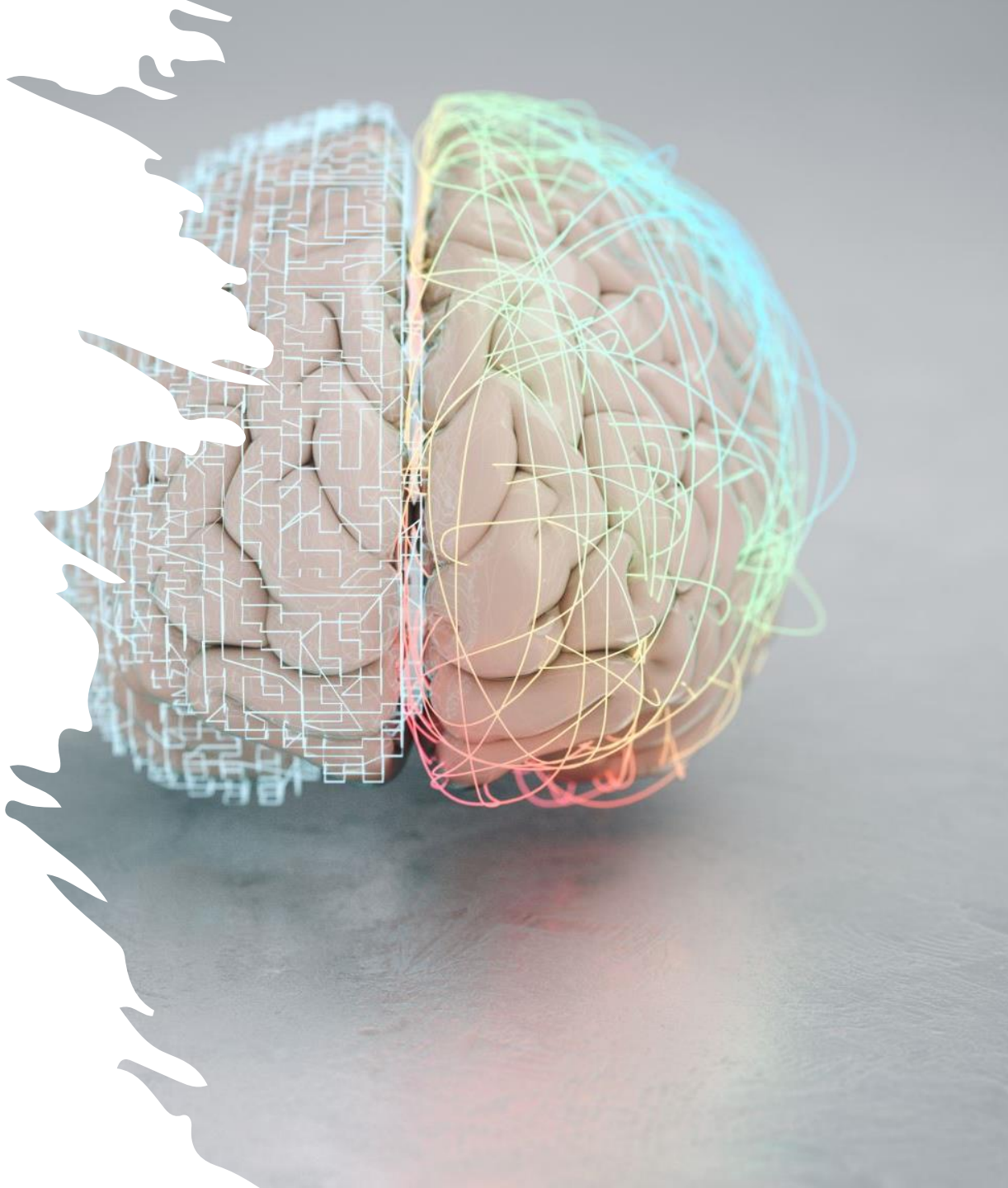
uclh

The Obtunded Patient



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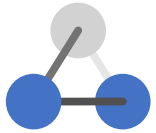
National Hospital for Neurology and Neurosurgery | UCLH Foundation NHS Trust

London, UK

OBJECTIVES

Distinguish the imaging features of common acute intracranial pathology (CASE-BASED)

Recognise the life-threatening signs in neuroimaging

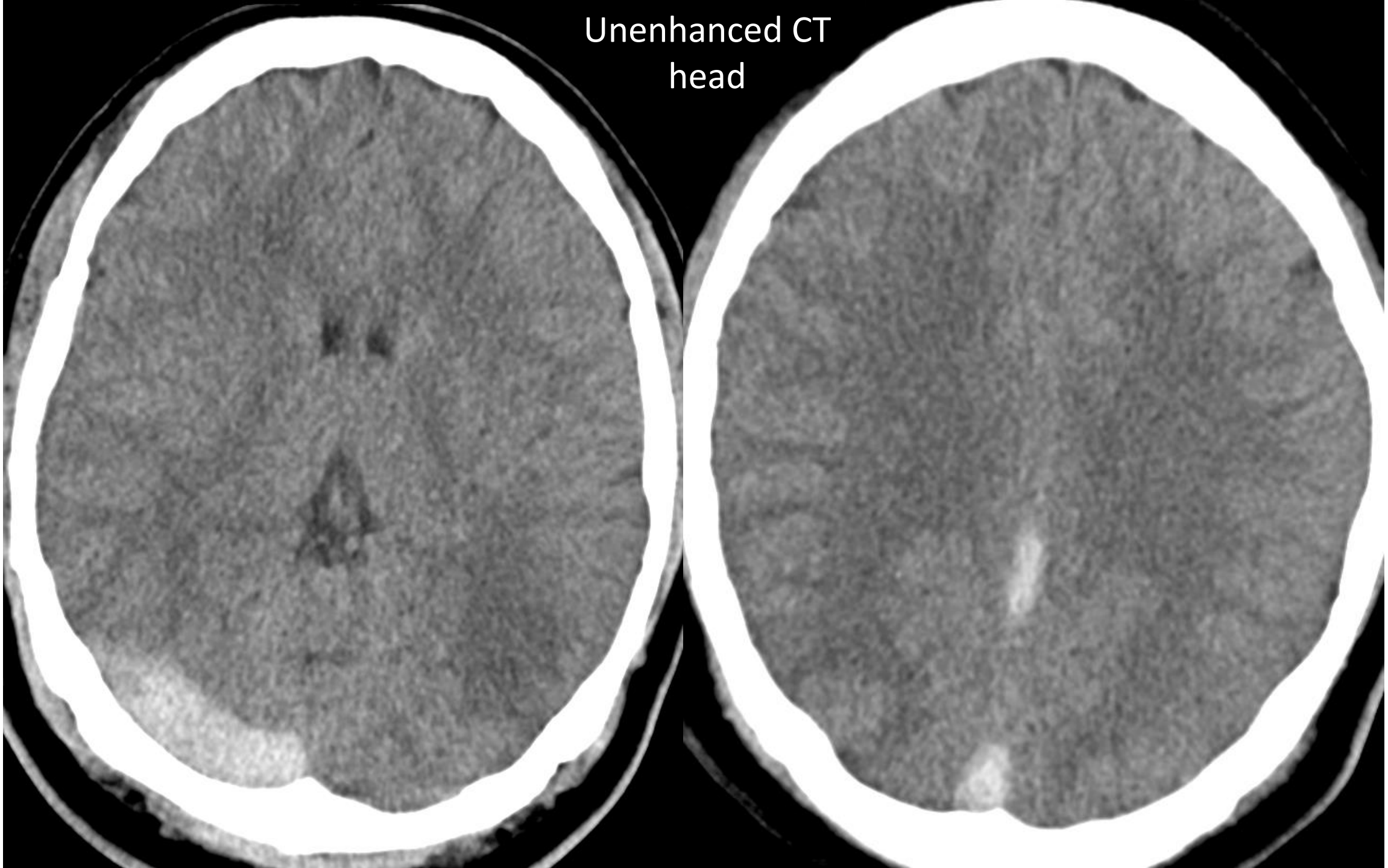


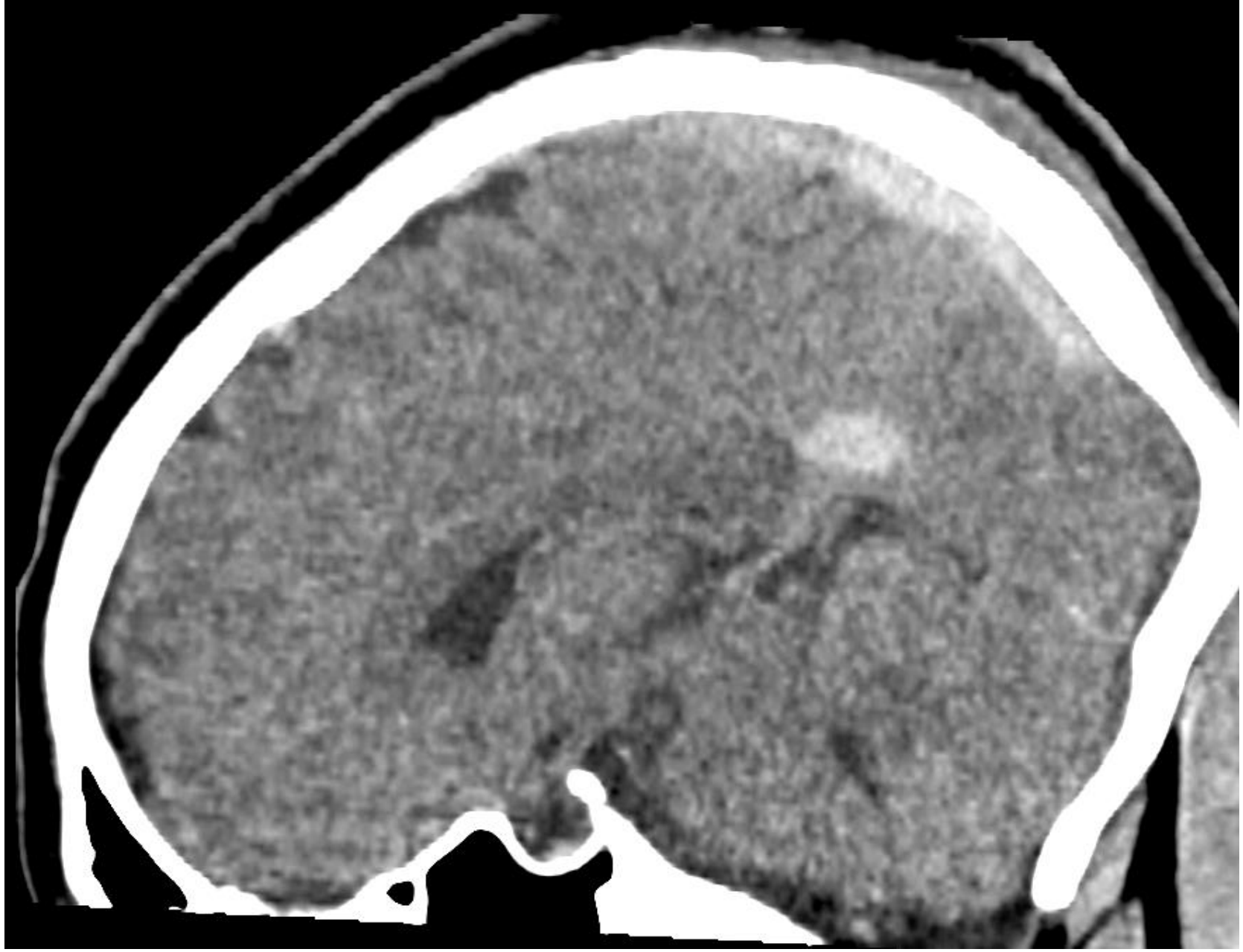
Review of the causative aetiologies

In 20 mins...

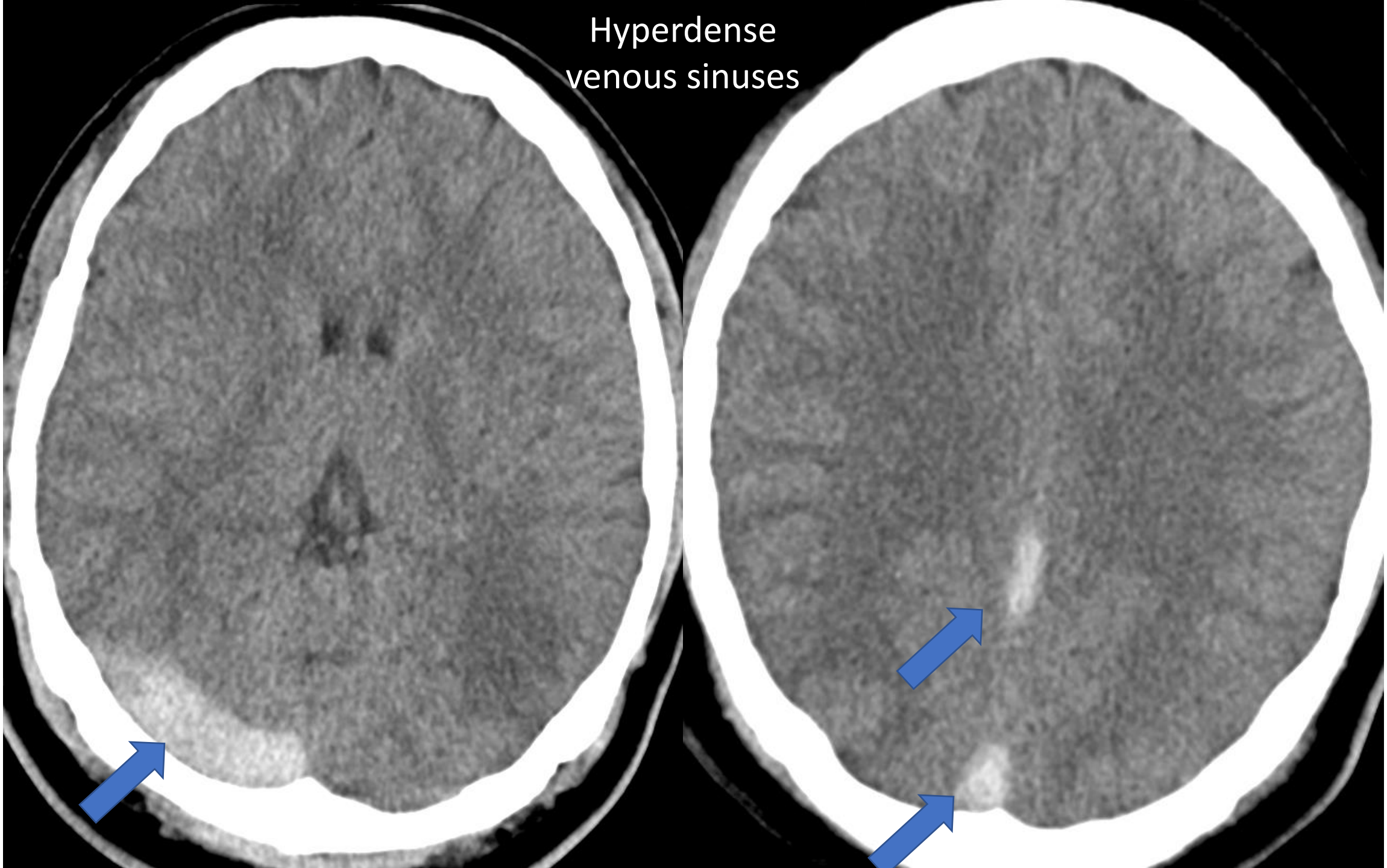
Case 1

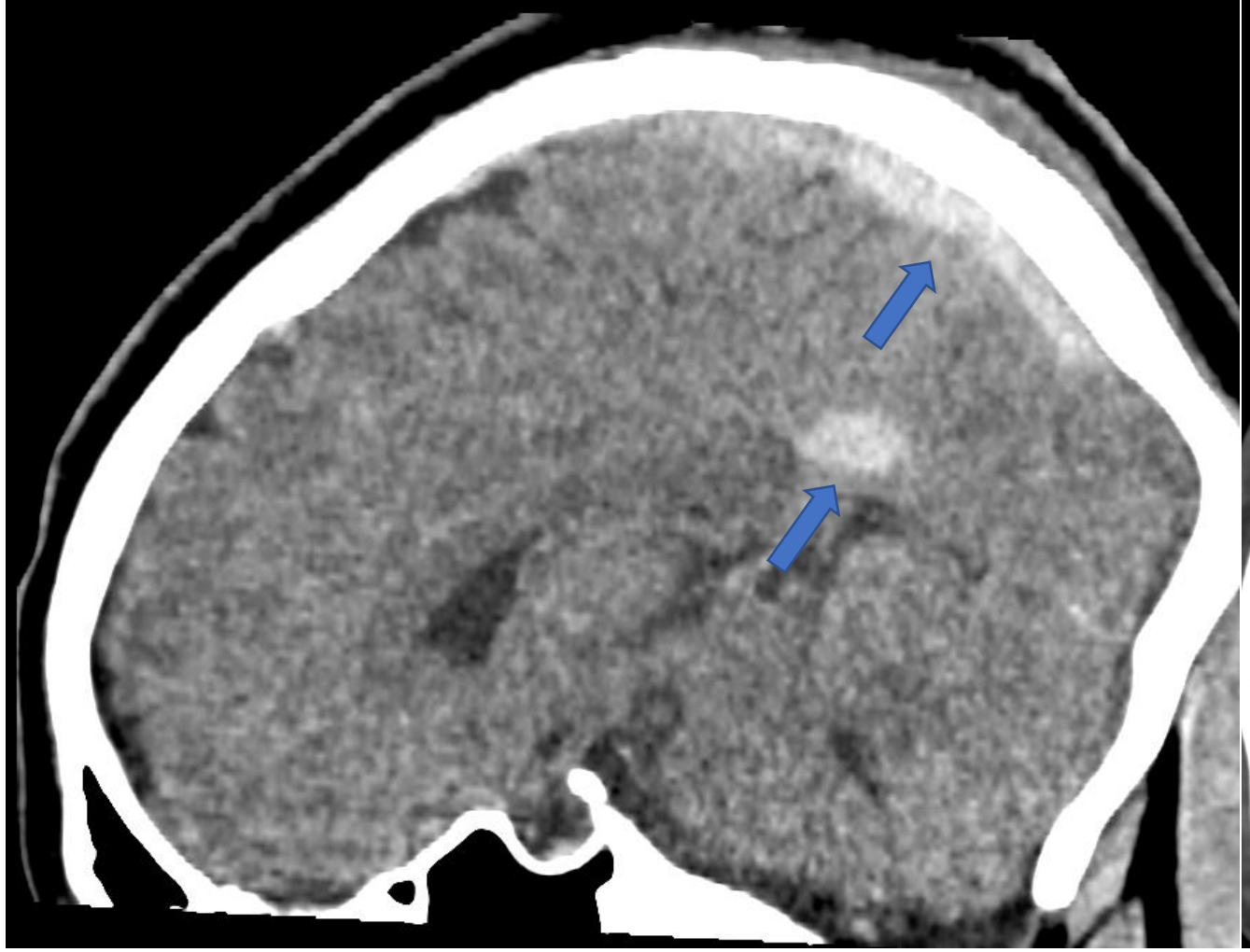
Young adult (20s) with new onset headaches for a few weeks.
Presents acutely with seizures and unequal pupils.


Unenhanced CT
head

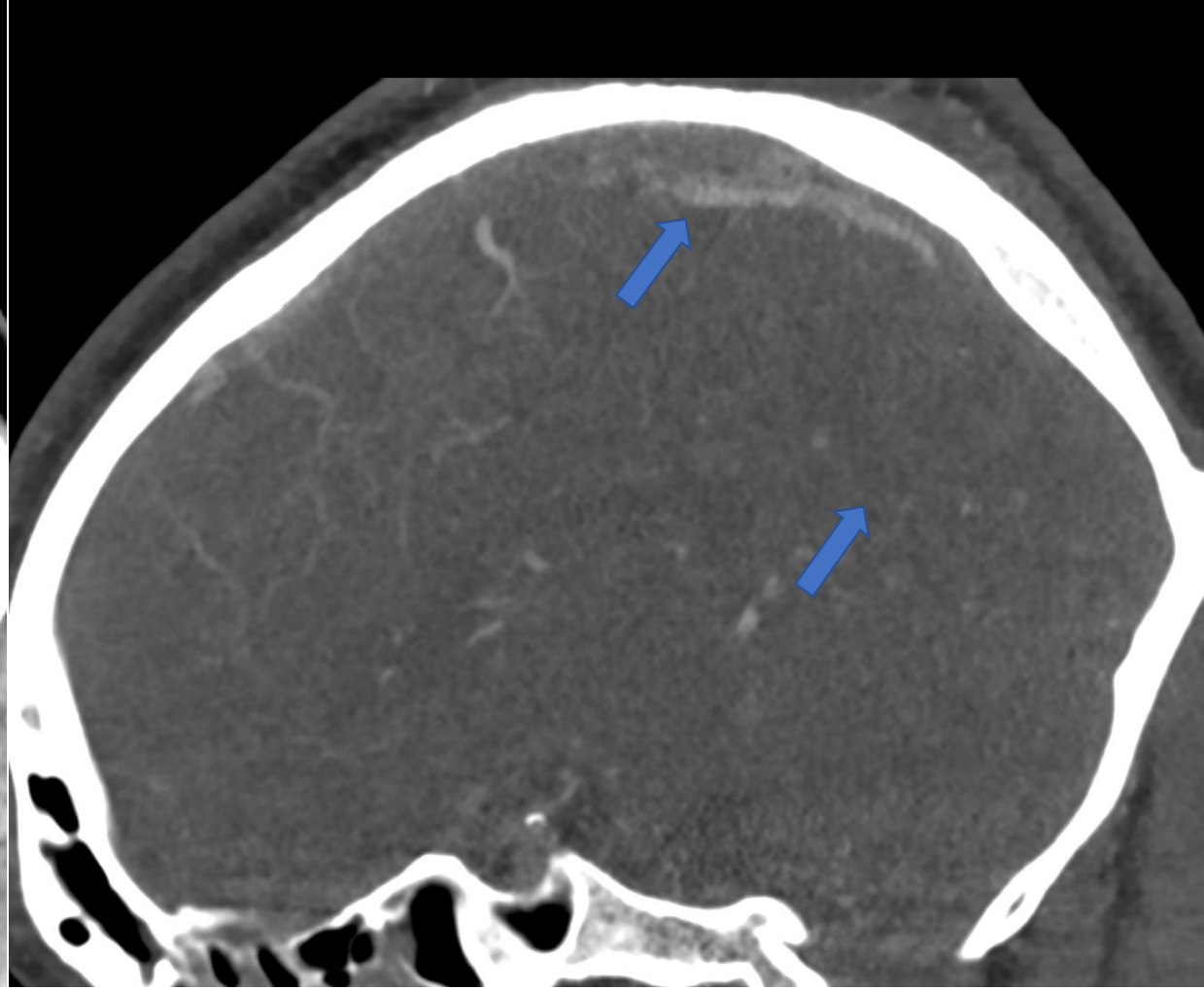


Unenhanced CT head

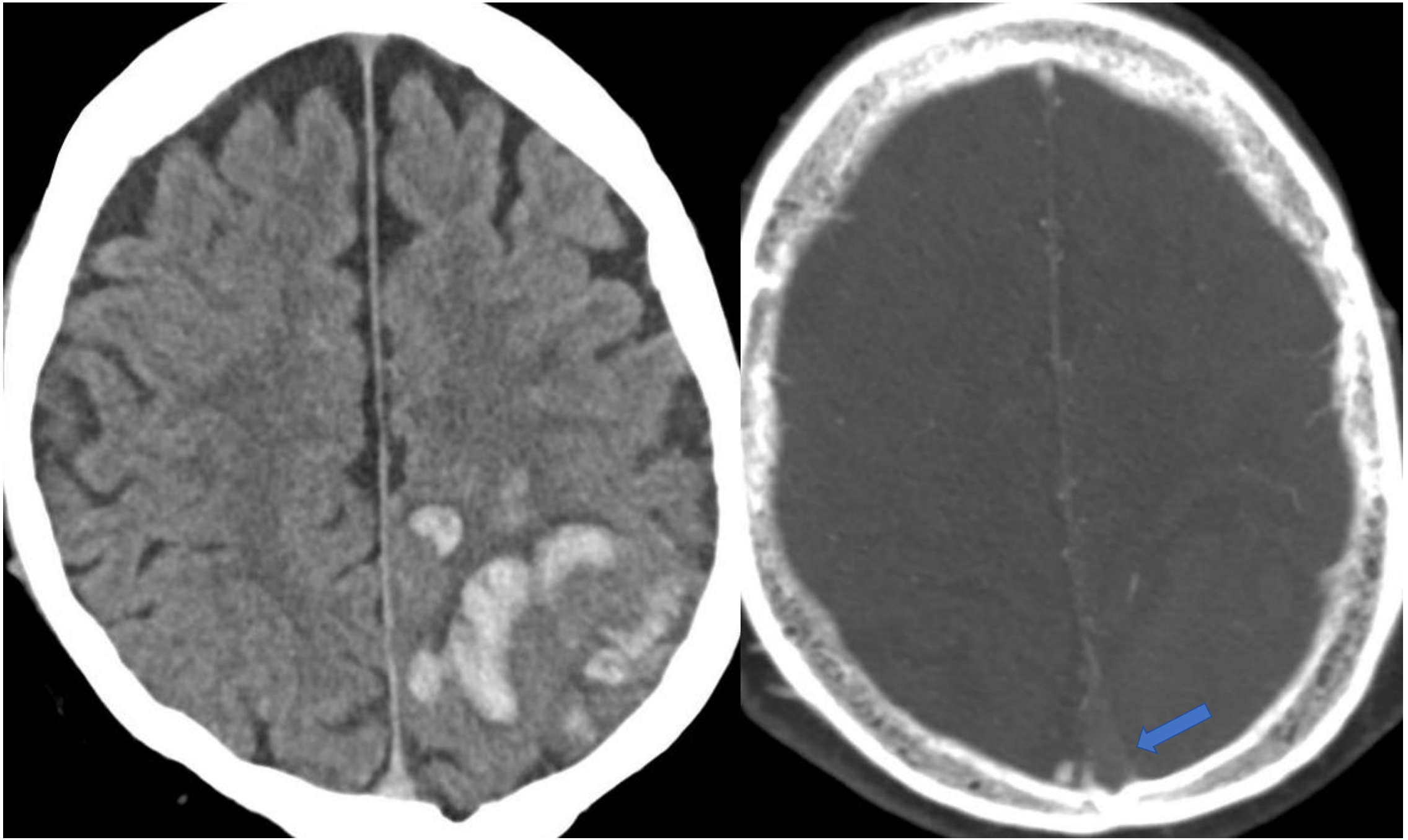

Hyperdense
venous sinuses



CT head: hyperdense venous sinuses

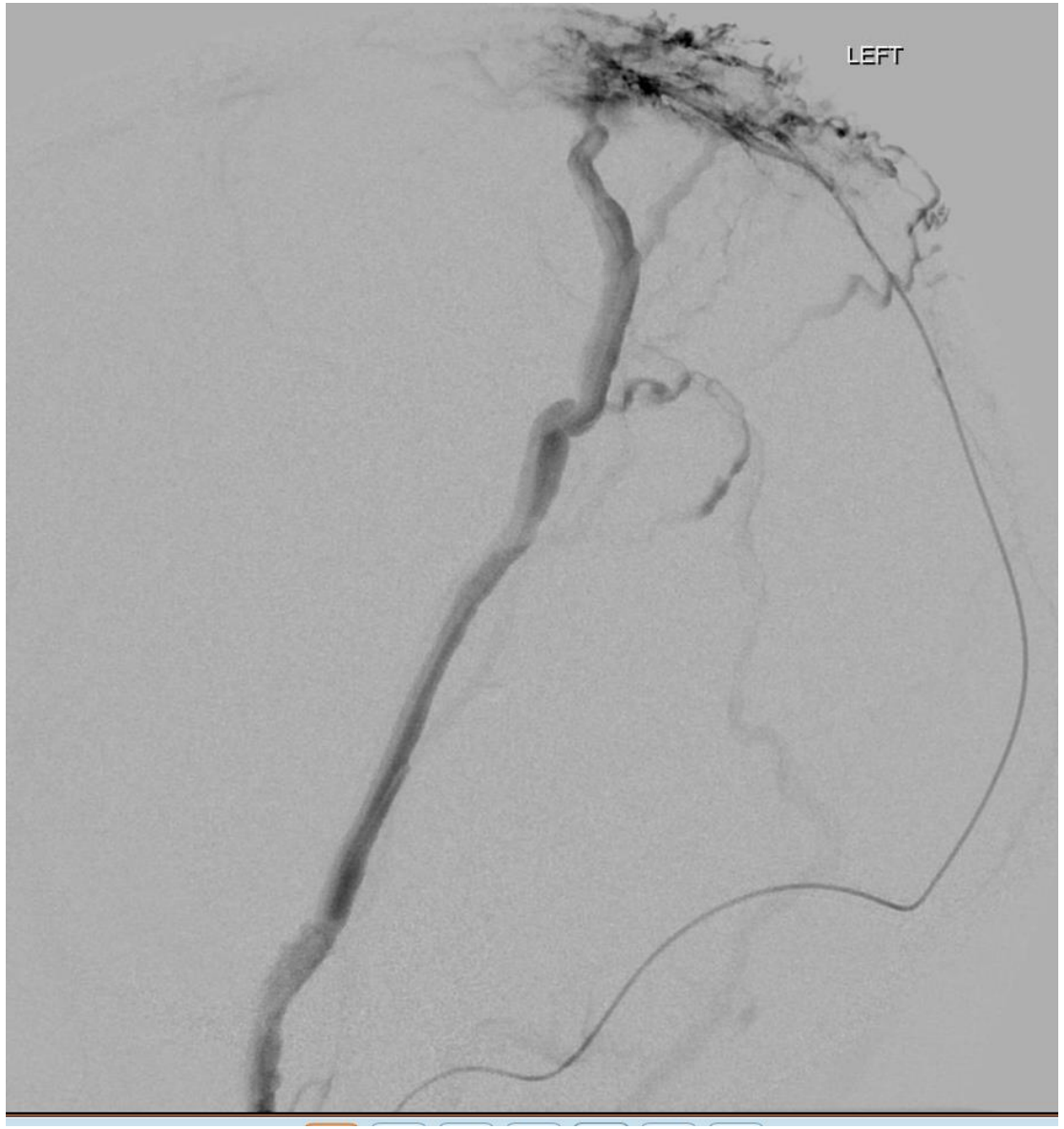


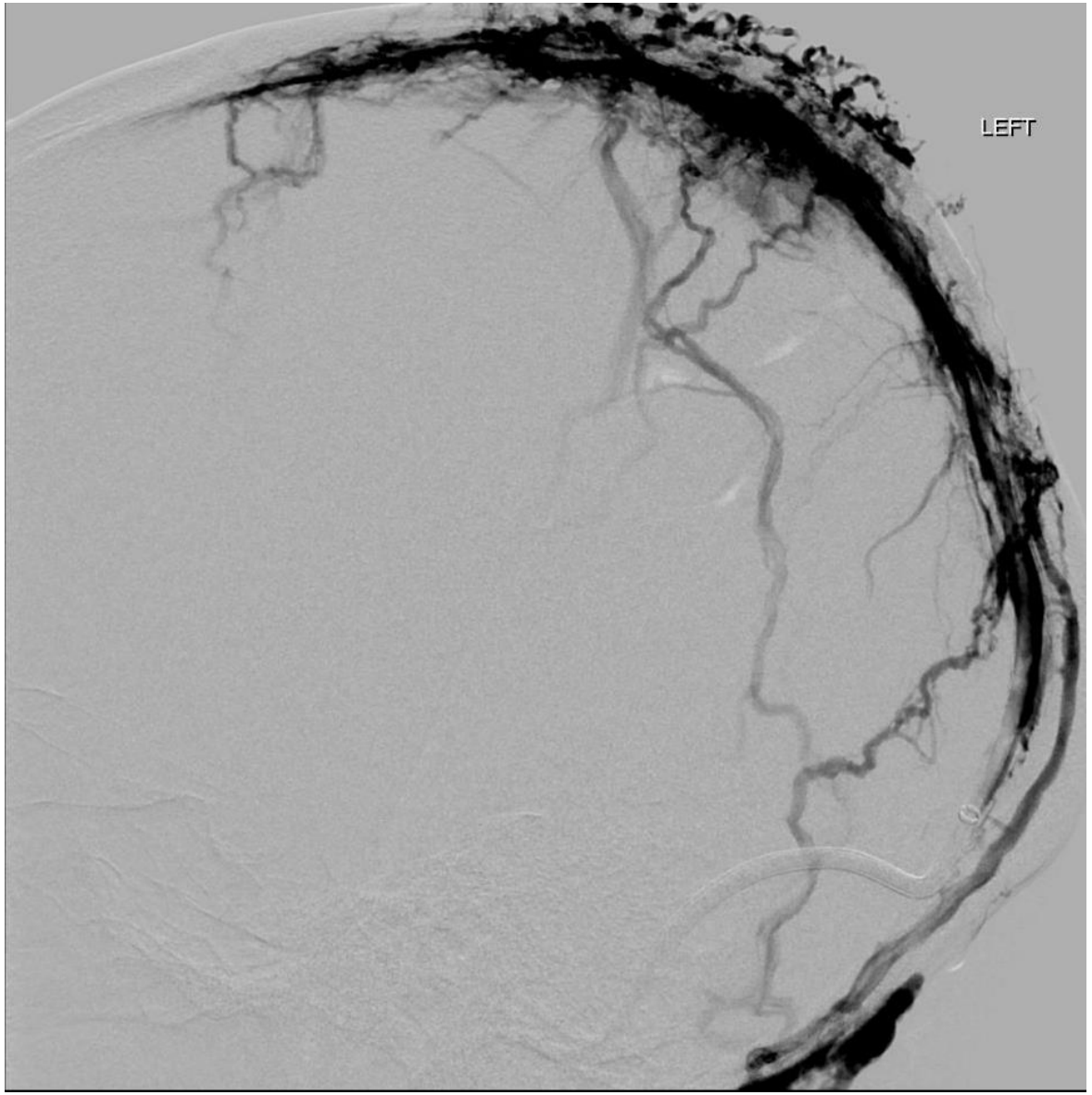
CT venogram: unopacified venous sinuses

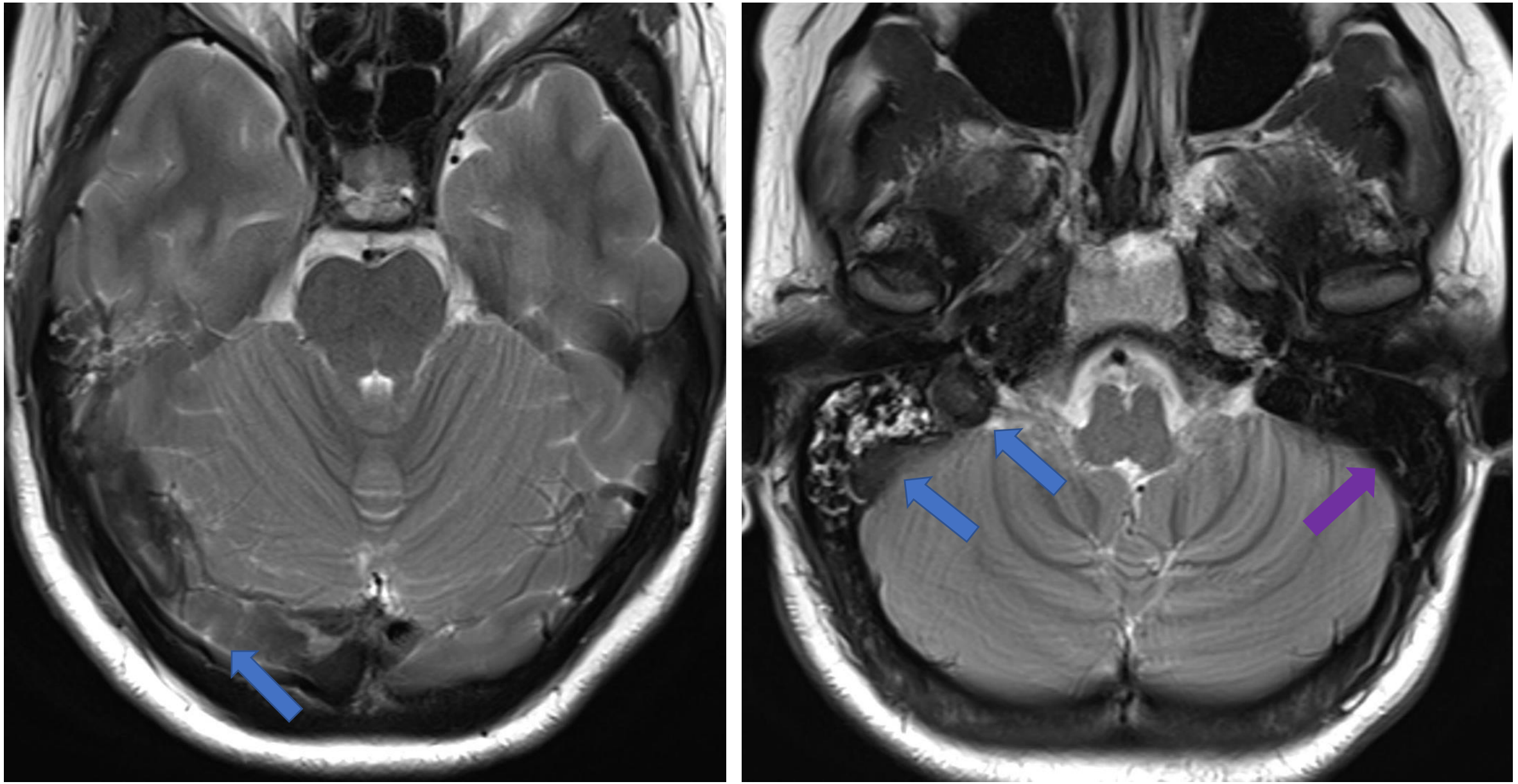


VENOUS SINUS THROMBOSIS

Treatment: mechanical thrombectomy

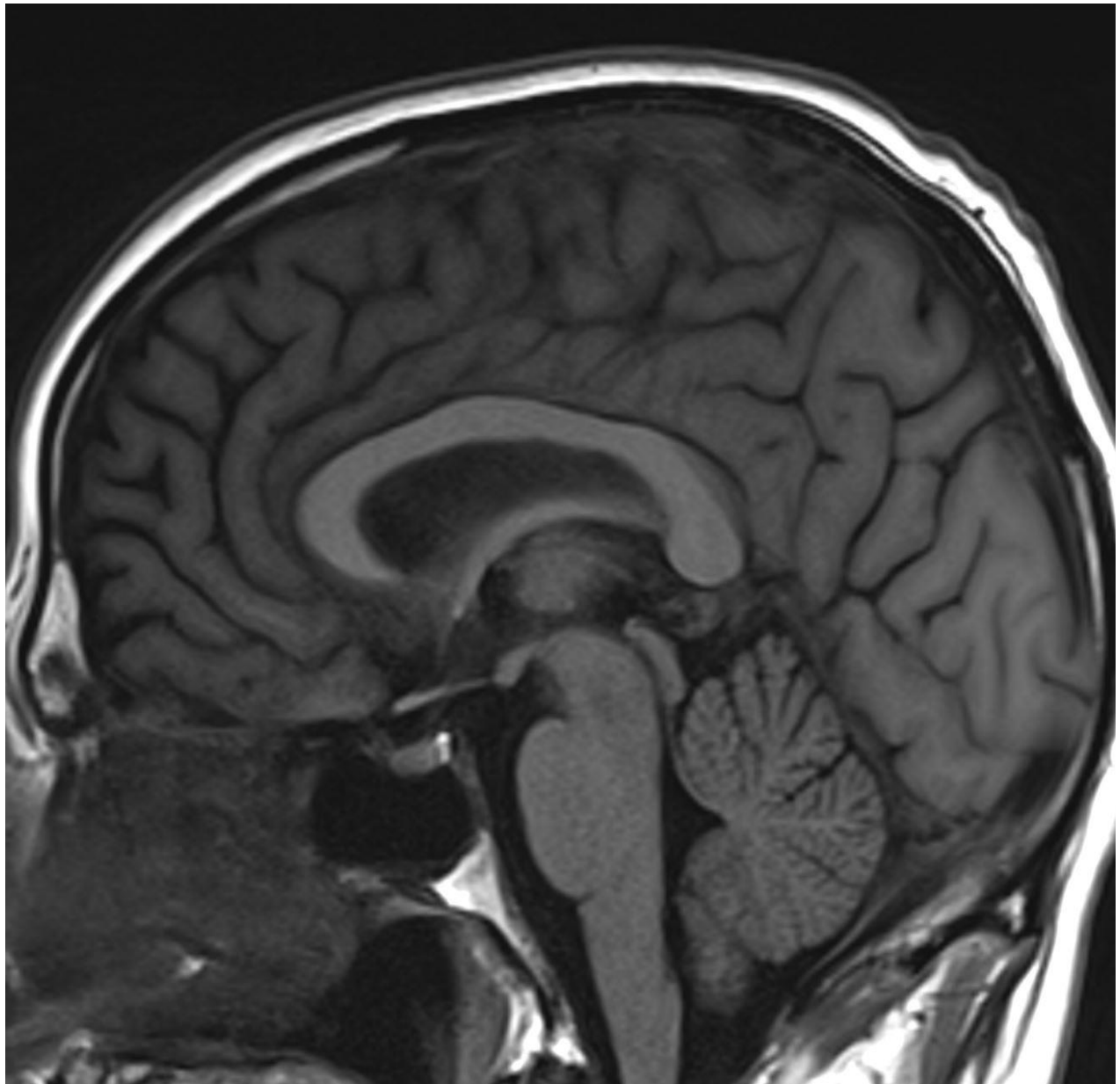




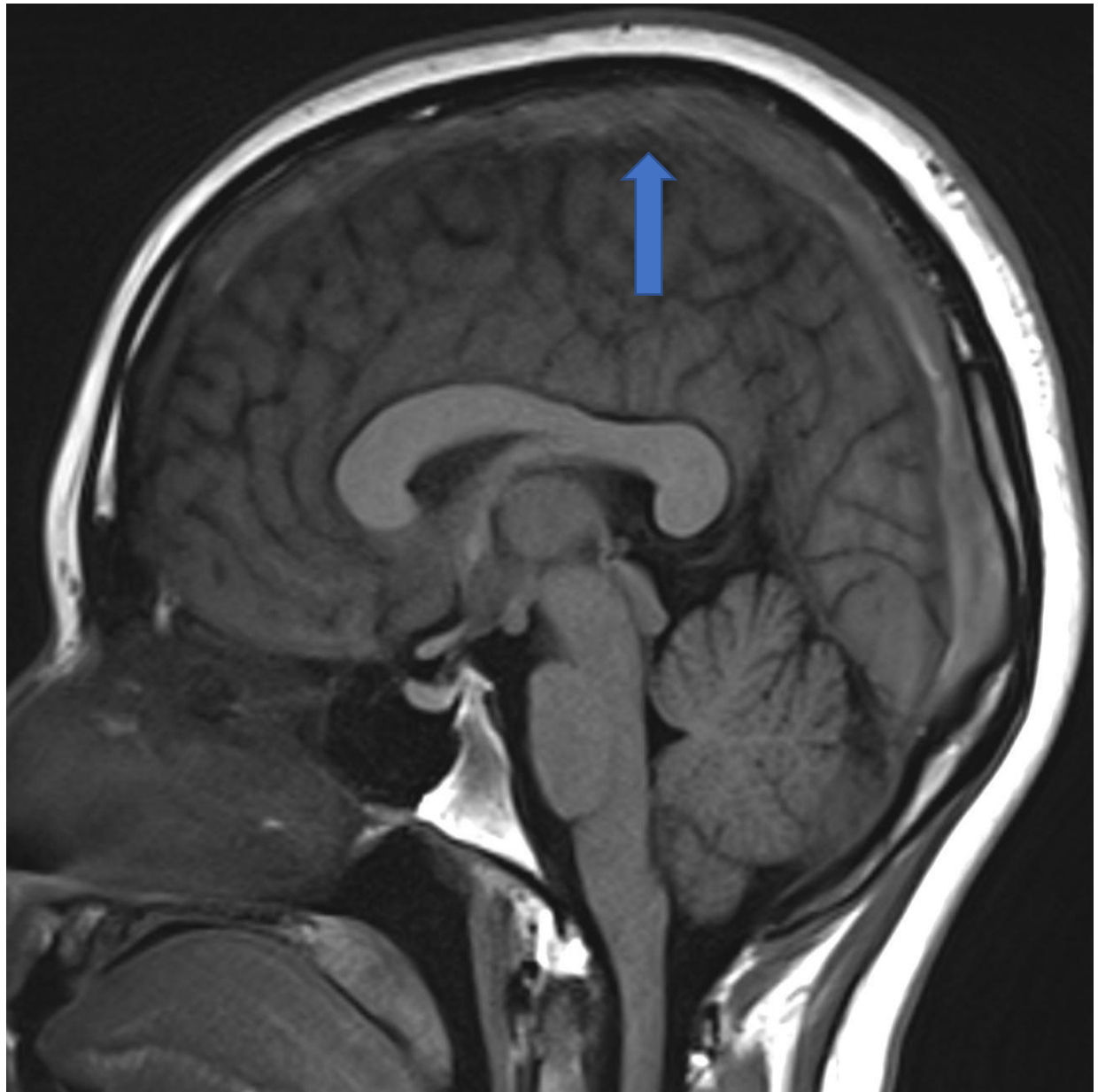


Axial T2W images showing abnormal signal (arrows). Normal LEFT sigmoid sinus (arrow). Note the opacified right mastoid air cells – acute mastoiditis!

Normal T1-W sagittal

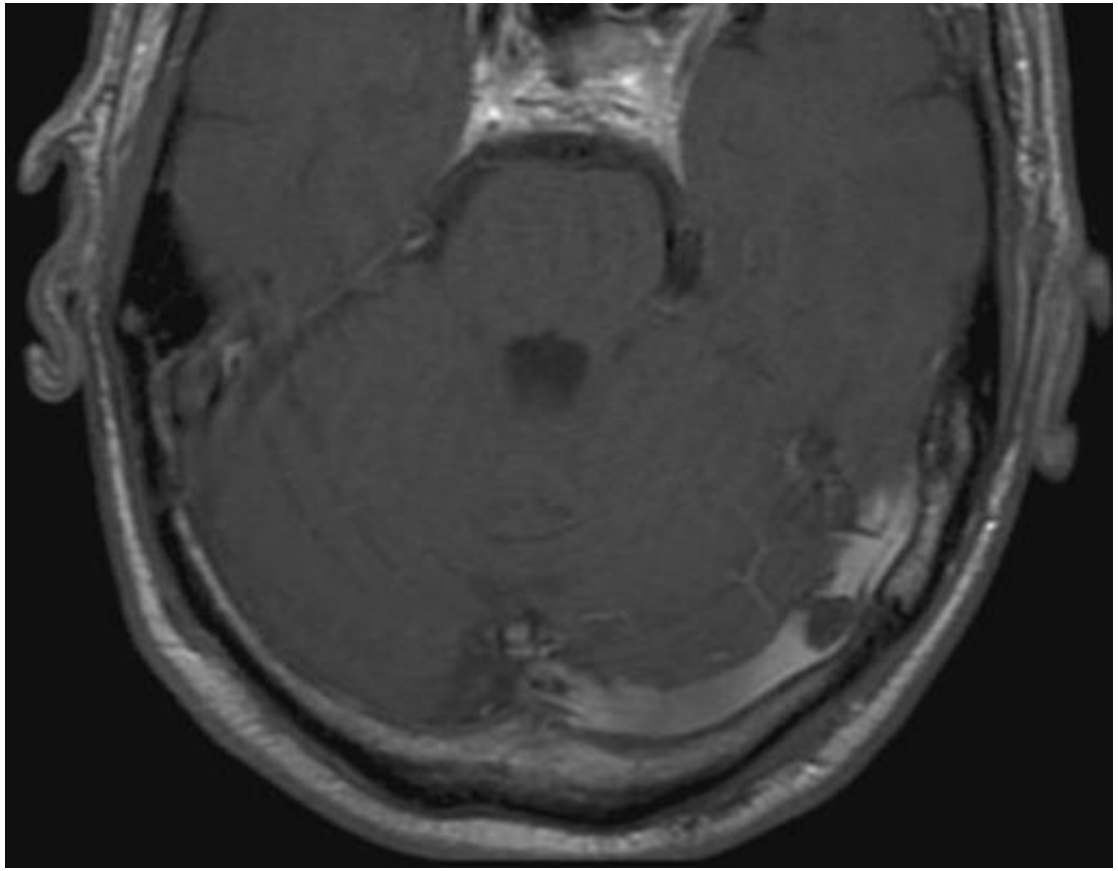


Abnormal T1-W sagittal – heterogenous signal (arrow) in the superior sagittal sinus



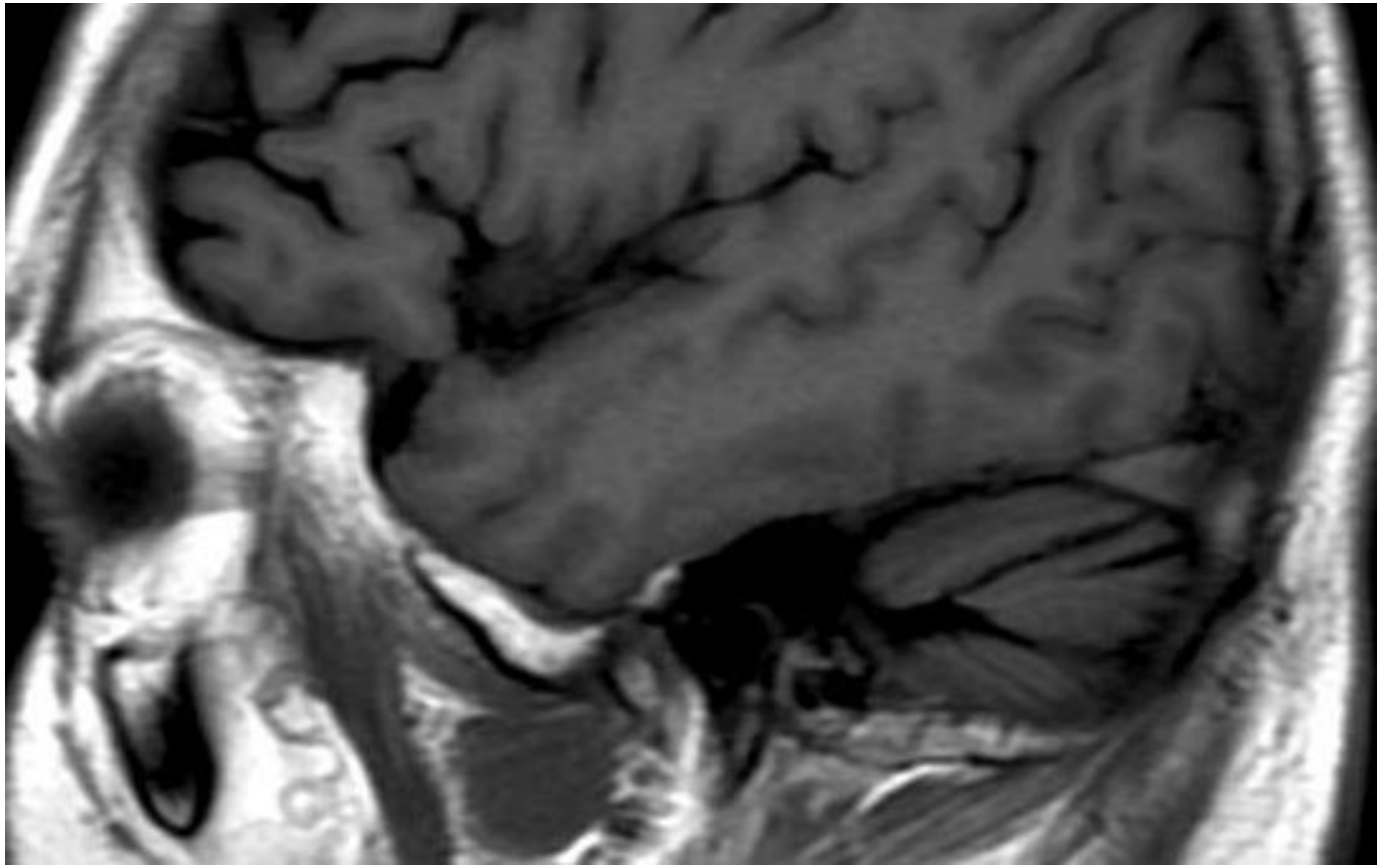
MIMICS

Arachnoid granulation



Gaillard, F. Arachnoid granulation. Case study, Radiopaedia.org. (accessed on 13 Oct 2021) https://radiopaedia.org/cases/12840

Abnormal flow void

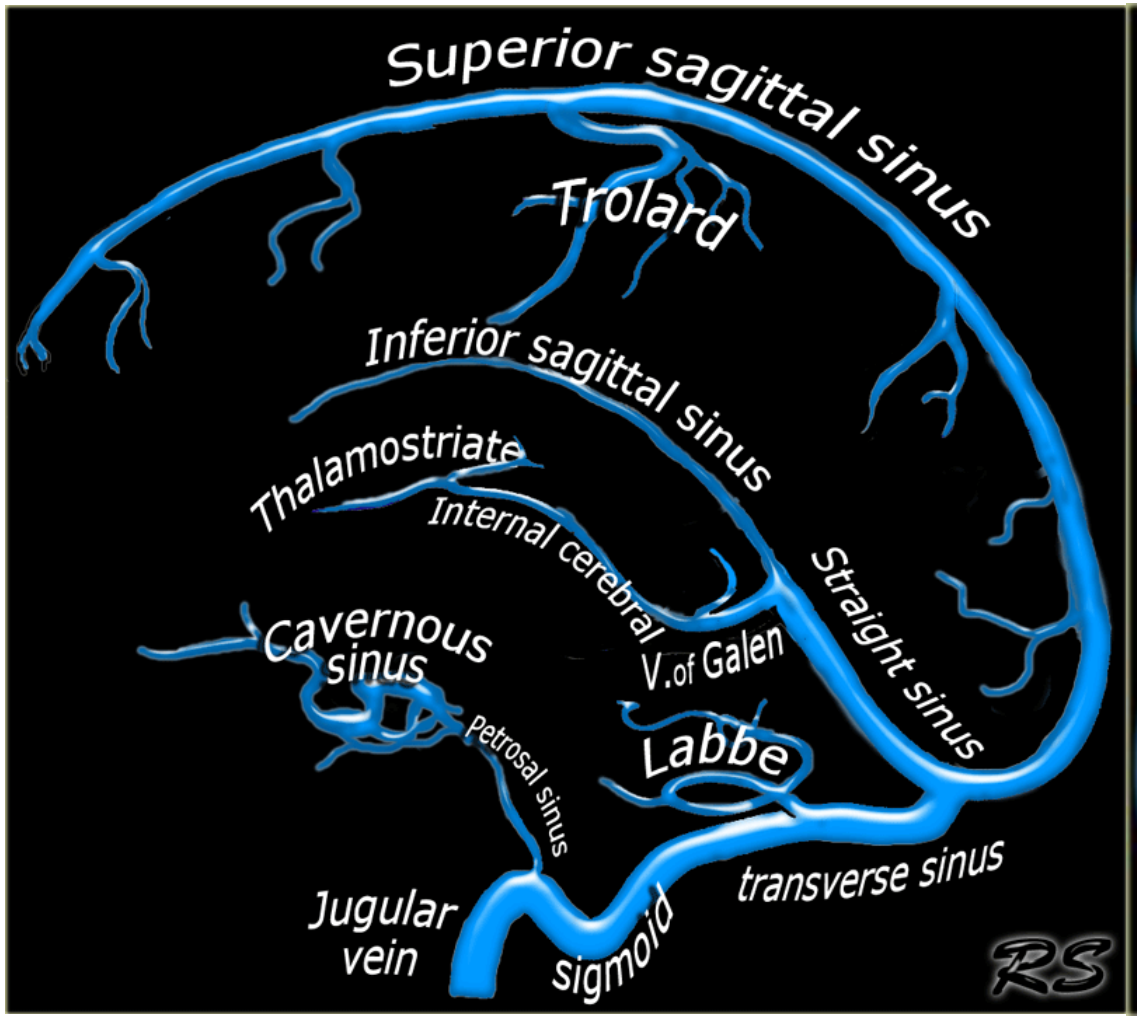


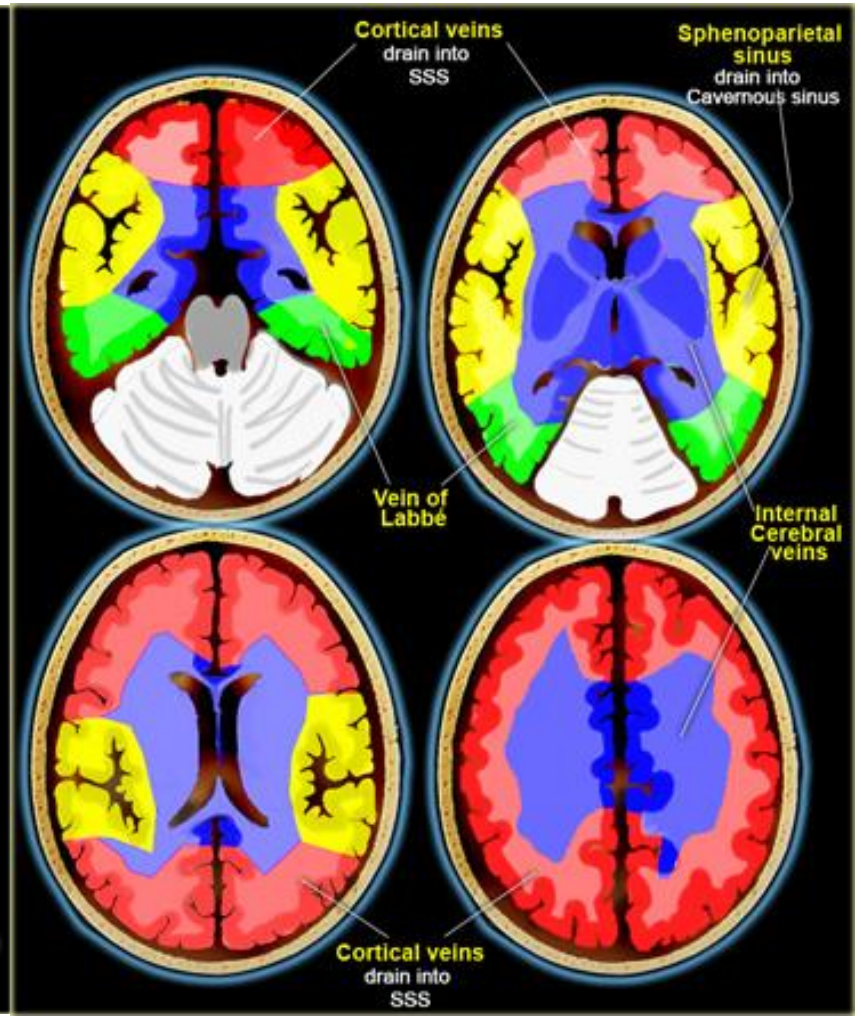
Gaillard, F. Asymmetric flow in sigmoid sinus. Case study, Radiopaedia.org. (accessed on 13 Oct 2021) https://radiopaedia.org/cases/9012

Cerebral venous sinus thrombosis

- Vasogenic oedema secondary to venous hypertension (extra-cellular fluid increase)
- Infarction (cytotoxic oedema) and parenchymal haemorrhage
- Treatment very different to ischaemic stroke – systemic anti-coagulation
- Risk factors:
  - age/gender, (child-bearing age women)
  - drugs (OCP, cancer treatment)
  - medical history: pro-thombotic conditions, haematological disorders (e.g. polycythaemia), collage-vascular disorders, pregnancy, sepsis, malignancy

VENOUS ANATOMY





There can be great variation in venous anatomy, but infarcts in non-arterial locations should raise your index of suspicion.

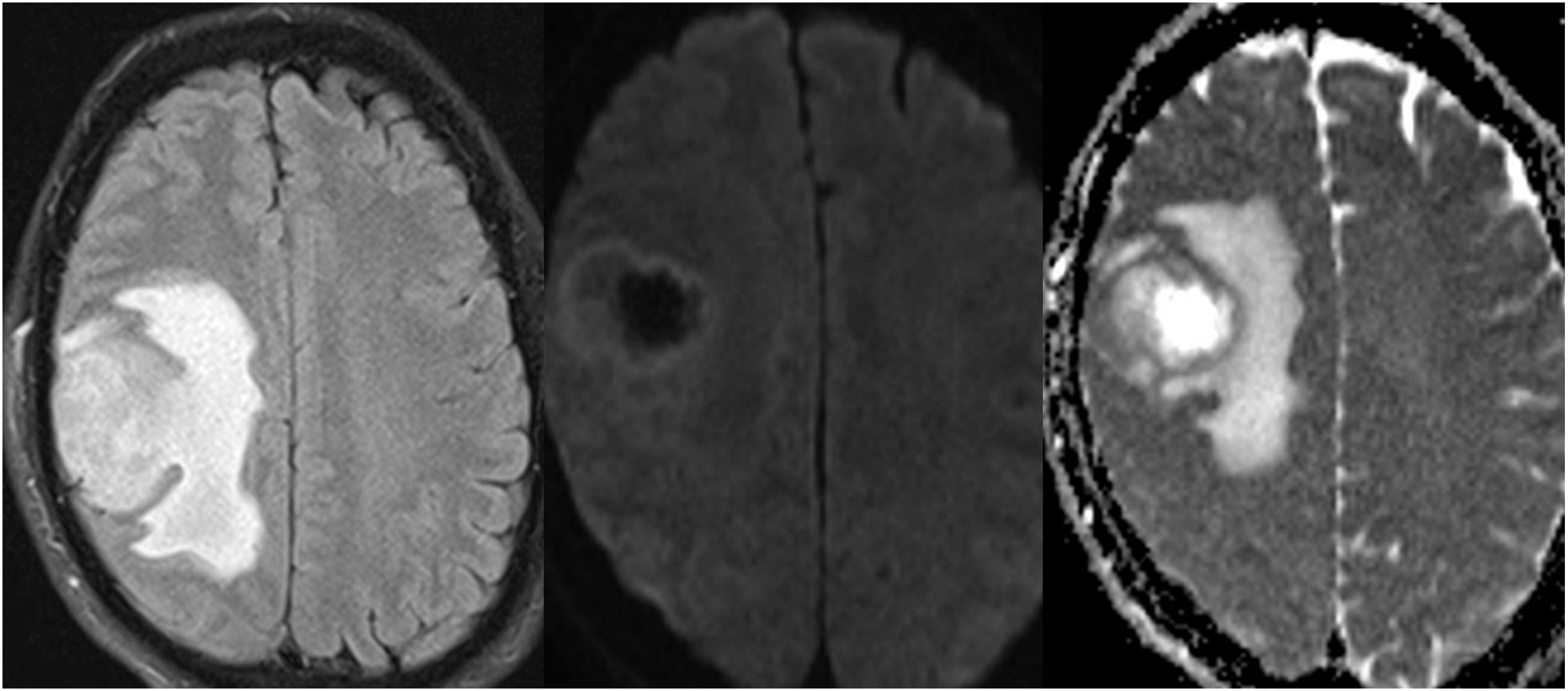
Images from: https://radiologyassistant.nl/neuroradiology/sinus-thrombosis/cerebral-venous-thrombosis

Case 2

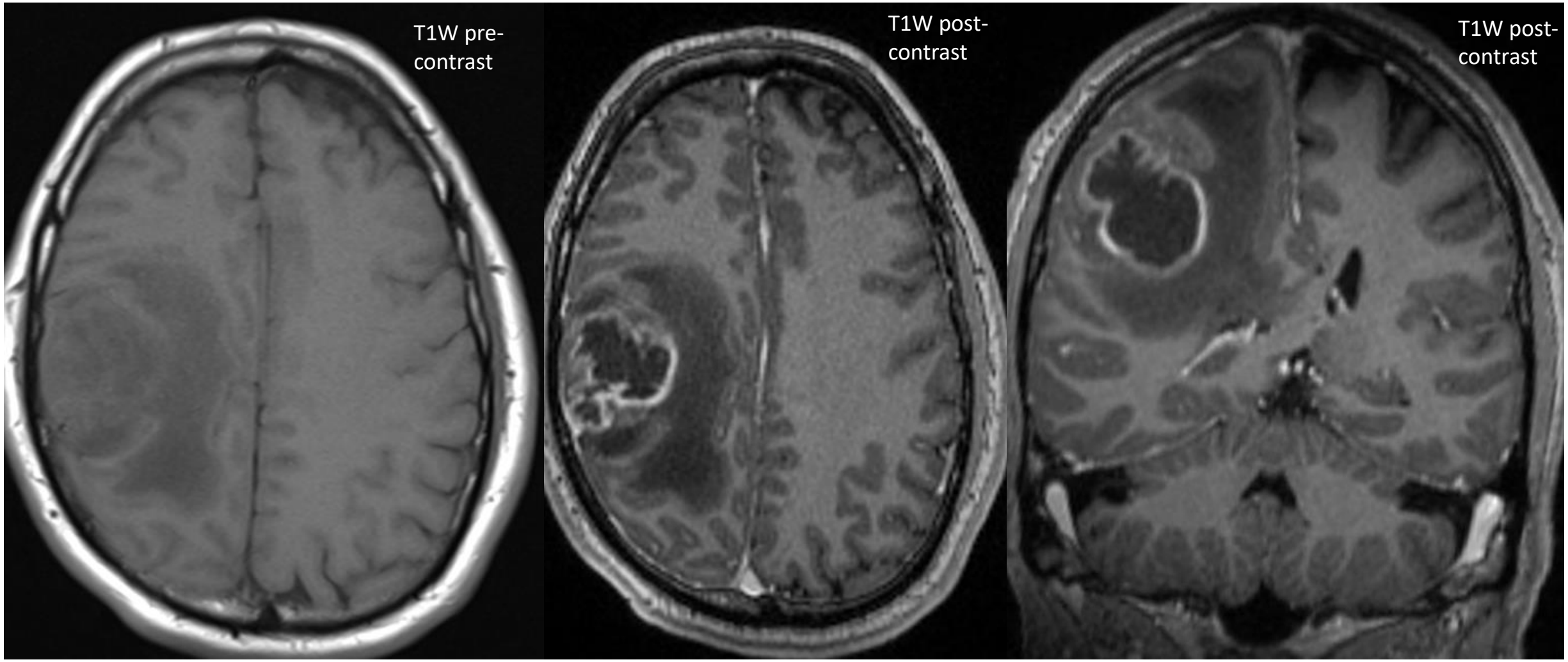
Adult (50s) with headaches. Presents acutely with left sided weakness and confusion.

Differential for space occupying lesion with oedema:

- Abscess
- Primary tumour
- Secondary tumour

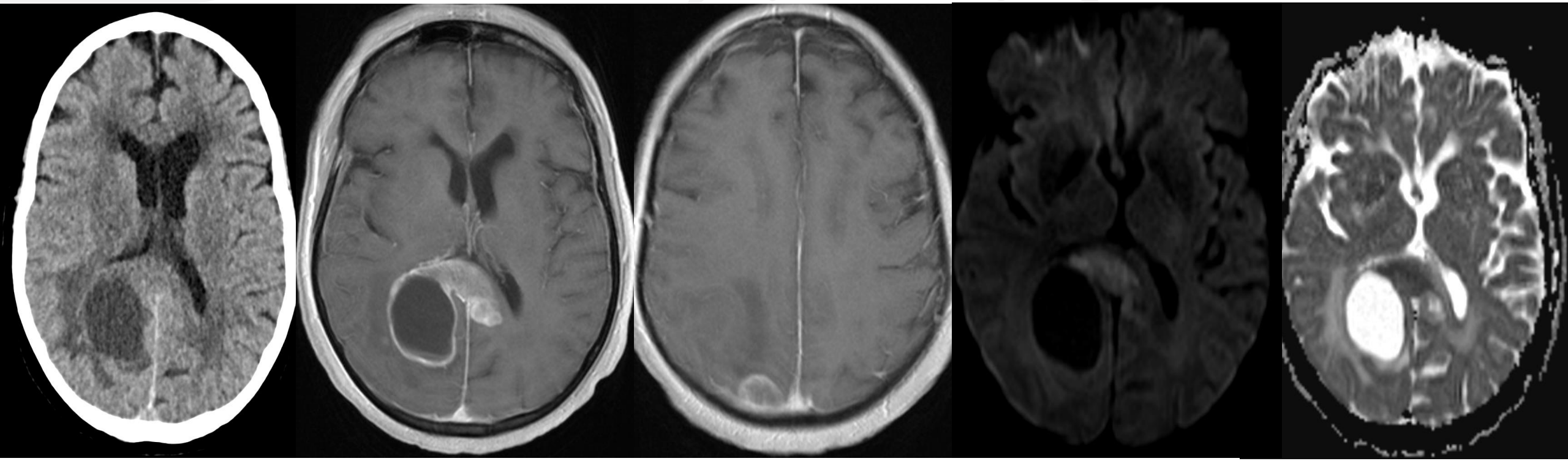


FLAIR B1000 ADC



Mass effect

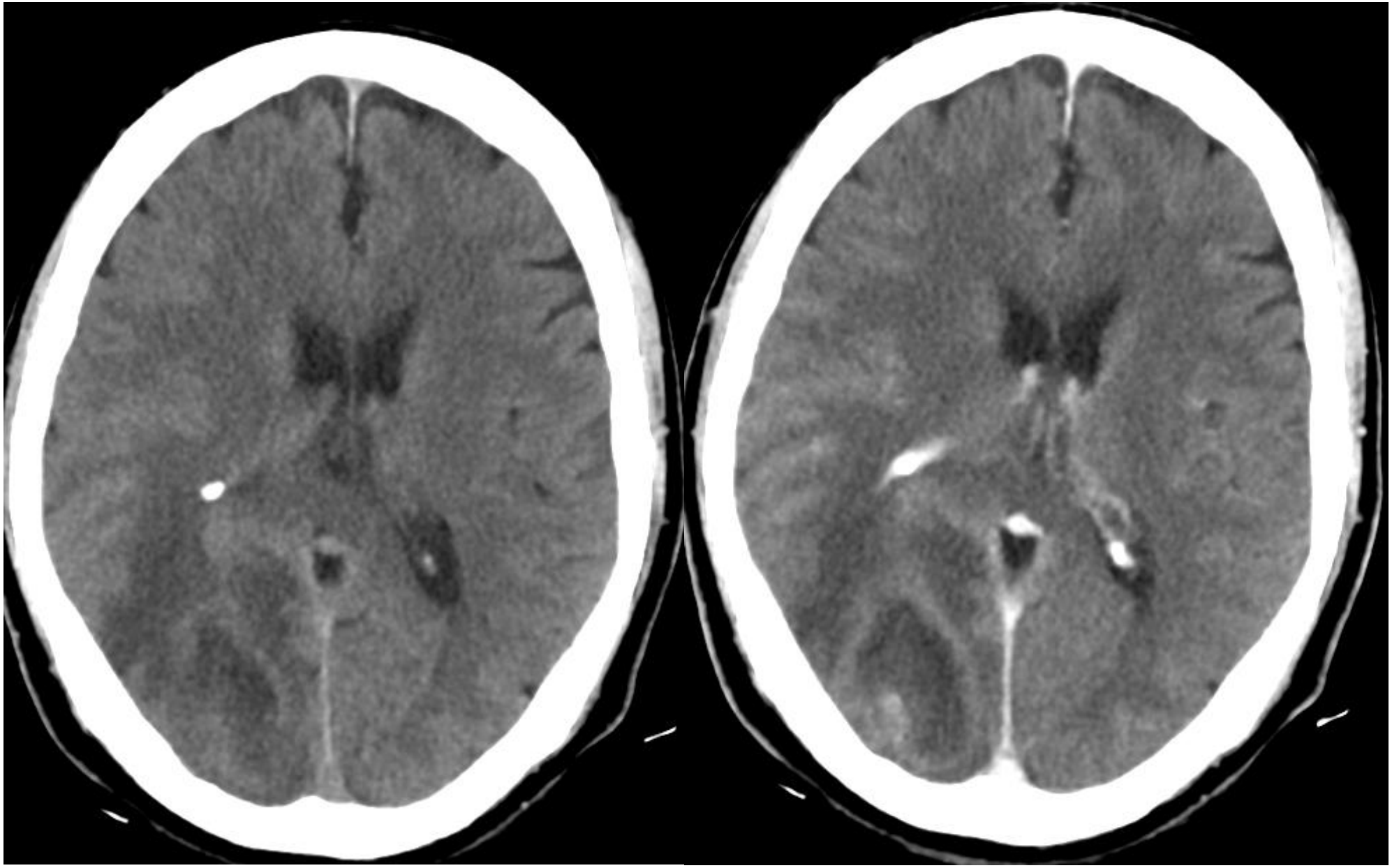
Glioblastoma



Glioblastoma

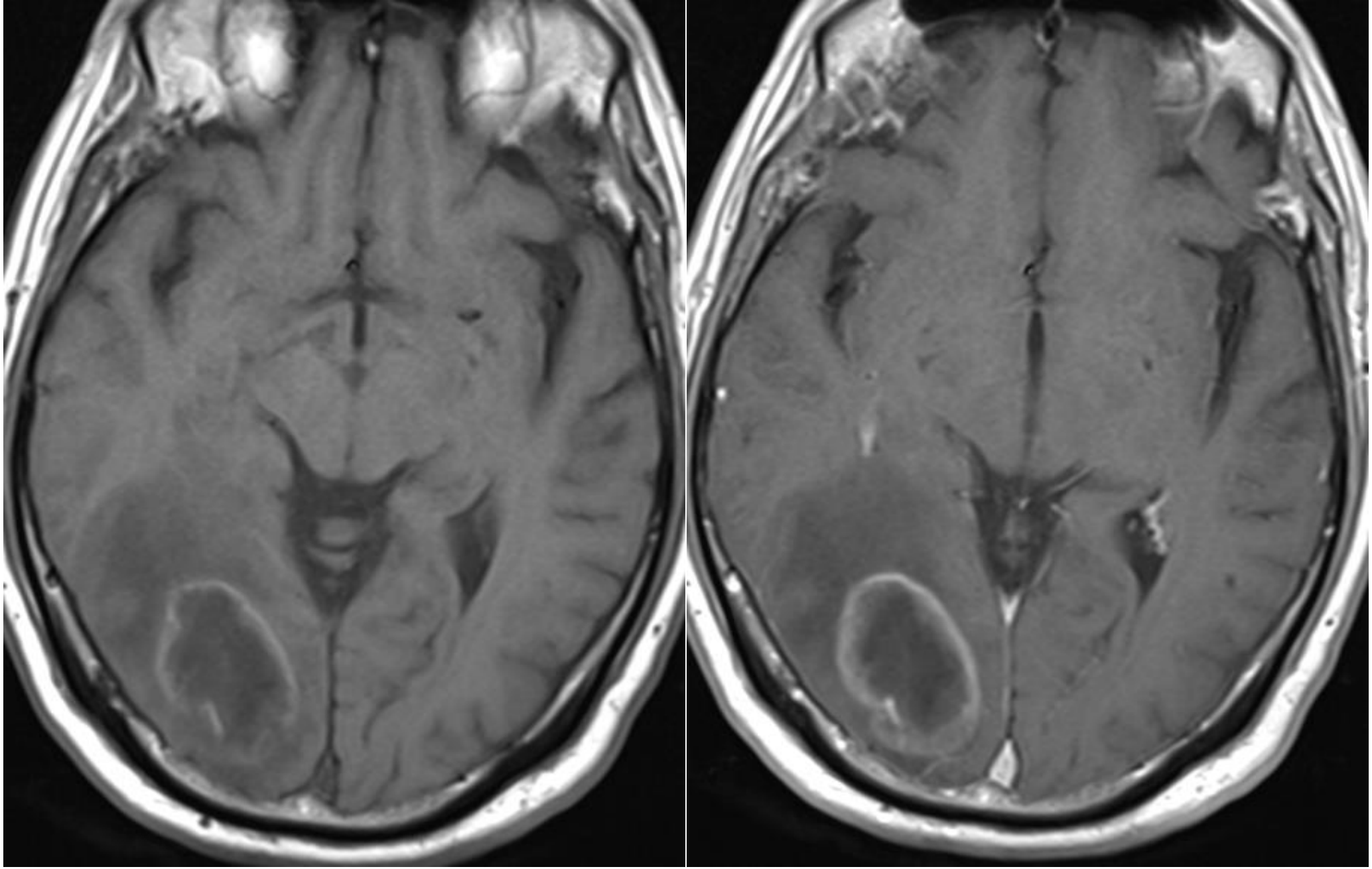
- WHO grade 4, most common primary brain tumour in adults
  - Diffuse astrocytoma
  - 5th Edition WHO classification
    - Molecular status: ***IDH-wild type***
  - IDH-mutant now considered a separate entity
- Aggressive and progressive

Companion Cases



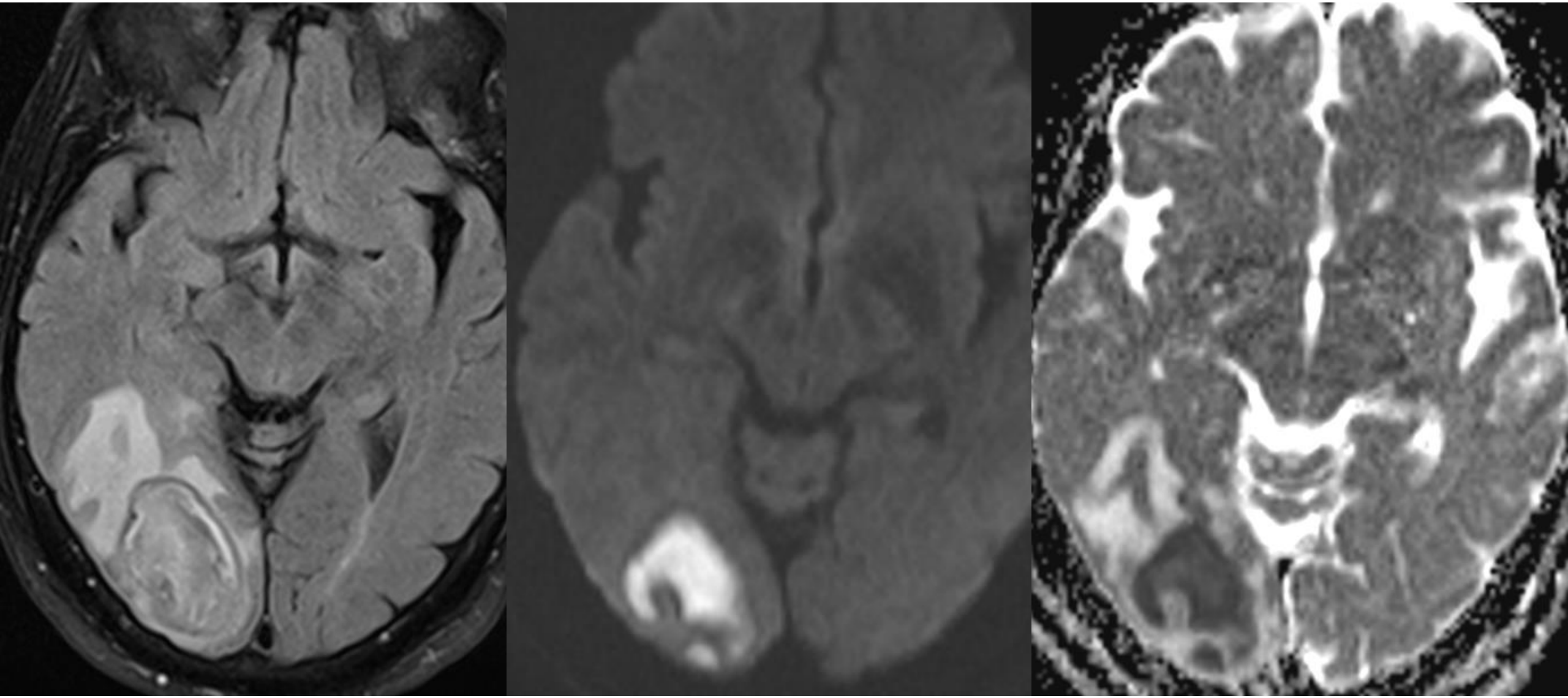
Unenhanced CT head

Enhanced CT head



T1W pre-contrast

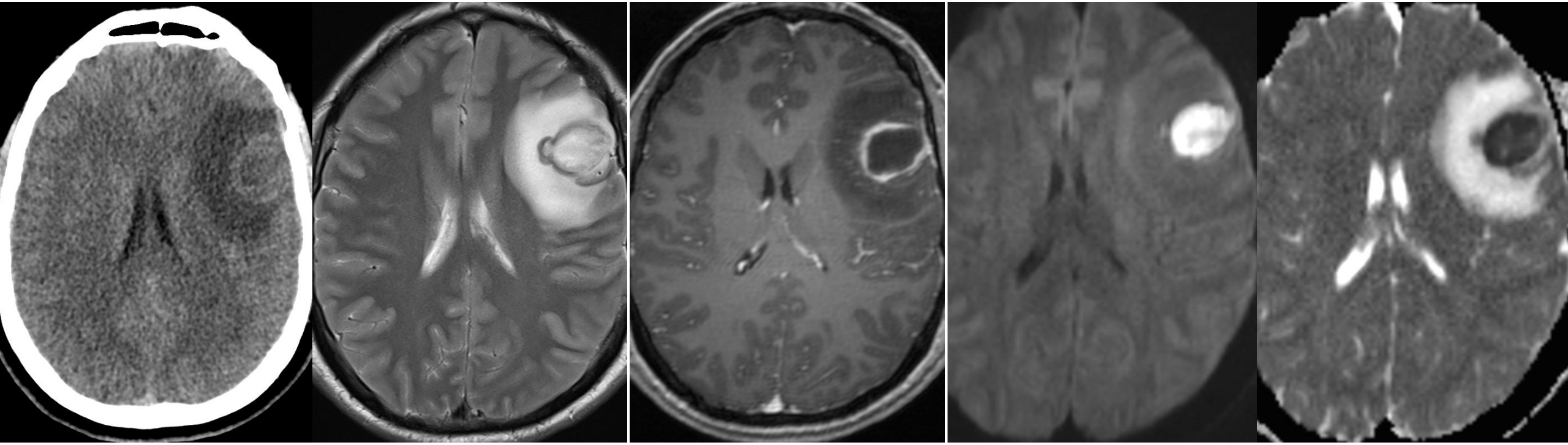
T1W post-contrast



FLAIR

B1000

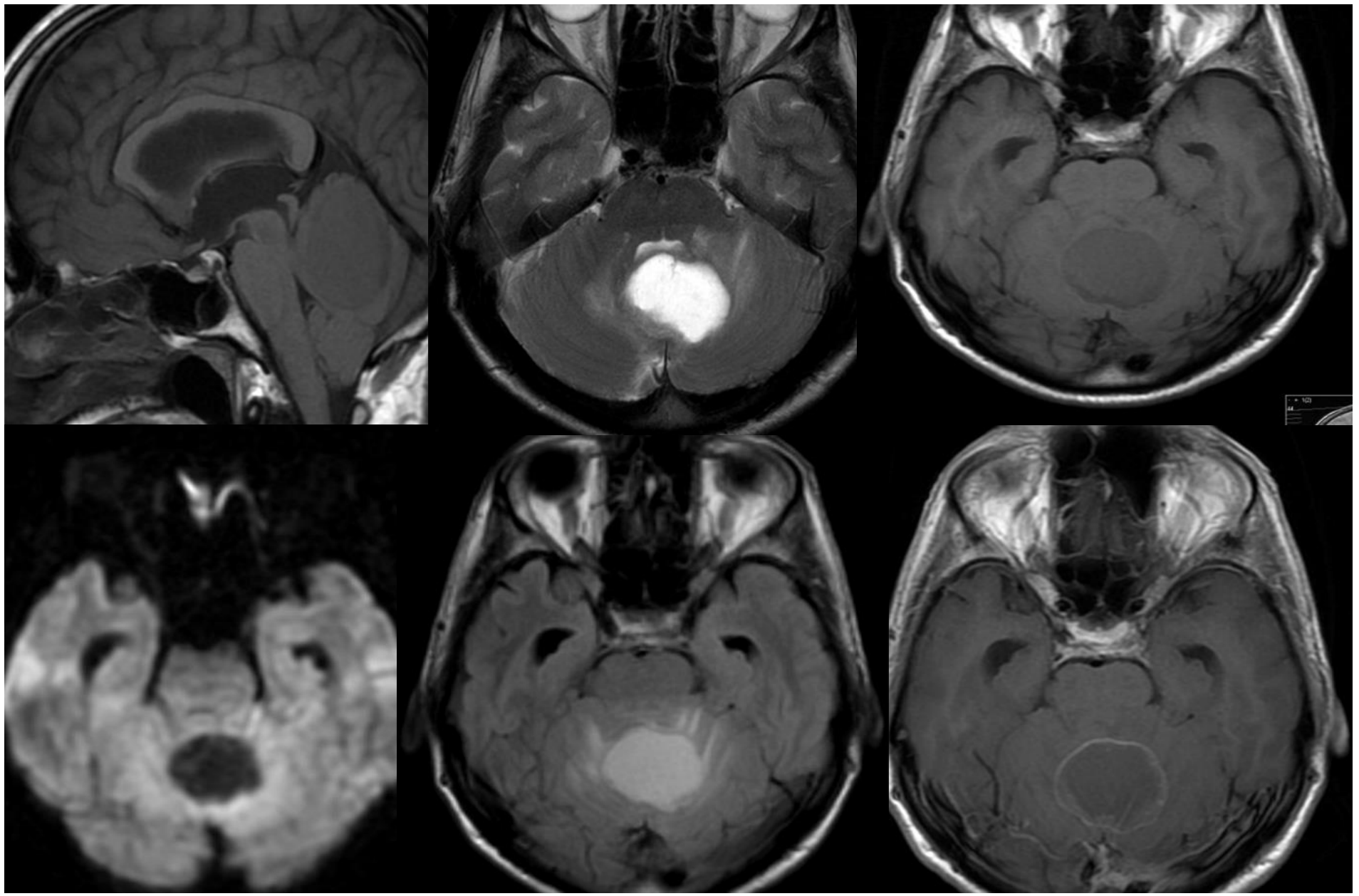
ADC



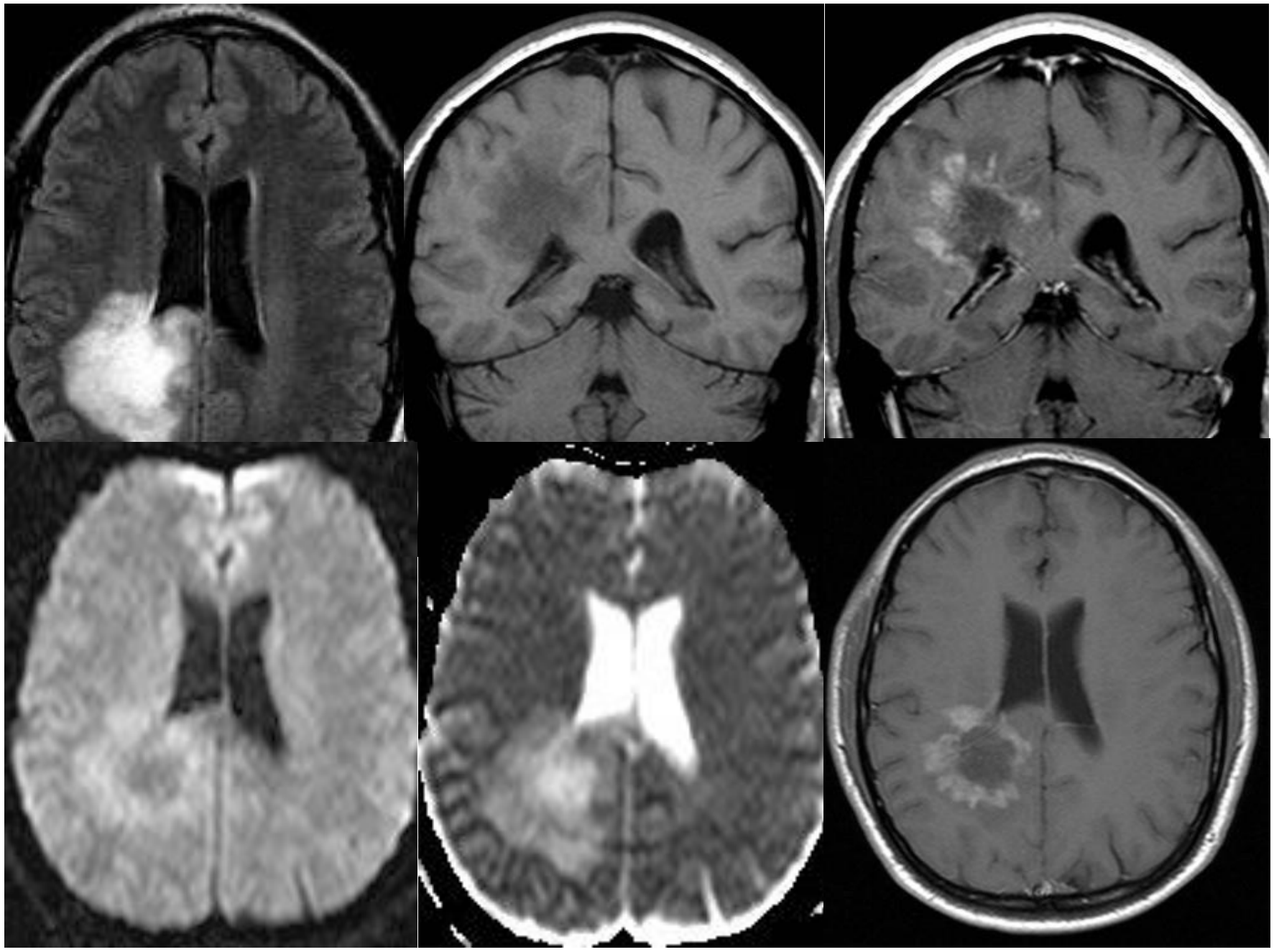
CT head T2W T1W + c B1000 ADC

Pyogenic Abscess

Metastasis

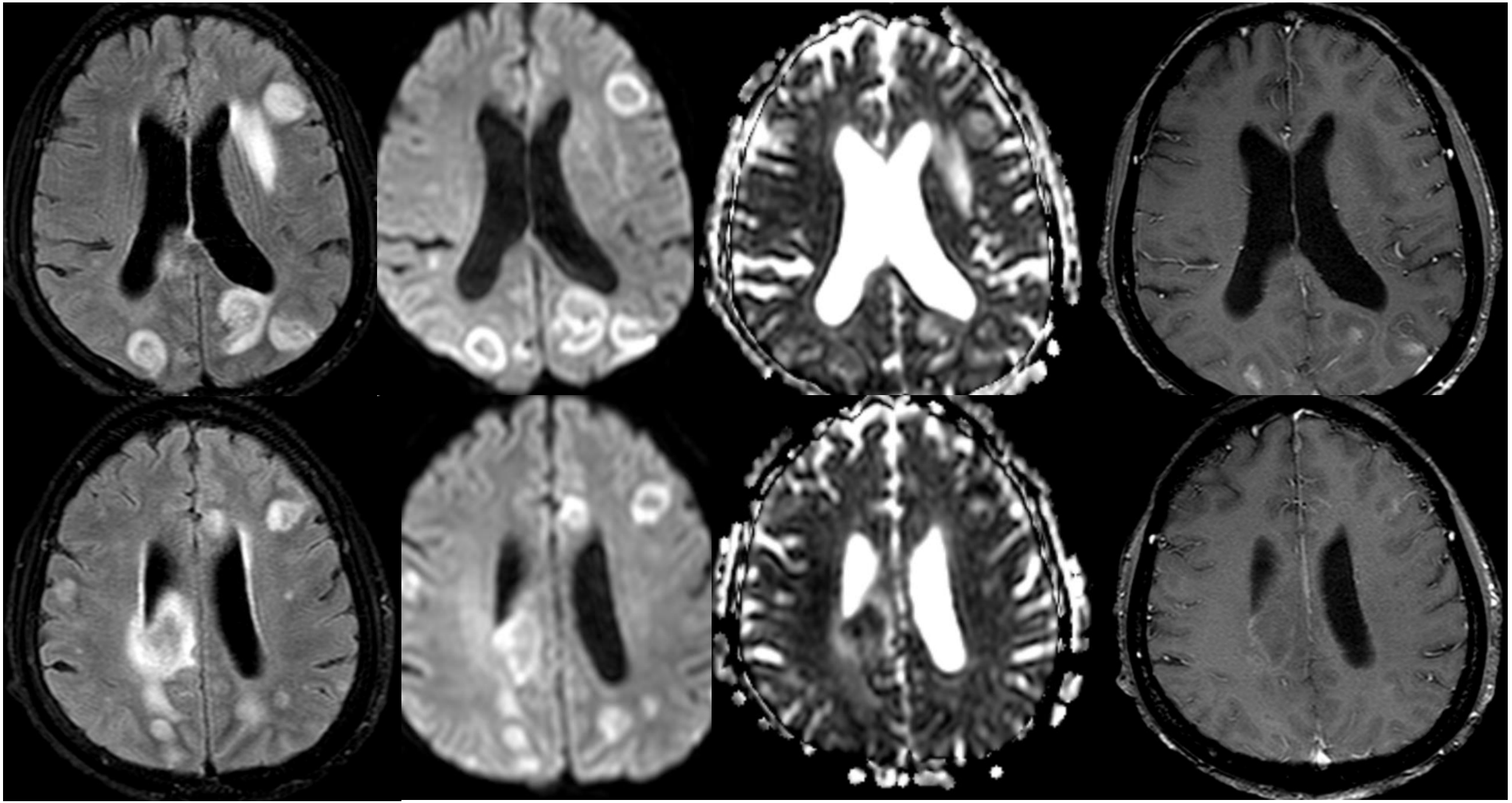


TUMEFACTIVE DEMYELINATION



Case 3

Adult (50s) found collapsed. Confused with reduced GCS.



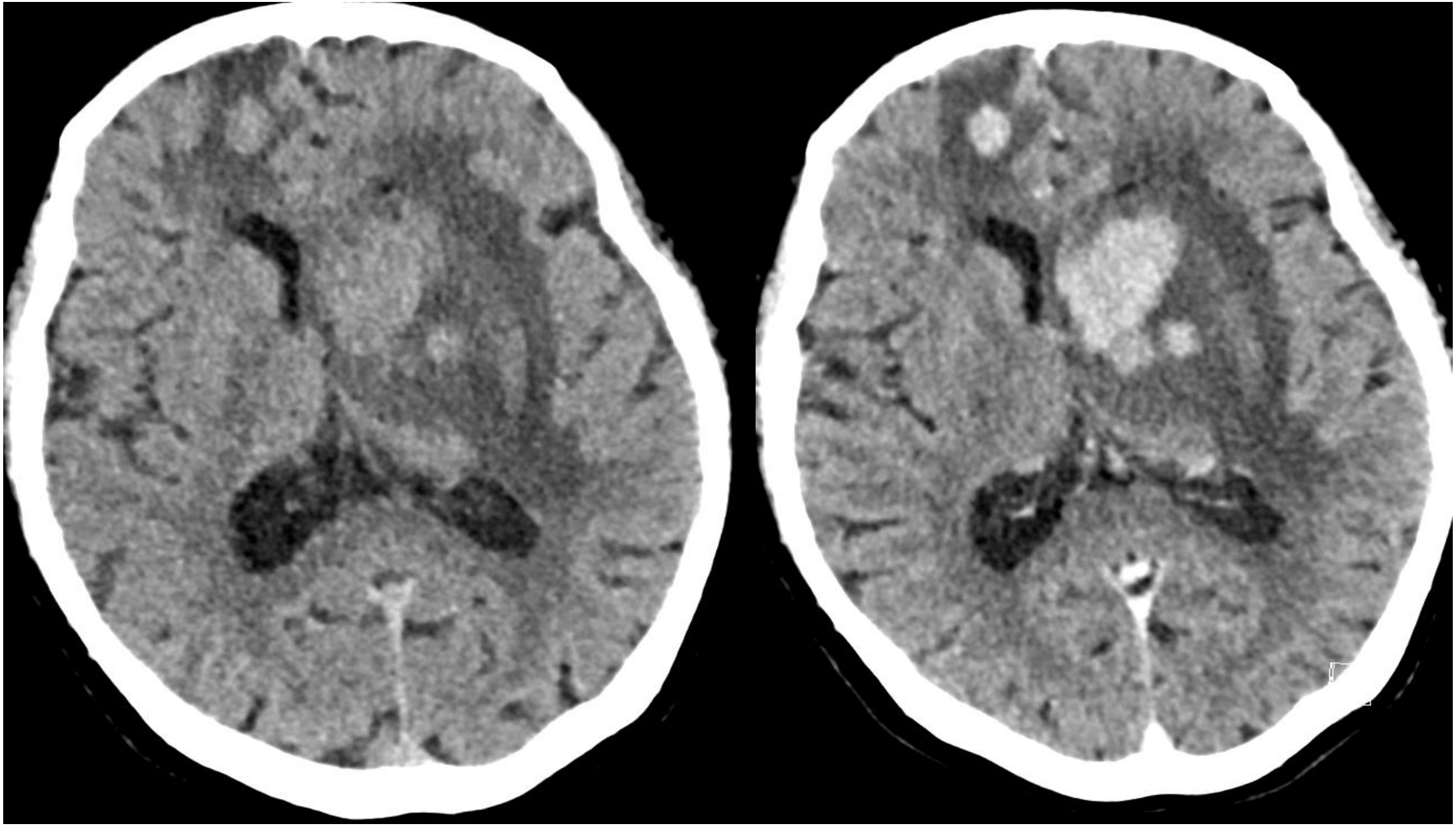
Toxoplasmosis

- Common opportunistic infection by parasite *Toxoplasma gondii*
- Immunocompromised
- Imaging: basal ganglia, thalami, corticomedullary junction and cerebellum
- Typically multifocal

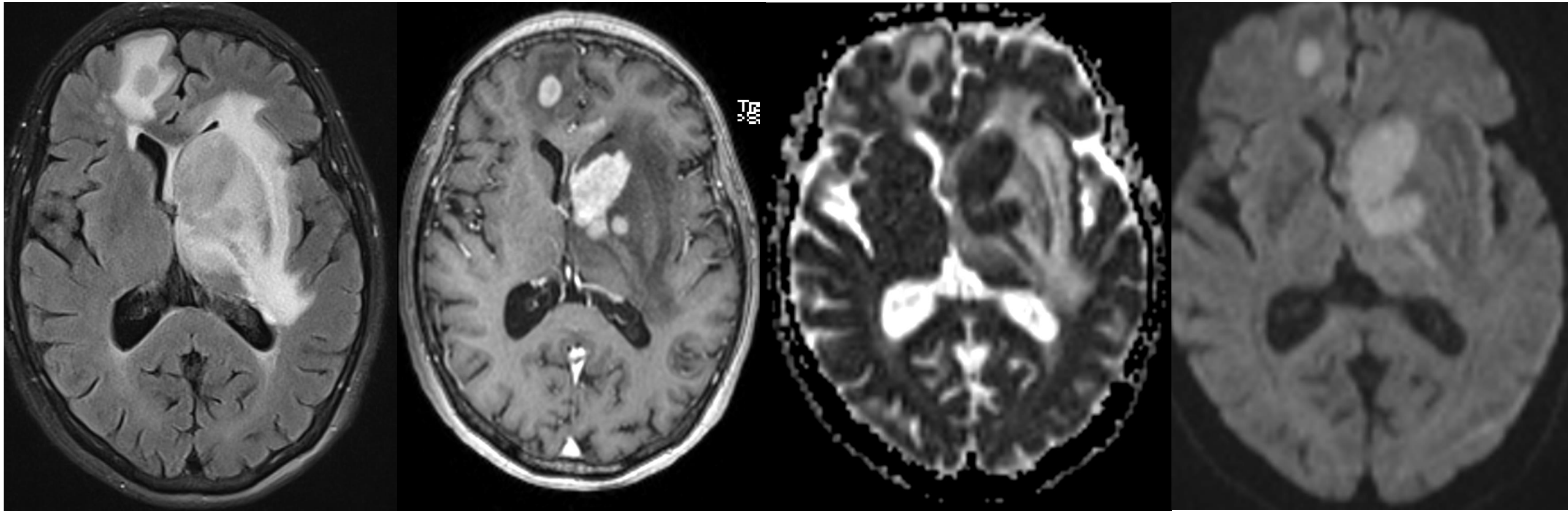
Companion Case

Unenhanced CT head

Enhanced CT head



FLAIR T1W + c ADC B1000



LYMPHOMA

LYMPHOMA versus TOXOPLASMOSIS

LYMPHOMA

- Solitary > multifocal
- Ependymal/subependymal contant
- Homogenous enhancement
- Low ADC (restricted diffusion)
- Haemorrhage uncommon

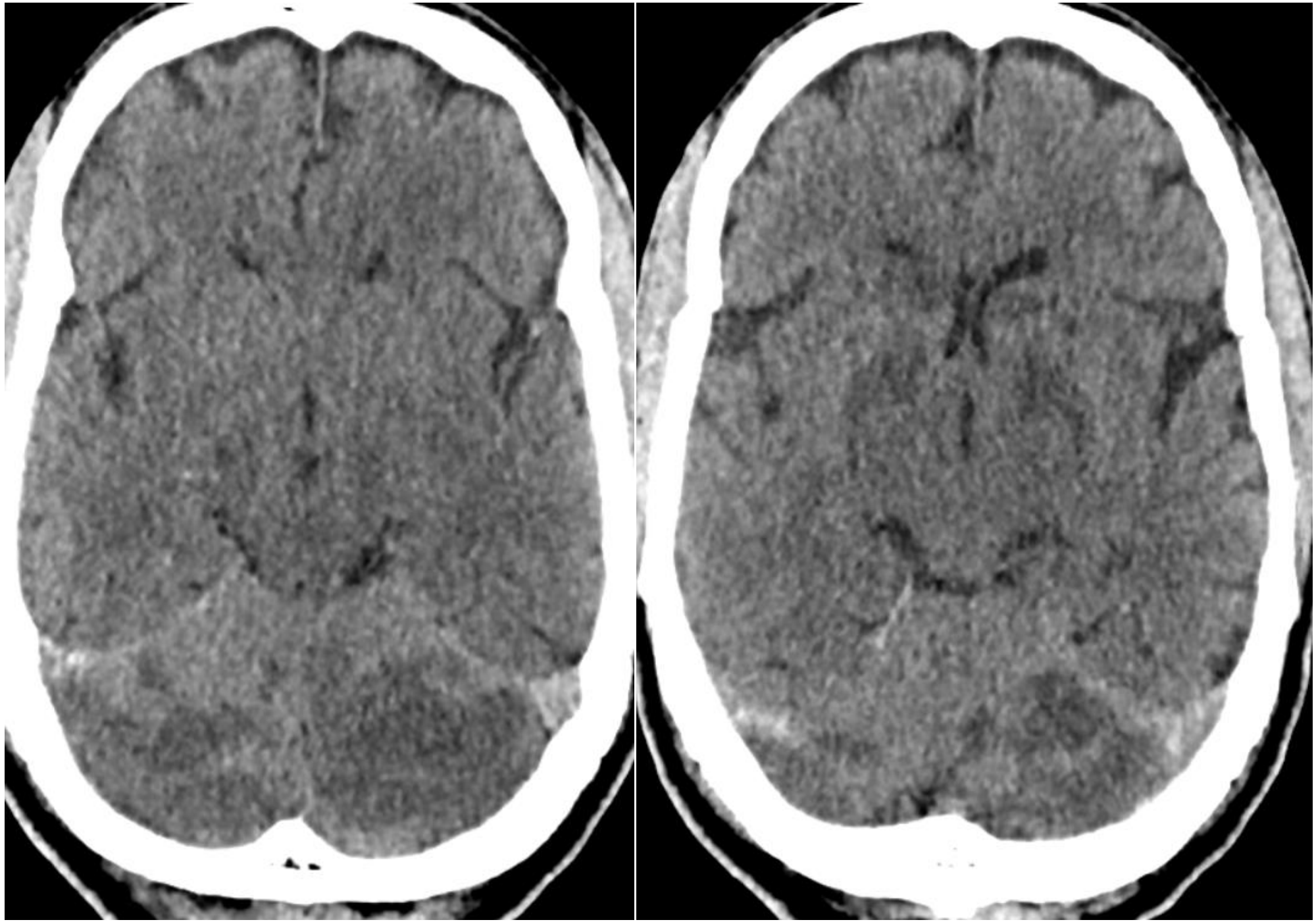
TOXOPLASMOSIS

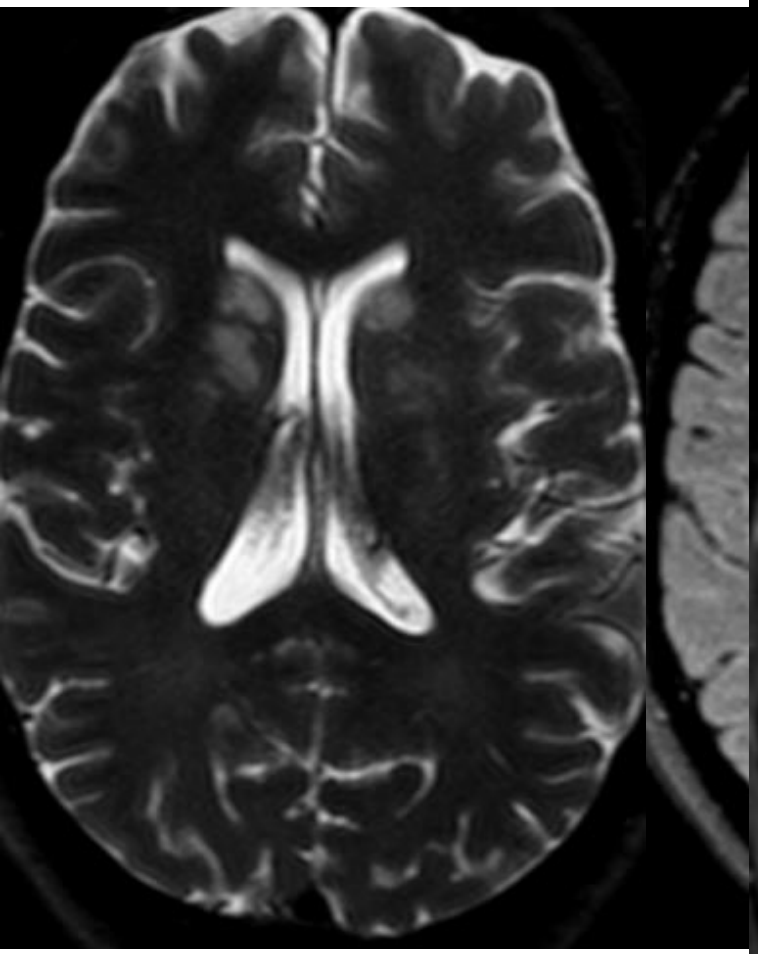
- Multifocal > solitary
- Deep structures, CM junction
- Ring/nodular enhancement
- Higher ADC (facilitated diffusion)
- Can have haemorrhage

Case 4

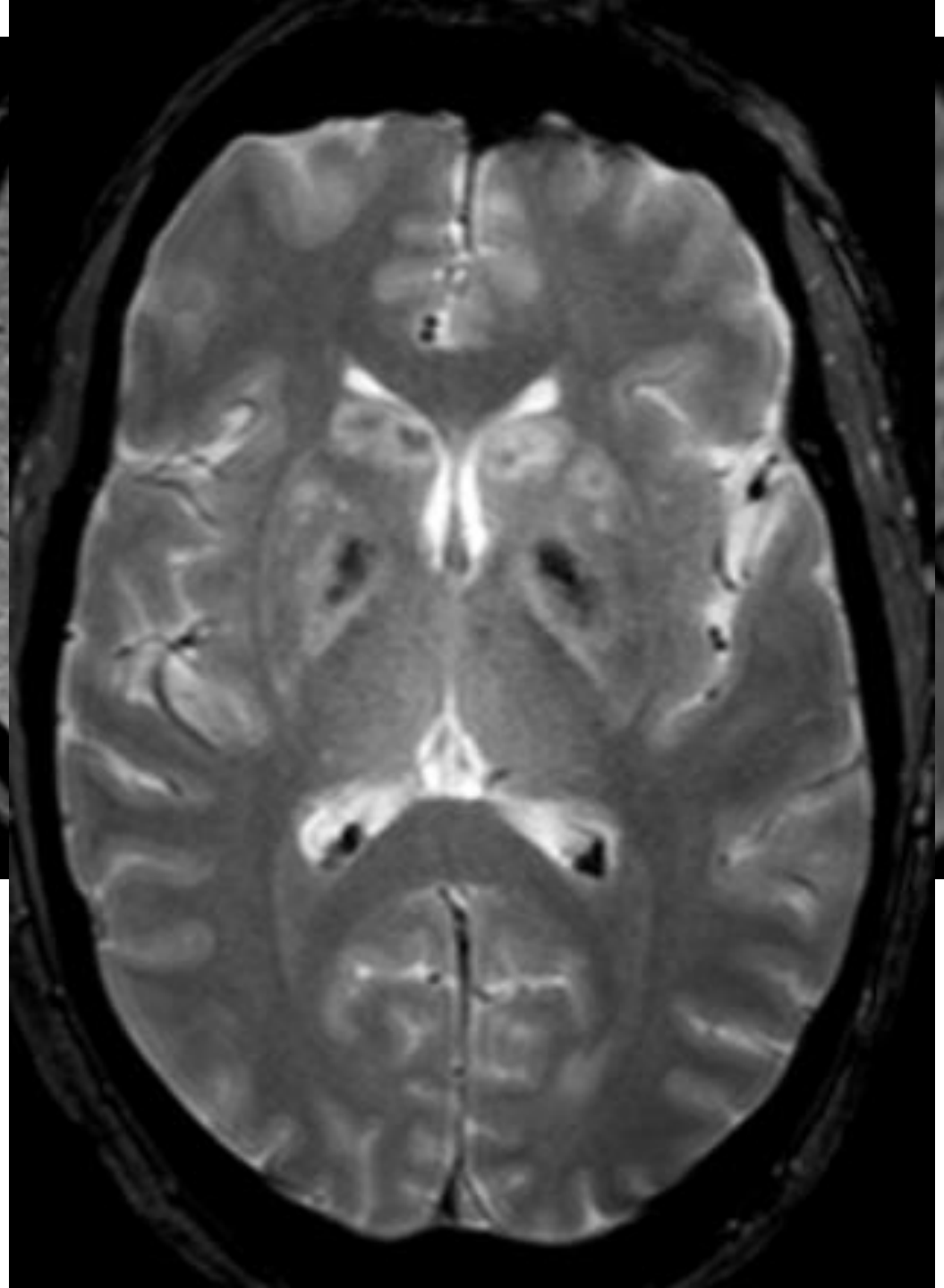
Adult (60s) presents acutely confused, slurring and reduced GCS.

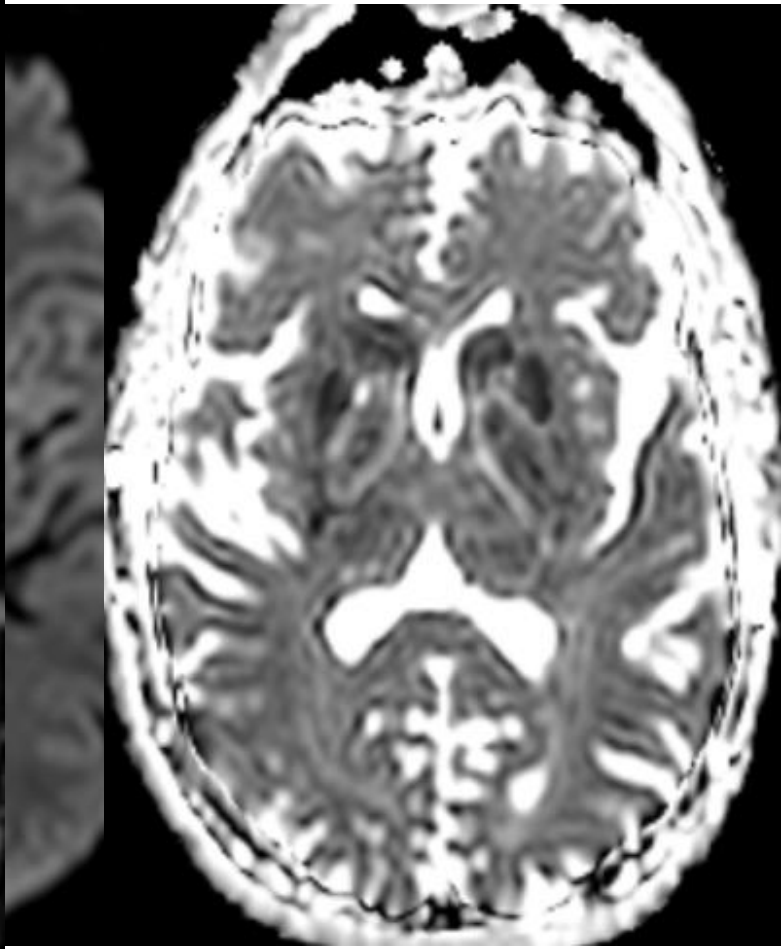
Unenhanced
CT head



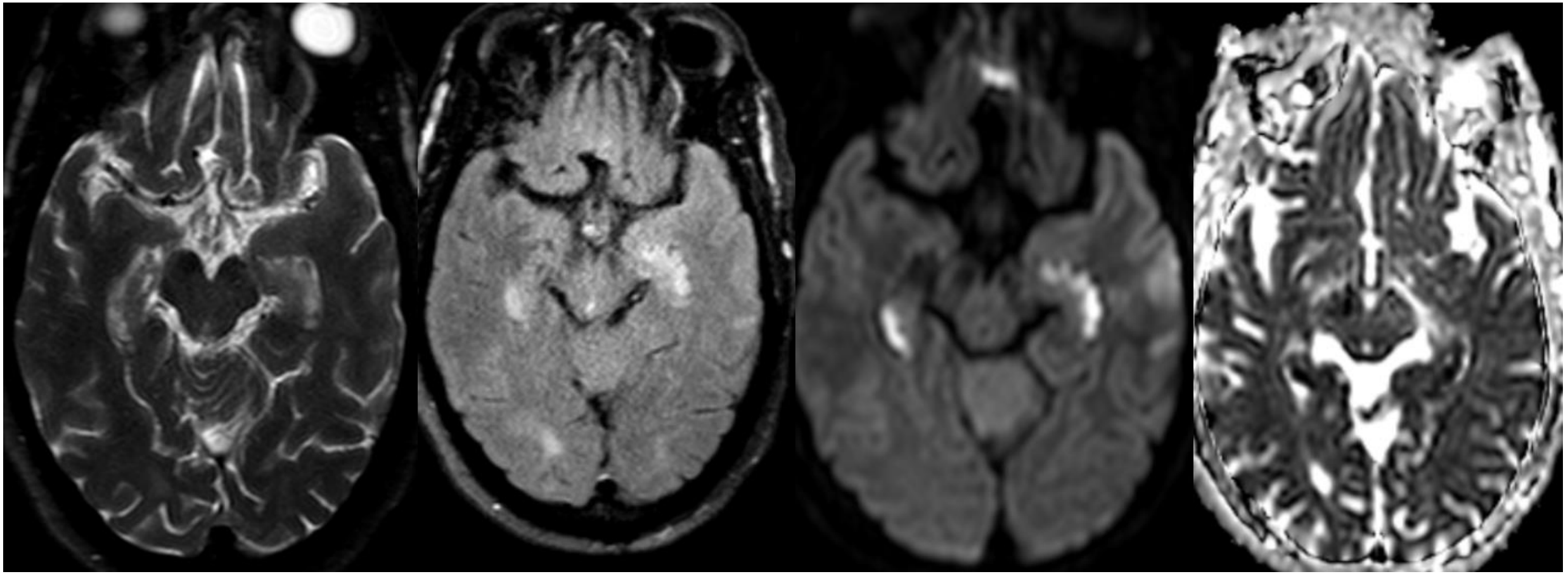


T2W

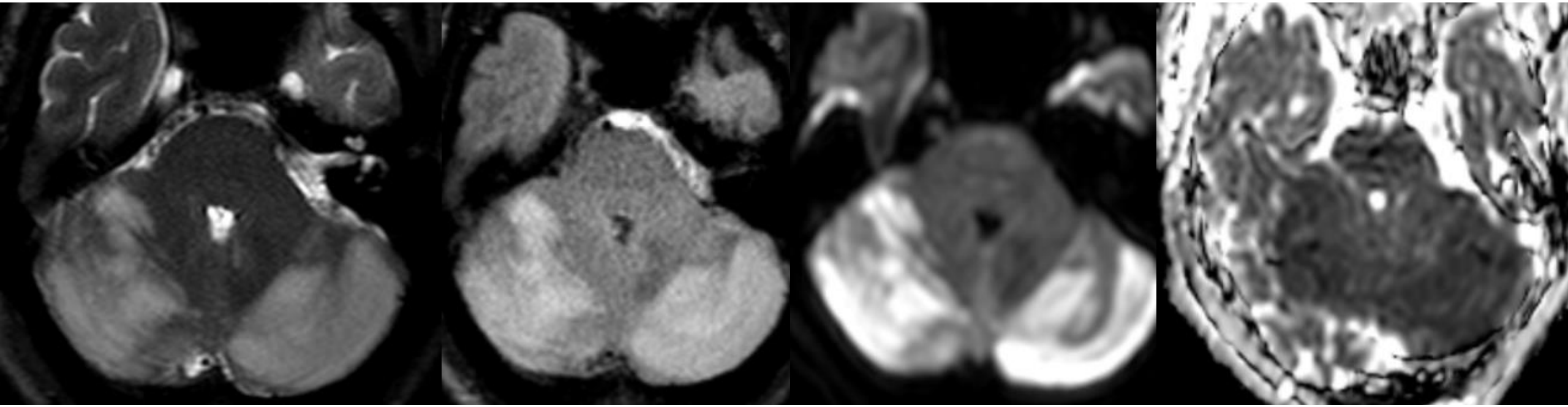




ADC



T2W FLAIR B1000 ADC

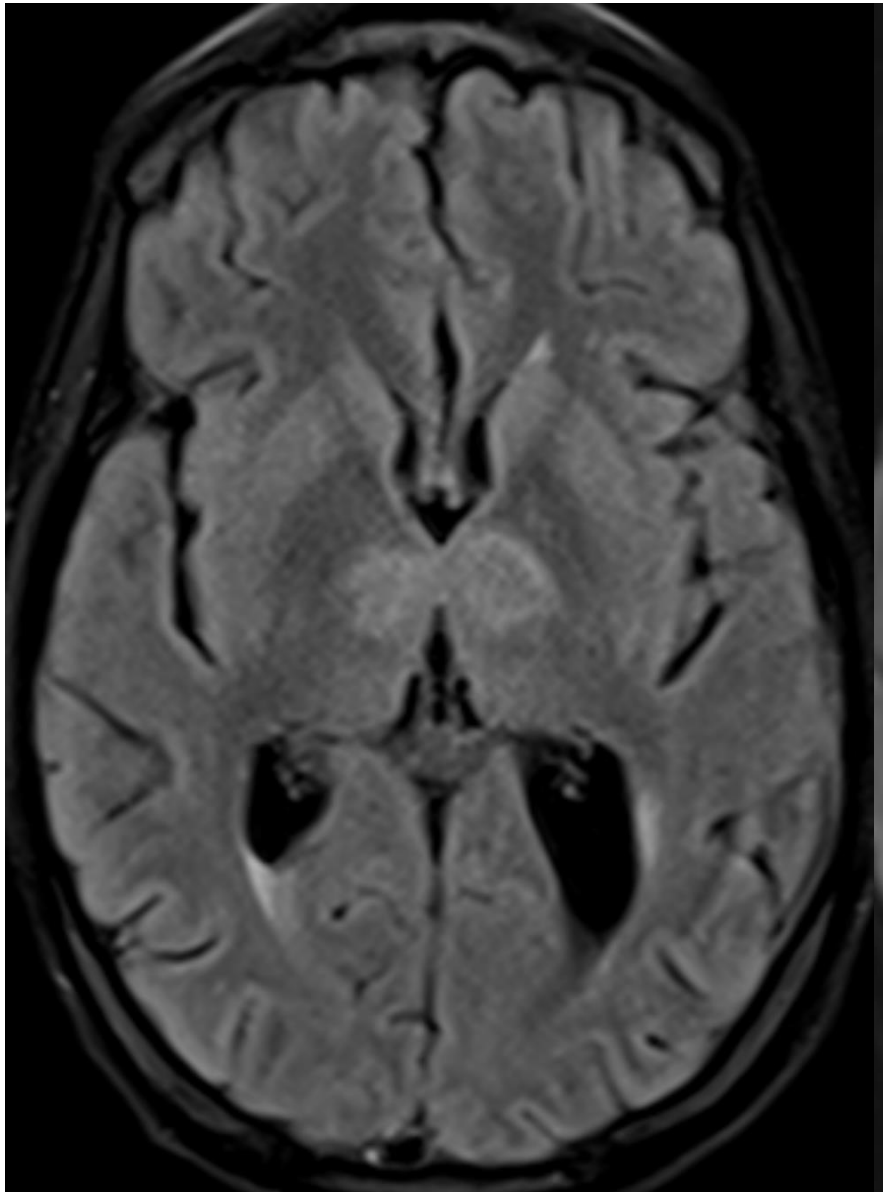


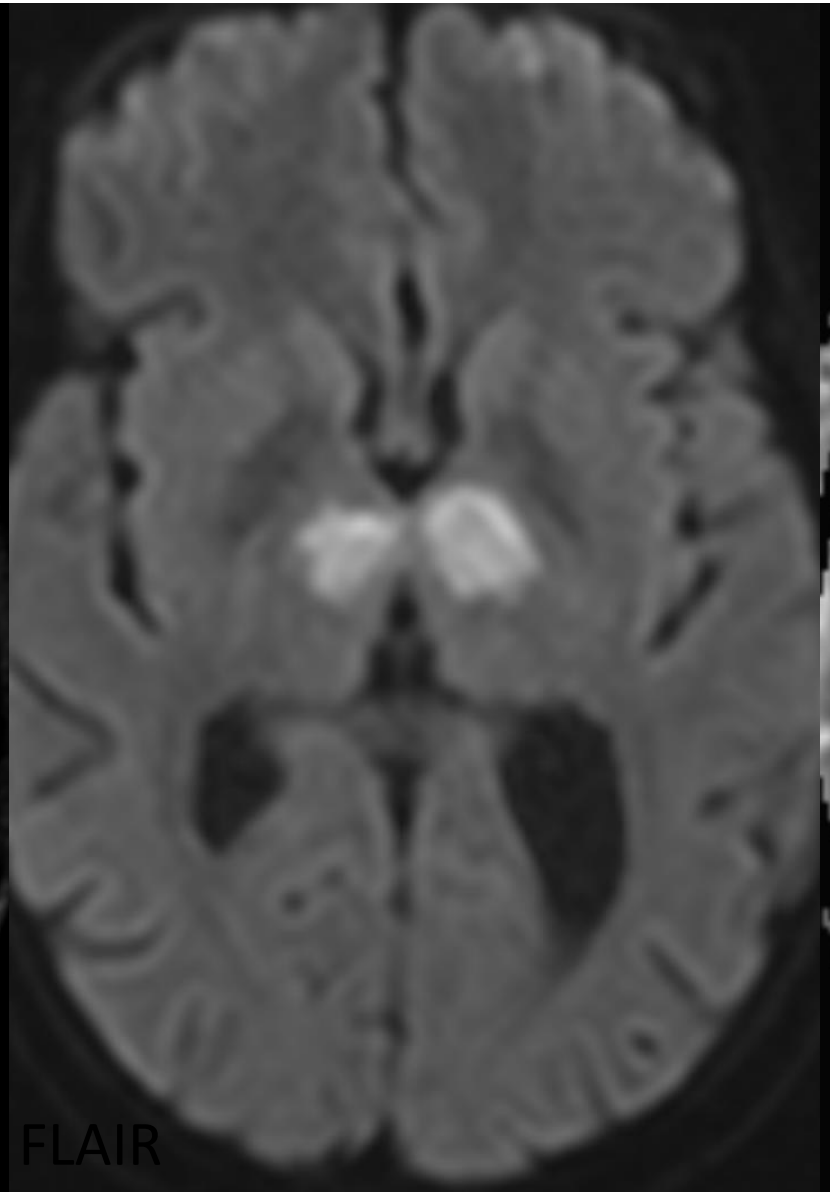
T2W FLAIR B1000 ADC

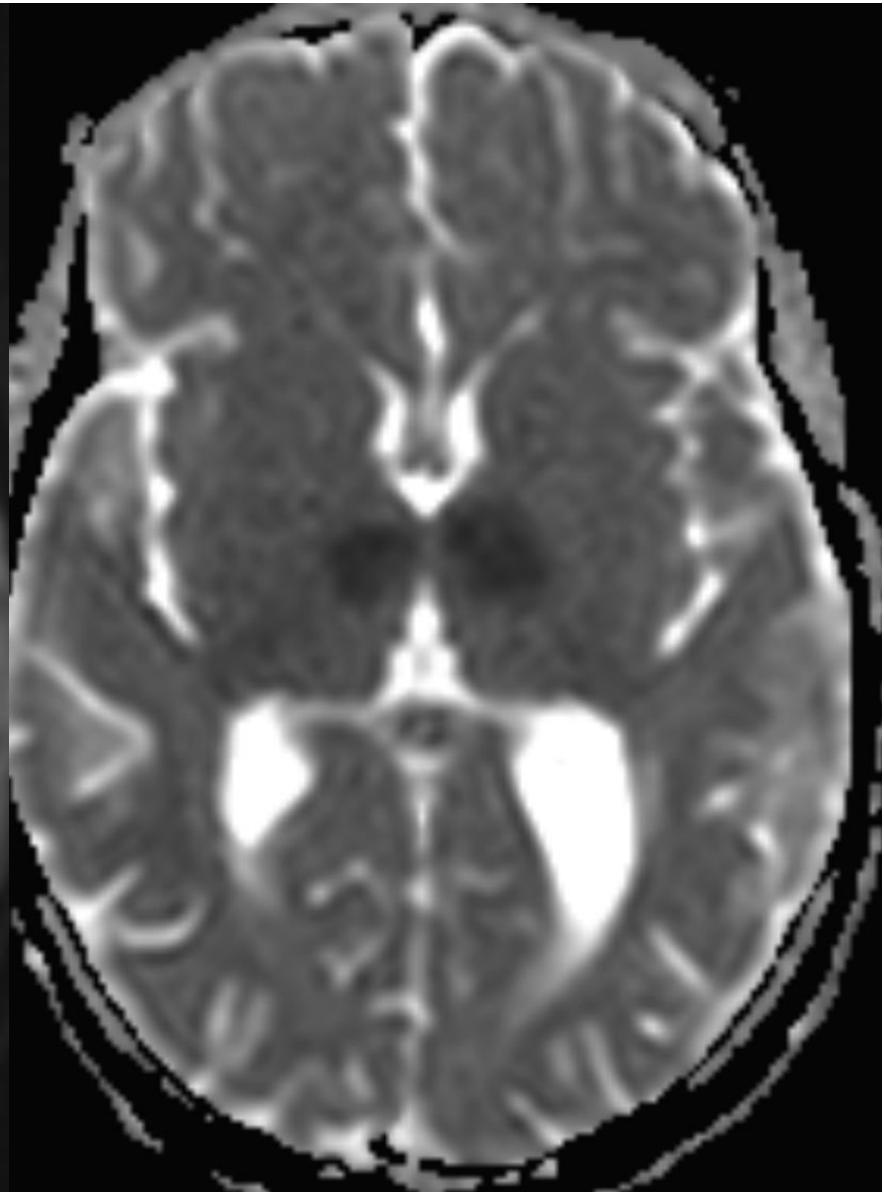
CHANTER syndrome

- **C**erebellar, **H**ippocampal **A**nd basal **N**uclei **T**ransient o**E**dema with **R**estricted diffusion
- Opioid-induced neurotoxicity
- Infarction (cytotoxic oedema) involving hippocampi, basal ganglia, cerebellum
- Toxic encephalopathy

Companion Cases



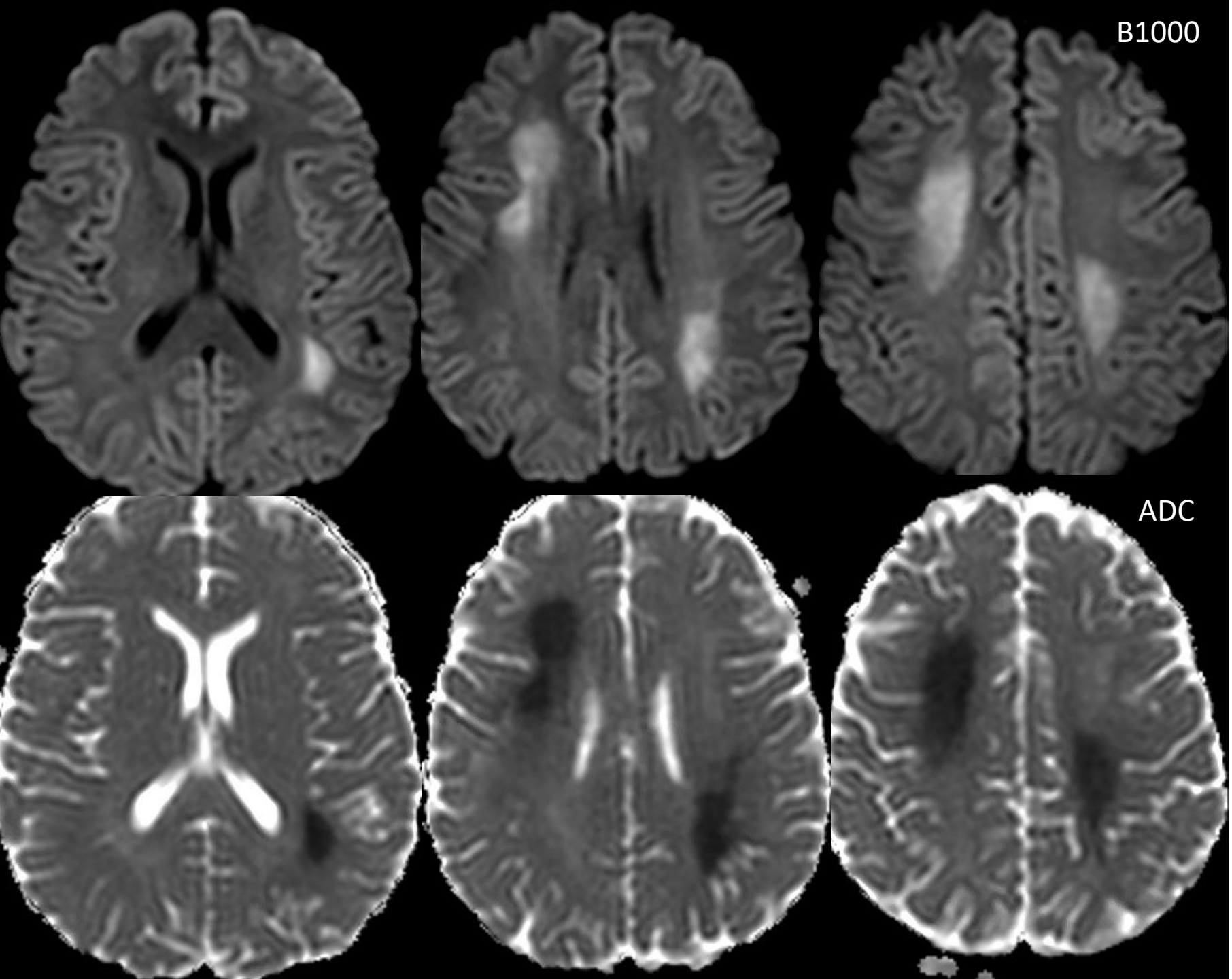




FLAIR

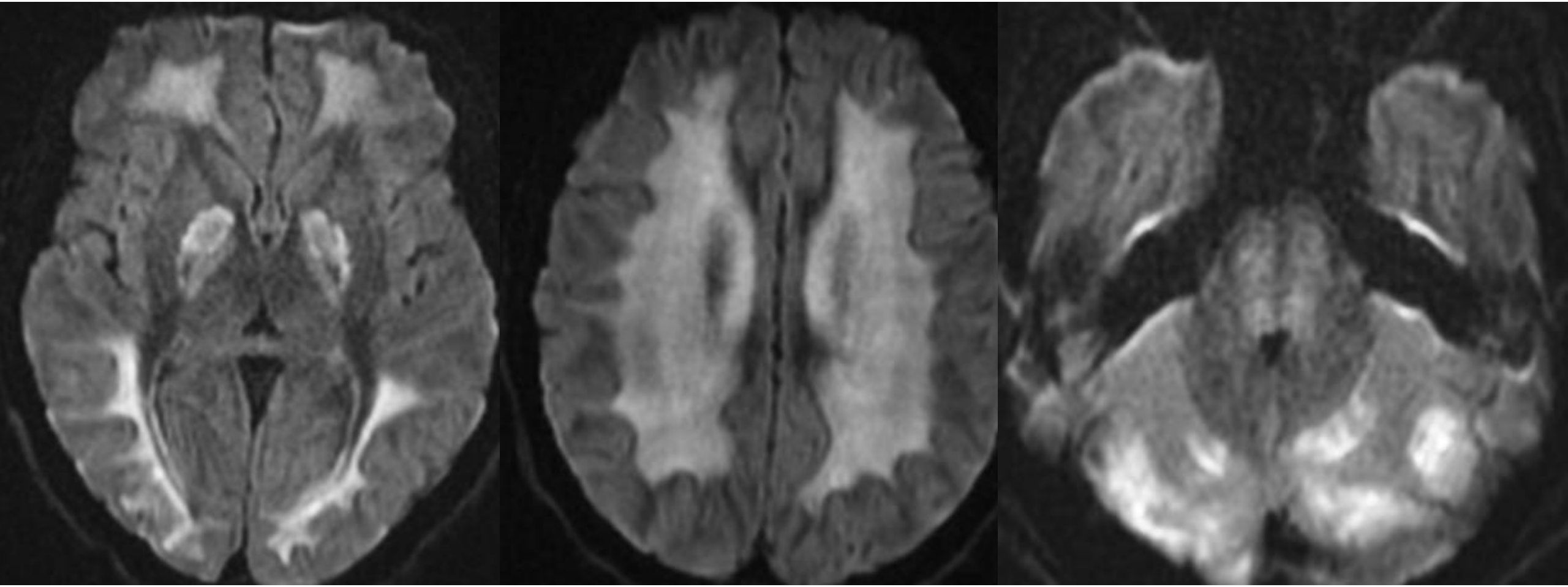
B1000

ADC



Methotrexate Leukoencephalopathy

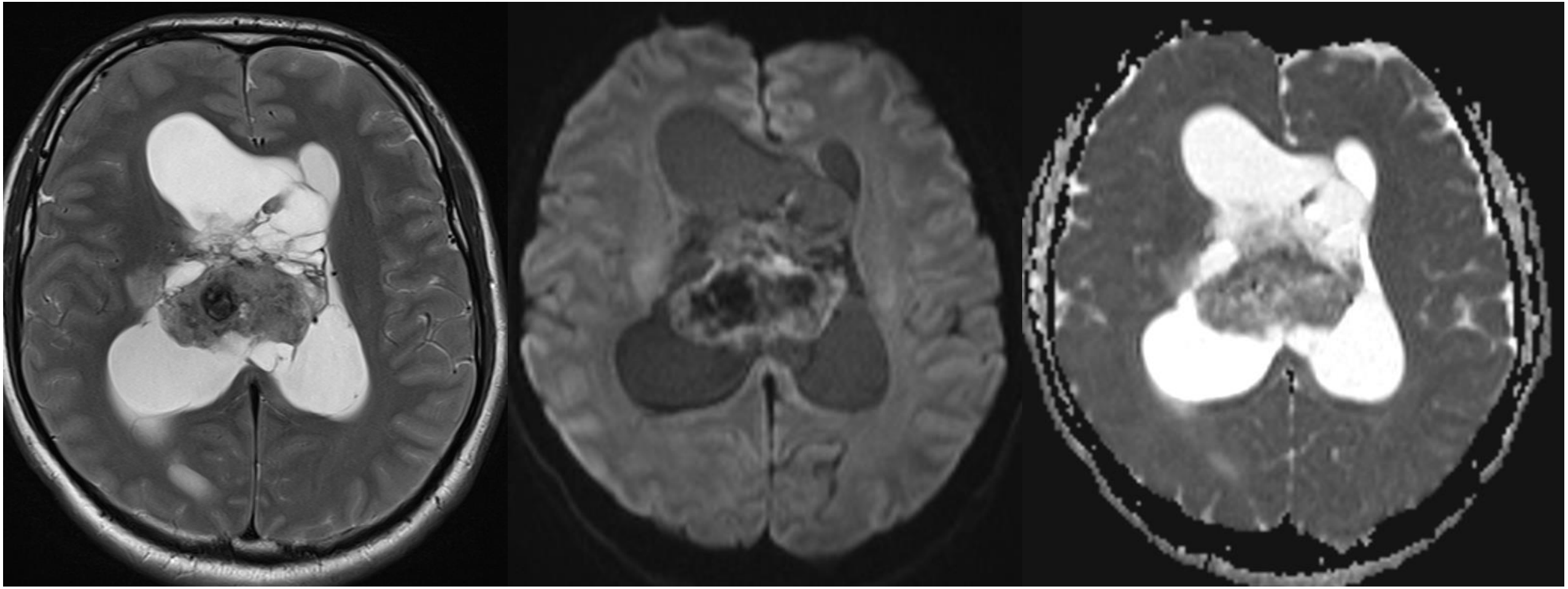
Heroin-induced leukoencephalopathy – “chasing the dragon”



Lund M, Heroin induced leukoencephalopathy. Case study, Radiopaedia.org (Accessed on 20 Apr 2023) https://doi.org/10.53347/rID-91836

Case 5

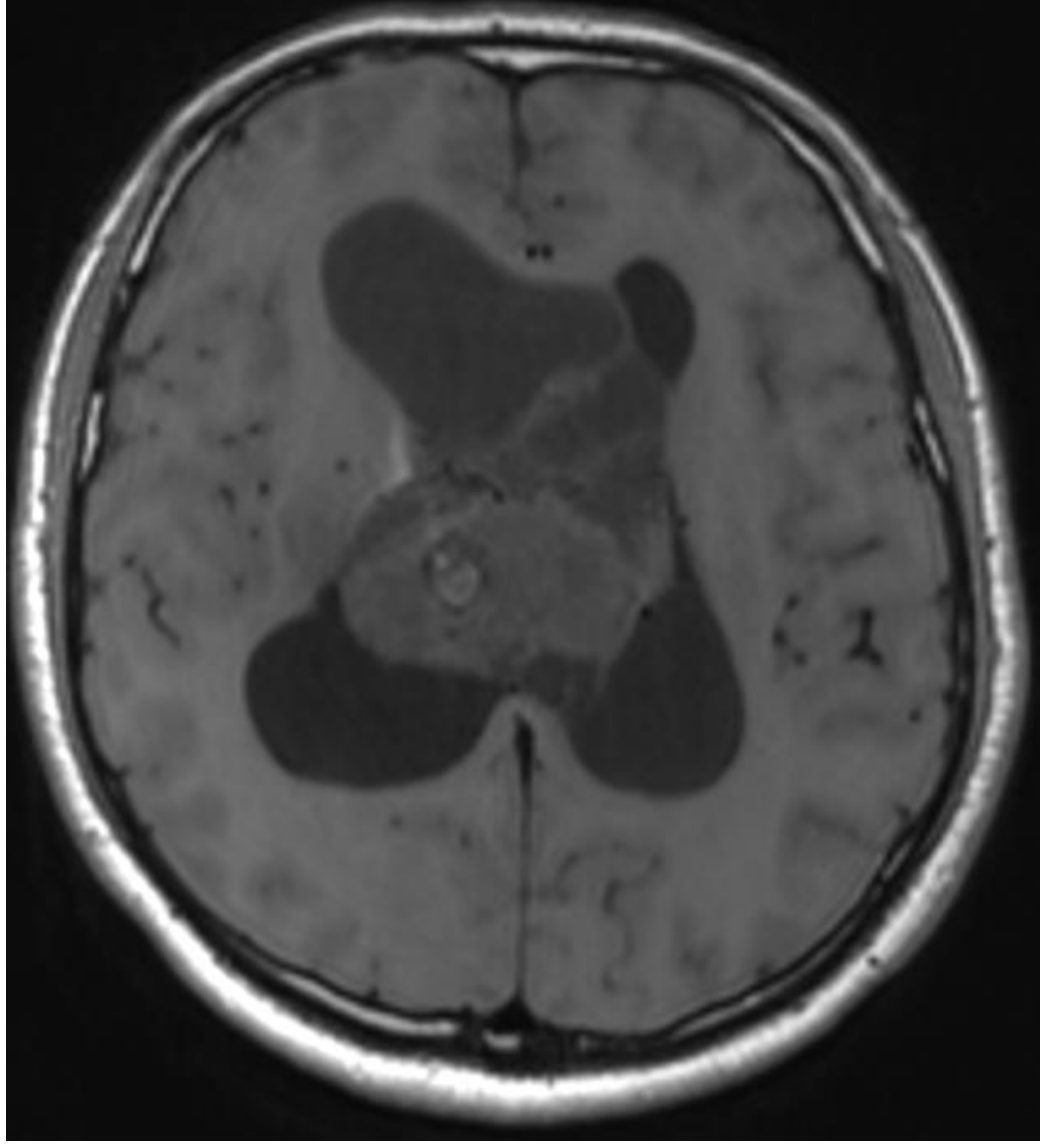
Young adult (20s) persistent progressive headache for 6 months and worsening dizziness. Presents acutely with reduced GCS following a black out.



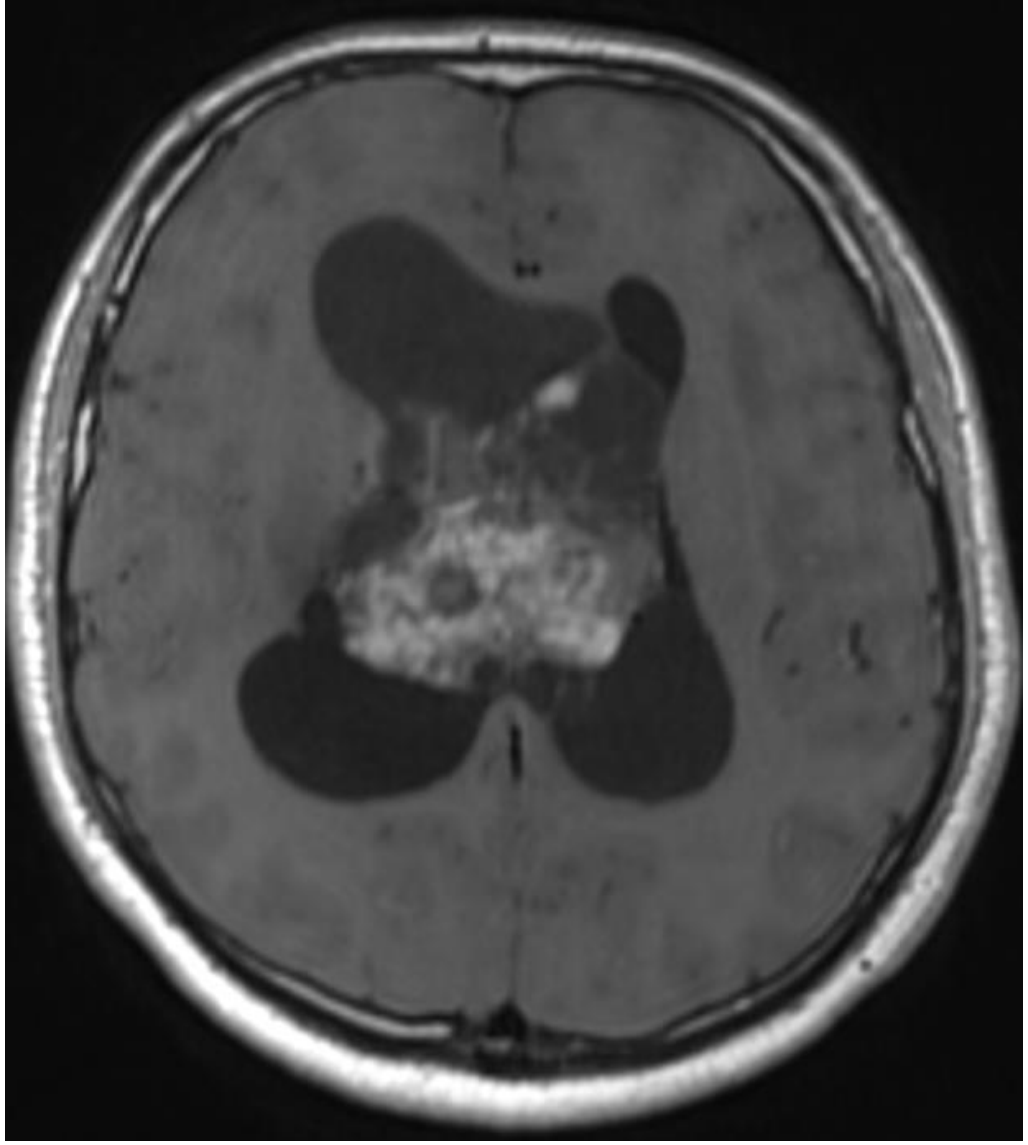
T2W

B1000

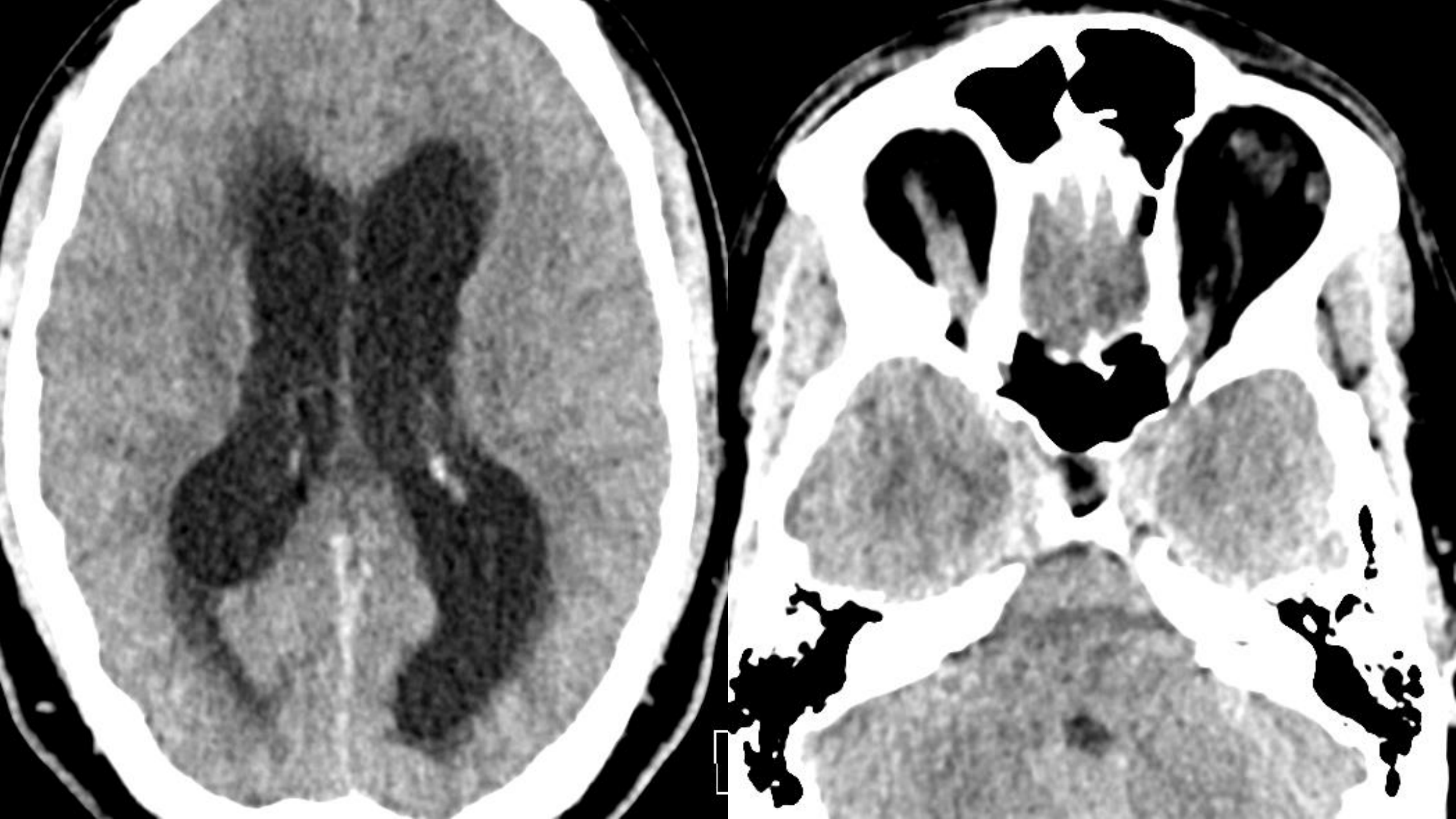
ADC

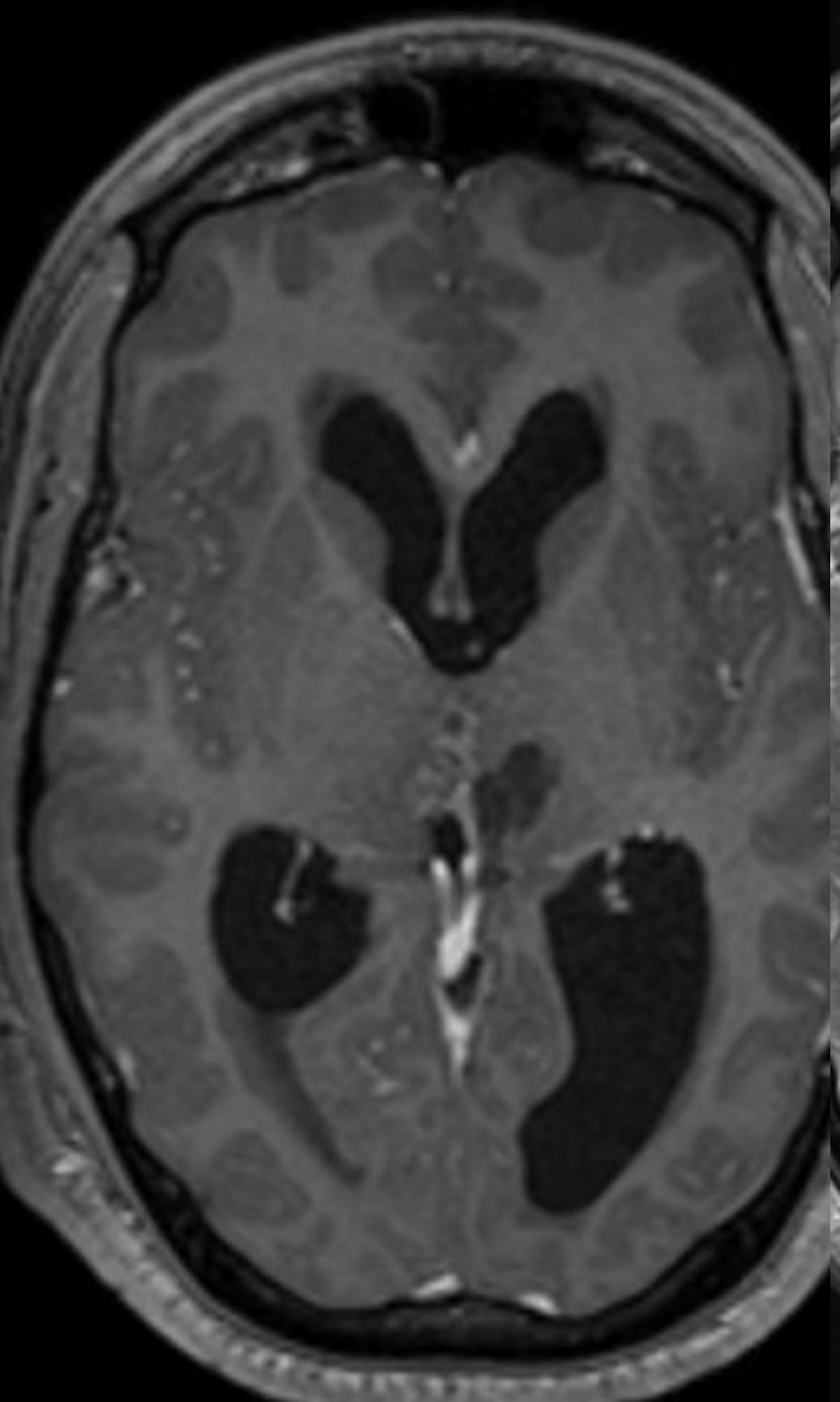
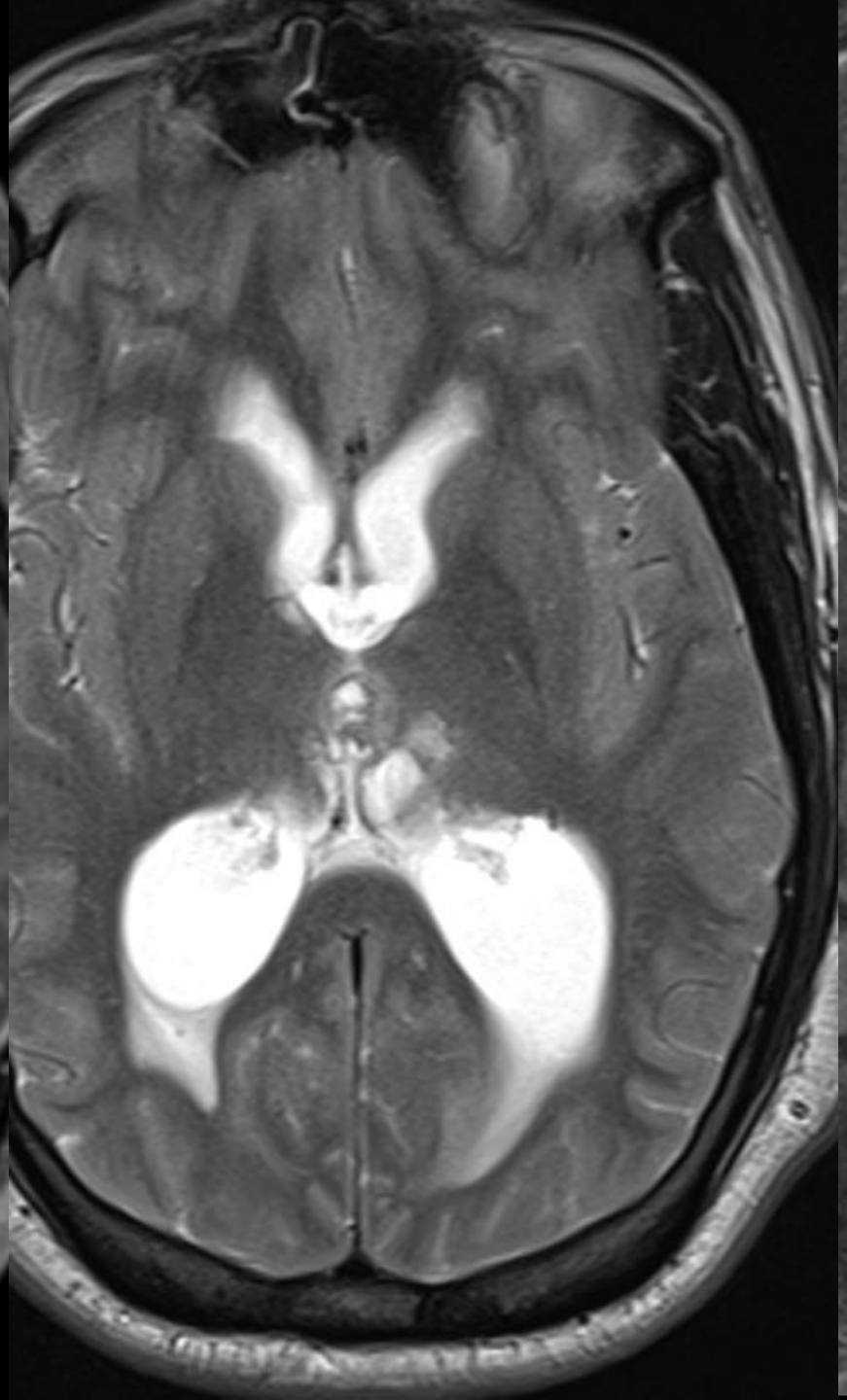
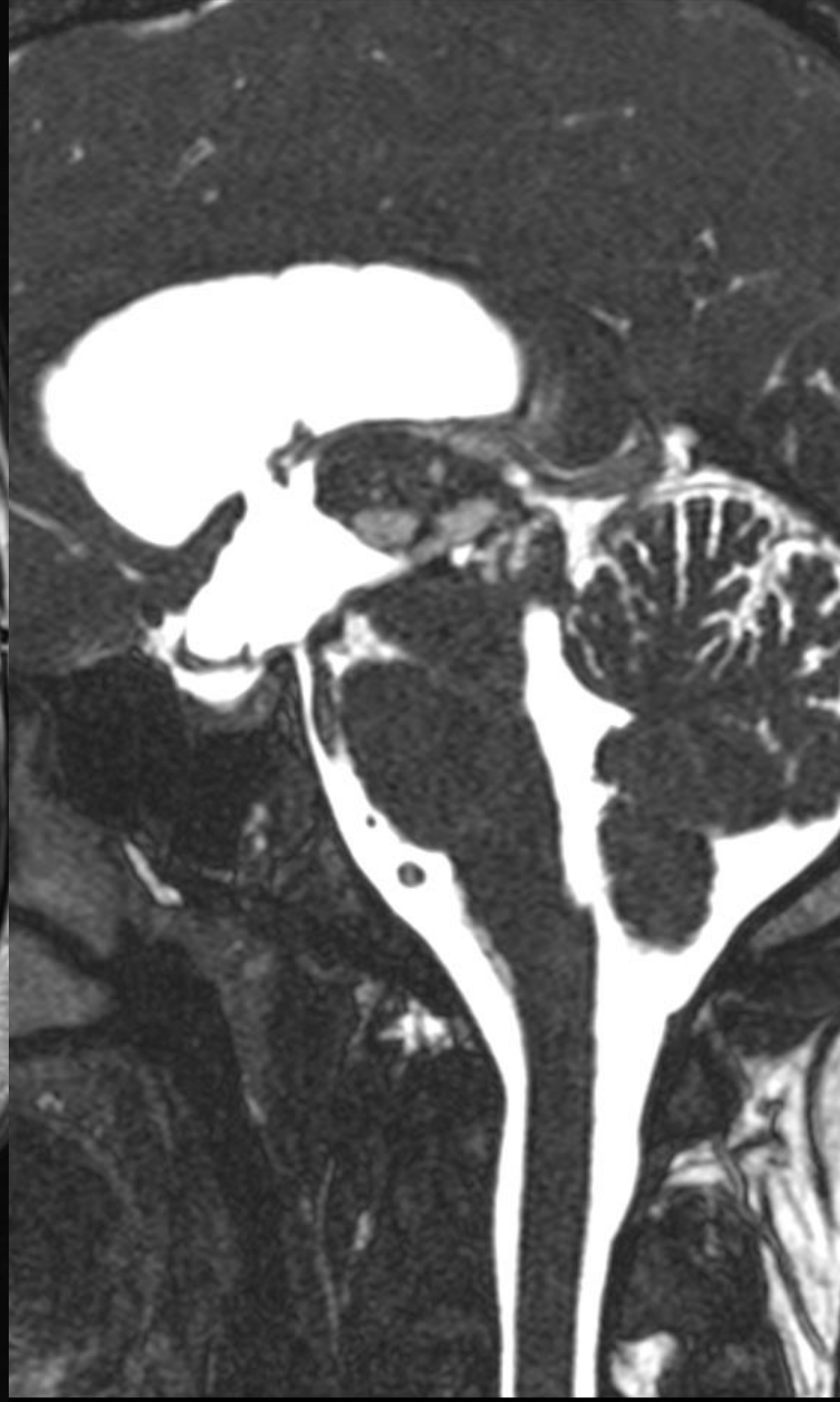


T1W



T1W+c

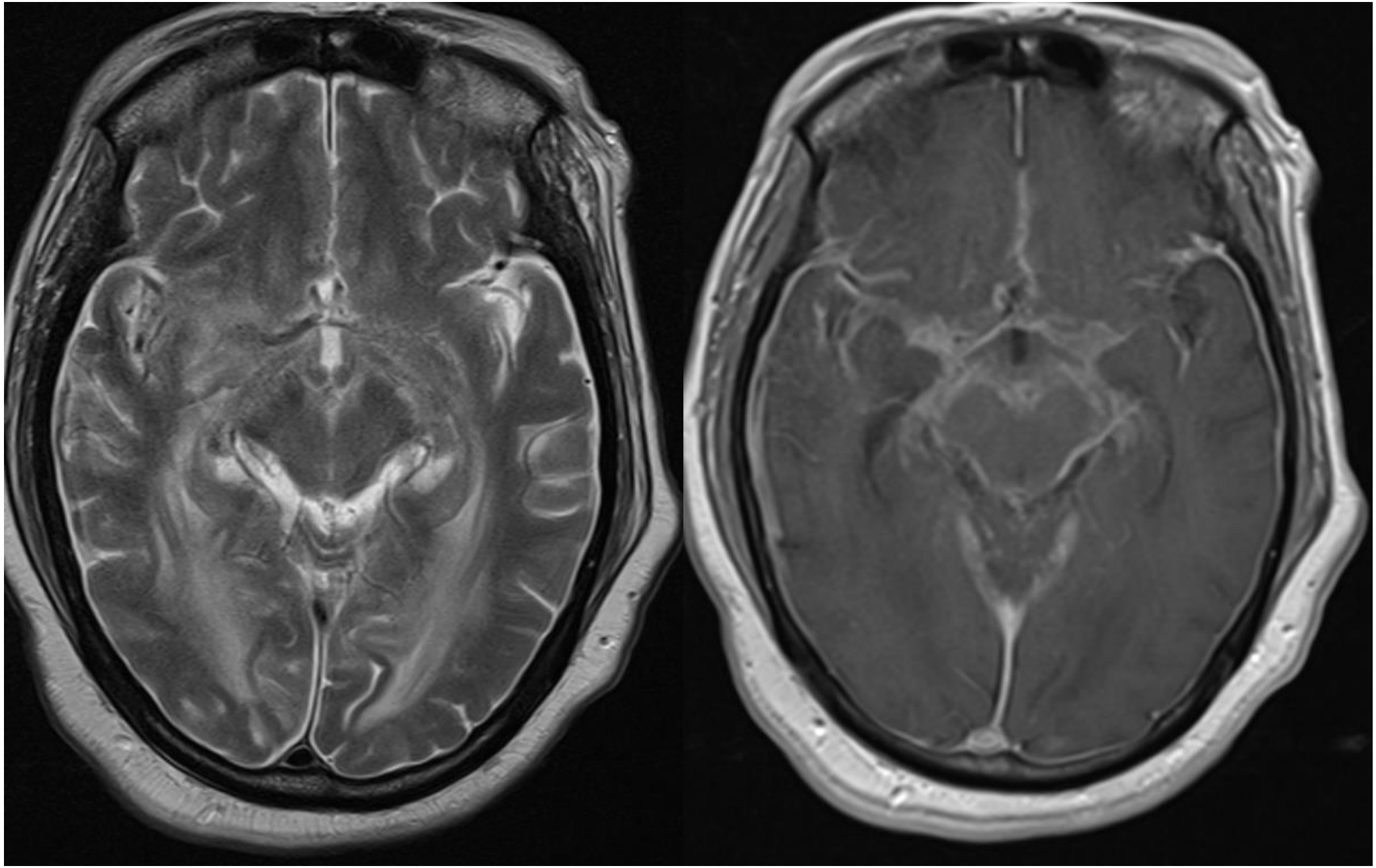


Hydrocephalus

Hydrocephalus

- Acute versus chronic
- Communicating (CSF can move around)
  - With obstruction (blood, pus, tumour cells)
  - Without obstruction (NPH)
- Non-communicating (obstructive - CSF cannot move around)
  - Mass lesions
  - Aqueduct stenosis



Raised ICP

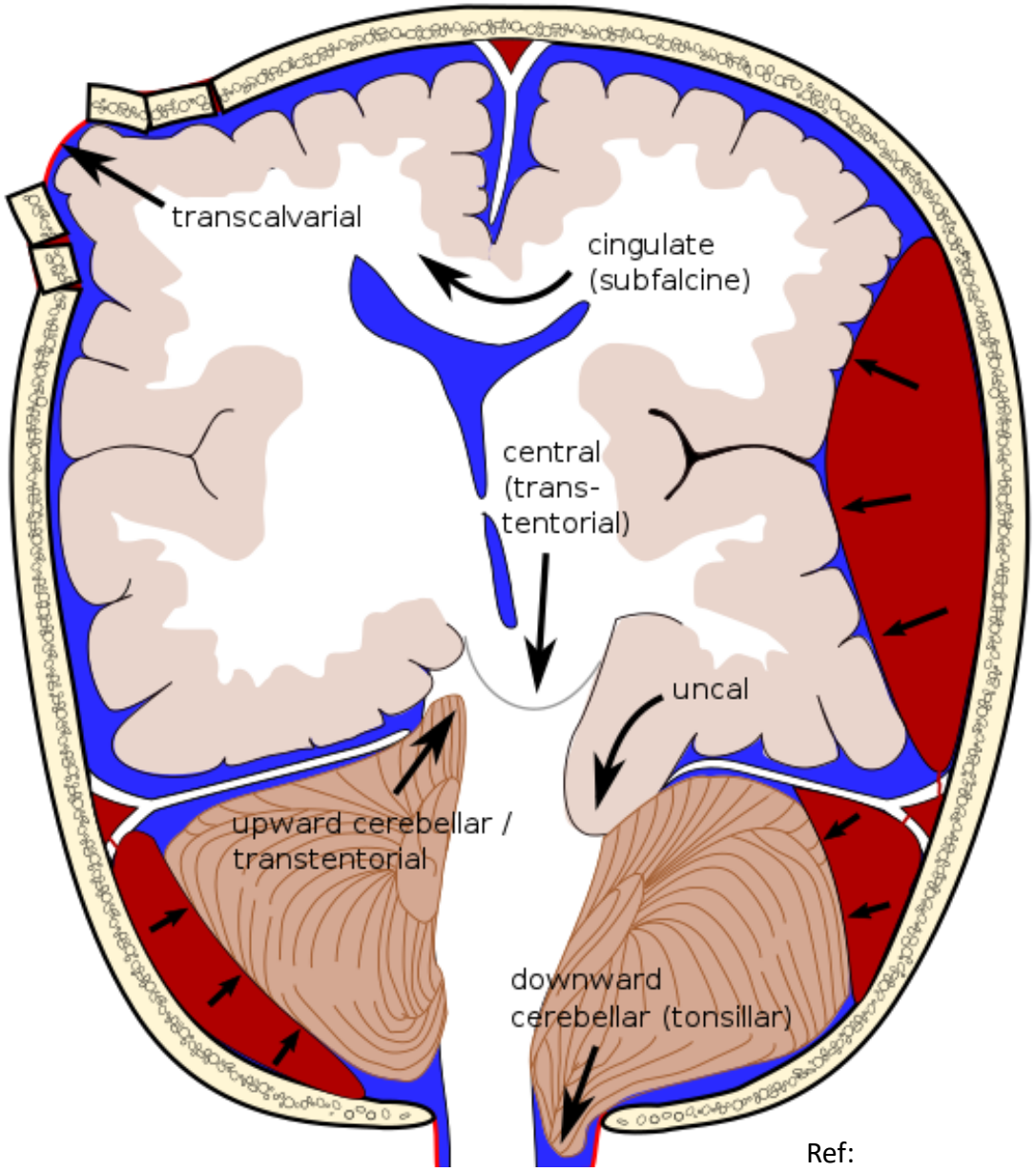
- Monroe-Kellie principle → constant volume inside rigid space

Parenchyma (1400ml)
CSF (150ml)
Blood (150ml)

} approx 1700ml

- If CSF goes up – other compartments have to compensate… and so on

Herniation

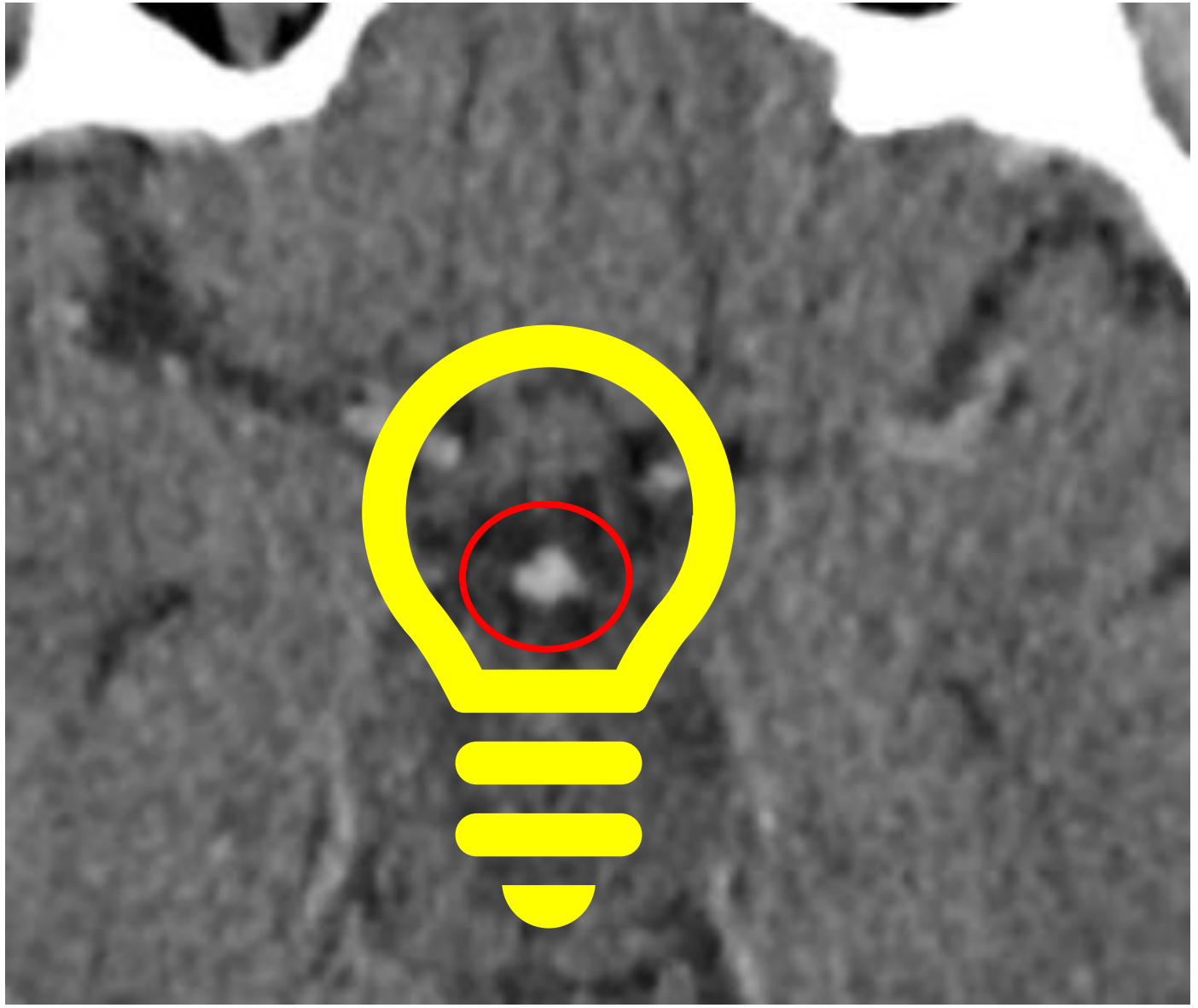


Ref:
https://commons.wikimedia.org/wiki/File:Brain_herniation_types.svg


And finally

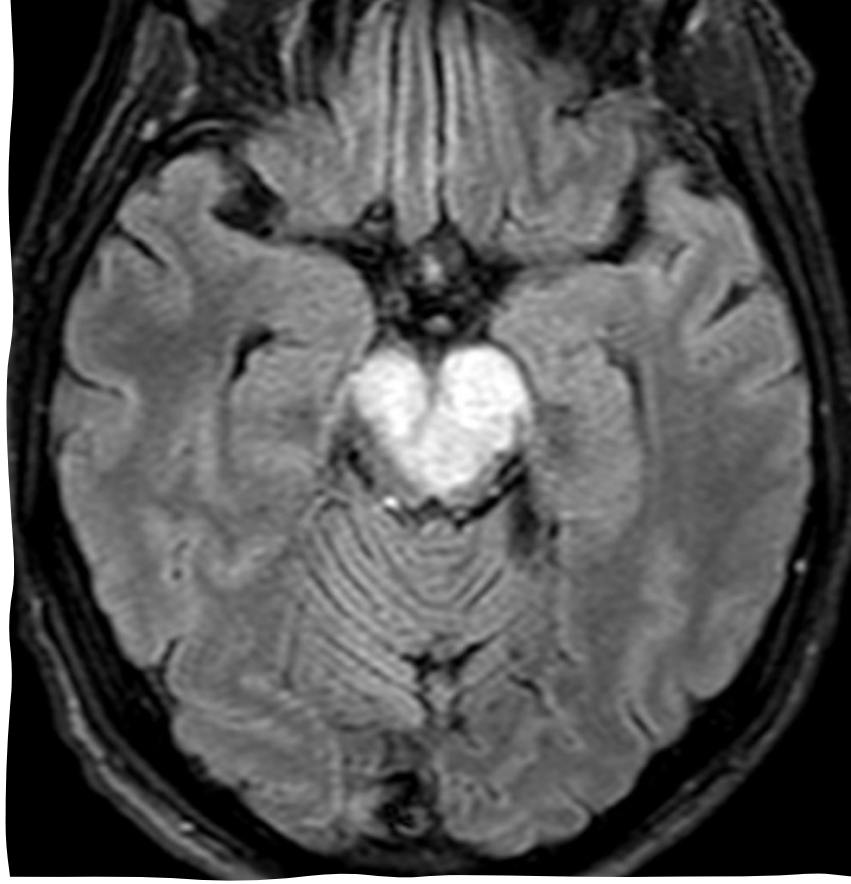
Bonus Case

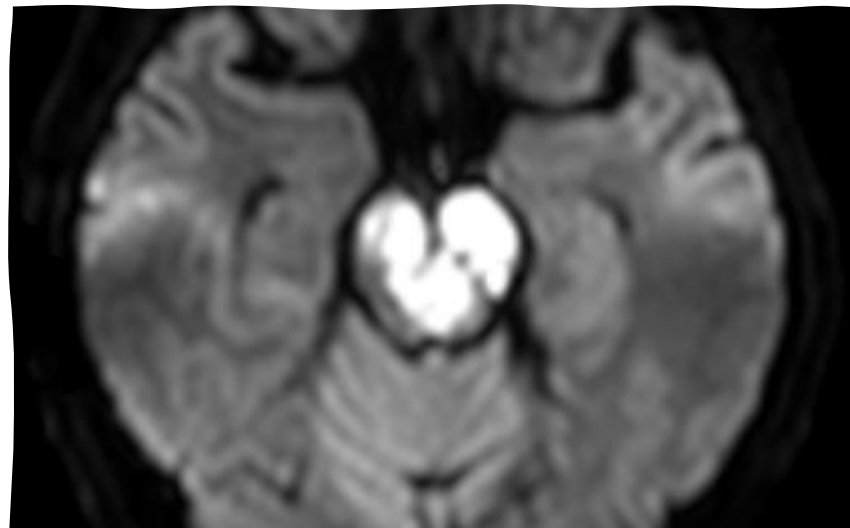
Adult (50s) found unconscious ?traumatic injury



BASILAR TIP THROMBUS WITH BRAINSTEM INFARCTION

DON'T LET THE CLINICAL INFORMATION CATCH YOU OUT!





Summary

Distinguish the imaging features of common acute intracranial pathology

Recognise some of the life-threatening signs in neuroimaging

Review of the causative aetiologies

Thank you

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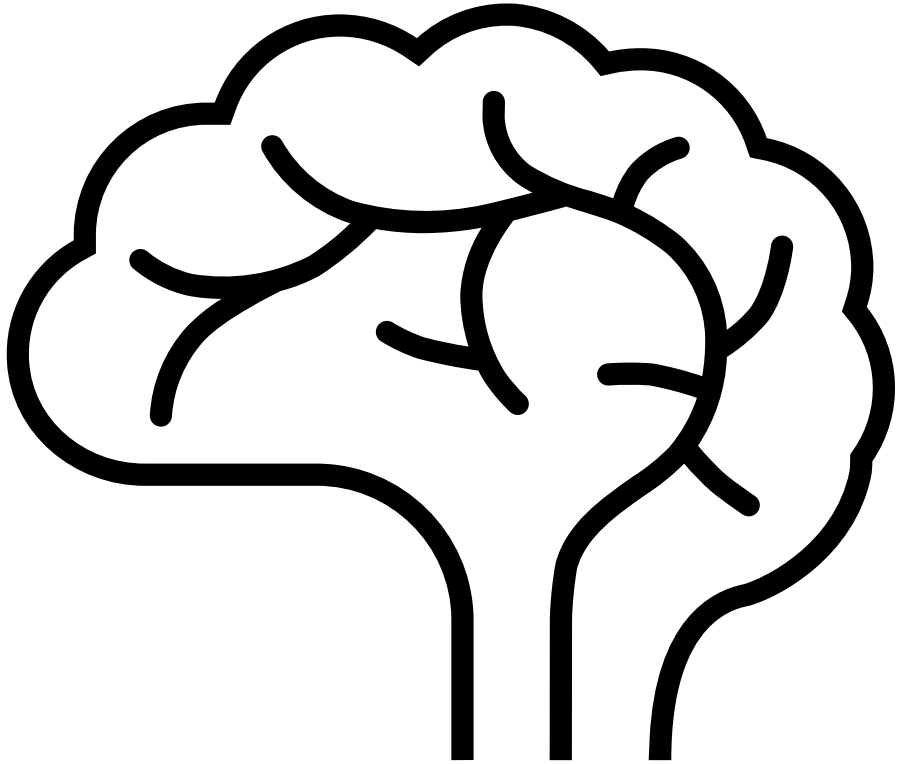

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