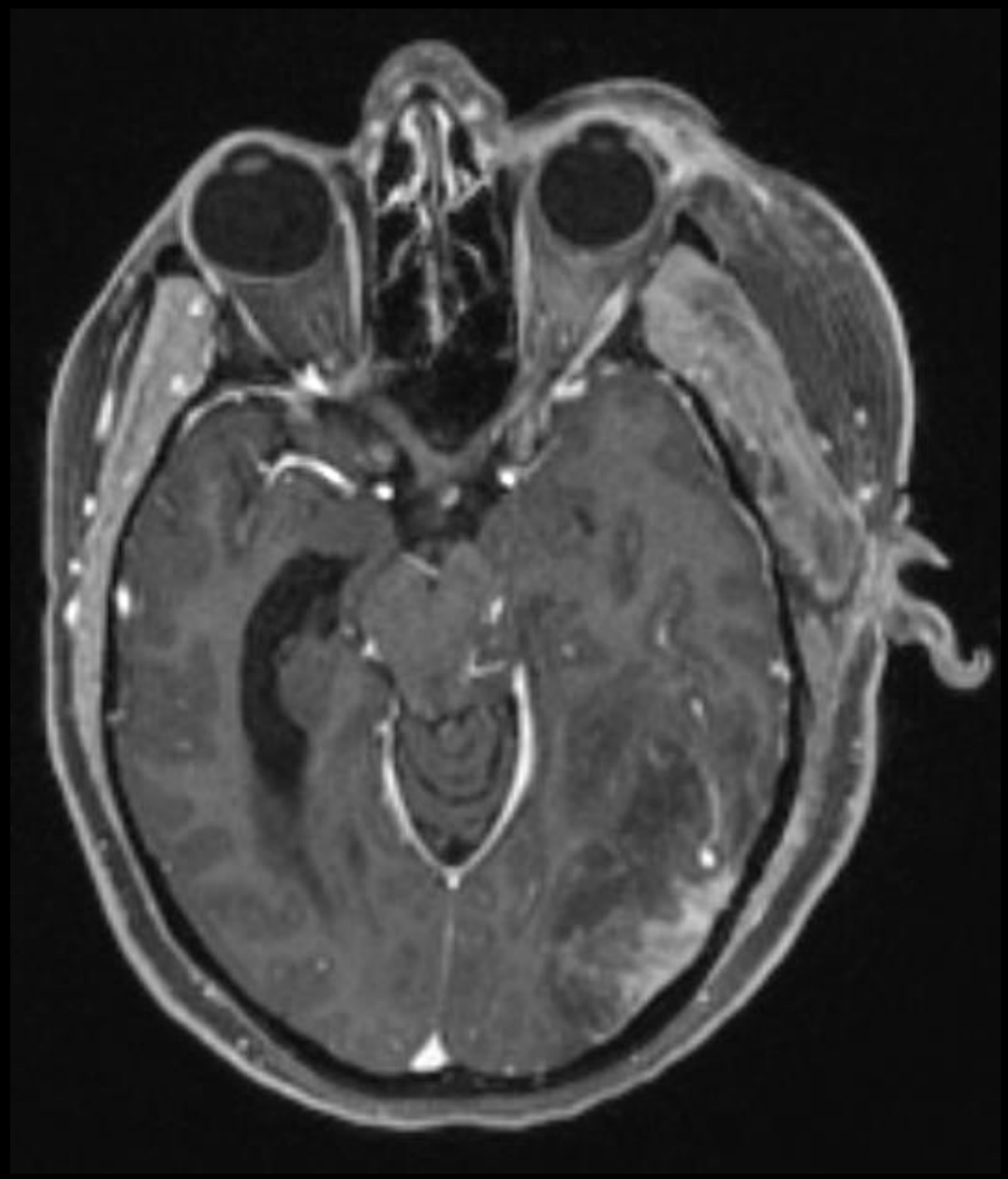
- 1. Uncal
- 2. Descending Transtentorial
- 3. Subfalcine (midline shift)
- 4. Transcranial
- 5. Ascending Transtentorial
- 6. Cerebellar Tonsillar



http://upload.wikimedia.org/wikipedia/commons/7/79/Brain_herniation_types-2.svg

HERNIATION

- Here is an example of a large left sided space occupying lesion that is causing mass effect.
- There is:
  - left uncal
  - left descending transtentorial herniation



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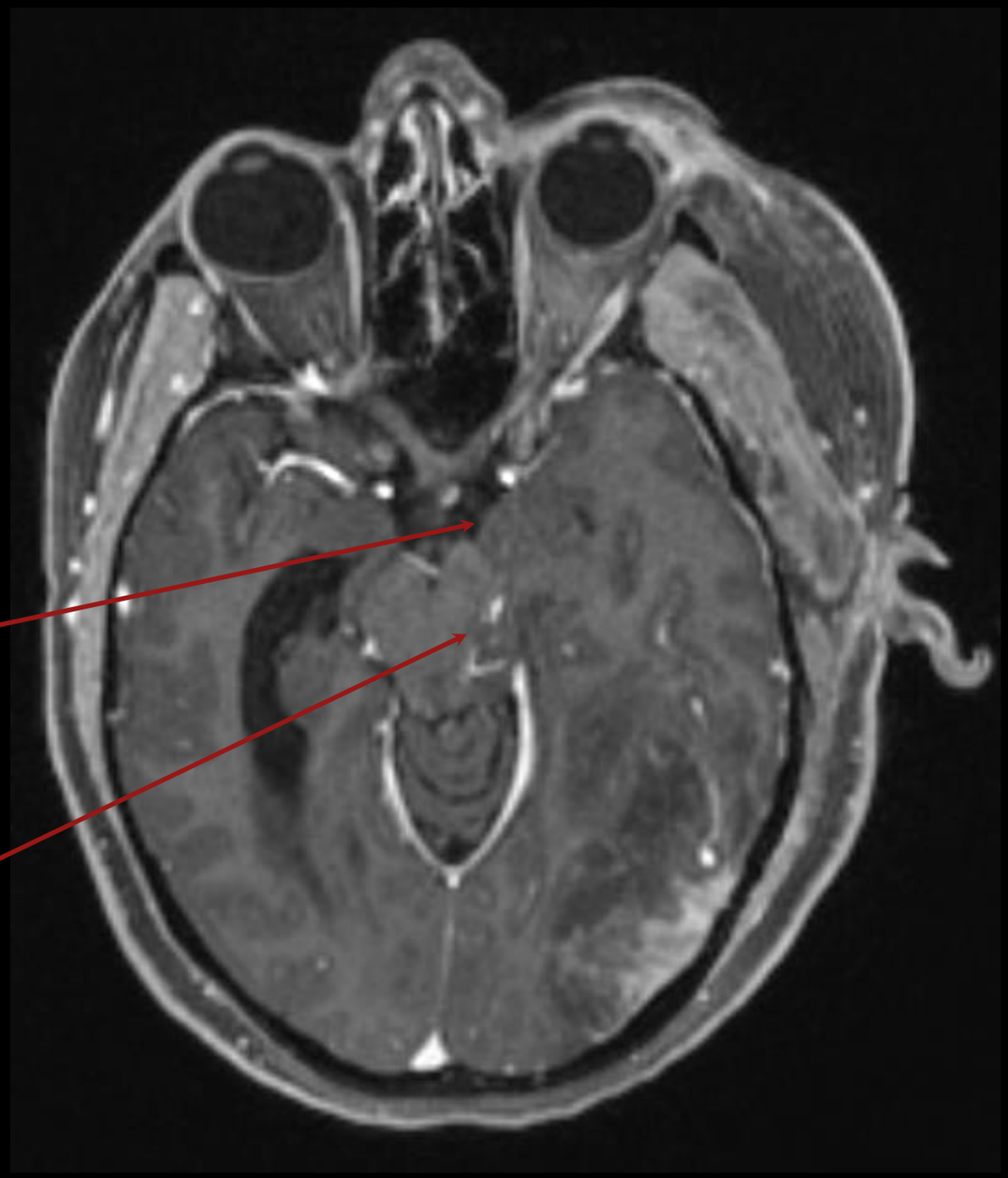
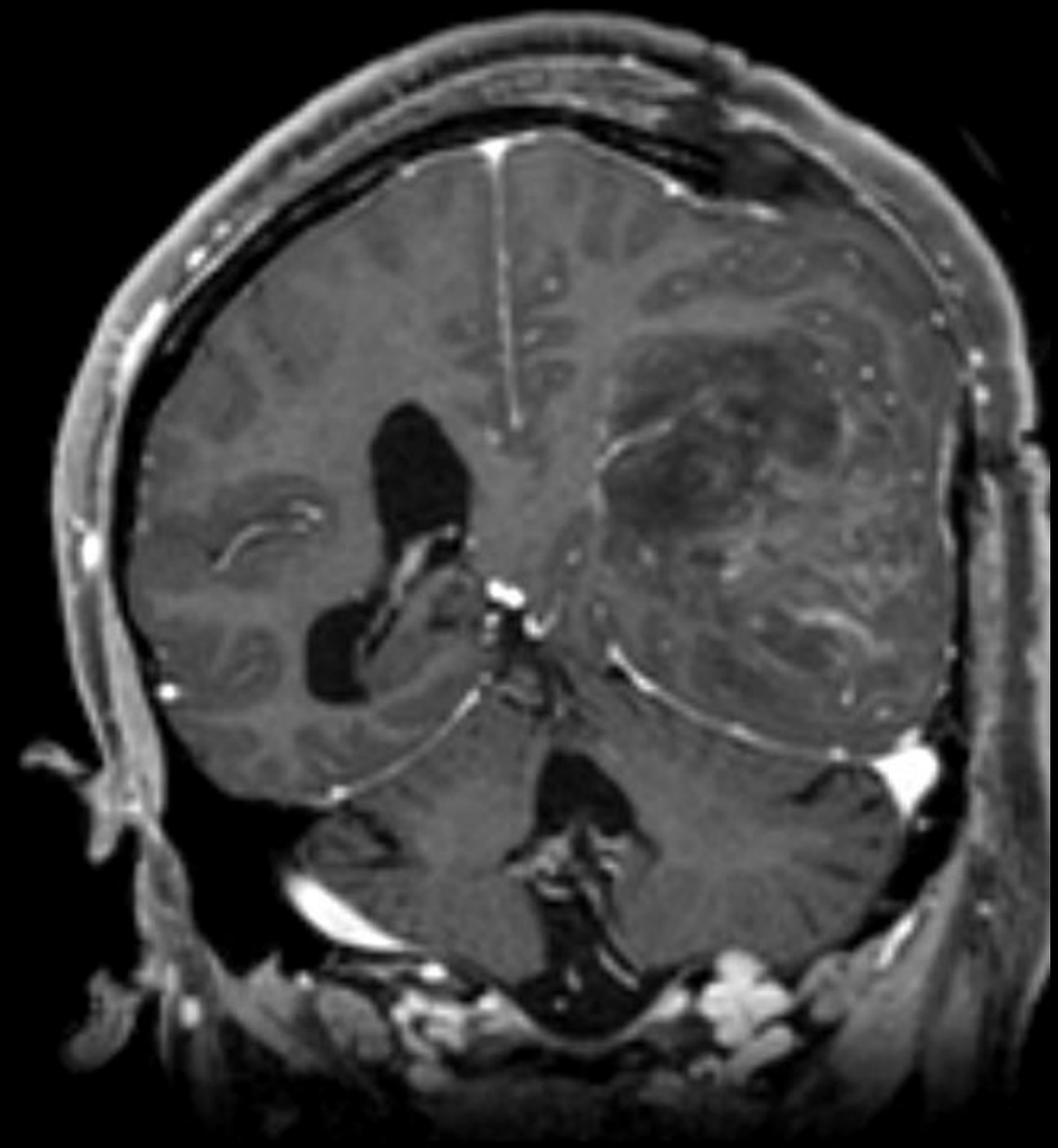


Axial

HERNIATION

- Sometimes it can be easier to appreciate herniation on coronal images.

- This is the same case, demonstrating left descending transtentorial herniation.



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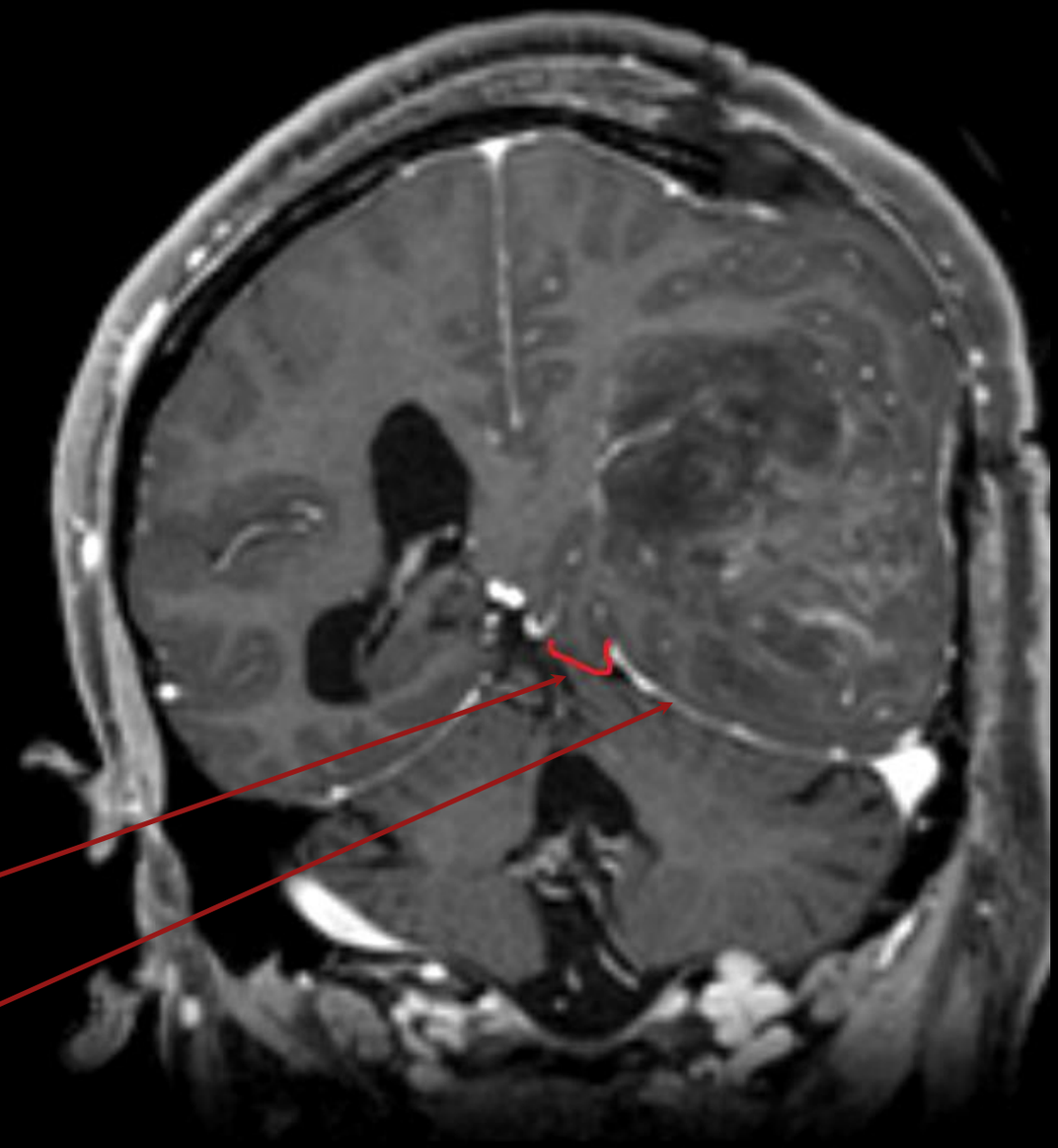

See the brain tissue squishing over the tentorium cerebelli.

BONES

- Don't forget the bone windows!
- Are there any acute fractures or destructive bone lesions?
  - If you see cortical disruption, look at the contralateral side to ensure it isn't a normal cranial suture.

Axial

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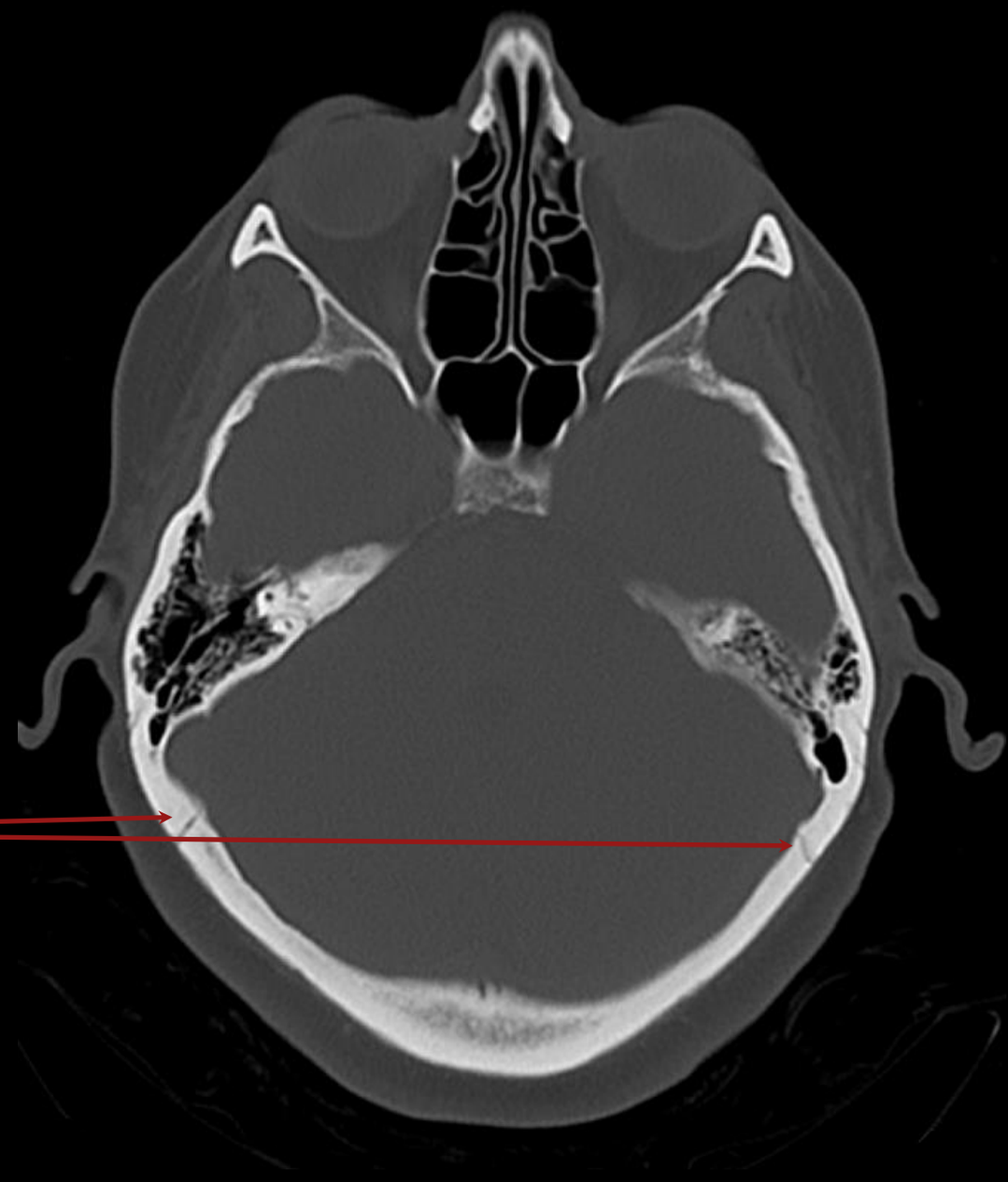

These are the lambdoid sutures between the temporal and occipital bones. Notice the symmetry. Don't get fooled for fractures!

Axial

BONES

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What about this case? Do you see any fractures?

Axial

BONES

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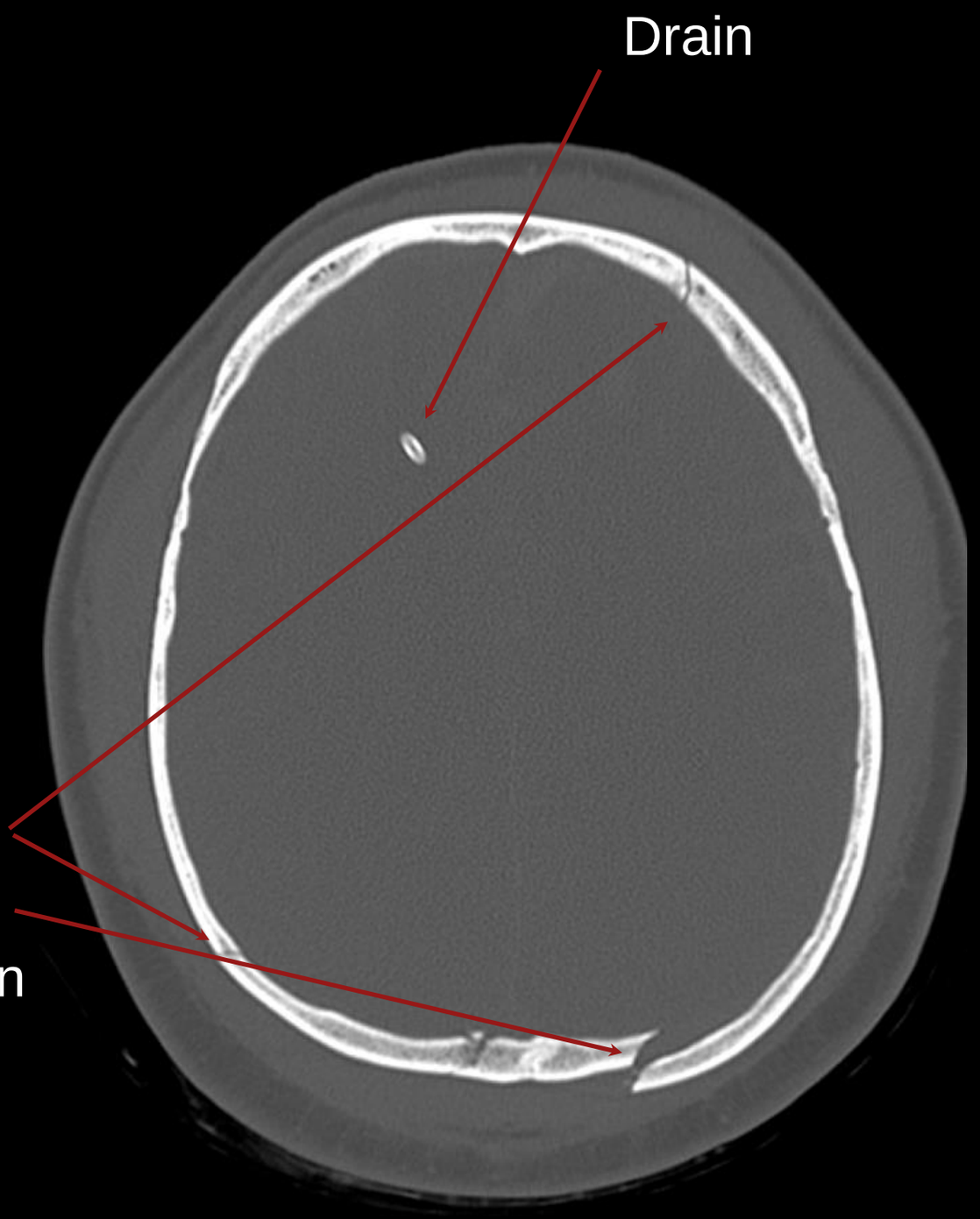
Notice the multiple asymmetric skull fractures, one of which is depressed. There is also part of a ventricular drain depicted as this patient had intraventricular hemorrhage and hydrocephalus.



Axial

End of module 2

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