

NEURORADIOLOGY

DIL part 4

Strokes and infarcts

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OVERVIEW

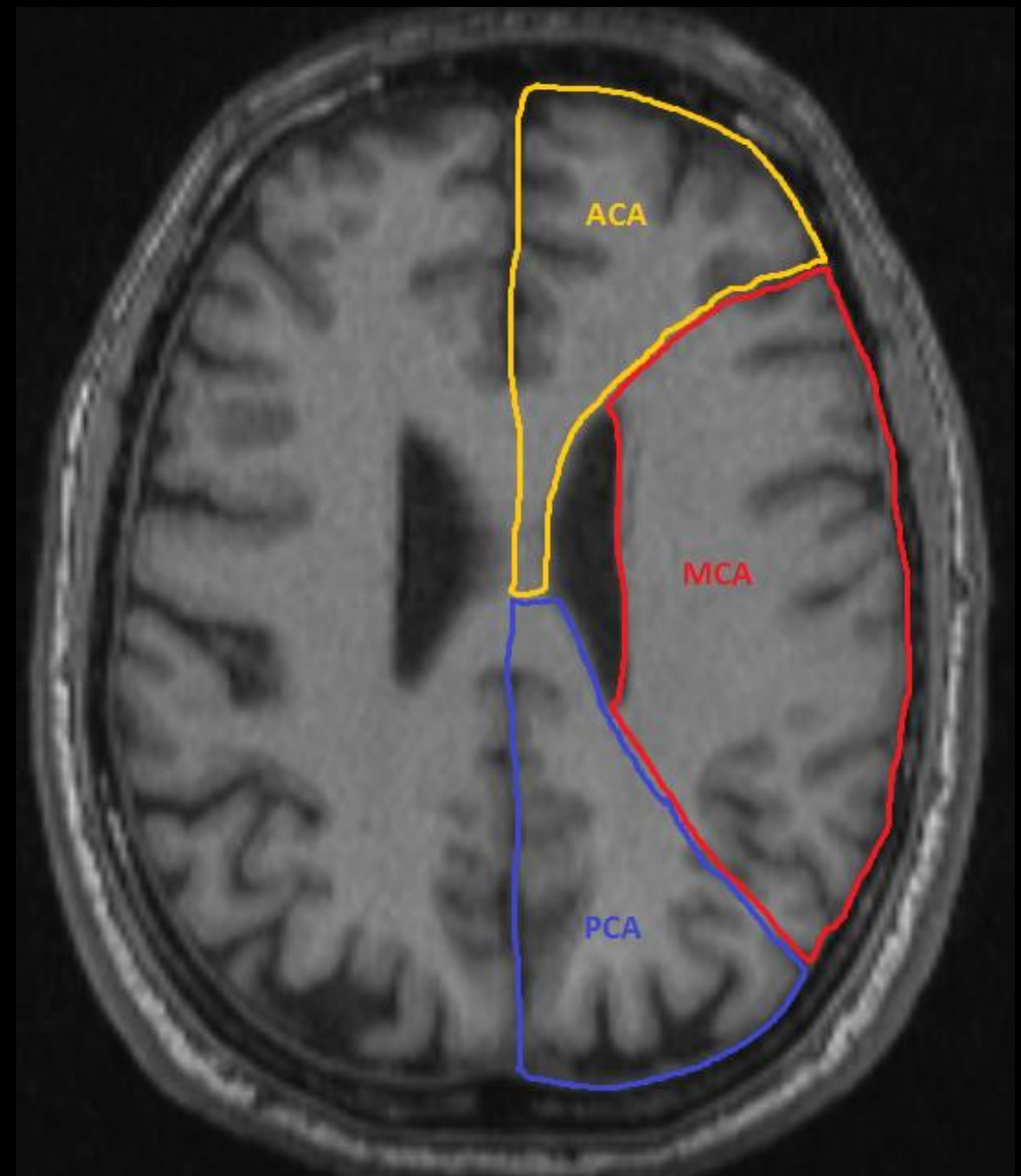
- Introduction to Neuroimaging - DIL part 1
- Basic Brain Anatomy - DIL part 1
- Standardized Approach to Image Interpretation - DIL part 2
- **Common Pathology**
 - Bleeds (Hemorrhages) - DIL part 3
 - **Strokes (Infarcts) DIL part 4**
 - Masses (Tumors) part 5

LOCATION

- A patient's history and neurological physical examination can help to predict the location of brain tissue that has become ischemic/infarcted.
- There are many different "stroke syndromes" that have been described.
- Good idea to know a few of the more common ones. The following slides suggest some of the more common presentations for specific territory infarcts/ischemia, but know that these are highly variable.

LOCATION

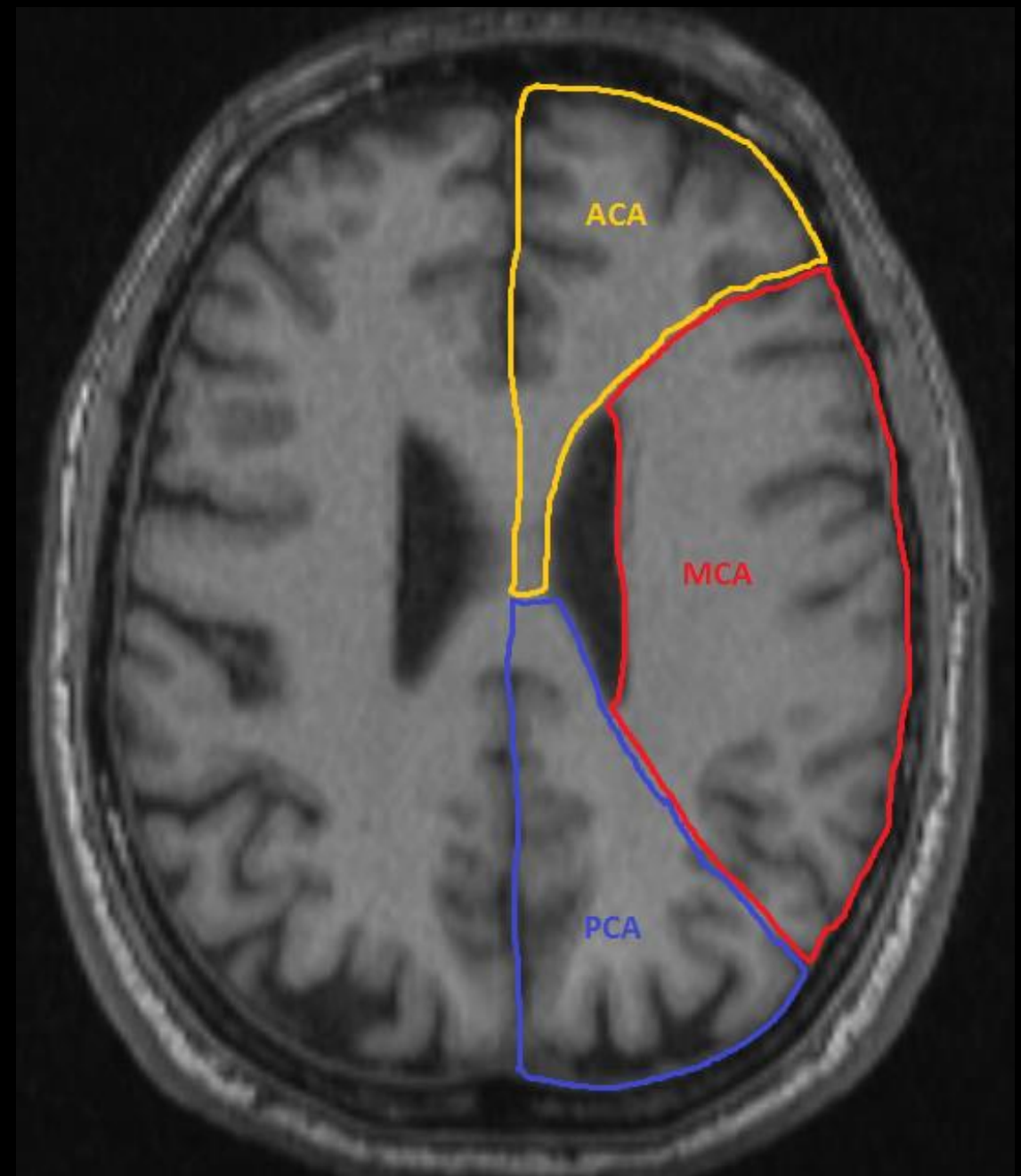
- This axial MRI roughly depicts the parts of the brain supplied by the major intracranial vessels.
- Yellow = Anterior Cerebral Artery
- Red = Middle Cerebral Artery
- Blue = Posterior Cerebral Artery



Axial

LOCATION

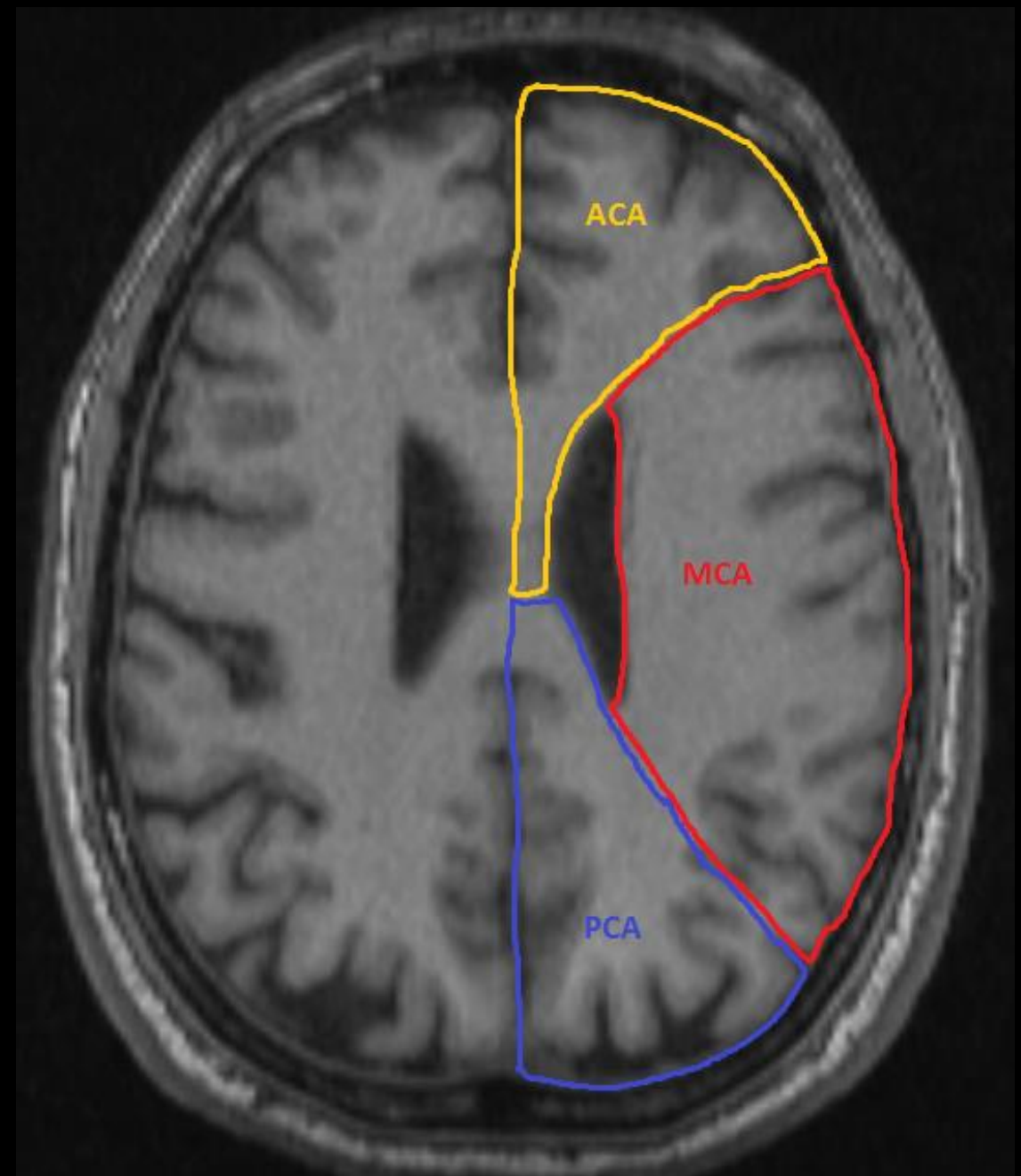
- Anterior Cerebral Artery
 - Contralateral leg/foot hemiparesis
 - Contralateral leg/foot sensory deficits
 - Gait apraxia



Axial

LOCATION

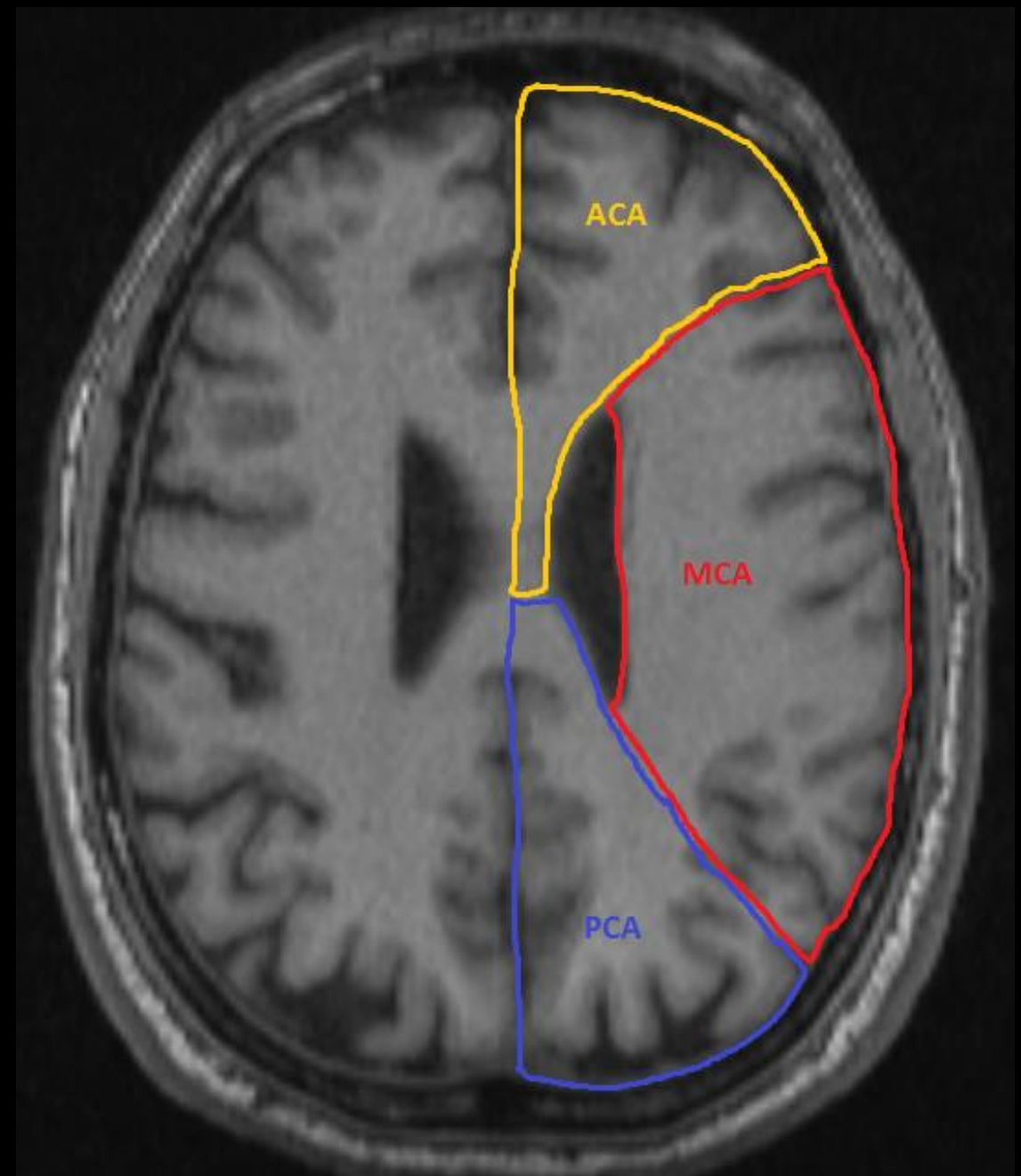
- Middle Cerebral Artery
 - Contralateral face/arm/leg hemiparesis
 - Contralateral face/arm/leg sensory deficits
 - Aphasia
 - Homonymous hemianopsia



Axial

LOCATION

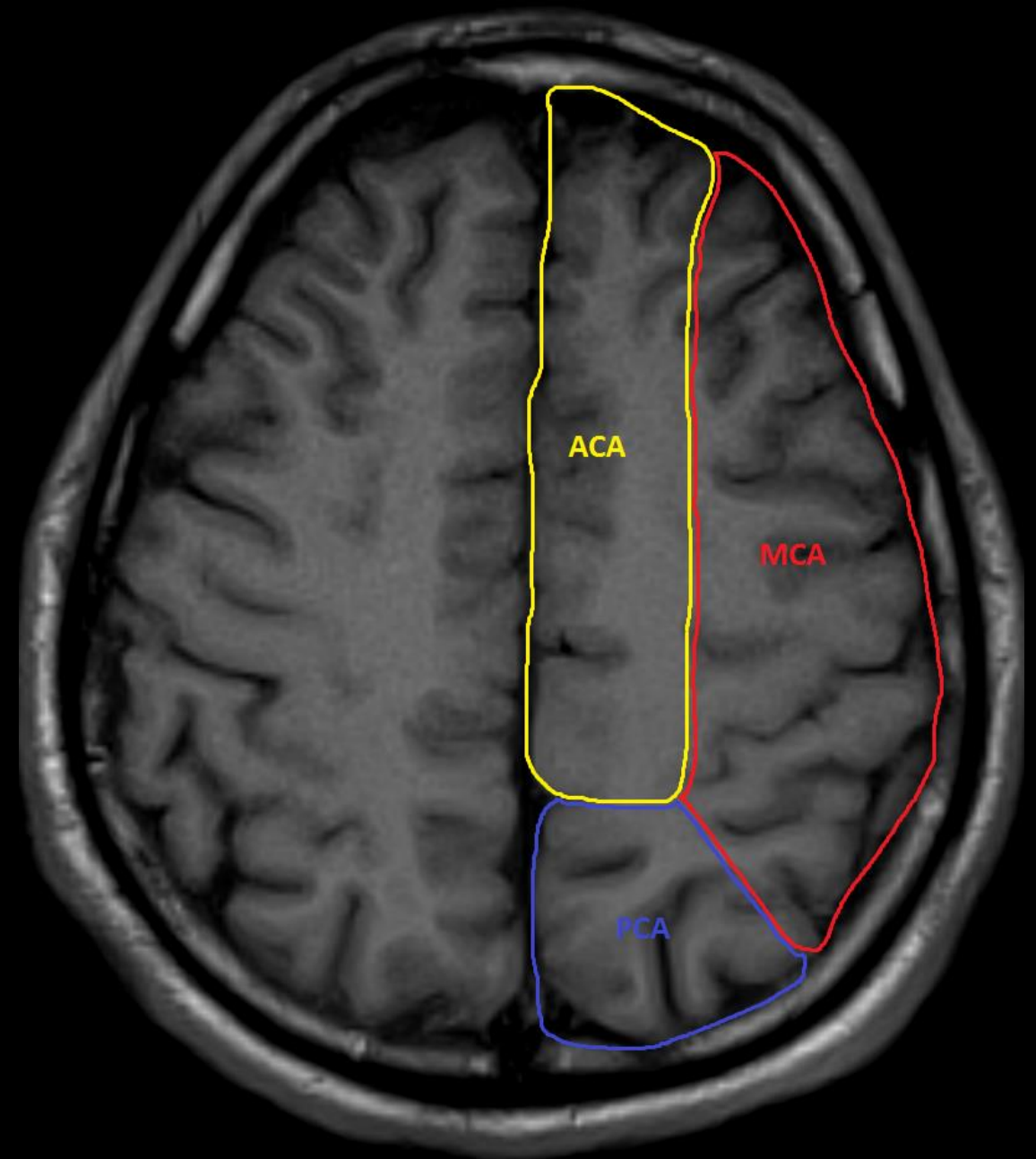
- Posterior Cerebral Artery
 - Visual deficits, often homonymous hemianopsia
 - Verbal dyslexia without agraphia
 - Memory deficits
 - All modality sensory loss if thalamic stroke



Axial

LOCATION

- Here is an axial slice slightly higher up, closer to the vertex, that roughly shows the vascular territories of the same vessels.



Axial

LOCATION

- There are many, many other stroke syndromes that we are not discussing in this section. Consider pontine, medullary, cerebellar etc.

IMAGING FINDINGS

- Non-Contrast CT Findings:
 - Loss of grey-white differentiation (first 3 hours)
 - This finding can be subtle, but it is key. What you are looking for is difficulty in differentiating grey matter and white matter. This is due to ischemia that preferentially targets grey matter (more metabolically active), resulting in cytotoxic edema.
 - Insular ribbon sign
 - Loss of grey-white differentiation of the insular cortex.
- Hyperdense vessel / MCA Dot Sign
 - Bright white within a vessel is suggestive of acute thrombus.

IMAGING FINDINGS

- CT angiogram:
 - Vessel occlusion, stenosis or dissection
- MR Findings:
 - Bright signal on a specific series called diffusion weighted imaging (DWI).

ACUTE STROKE

- Now, using your knowledge of anatomy, the vascular territories, and imaging features of ischemia, try going through a few cases.

ACUTE STROKE

- Case 1

ACUTE STROKE

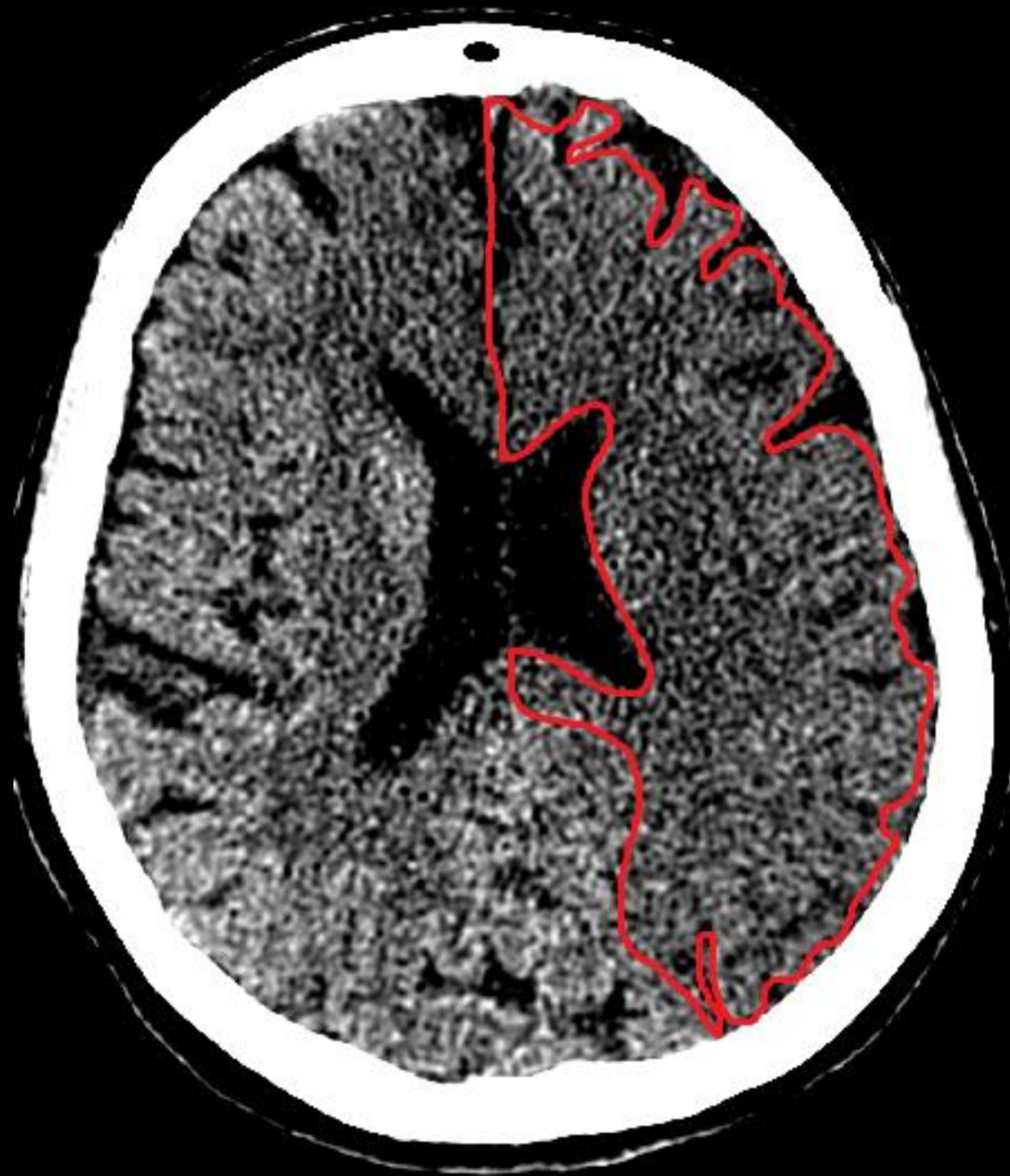
- 68 year old female
- Acute right sided hemiparesis, rapidly progressing to decreased level of consciousness.

ACUTE STROKE



Axial

ACUTE STROKE



Axial

ACUTE STROKE

- Hyperdense left ICA
= thrombus



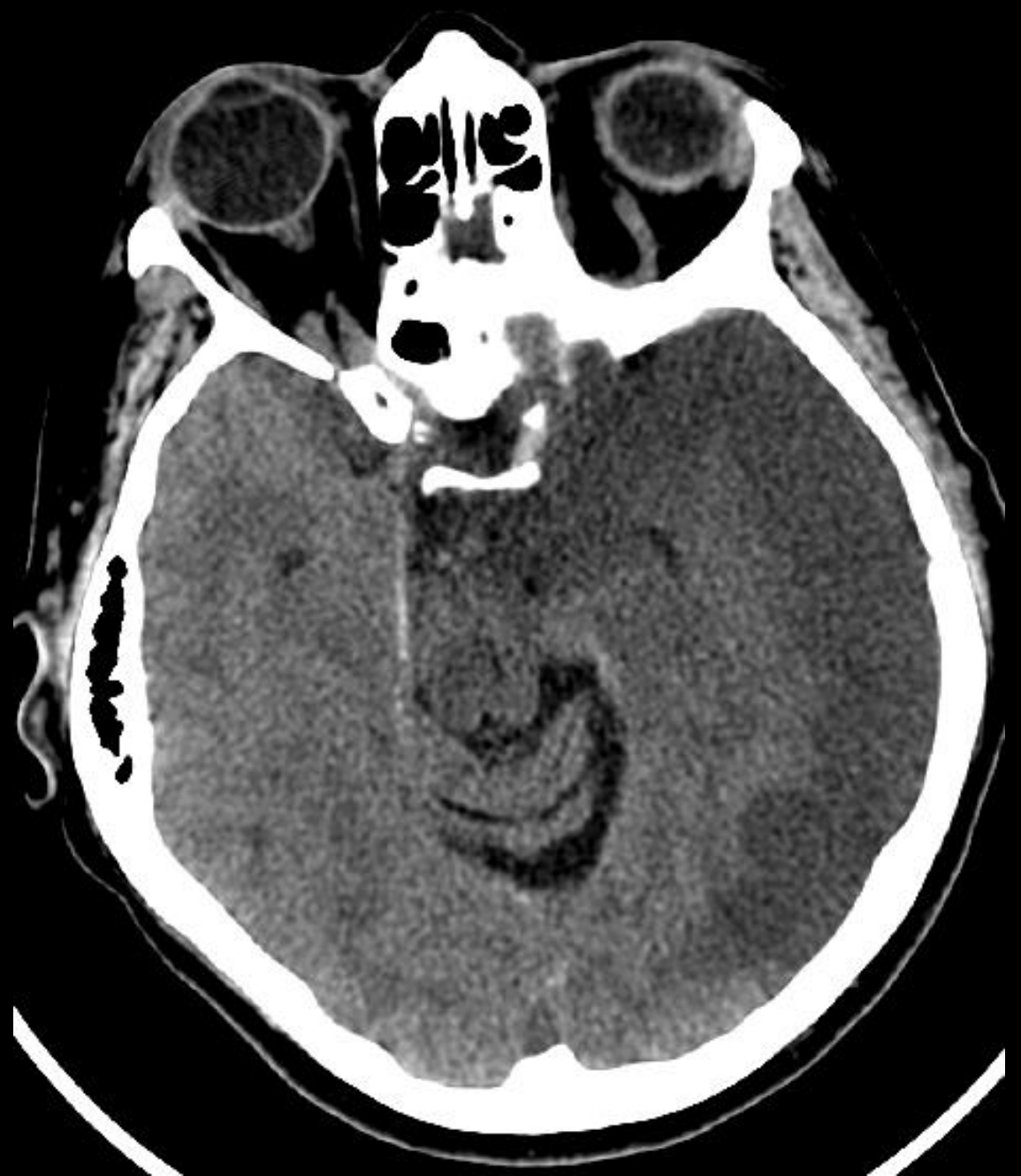
Axial

ACUTE STROKE

- Loss of grey-white differentiation throughout left cerebral hemisphere.
- Subtle, but key!
- This territory is supplied by the left ACA and MCA (because they are fed by the occluded left ICA). Notice how the PCA territory is spared, due to its supply from the posterior circulation (vertebrobasilar).



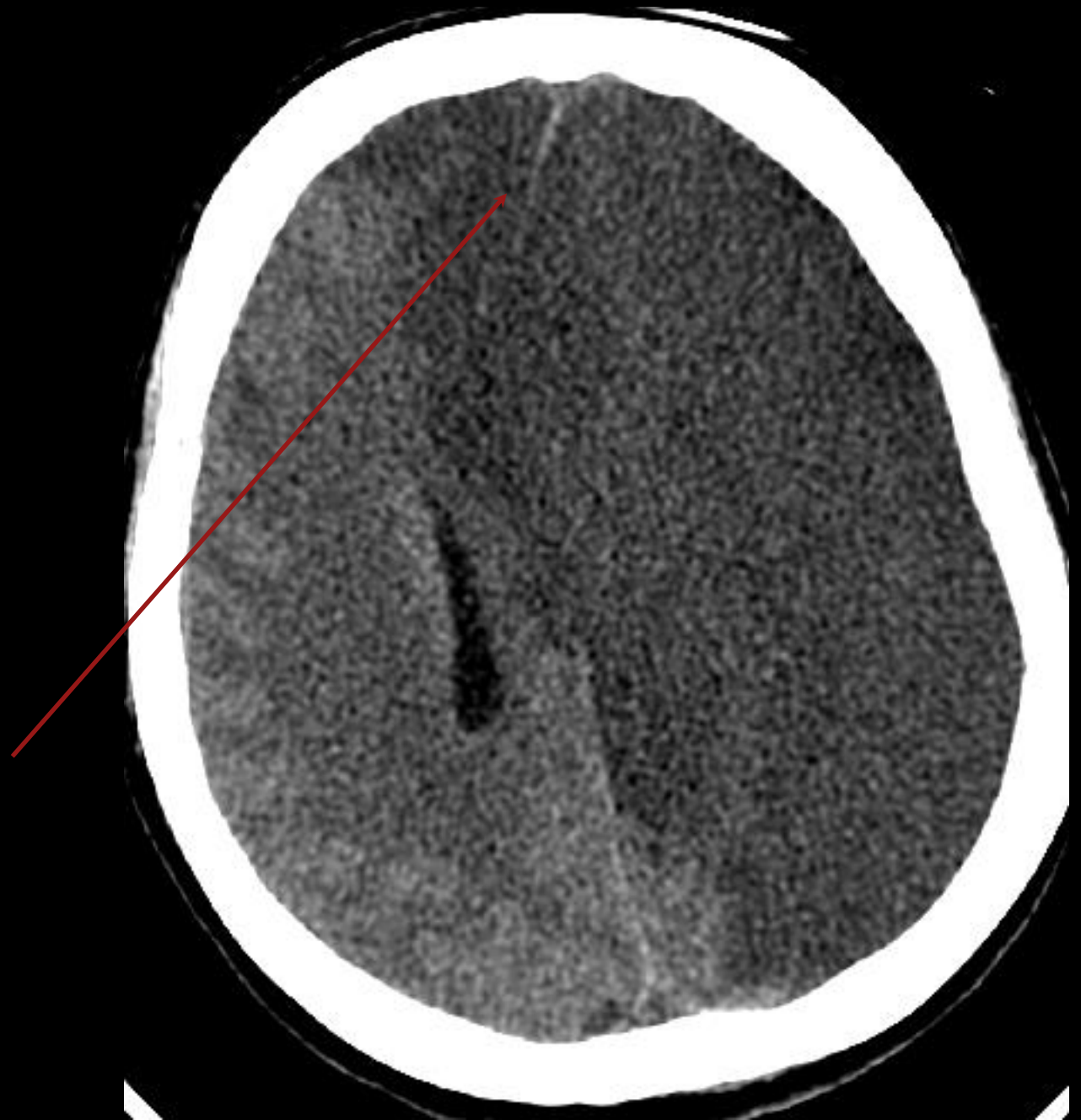
24 HOURS LATER



Axial

24 HOURS LATER

- Due to the significant infarct this patient experienced, there has been progressive edema and now there is mass effect with shift of the brain tissue from left to right.
- Notice the falx deviated to the right.



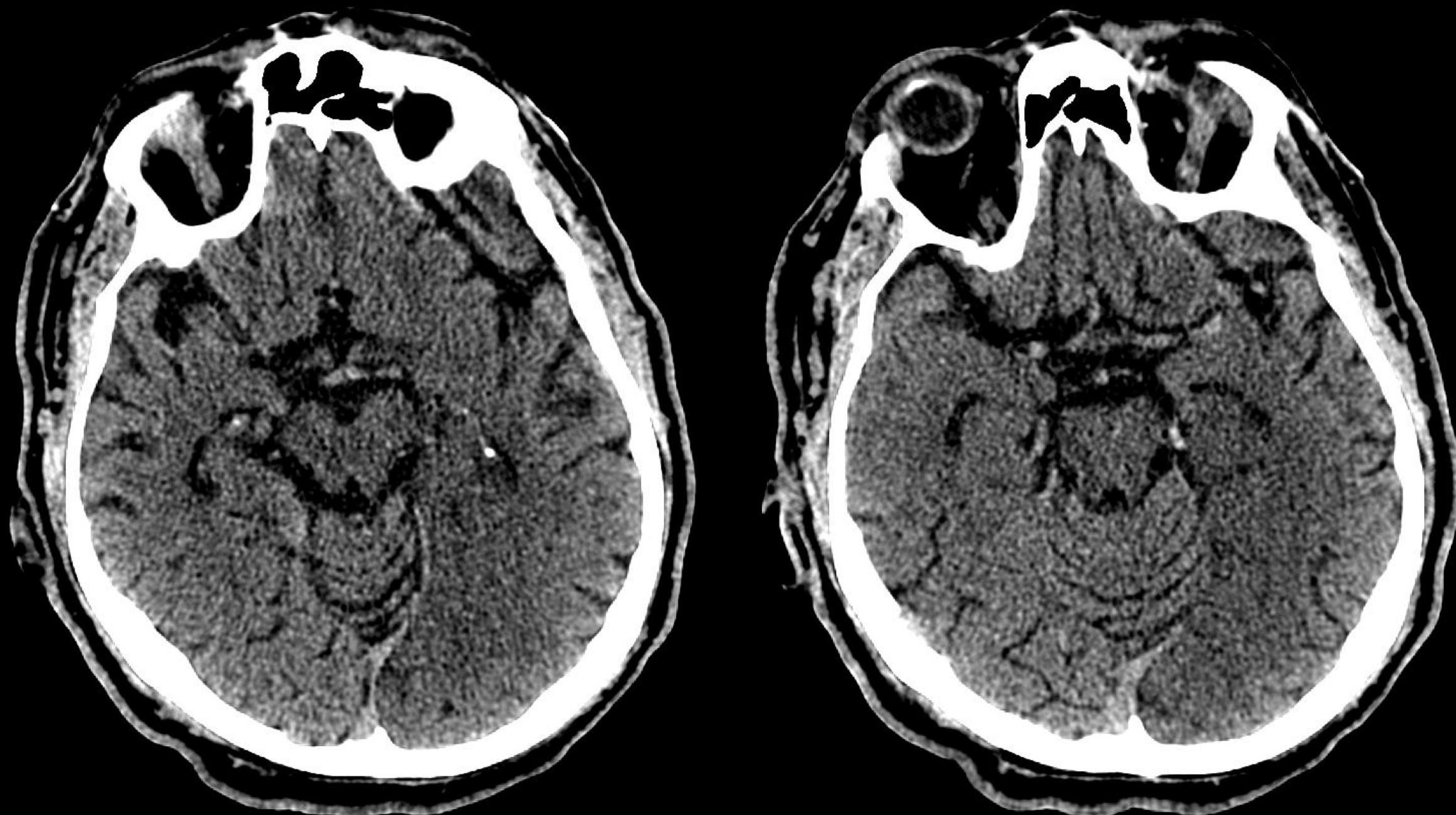
ACUTE STROKE

- Case 2

ACUTE STROKE

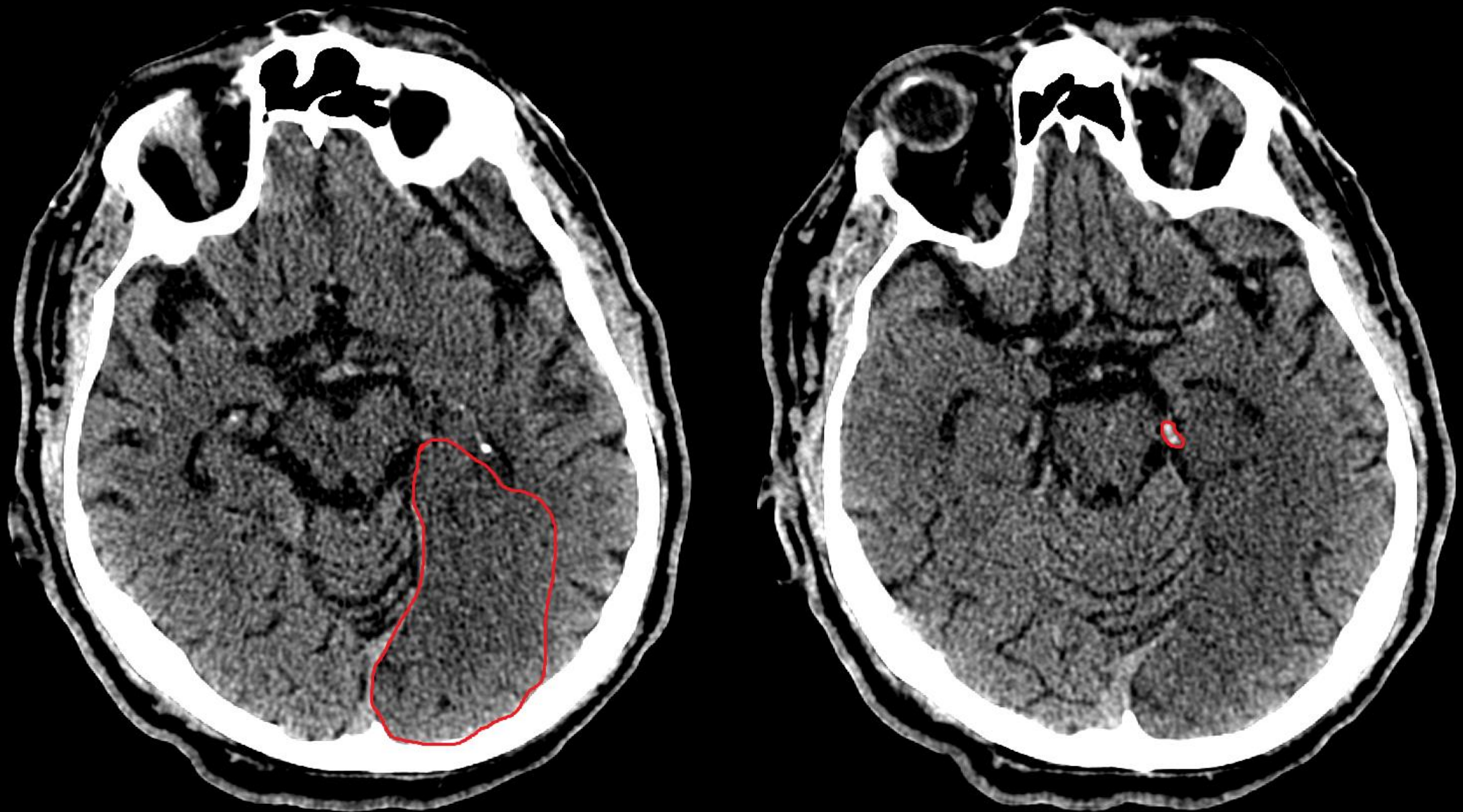
- 69 year old male
- Right homonymous hemianopsia

ACUTE STROKE



Axial

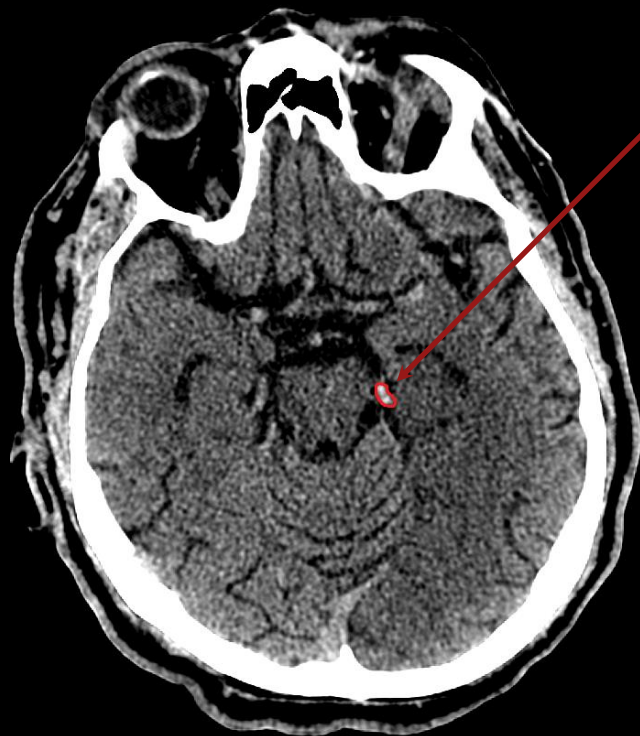
ACUTE STROKE



Axial

ACUTE STROKE

- Findings of left PCA acute infarct:
 - Loss of grey-white differentiation left PCA territory
 - Hyperdense thrombus left PCA



Axial

ACUTE STROKE

- Did you see the findings? It's not easy.
- Often a CT angiogram will be performed in acute strokes. This involves injecting the patient with IV contrast, then waiting a period of time until the contrast is predominately within the intracranial arteries.

ACUTE STROKE

- Have a look at this same case. Maybe it will solidify your diagnosis. Click ahead and you can scroll through transverse axial images of a CT Angiogram. It starts inferior and progresses superiorly (cranially). Scroll forward and backwards as you follow the vessel you are interested in! Look specifically at that left PCA!

ACUTE STROKE



Axial

ACUTE STROKE



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Axial

ACUTE STROKE

- Did you spot the finding?
- Let's have a look at CT Angiogram finding.

ACUTE STROKE

CTA demonstrates
occlusion of left PCA.

If you didn't spot the
finding, feel free to scroll
back and have another
look.



Axial

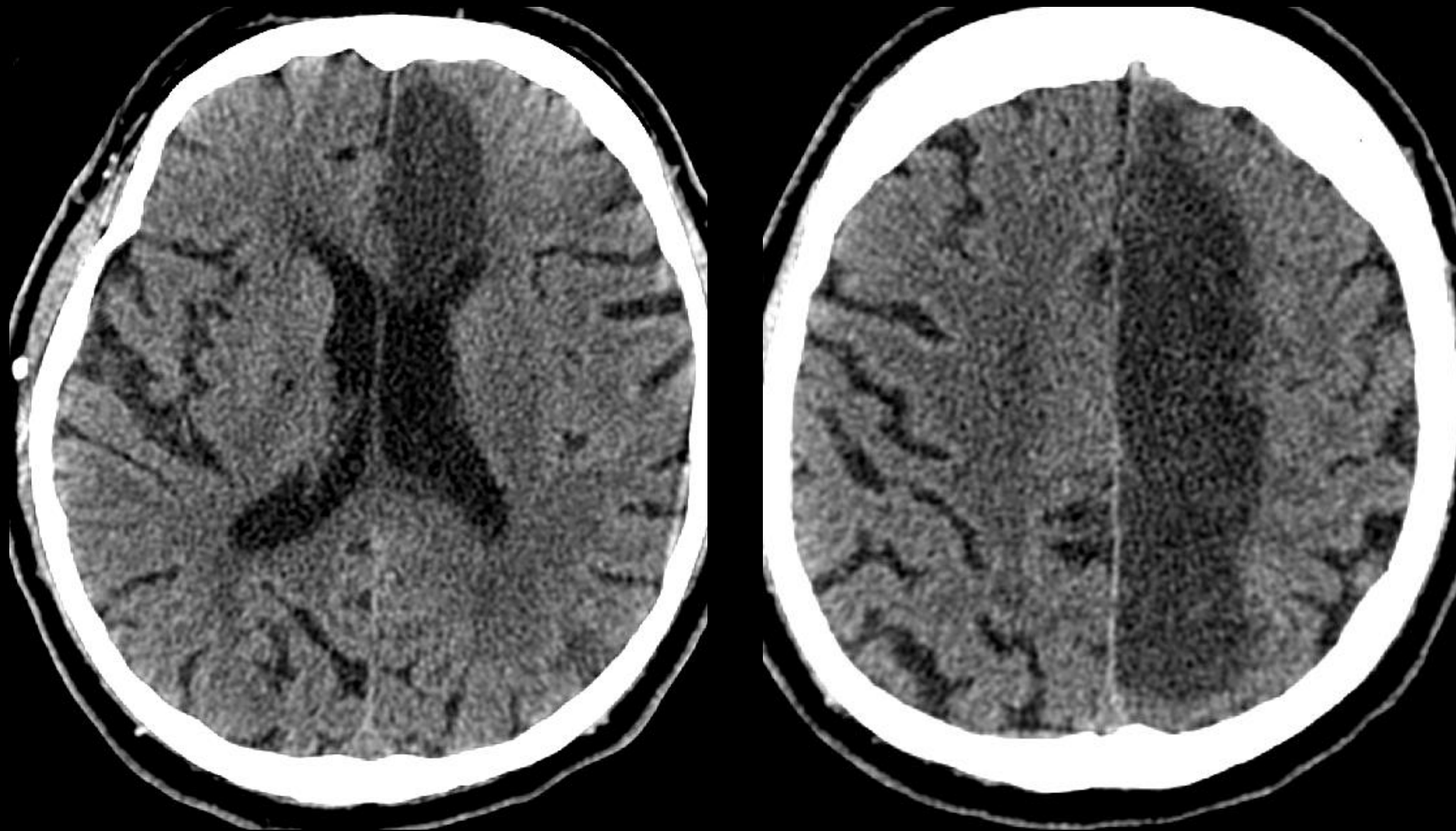
ACUTE STROKE

- Case 3

ACUTE STROKE

- 50 year old female
- Awoke, unable to move right leg.

ACUTE STROKE



Axial

ACUTE STROKE

- Findings of left ACA acute infarct:
 - Loss of grey-white differentiation throughout left ACA territory, extending from superior frontal lobe to superior parietal lobe.



ACUTE STROKE

- Findings of left ACA acute infarct:
 - Loss of grey-white differentiation in left ACA territory.



Axial

ACUTE STROKE

- Case 4

ACUTE STROKE

- 75 year old male
- Sudden left facial droop.

ACUTE STROKE



Axial

ACUTE STROKE

There is a hyperdense right MCA, in keeping with acute thrombus!



Axial

ACUTE STROKE

There is a hyperdense right MCA, in keeping with acute thrombus!

Notice there is no loss of gray-white differentiation.

The left and right hemispheres are identical.

In other words, no evidence of cortical infarct at this time.



Axial

ACUTE STROKE

- 2 days later...

ACUTE STROKE



Axial

ACUTE STROKE

The hyperdense vessel is still present.



Axial

ACUTE STROKE

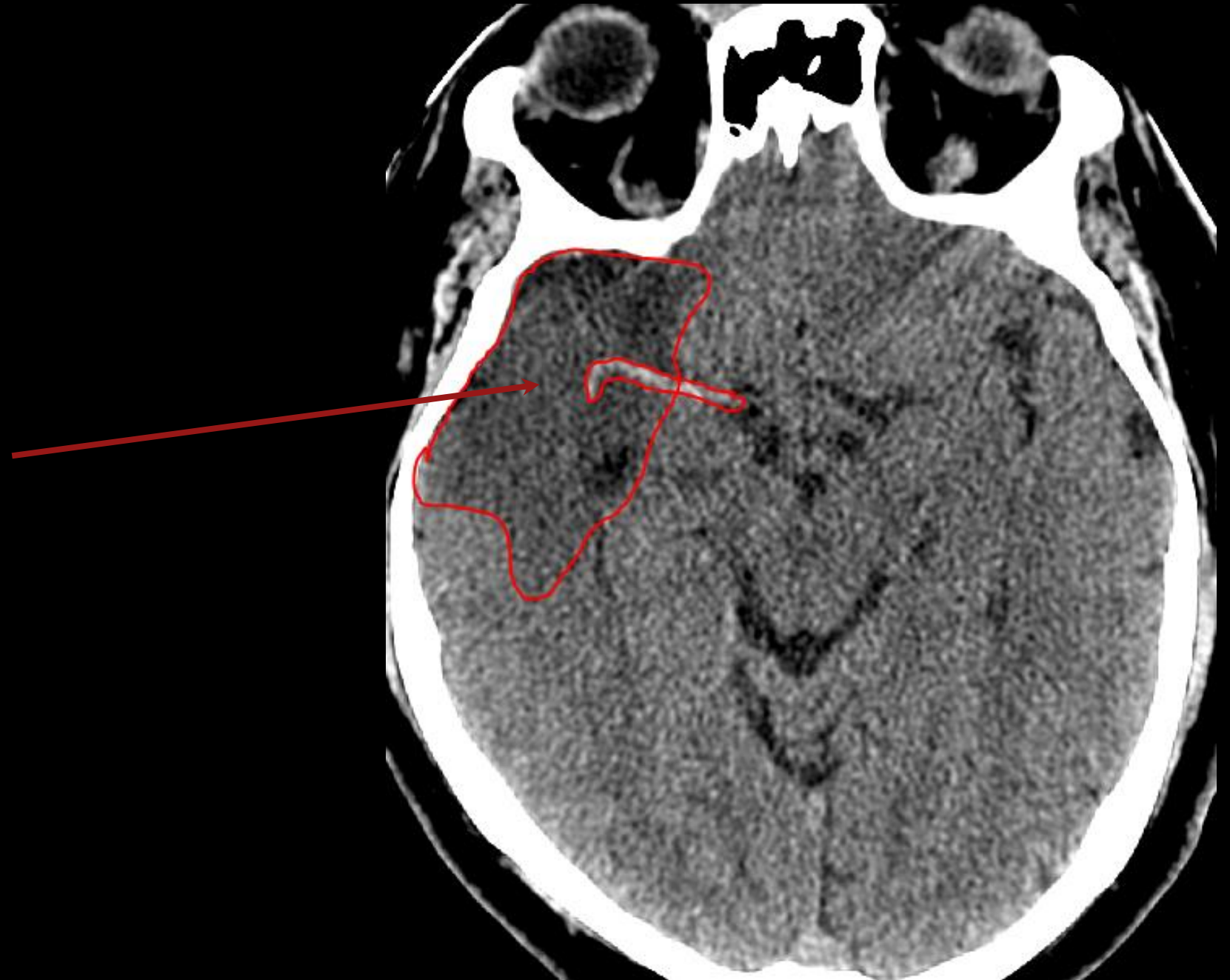
There is now loss of grey-white differentiation.



Axial

ACUTE STROKE

The region of infarct conforms with the vascular territory supplied by the right MCA.



Axial

ACUTE STROKE

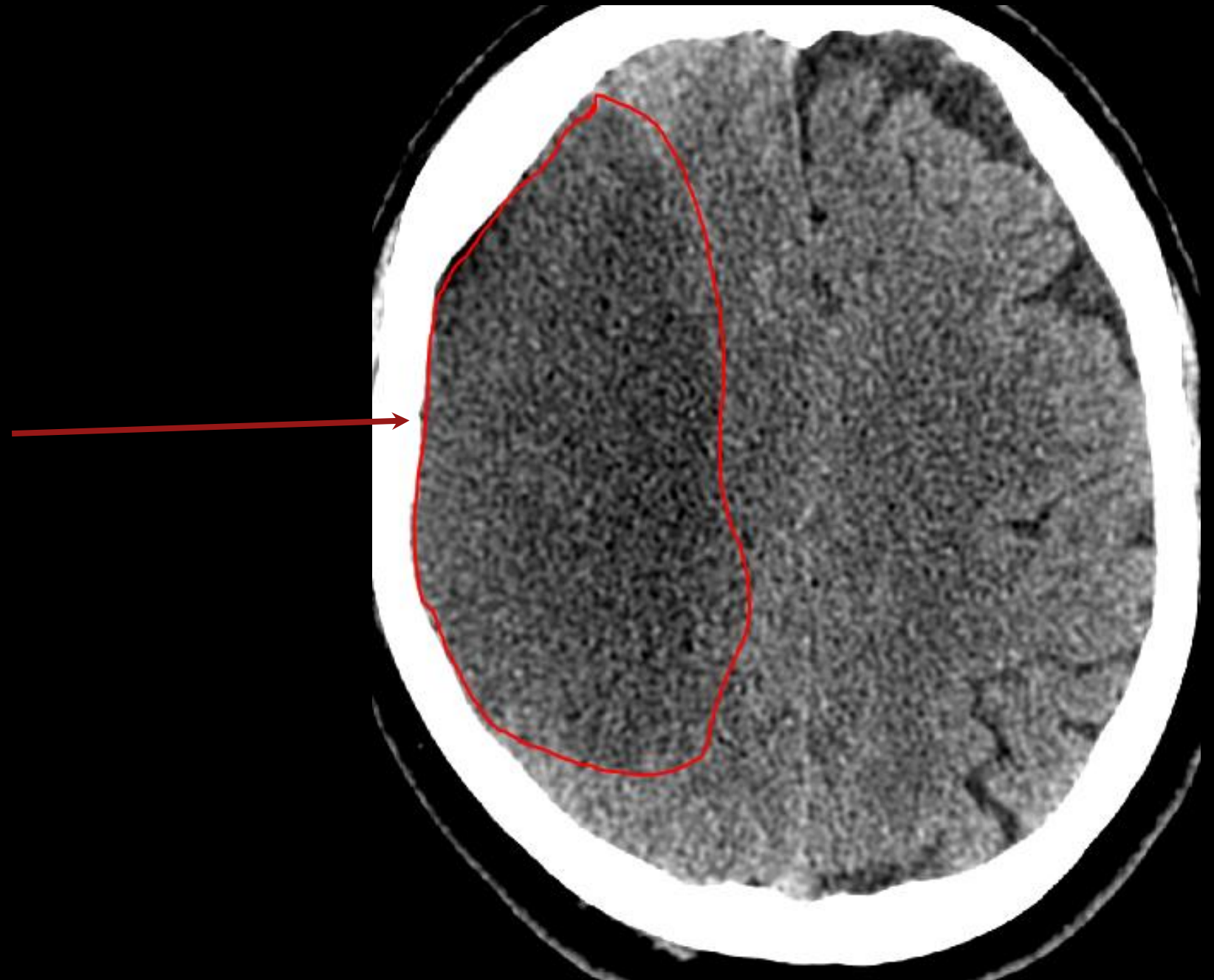
The region of infarct conforms with the vascular territory supplied by the right MCA.



Axial

ACUTE STROKE

The region of infarct conforms with the vascular territory supplied by the right MCA.



Axial

ACUTE STROKE



Initial Study

Lessons:

CT changes related to strokes take time to develop!

A "normal" CT head doesn't always mean a normal brain.



2 days later

Axial

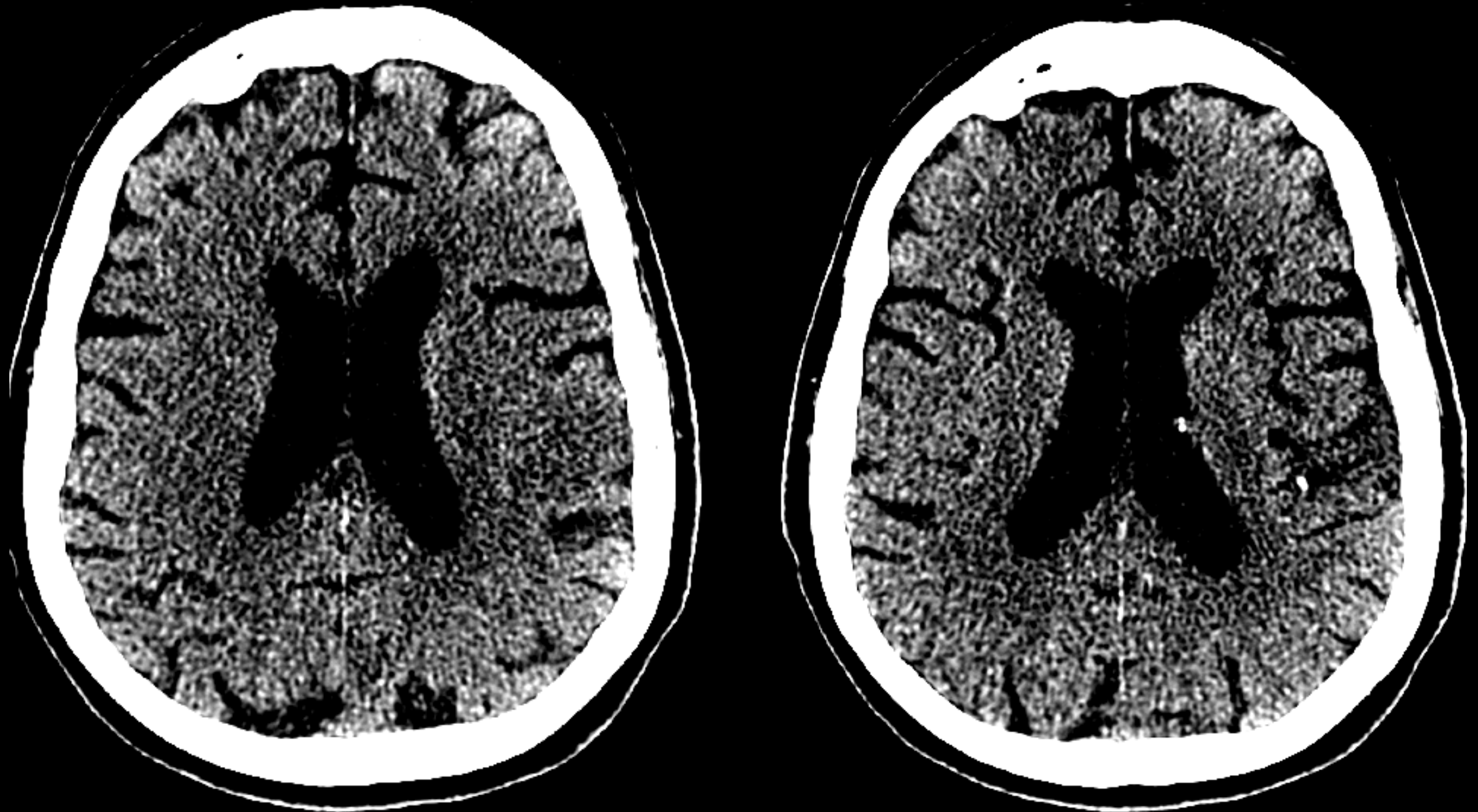
ACUTE STROKE

- Case 5 - This one is subtle!

ACUTE STROKE

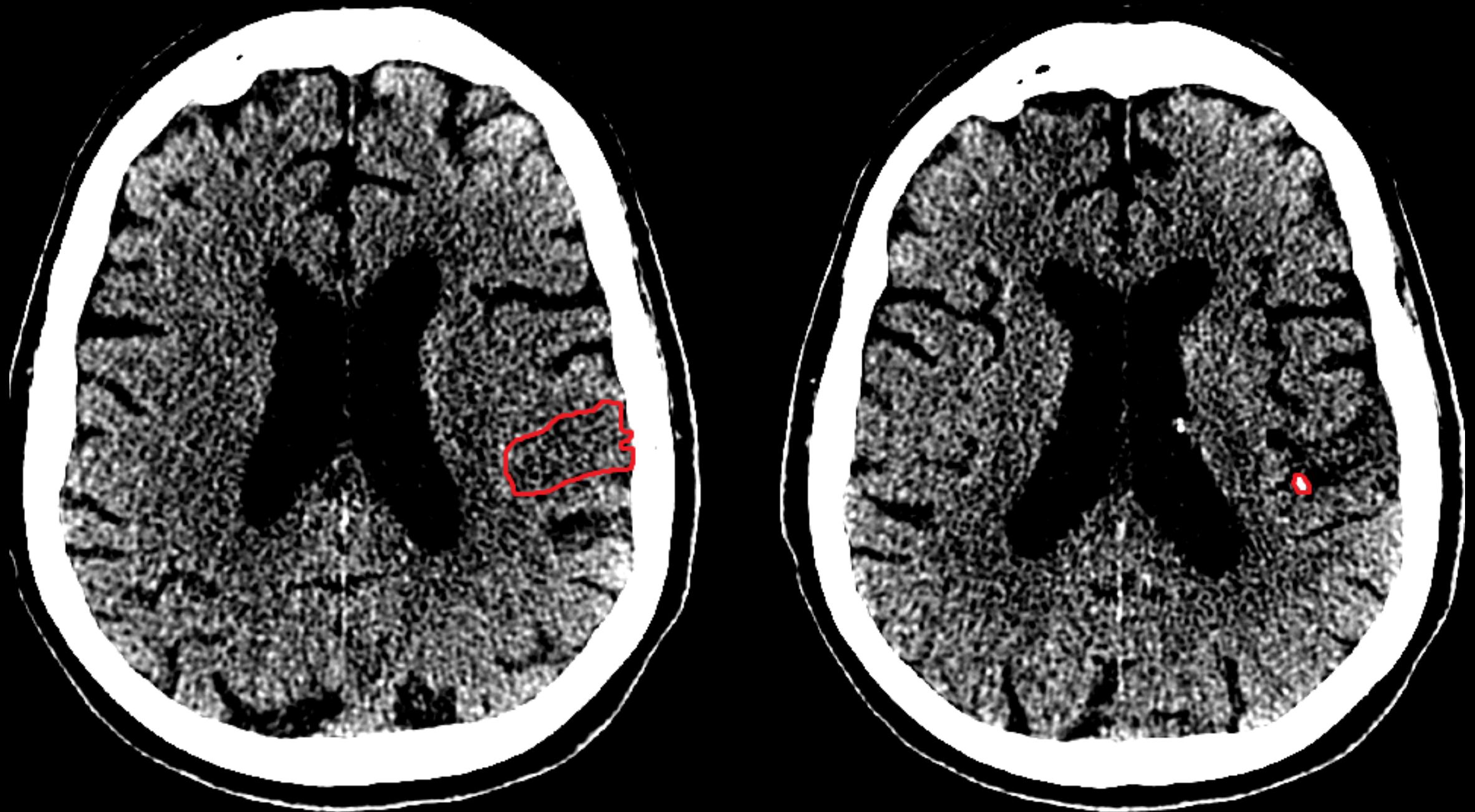
- 63 year old male
- Acute onset dysarthria/aphasia and right facial droop.

ACUTE STROKE



Axial

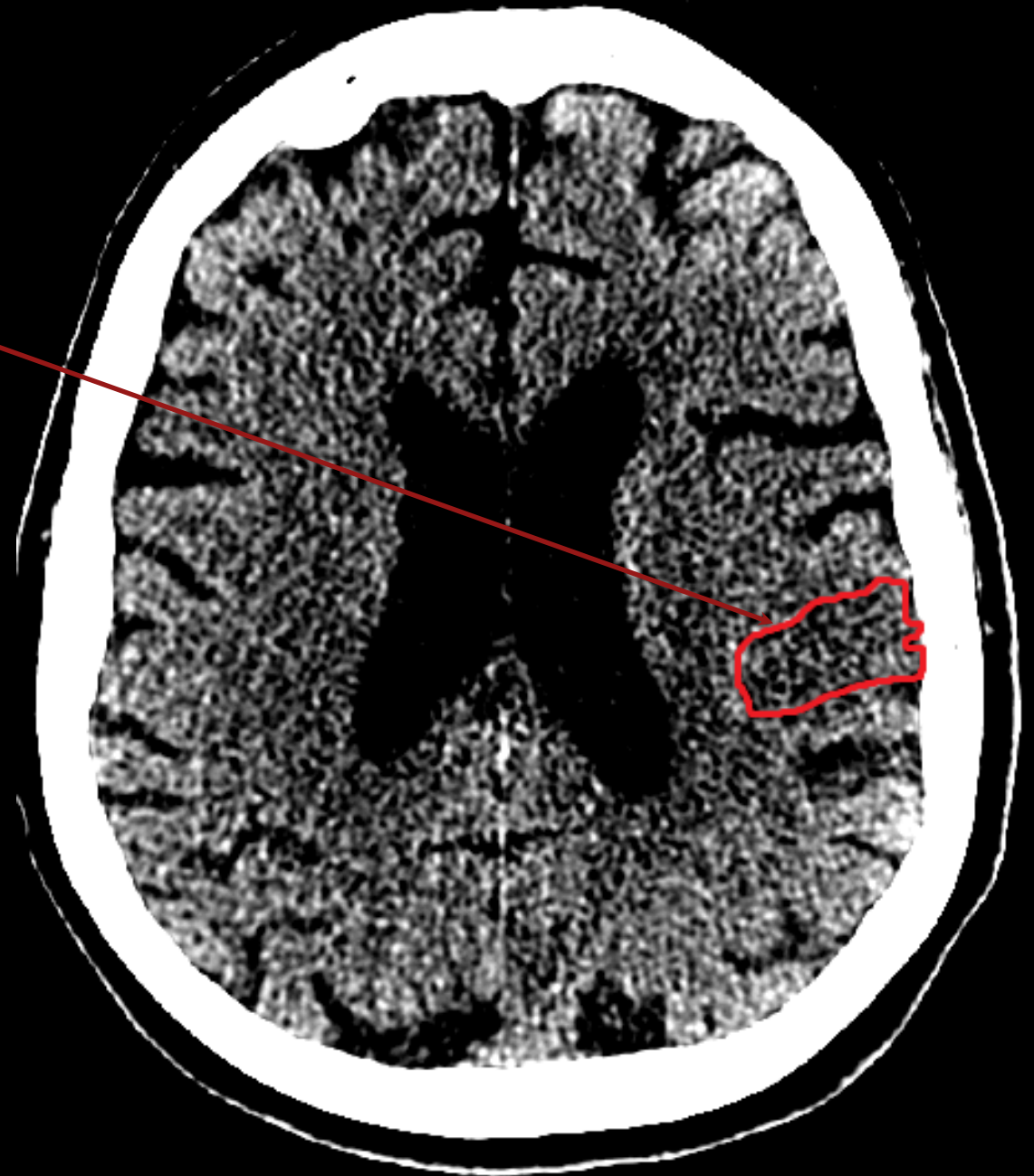
ACUTE STROKE



Axial

ACUTE STROKE

- Very subtle findings of loss of grey white differentiation in the left frontoparietal region.
- Additionally, a small hyperdense vessel in an MCA branch.



ACUTE STROKE

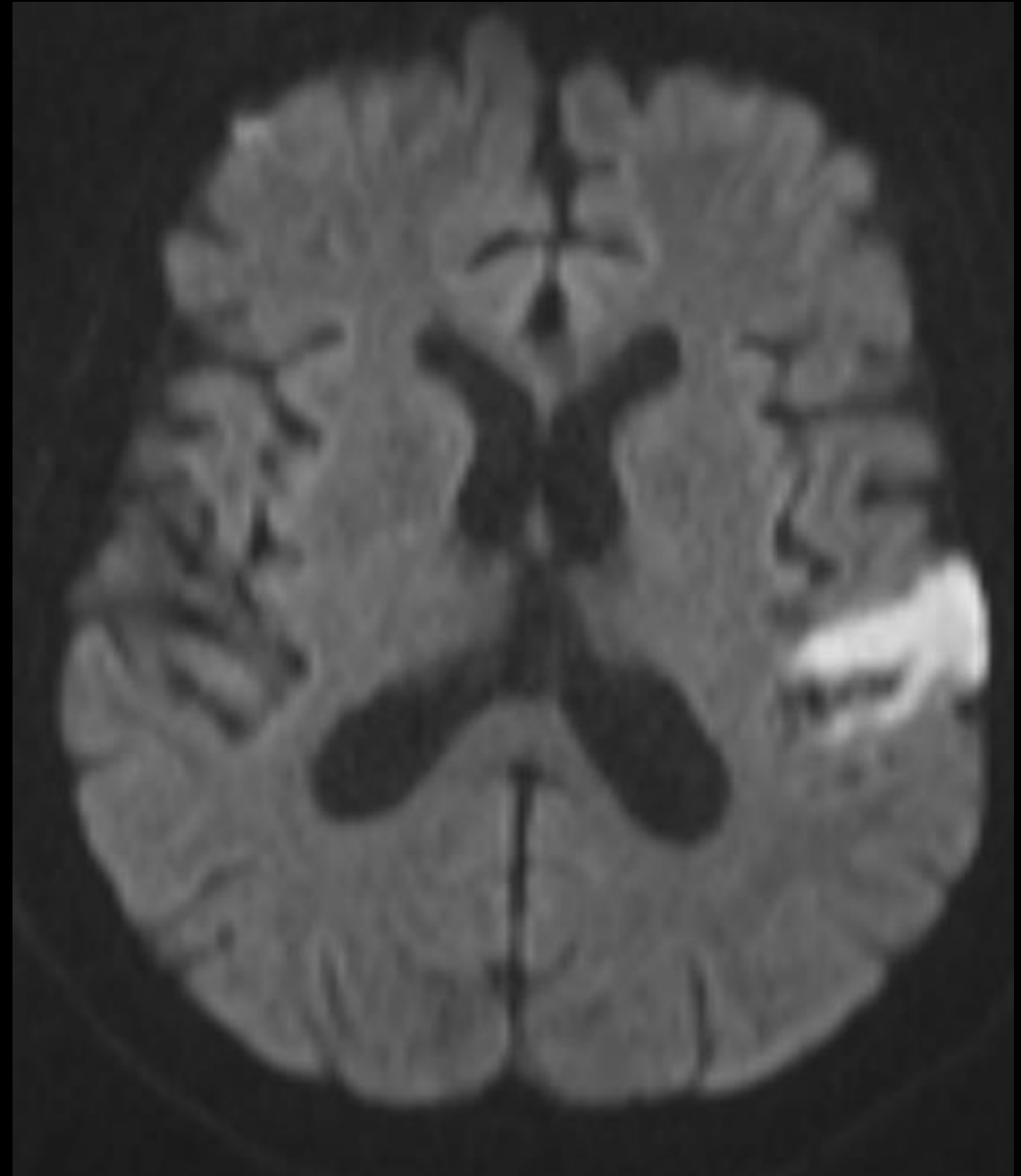
- Did you miss this one? That's ok. It goes to show how subtle the findings can be!
- Sometimes if we can't be sure on a CT, we can do another test that is more sensitive for picking up acute ischemia.
- One was ordered in this case. Let's have a look.



Axial

ACUTE STROKE

- This is a type of MRI sequence. It is called diffusion weighted imaging.
- It is very sensitive for picking up acute ischemia.
- Acute ischemia shows up as bright white. So what do you think? Is there ischemia?



Axial

ACUTE STROKE

- Doubt you needed to have this finding identified, it's pretty obvious!
- This confirms the suspected CT finding. This is an acute ischemic stroke of the left MCA distribution.



Axial

End of module 4

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