

Neuroimaging Case-Based Review



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Brain Summit 2024:
Current Trends in Neurology

UT Southwestern
O'Donnell Brain Institute

UT Southwestern
Medical Center

Aims and Outline

Goals:

- review select neurological disorders with **classic** imaging manifestations.
- **treatable** conditions, impactful patient outcomes

Format:

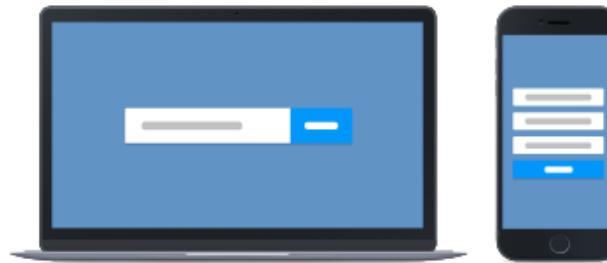
- Cased-based discussion
- Clinical vignettes, selected images
- Interactive polling platform – engagement and self assessment

How to Join


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Disclosures


- **No financial relationships to disclose**
- **Polling tool just for engagement, don't take it too seriously**

Warm up !

Warm up !

What is your occupation ? ✔ 0

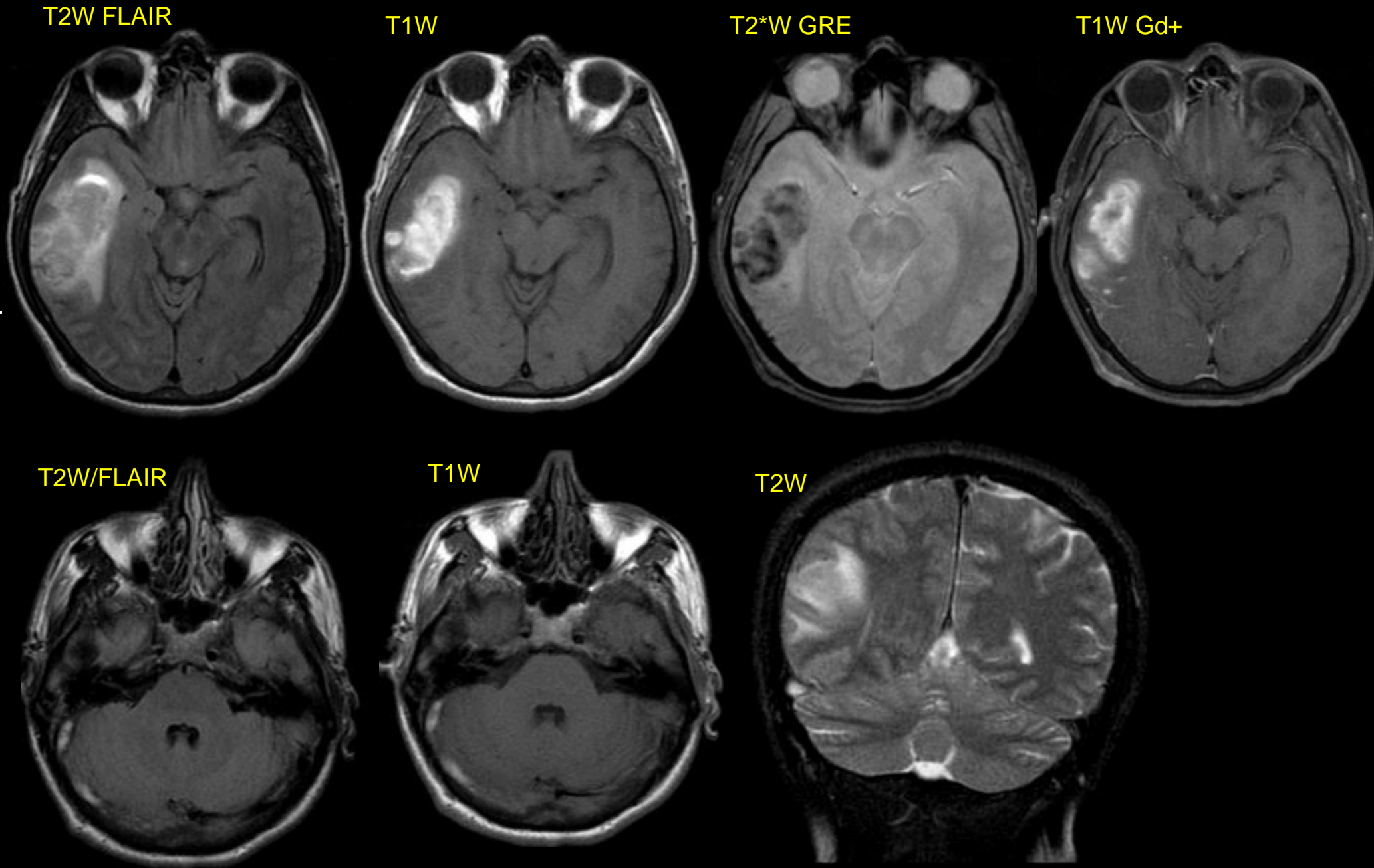
Resident Fellow Physician Assistant Medical Student Nurse Physical Therapist Practicing Physician Other

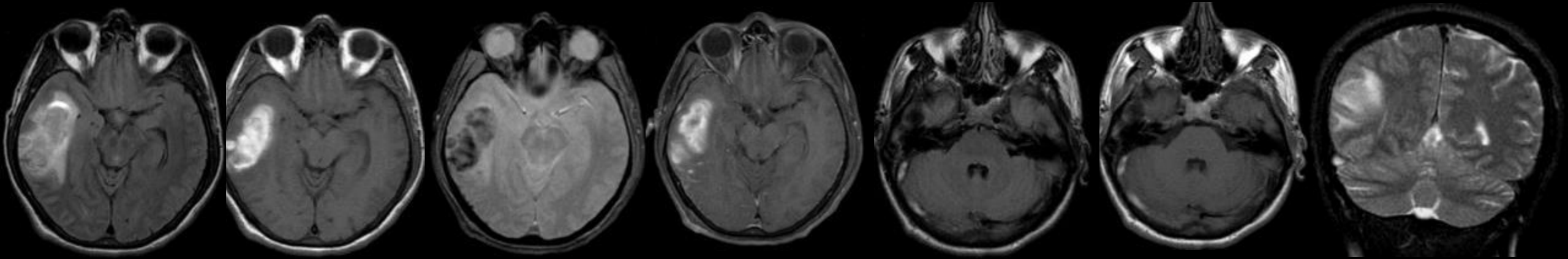


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Case #1

- 28 yo female
- Worsening headaches for 10 days.
- No improvement with medications.
- Negative CT a week ago.





Choose the correct statement



This patient probably has an undisclosed history of head trauma

0%

Treatment for this condition includes anticoagulation.

0%

Antiviral treatment should be started promptly

0%

Arteriovenous malformation is the most likely etiology for this bleed

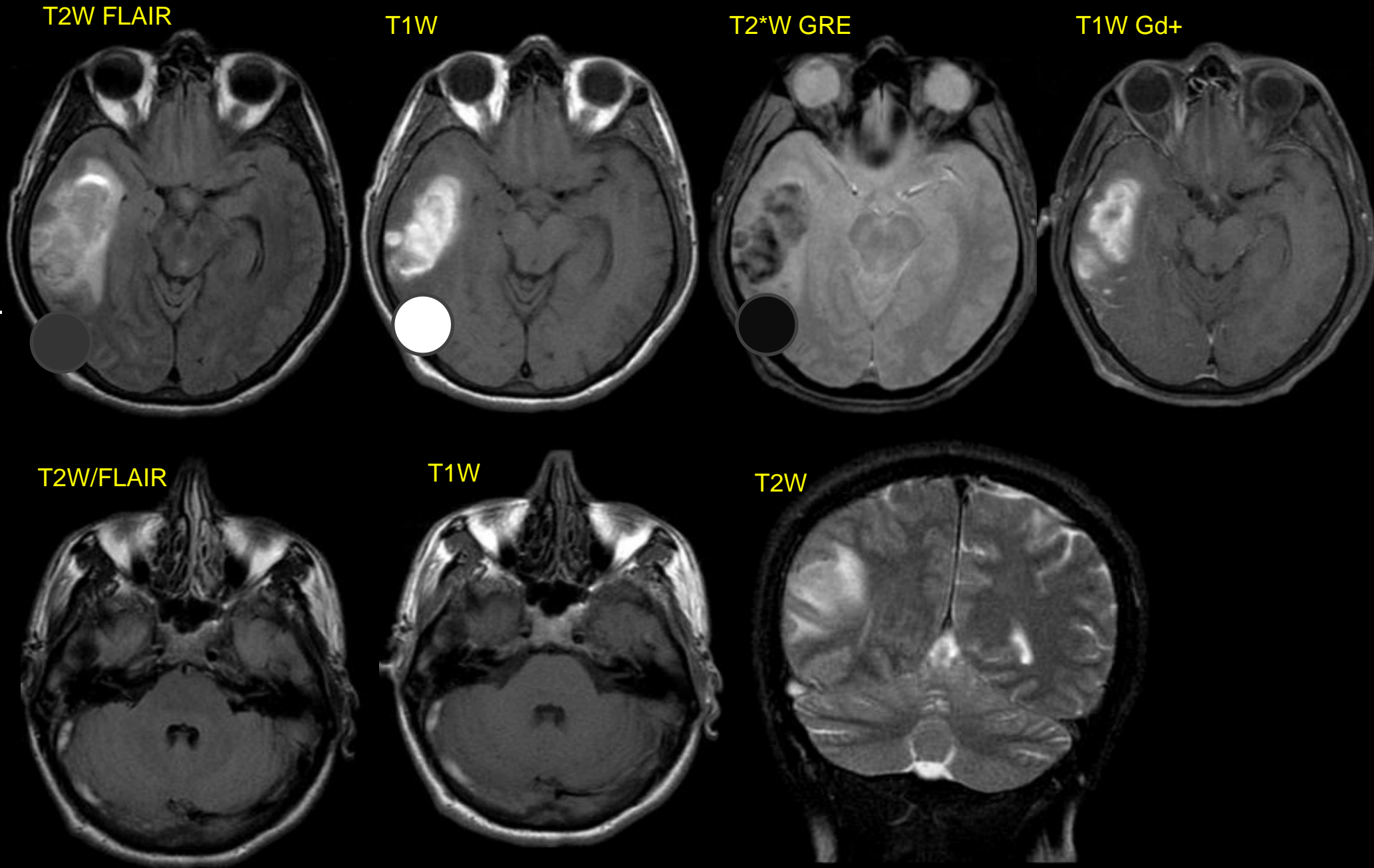
0%

CT chest, abdomen and pelvis recommended to search for primary

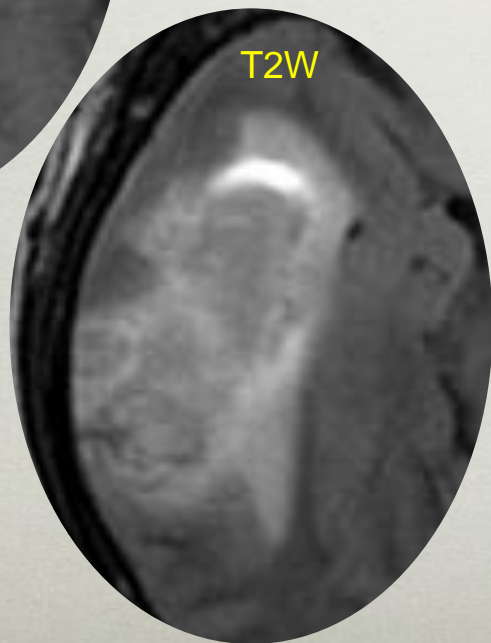
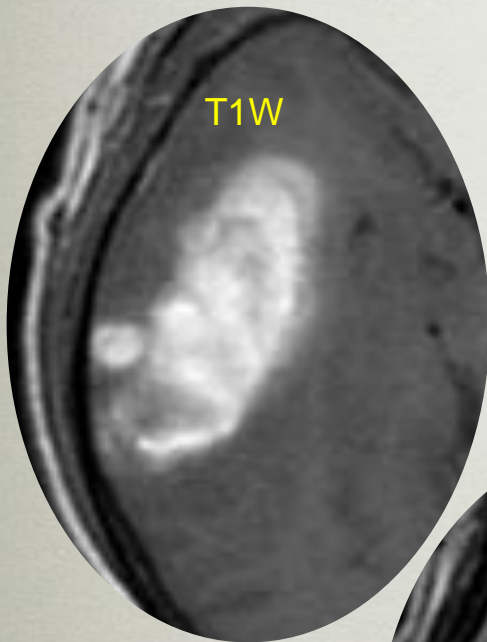
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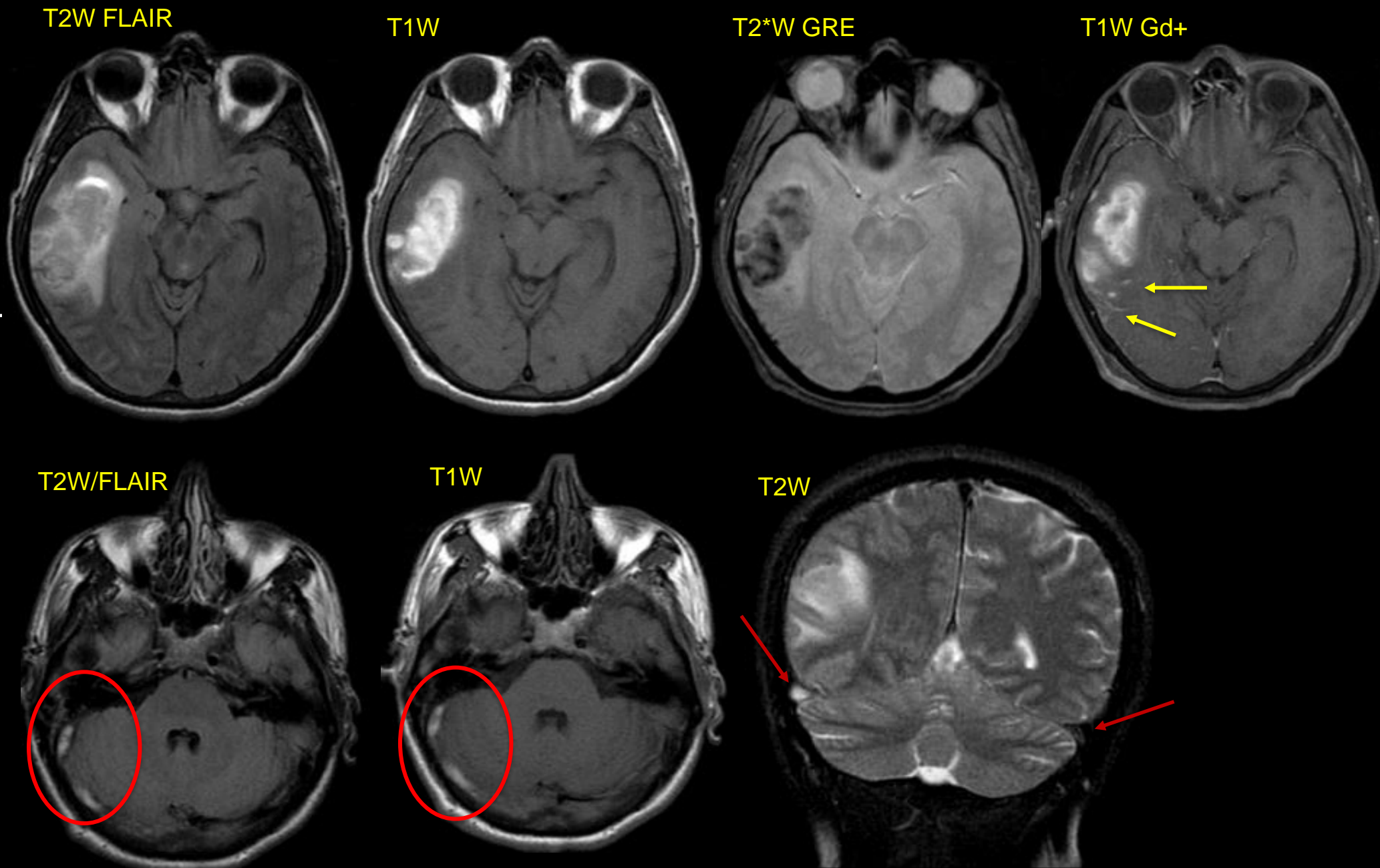
Hemoglobin Degradation



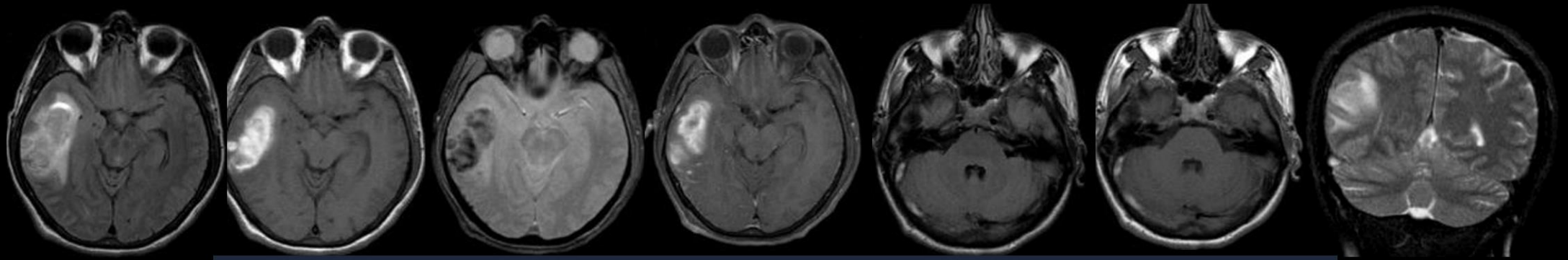
STAGE	TIME FRAME	T1W	T2W
HYPERACUTE	<6 HOURS	●	○
ACUTE	8 – 72 HOURS	●	●
EARLY SUBACUTE	1 – 3 WEEKS	○	●
LATE SUBACUTE	WEEKS TO MONTHS	○	○
CHRONIC	MONTHS TO YEARS	●	●

Case #1

- 28 yo female
- Worsening headaches for 10 days.
- No improvement with medications.
- Negative CT a week ago.



Dural Sinus Thrombosis - Hemorrhagic Venous Infarct



Choose the correct statement



This patient probably has an undisclosed history of head trauma

Treatment for this condition includes anticoagulation.

Antiviral treatment should be started promptly

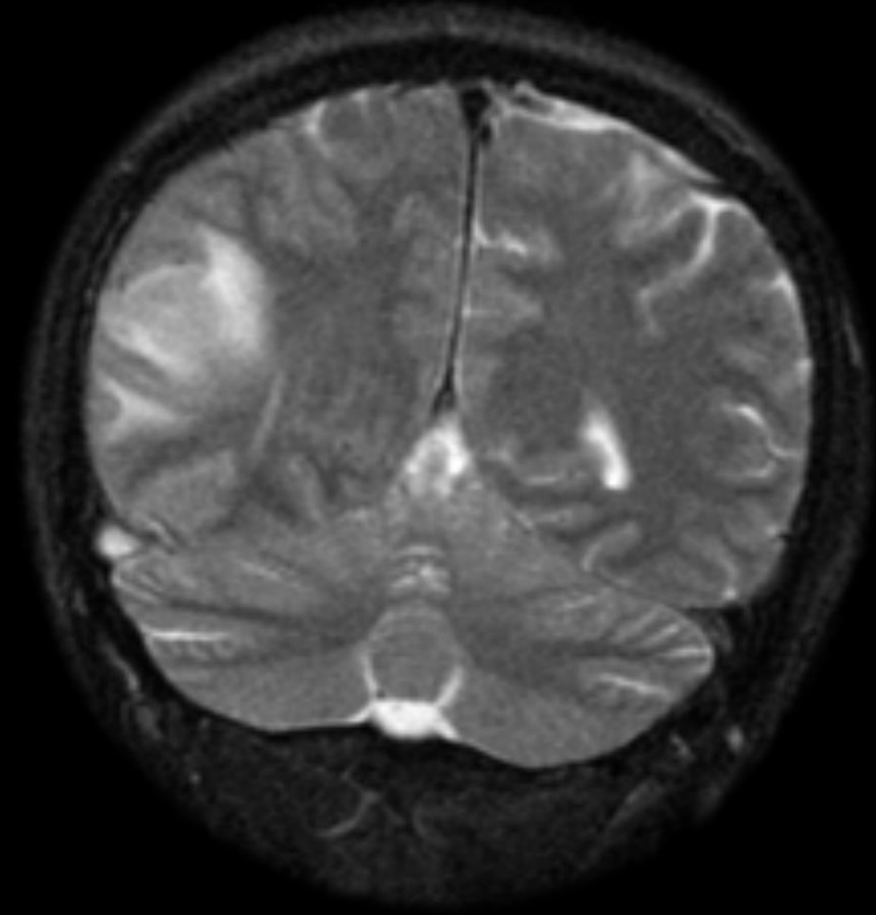
Arteriovenous malformation is the most likely etiology for this bleed

CT chest, abdomen and pelvis recommended to search for primary



Venous Sinus Thrombosis

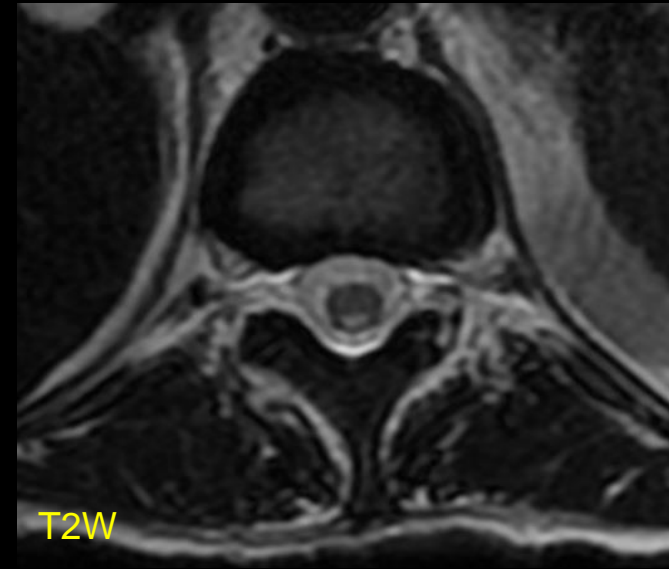
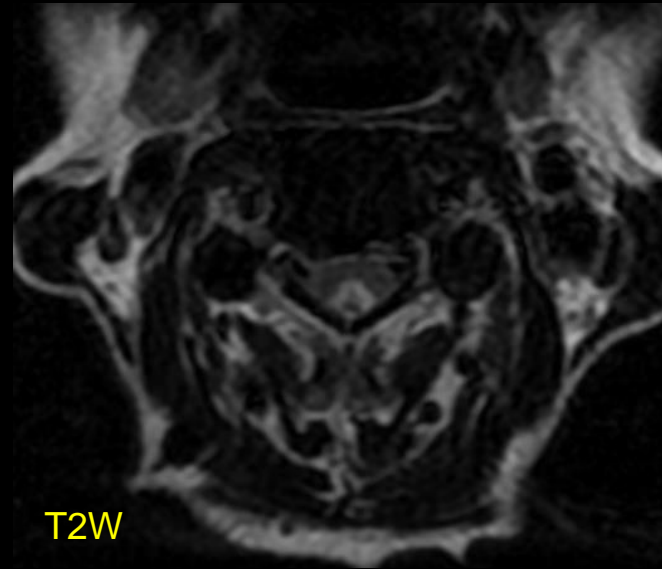
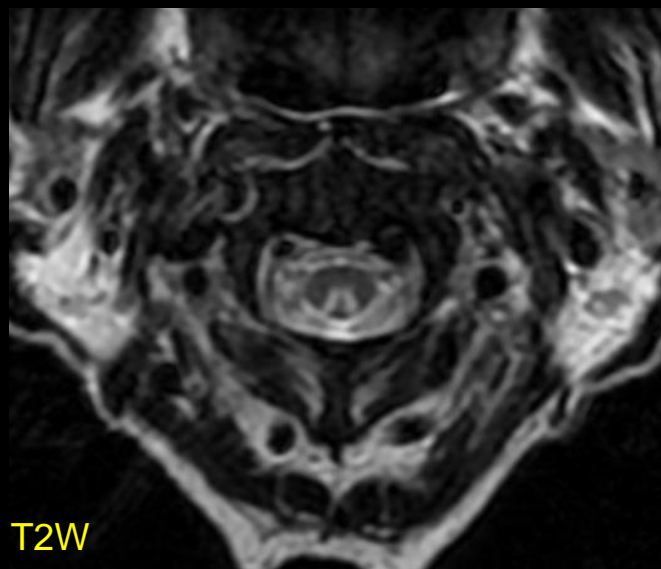
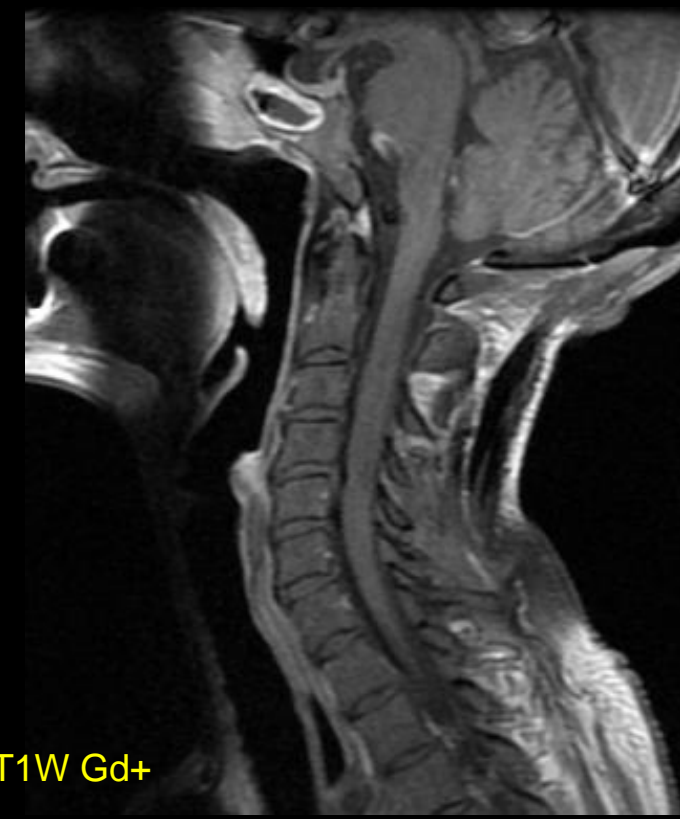
- Always search for **venous disease**:
 - unexplained parenchymal hemorrhage
 - infarcts in a non arterial distribution.
- **Noncontrast MRI** will often point to the correct diagnosis.
- **MR Venography**: confirmation and staging.
- **Tx: heparin** - even with hemorrhagic venous infarction !
- Rarely - catheter directed thrombolysis



Case #2

40 yo M.
Progressive
paresthesia of the
hands and feet,
ataxia.

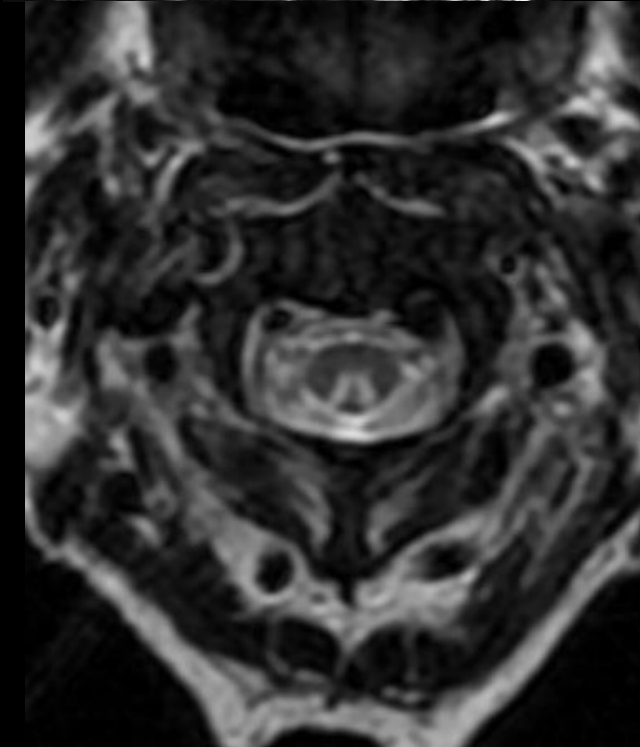
Hx of longstanding
inflammatory
bowel disease and
prior surgeries.





40 yo M. Progressive paresthesias of the hands and feet, **ataxia**.

Hx of **longstanding inflammatory bowel disease** and **prior surgeries**.



What is the correct statement about this condition?



This is most commonly an idiopathic condition with spontaneous resolution

0%

CSF in this patient will likely be abnormal

0%

This disease is potentially treatable and intervention can prevent progression

0%

Evaluation of the brain is recommended to search for additional periventricular lesions

0%

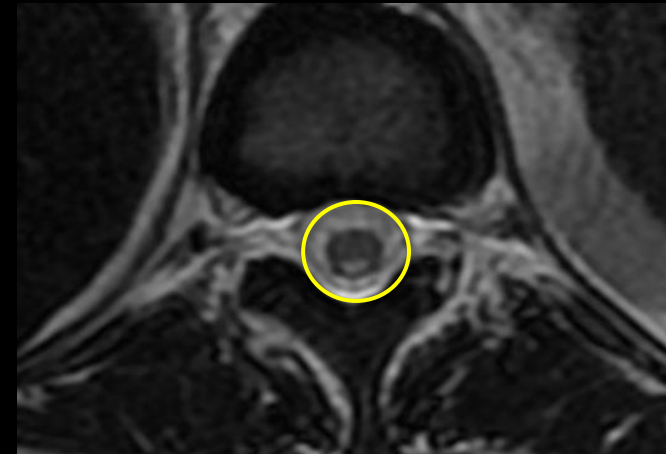
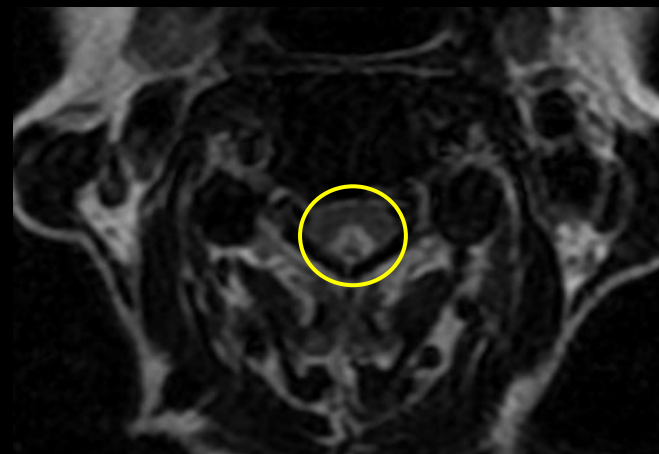
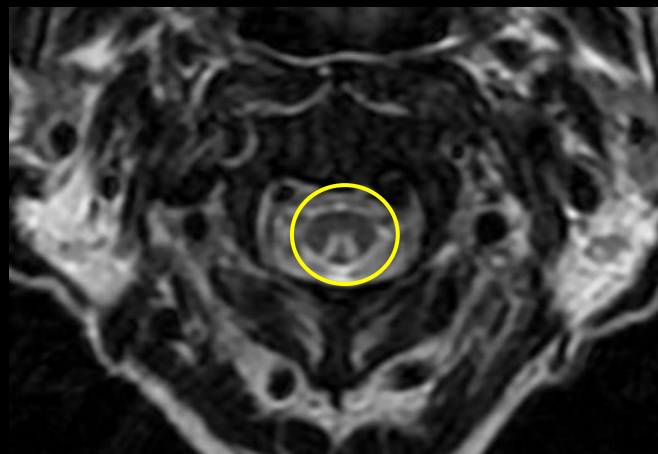
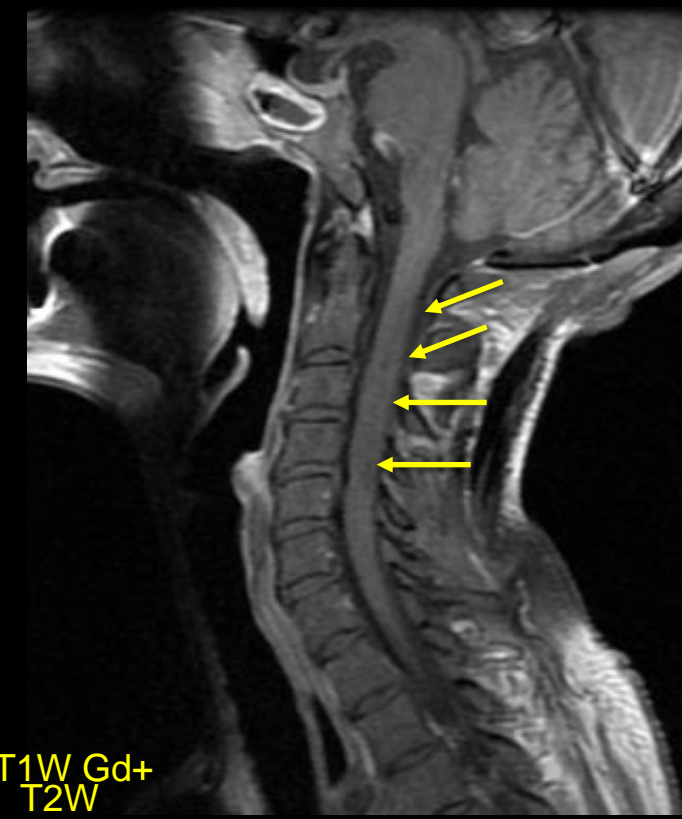
DWI would be helpful to confirm the most likely diagnosis

0%

Case #2

40 yo M.
Progressive
paresthesias of
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feet, **ataxia**.

Hx of **longstanding
inflammatory
bowel disease** and
prior surgeries.



Subacute Combined Degeneration – B12 Deficiency

Subacute Combined Degeneration

• Pathophysiology

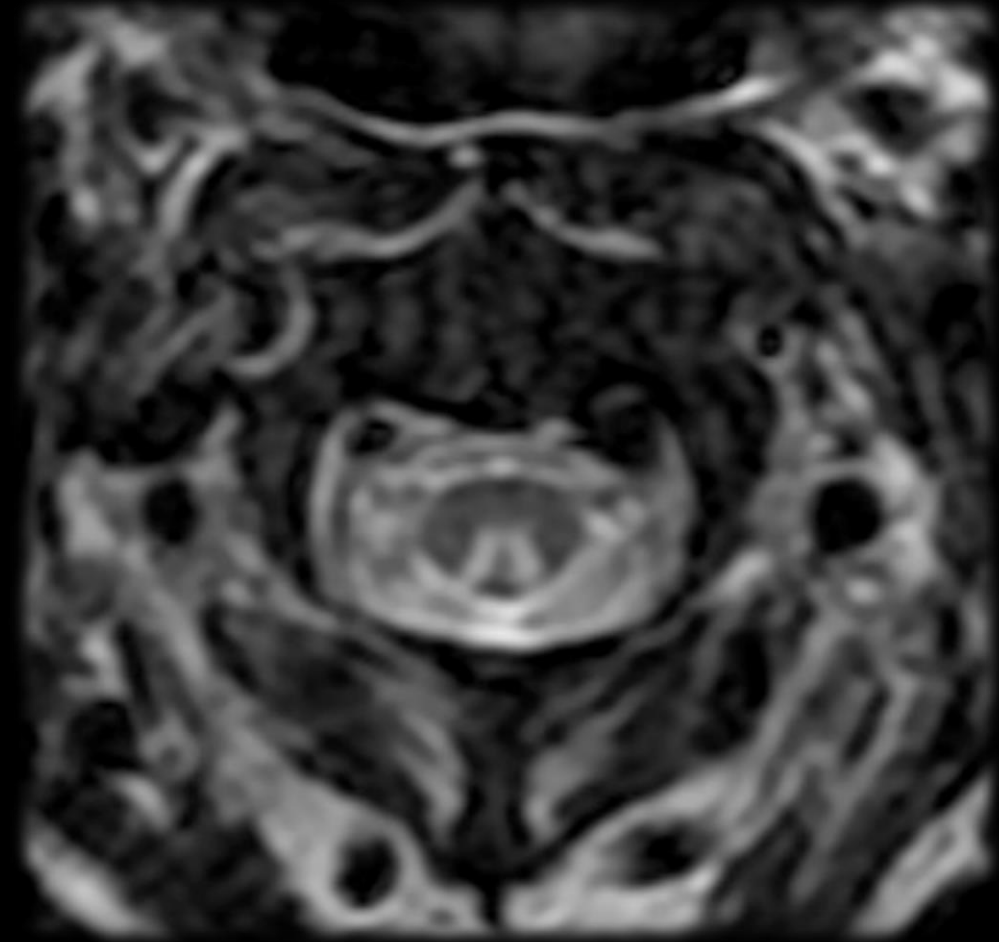
- B12 deficiency
- Risk factors: pernicious anemia, IBD, strict vegetarians.
- Degradation **posterior** and **lateral** columns spinal cord
- Symmetrical myelopathy (distal proprioception and vibration with progression to all modalities, ataxia and distal weakness)

• Imaging Findings

- Myelopathy - posterior and lateral columns
- Inverted “V” sign, long segmental
- Reversible

• Differential Diagnoses

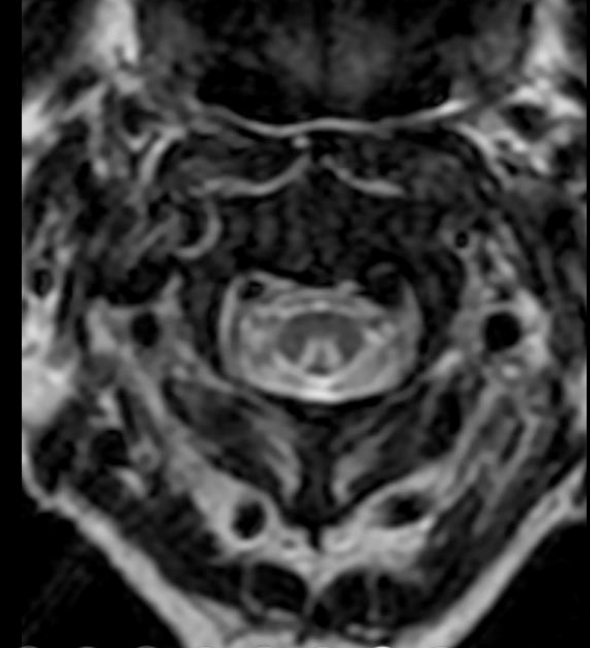
- Copper or vit E deficiency: may look identical
- HIV and methotrexate induced myelopathy: may look identical
- Infectious: tabes dorsalis, herpes and HIV myelopathy
- Transverse Myelitis
- MS, Neuromyelitis Optica
- Cord Infarct





40 yo M. Progressive paresthesias of the hands and feet, **ataxia**.

Hx of **longstanding inflammatory bowel disease** and **prior surgeries**.



What is the correct statement about this condition?

0

This is most commonly an idiopathic condition with spontaneous resolution (A)

CSF in this patient will likely be abnormal (B)

✓ This disease is potentially treatable and intervention can prevent progression (C)

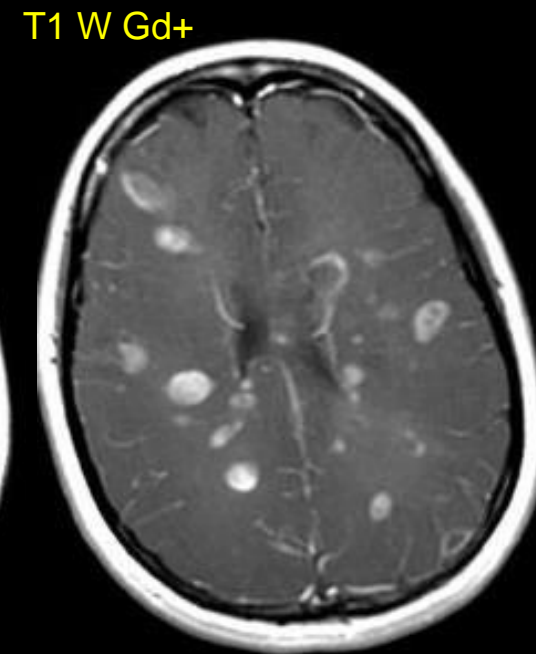
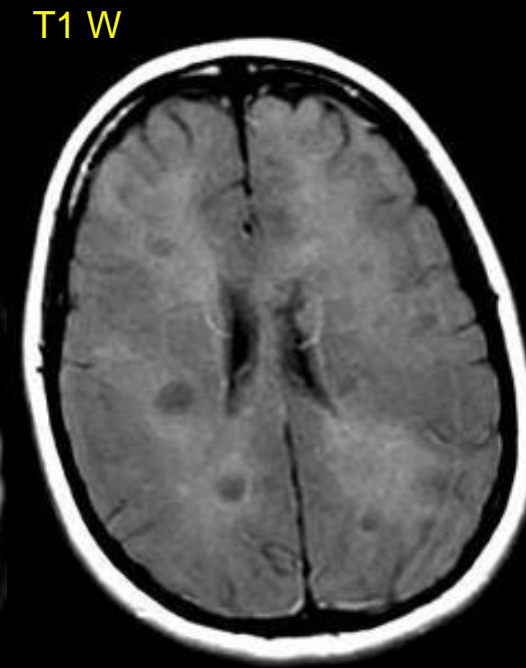
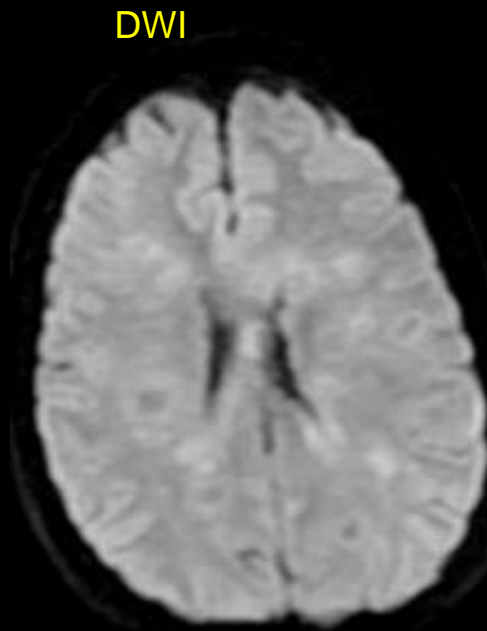
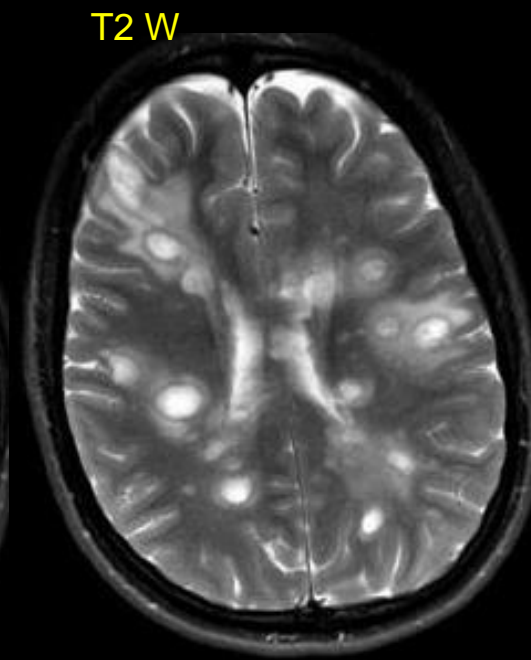
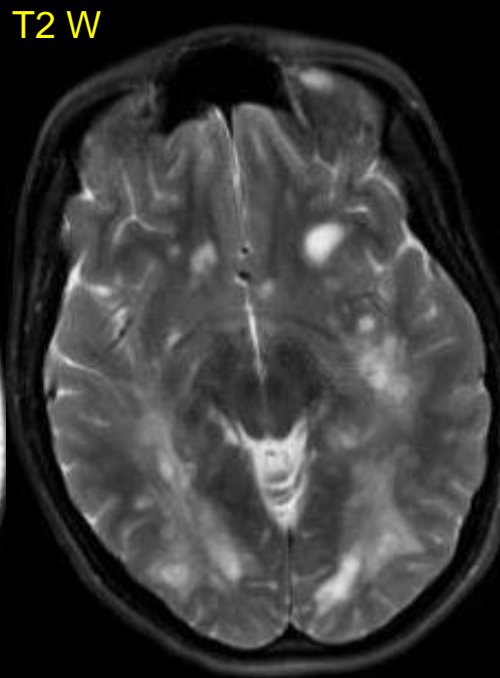
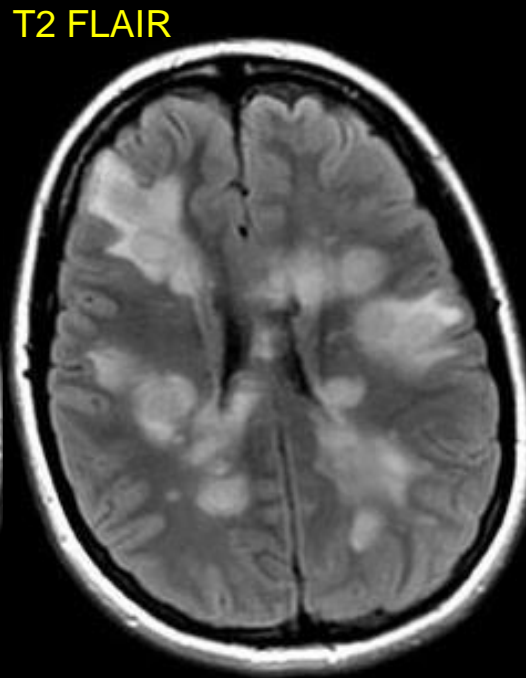
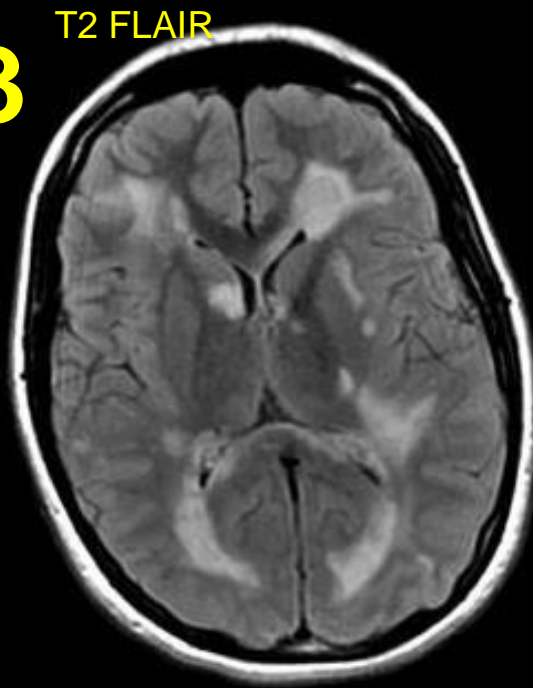
Evaluation of the brain is recommended to search for additional periventricular le... (D)

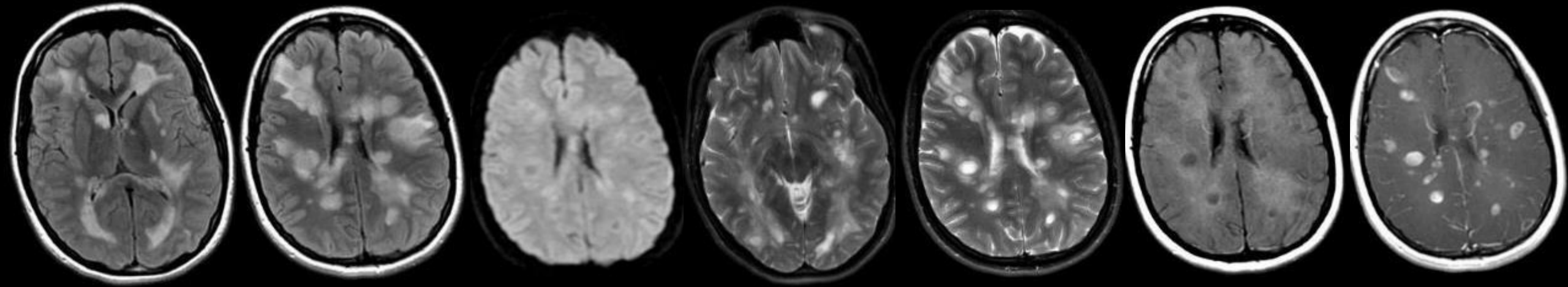
DWI would be helpful to confirm the most likely diagnosis (E)



Case #3

- 7 yo male, recovering from GI infection
- Irritability for 5 days, followed by **lethargy**, and seizures.





What statement is true about the presumed diagnosis for this case ?

Antibiotic coverage should be started immediately, even before LP results

0%

Clinical and imaging findings favor de possibility of septic emboli

0%

This patient is at risk of hydrocephalus

0%

Given the combination of solid and ring enhancing lesions, metastatic disease is the top diagnostic consideration

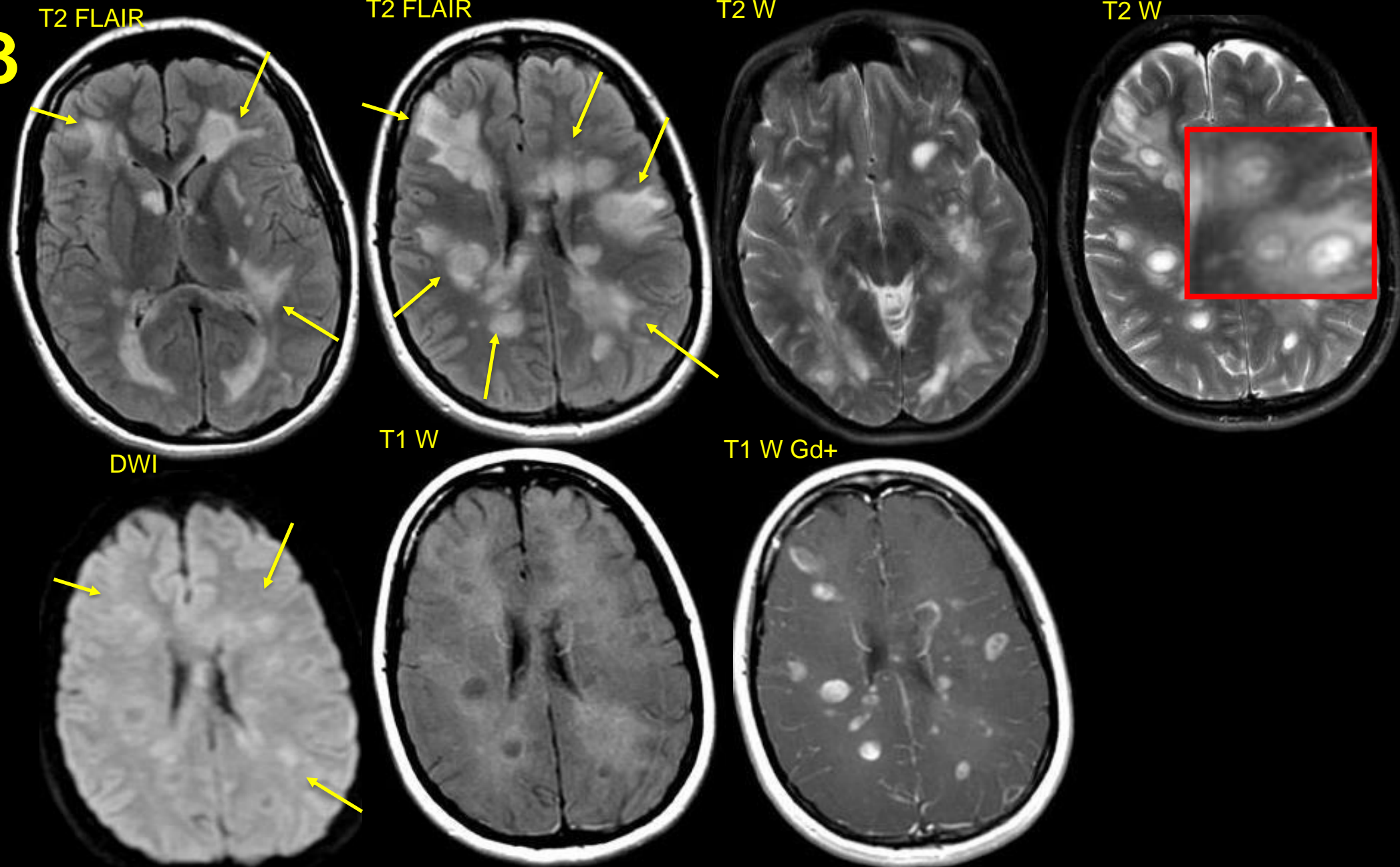
0%

The prognosis for this patient is favorable with out without treatment, with expectation of good neurological recovery

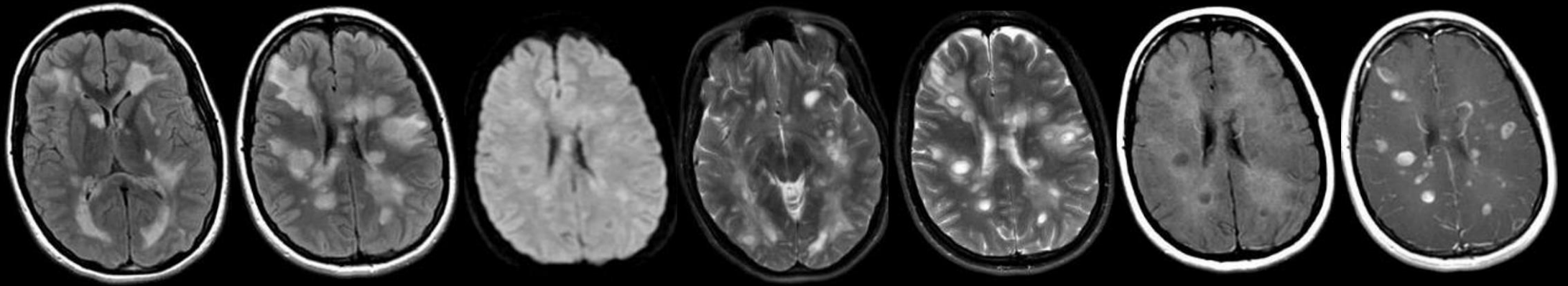
0%

Case #3

- 7 yo male, recovering from GI infection
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Acute Demyelinating Encephalopathy Syndrome



What statement is true about the presumed diagnosis for this case ?



Antibiotic coverage should be started immediately, even before LP results (A)

Clinical and imaging findings favor de possibility of septic emboli (B)

This patient is at risk of hydrocephalus (C)

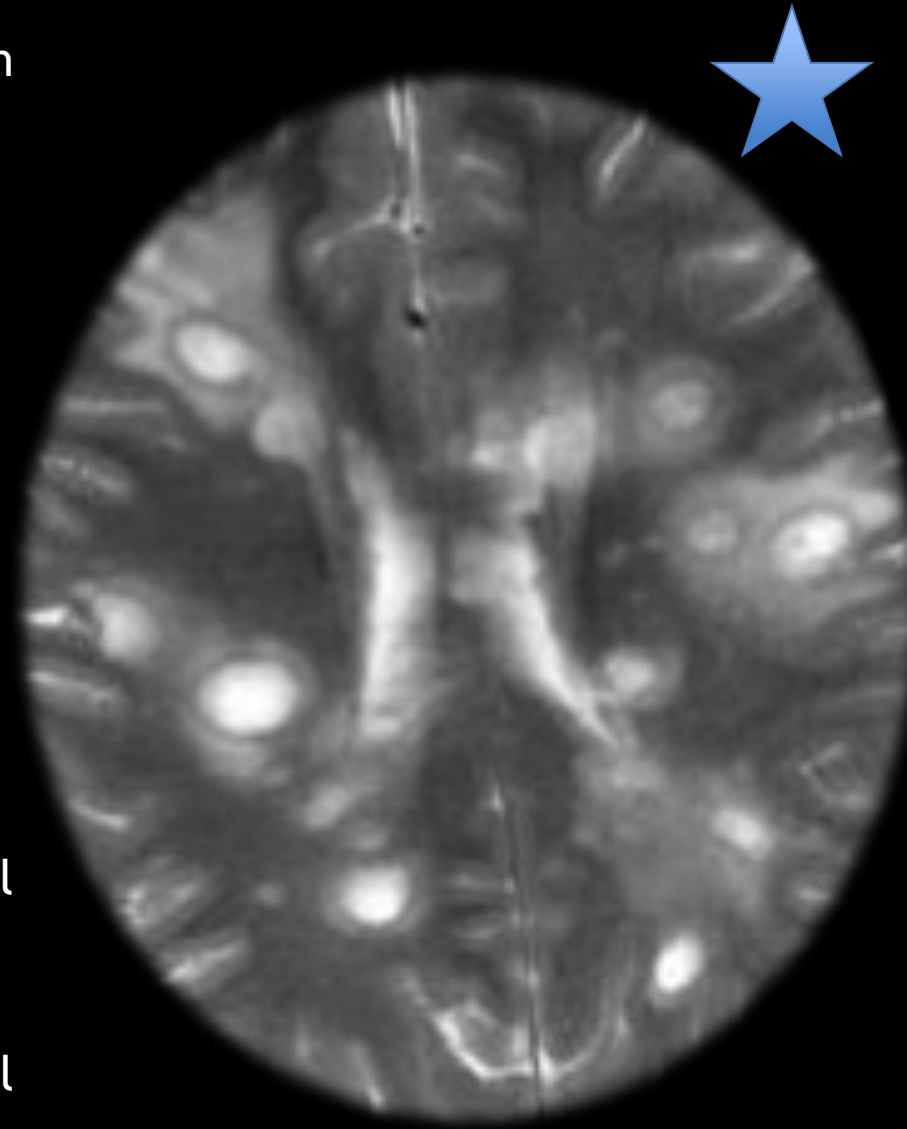
Given the combination of solid and ring enhancing lesions, metastatic disease is the top diagnostic consideration (D)



The prognosis for this patient is favorable with out without treatment, with expectation of good neurological recovery (E)

Acute Disseminated Encephalopathy Syndrome

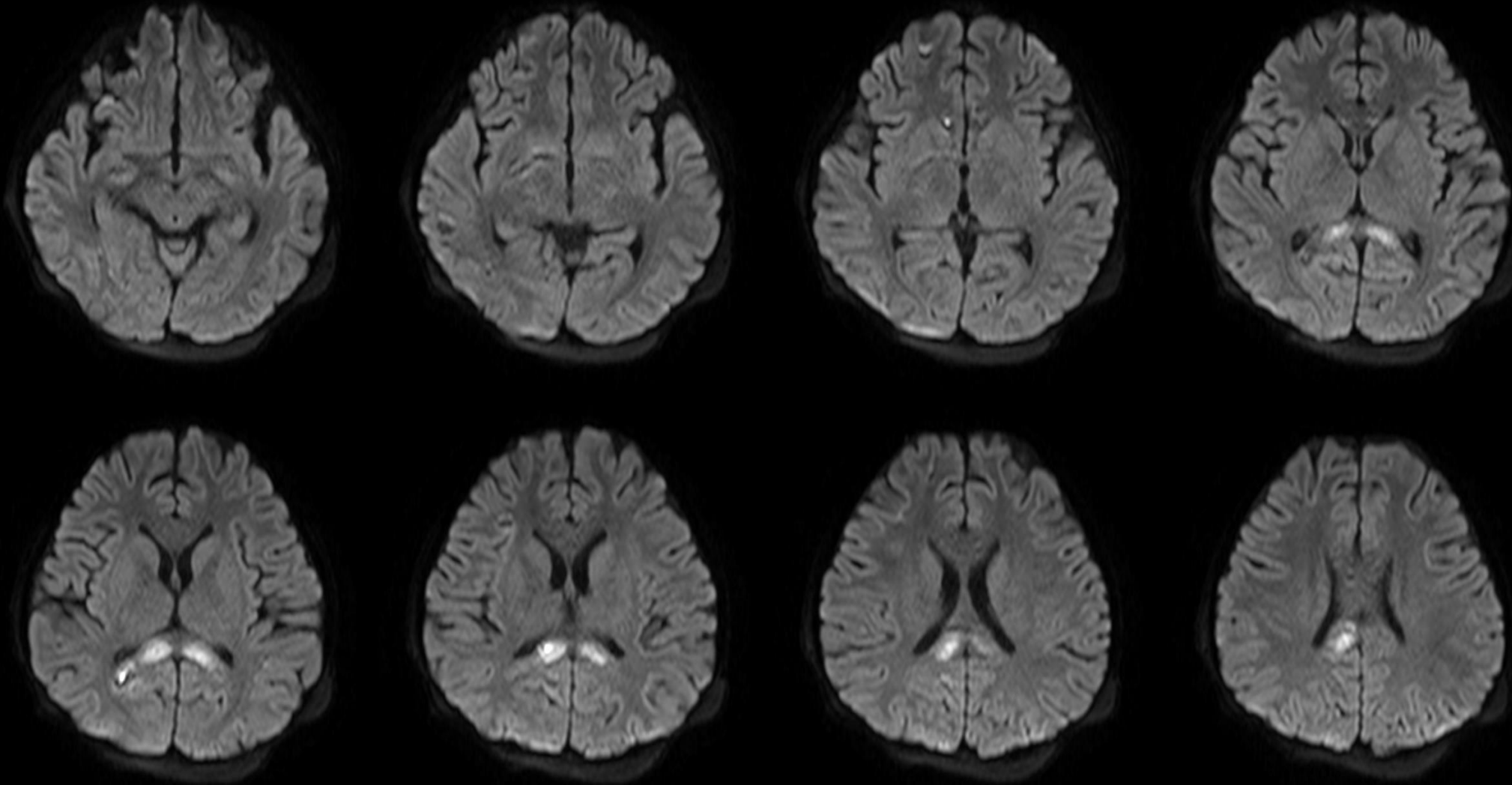
- **Monophasic acute** inflammation and demyelination associated with multifocal neurological symptoms.
- **Debated pathogenesis**
 - autoimmune mechanism
 - environmental stimulus + genetically susceptible
- Recovery phase (~1 month) nonspecific **systemic infection** (75%)
 - **Postinfections Encephalomyelitis**
 - postvaccinal (< 5%)
 - Common presentation of MOGAD in pediatric patients
- **Clinical characteristics:** acute/subacute presentation, multifocal neurological symptoms, encephalopathy
- **Imaging:** multifocal tumefactive WM lesions, enhancement, basal ganglia, little or no mass effect, **no dissemination in time.**



Case #4

DWI

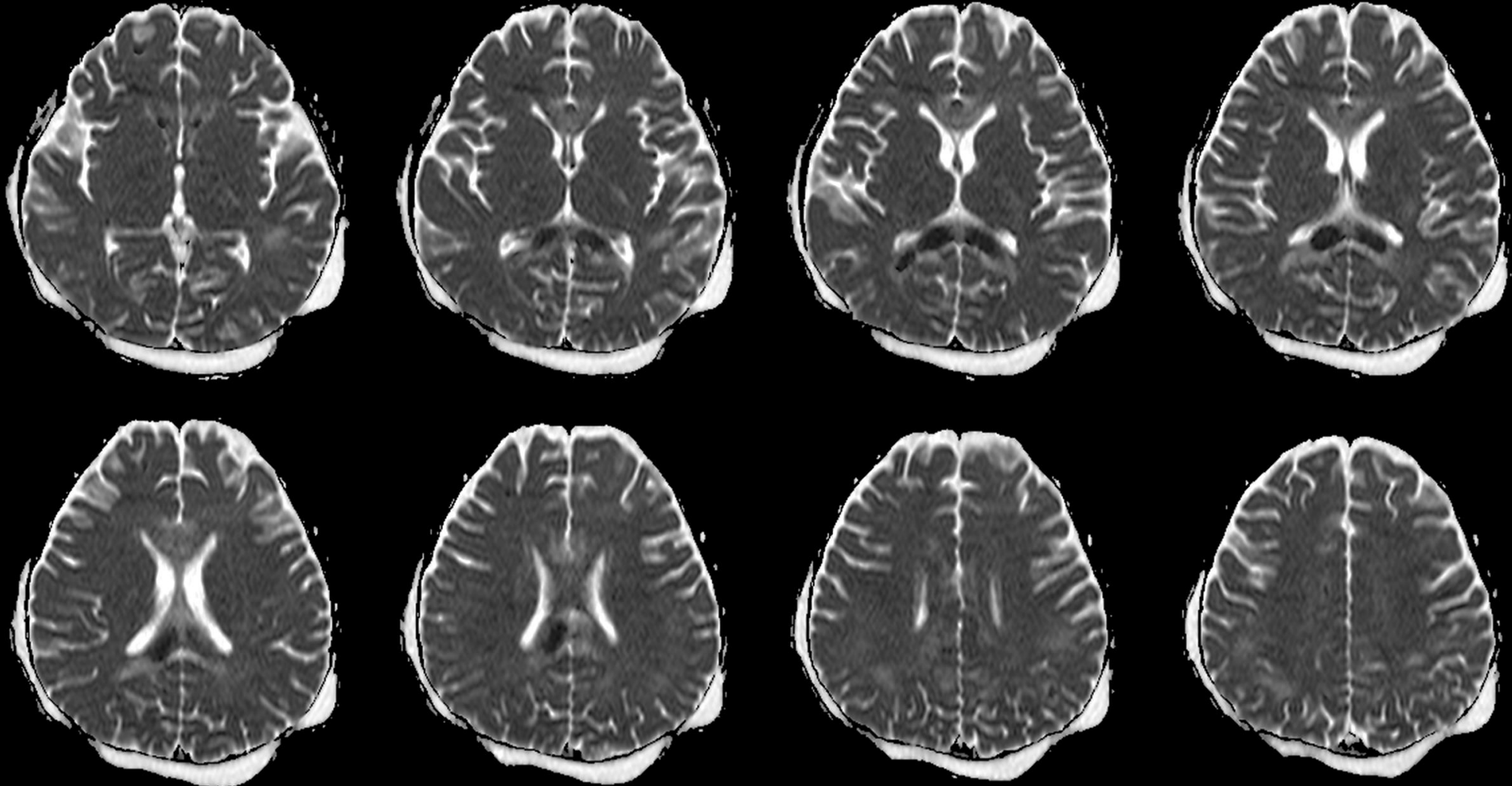
- 11 yo female, transfer from outside hospital
- Admitted due to MCC, hit while riding a bike
- Multiple rib and limb fractures
- Normal Head CT admission
- Acute neurological deterioration 5 days post admission



Case #4

ADC

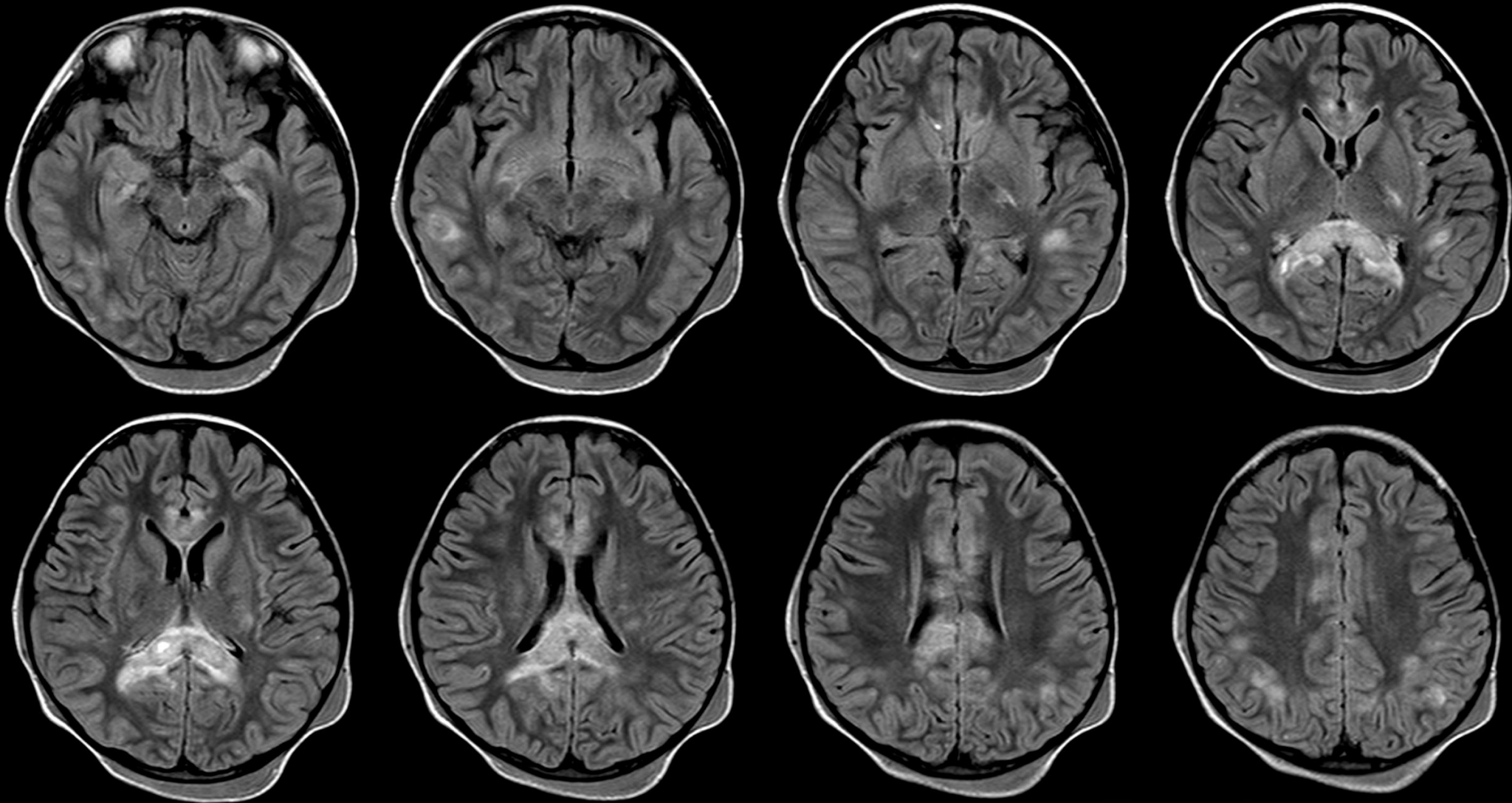
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Case #4

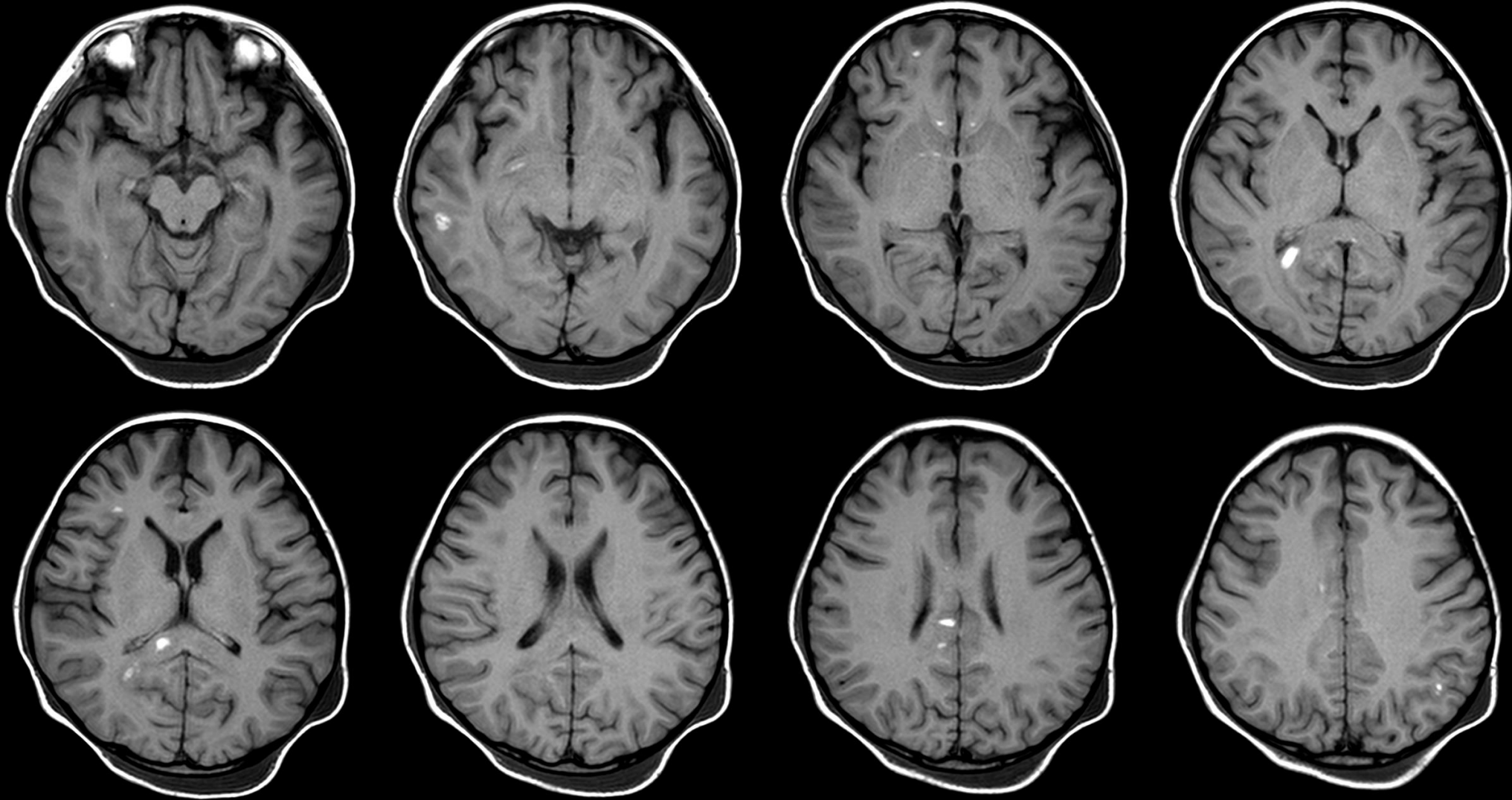
T2FLAIR

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Case #4

T1 WI



- 11 yo female, transfer from outside hospital

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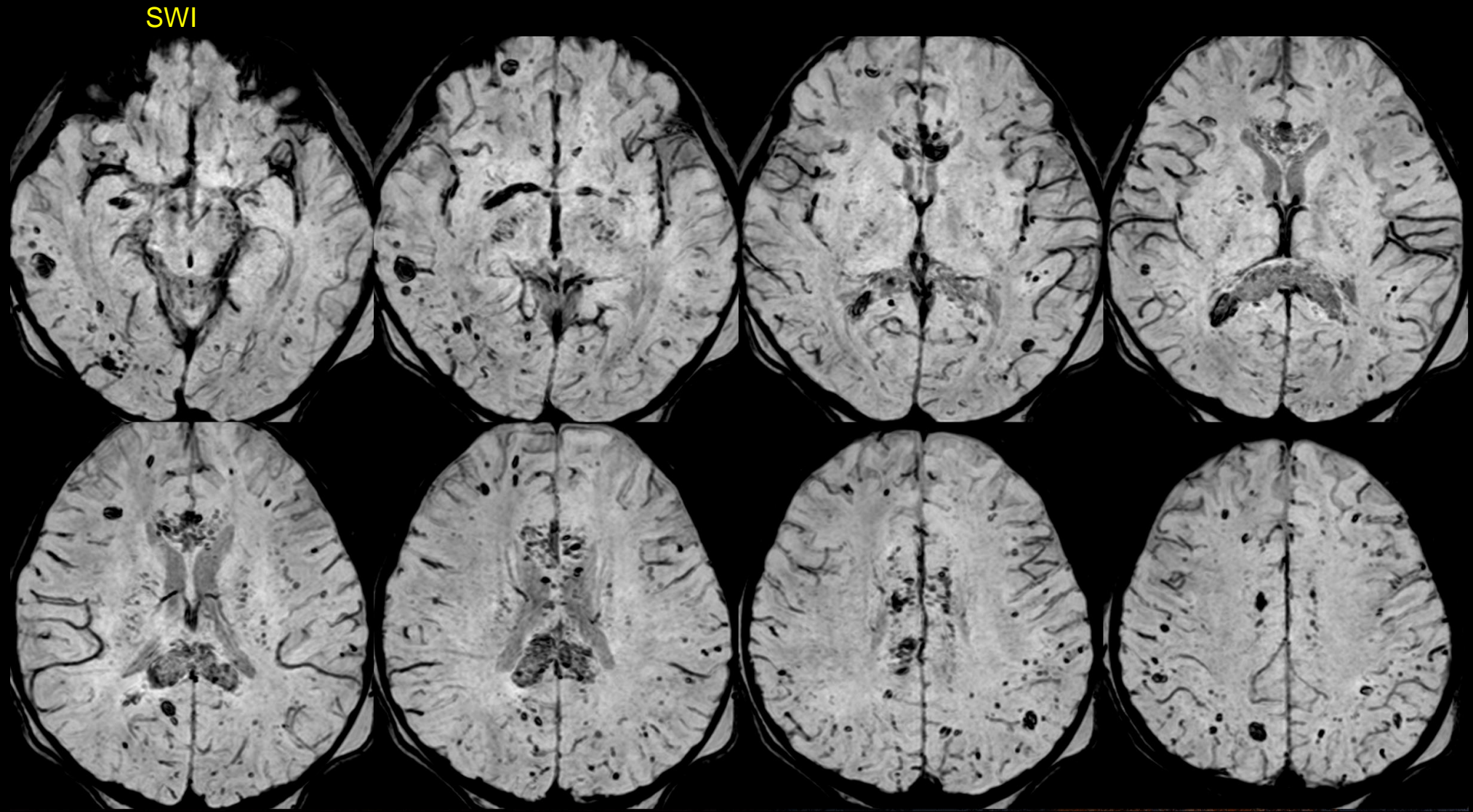
- Multiple rib and limb fractures

- Normal Head CT admission

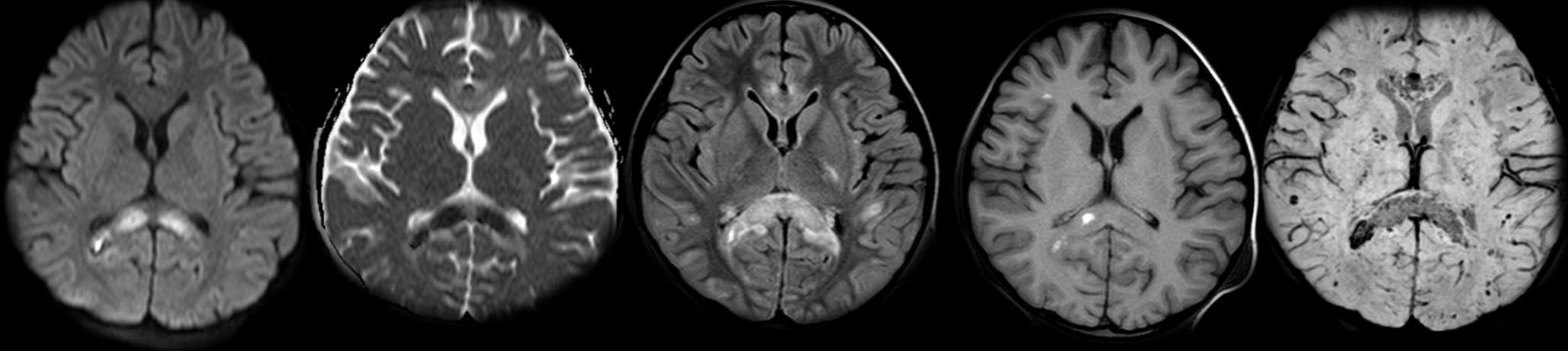
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Select the correct statement for this condition:

The primary mechanism for this imaging abnormality is a coagulopathy

0%

Pulmonary and cutaneous manifestations are not usually present in this clinical scenario

0%

Vascular imaging is recommended and will likely disclose a central source of embolism

0%

CSF tap highly recommended to identify the causative infectious agent

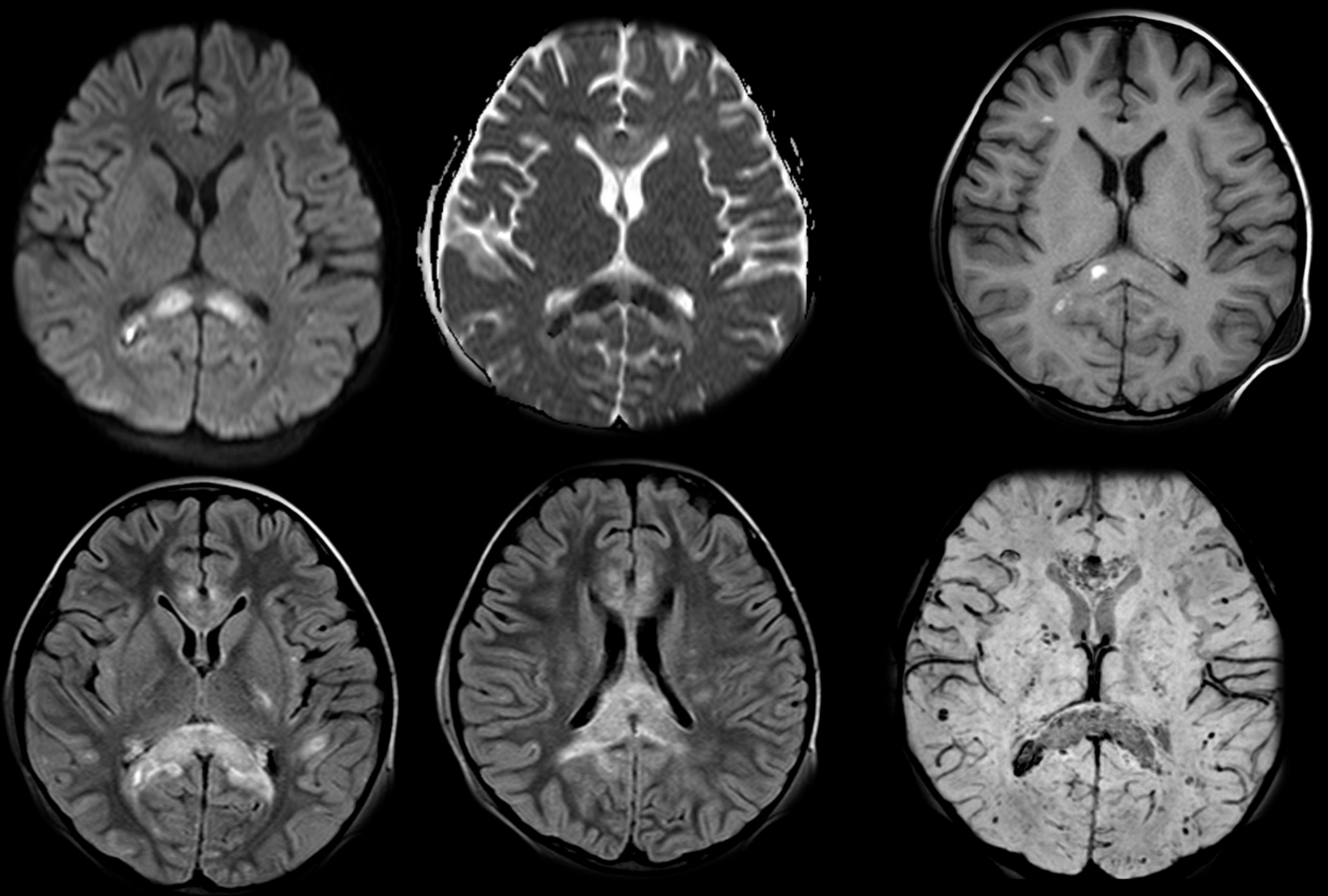
0%

Treatment for this condition is mainly supportive medical care

0%

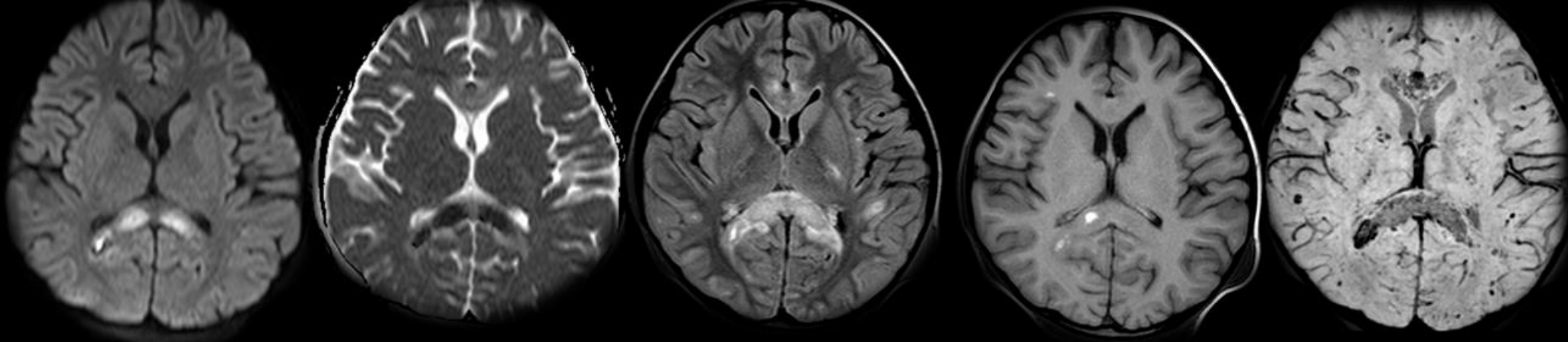
Case #4

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Fat Embolism Syndrome

Case #4



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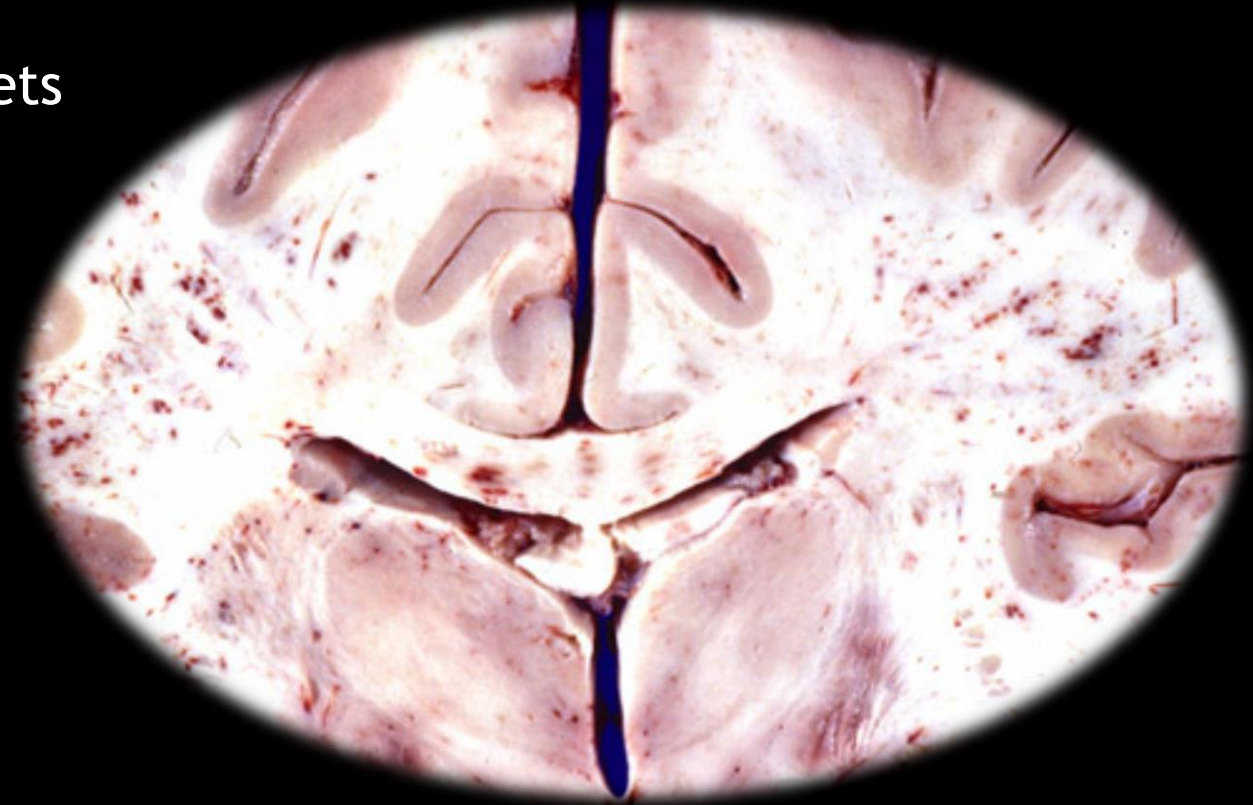


Treatment for this condition is mainly supportive medical care

0%

Fat Embolism Syndrome

- Occlusion of small CNS vessels by fat droplets
- Traumatic injury long bones and pelvis
- Subclinical fat embolism: common
- Clinical manifestations: 3-10%
- **Classical Triad**
 - Pulmonary - dyspnea
 - Cutaneous - petechial rash
 - CNS symptoms



Fat Embolism Syndrome

- Occlusion of small CNS vessels by fat droplets
- Traumatic injury long bones and pelvis
- Subclinical fat embolism: common
- Clinical manifestations: 3-10%

- **Classical Triad**
 - Pulmonary - dyspnea
 - Cutaneous - petechial rash
 - CNS symptoms

Diagnostic Criteria (2 major or 1 major and 4 minor)

Major criteria	Petechial rash
	Respiratory insufficiency
	Cerebral involvement
Minor criteria	Tachycardia
	Fever
	Retinal changes
	Jaundice
	Renal signs
	Thrombocytopenia
	Anaemia
	High ESR
	Fat macroglobinemia

Fat Embolism Syndrome

- **Computed Tomography**

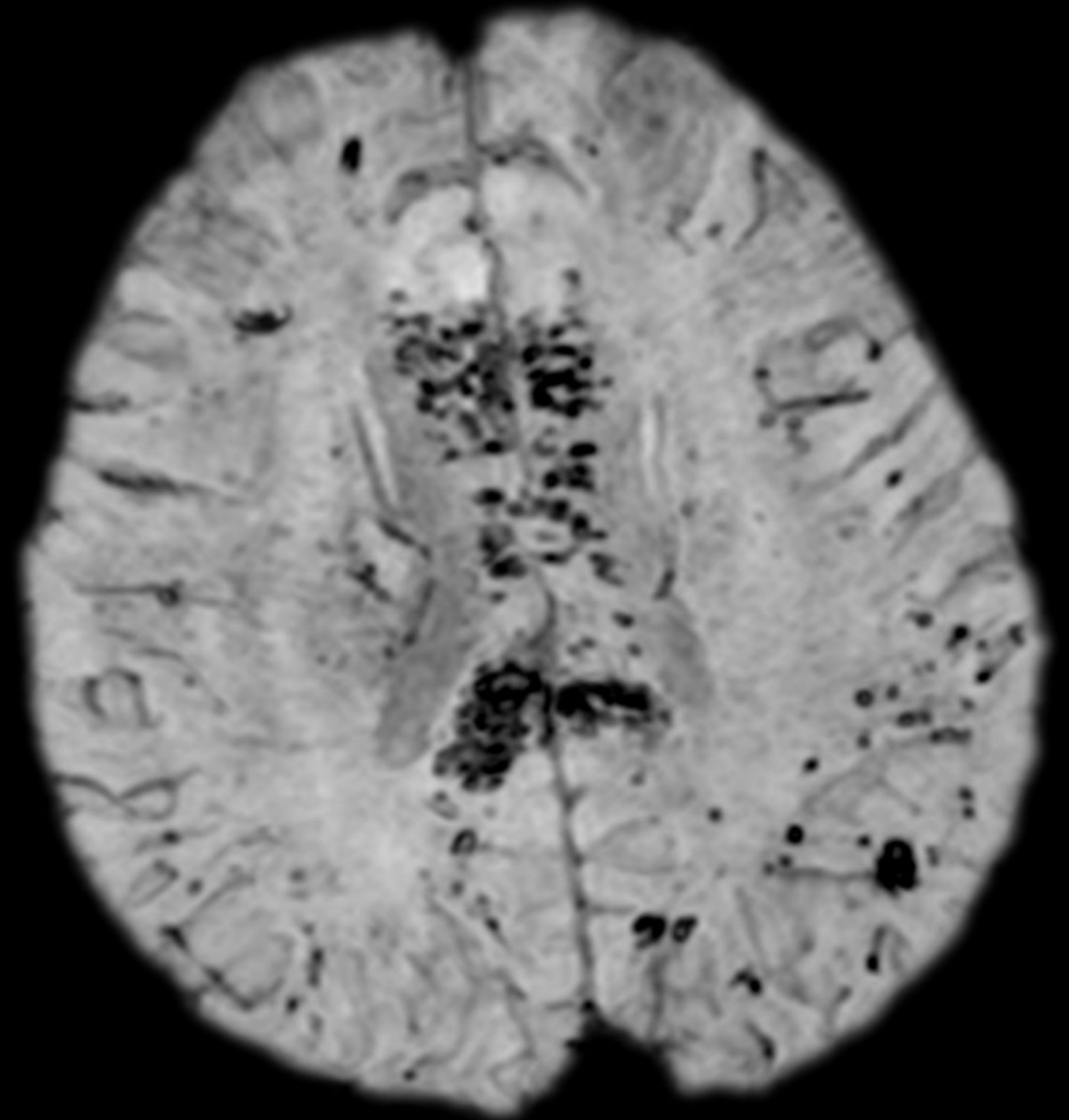
- Usually normal
- Patchy hypodensity, petechial Hemorrhages

- **MRI**

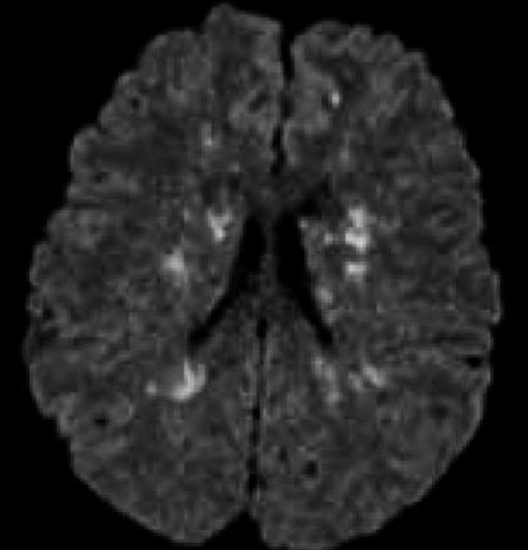
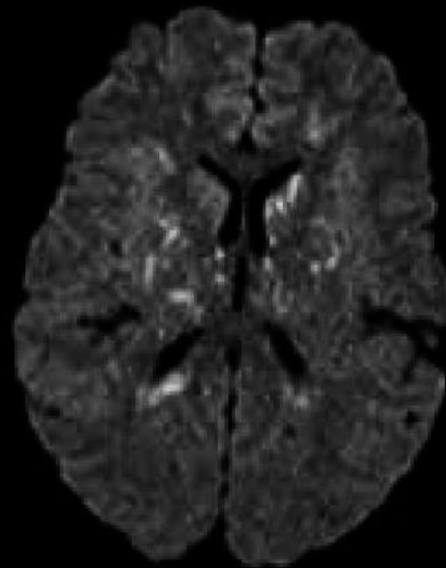
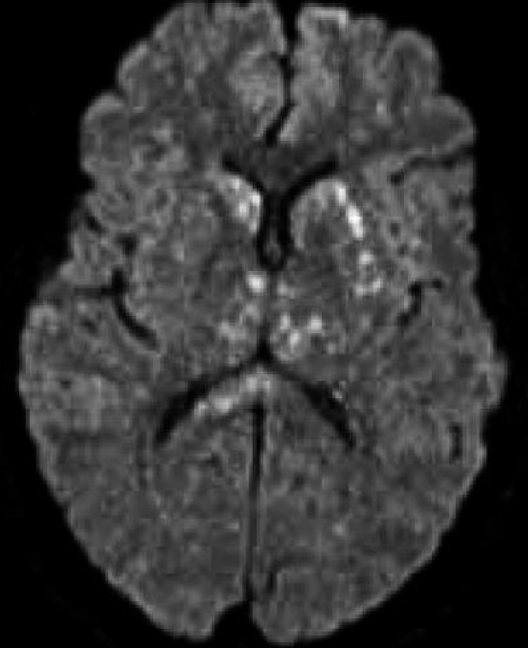
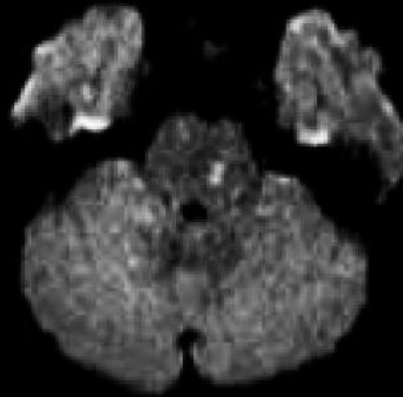
- **T2WI:** patchy areas of nonspehyperintensity
- **SWI:** widespread microhemorrhages
- **DWI:** multifocal punctate pattern

- **Dd**

- **Diffuse Axonal Injury**
- Cardiogenic/septic cerebral emboli
- Vasculitis
- Thrombotic thrombocytopenic purpura



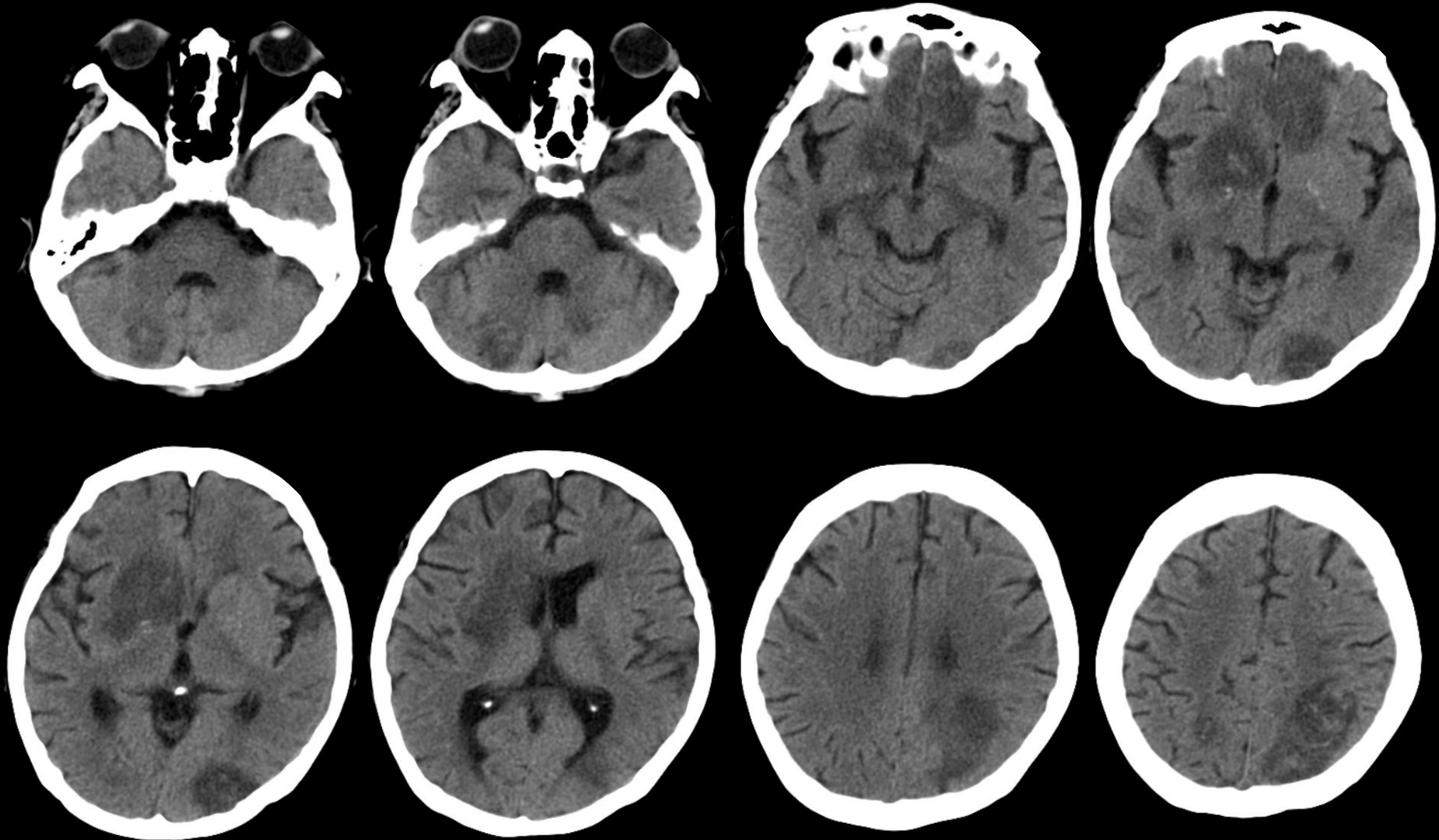
Starfield Pattern



Case

NCT

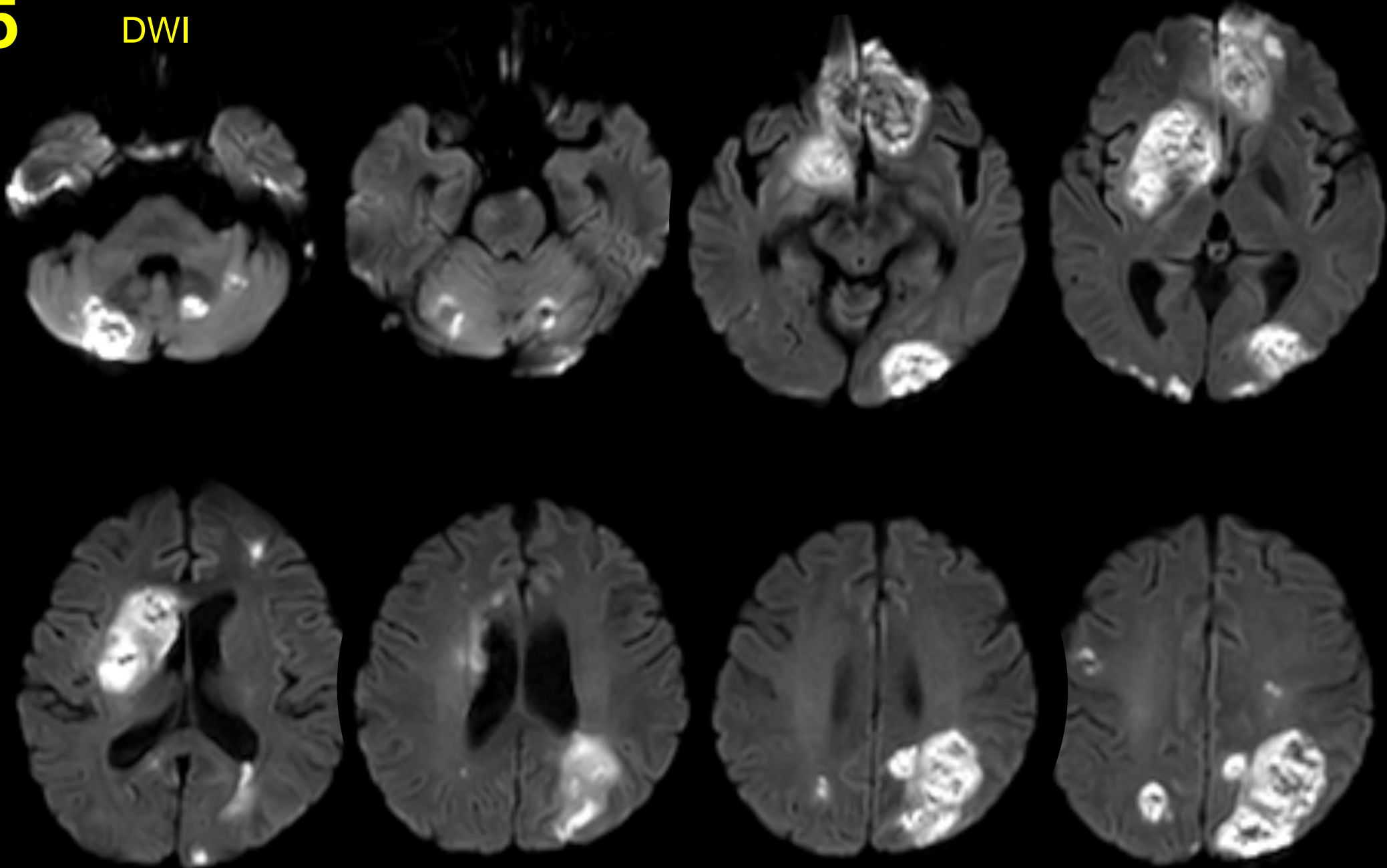
- 40 yo female, Hx B-ALL, prior allogenic transplant
- Steroid refractory GVHD
- Recent change in mental status



Case #5

DWI

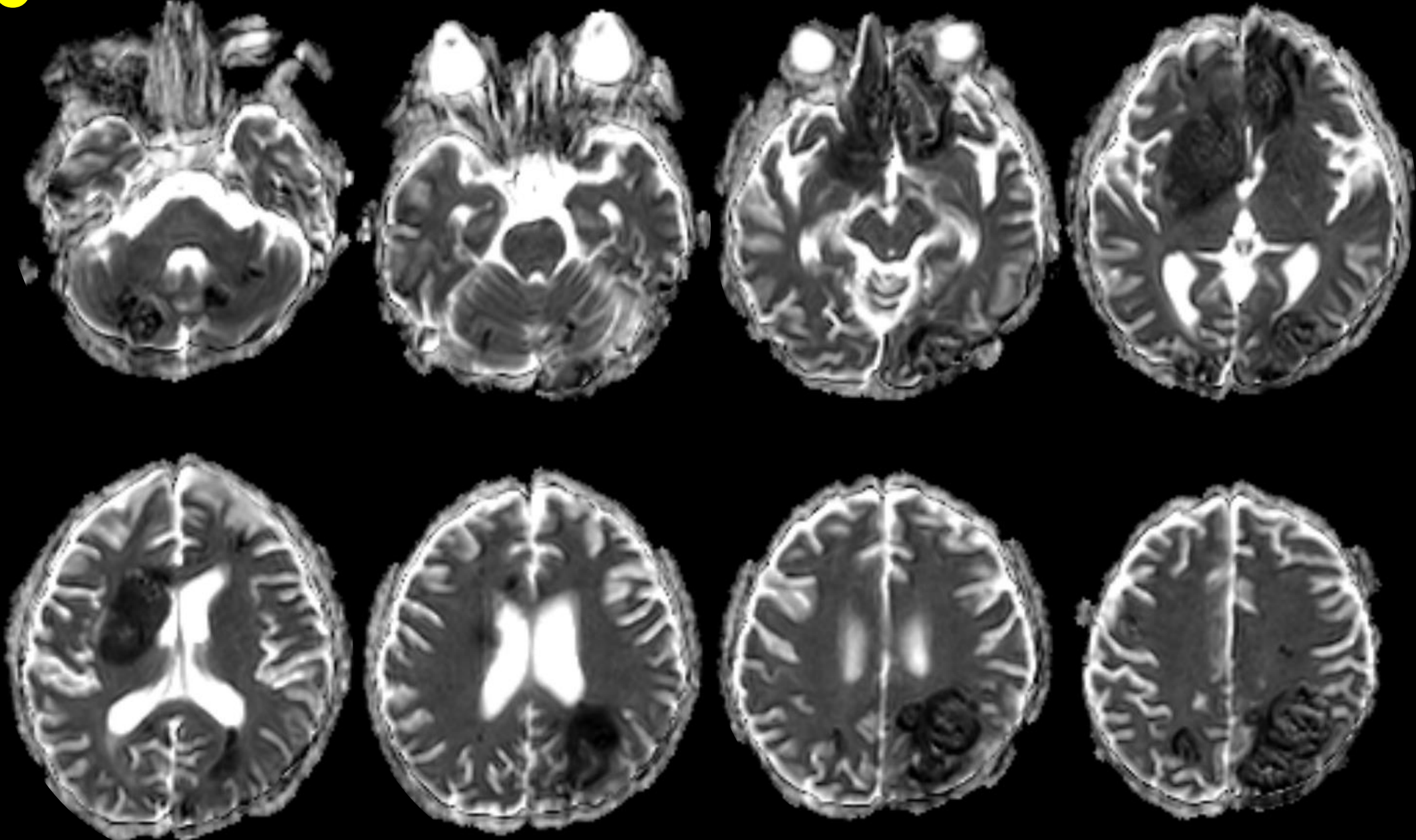
- 40 yo female, Hx B-ALL, prior allogenic transplant
- Admitted Steroid refractory GVHD
- Recent change in mental status



Case #5

ADC

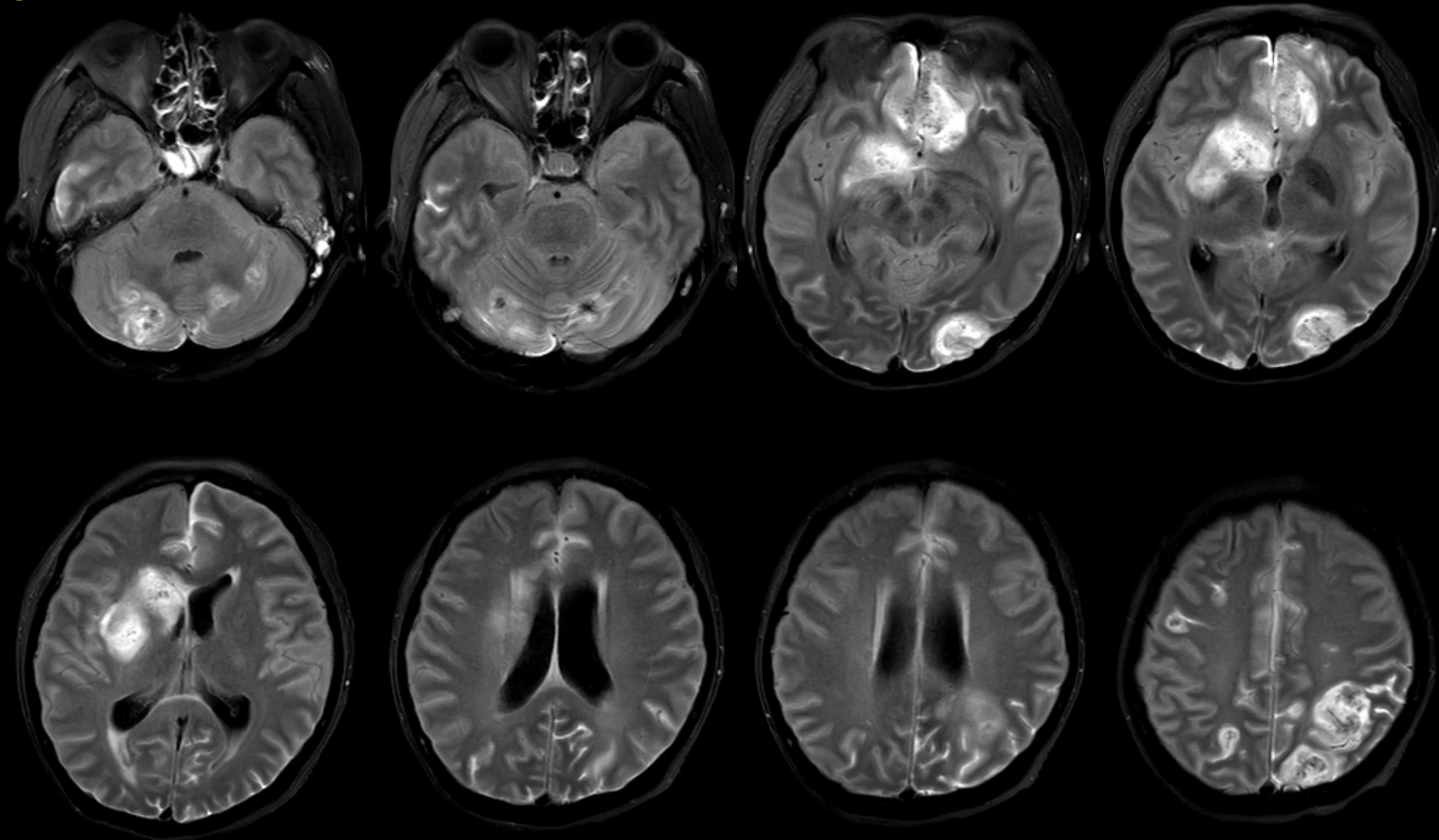
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Case #5

T2-FLAIR

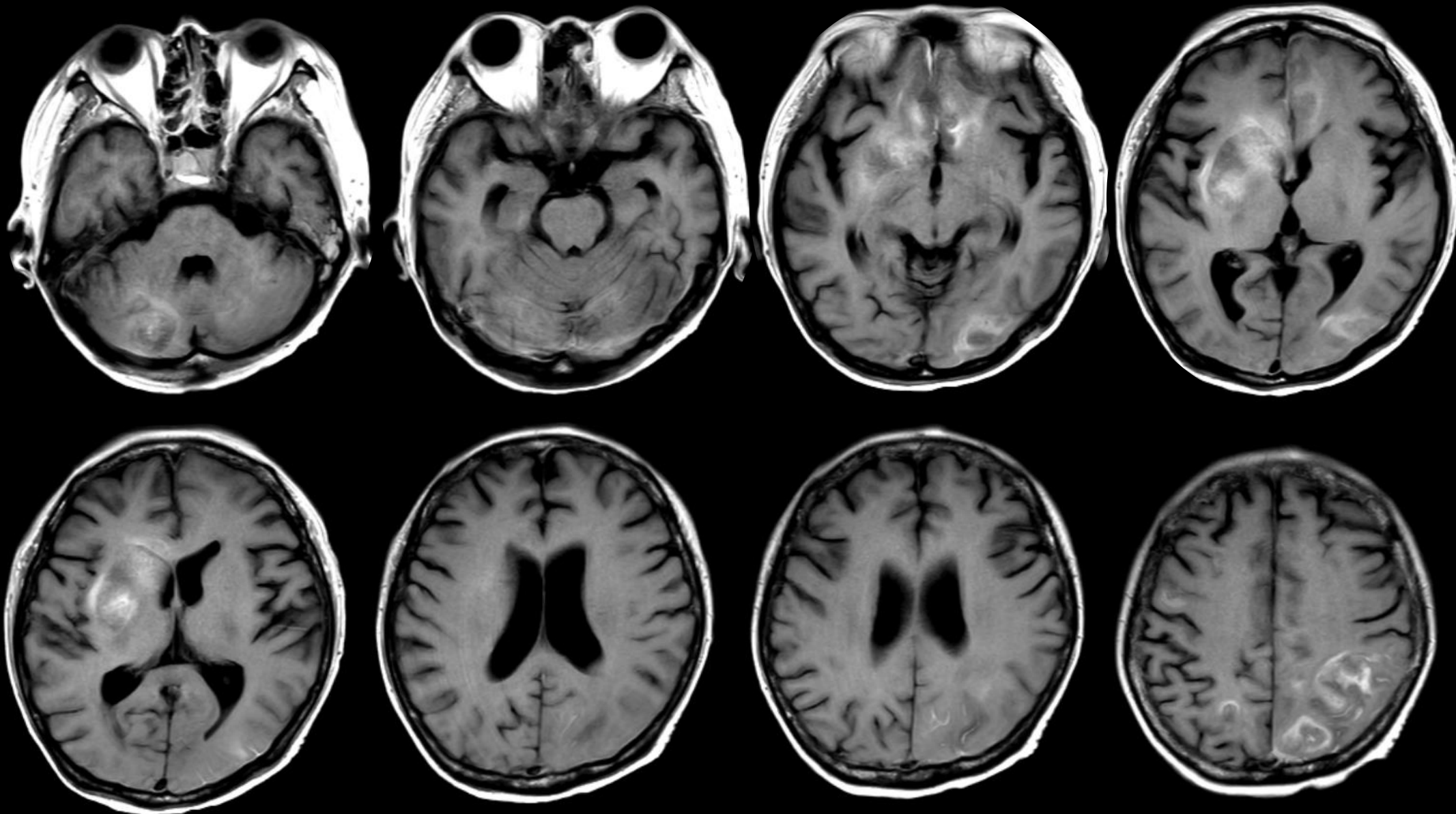
- 40 yo female, Hx B-ALL, prior allogenic transplant
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Case #5

TI-WI

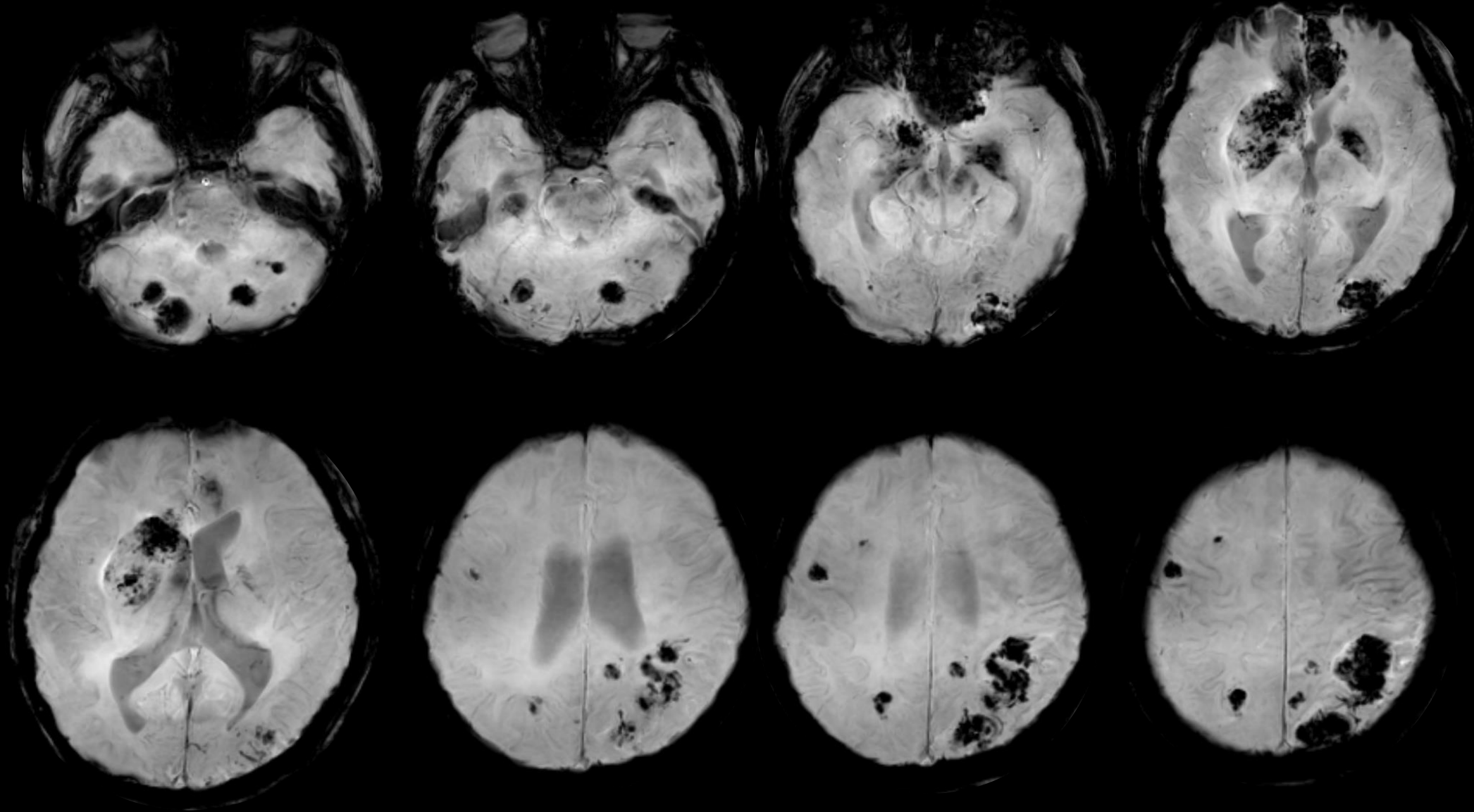
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Case #5

SWI

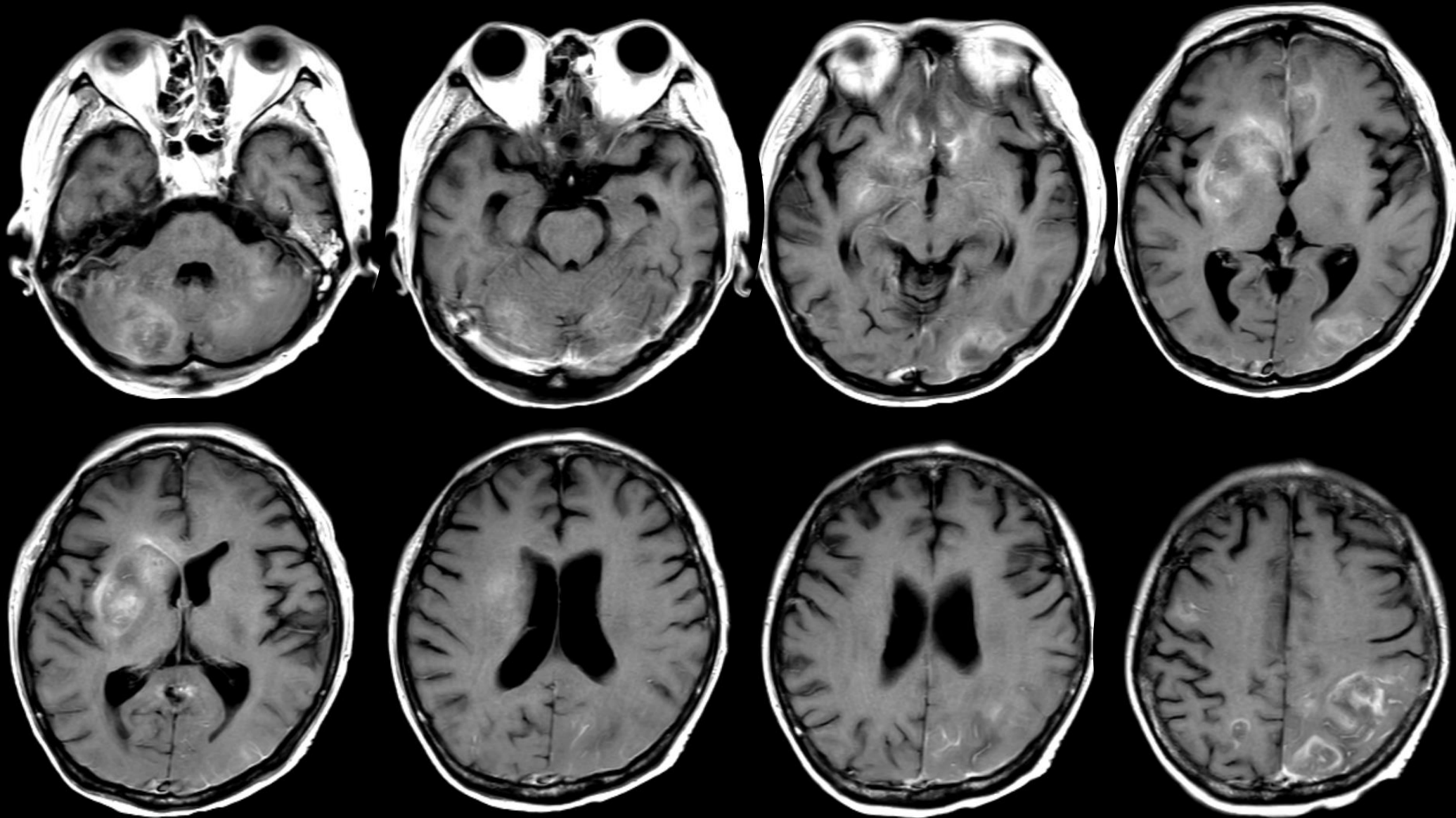
- 40 yo female, Hx B-ALL, prior allogenic transplant
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Case #5

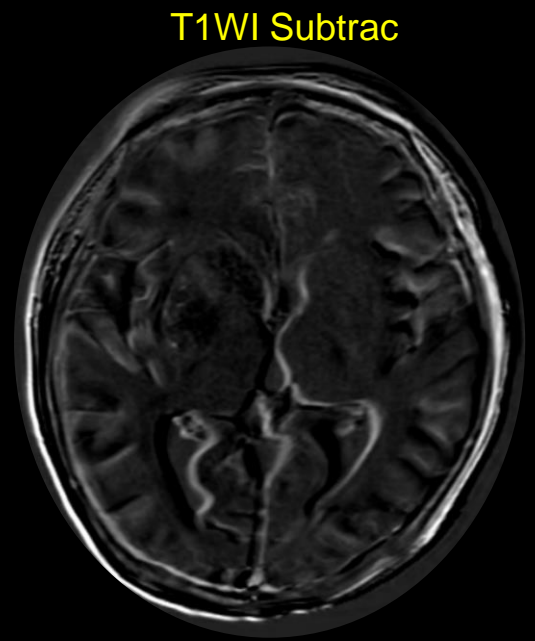
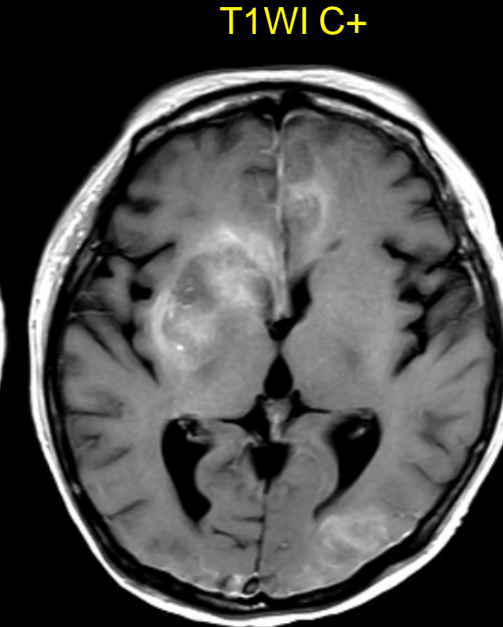
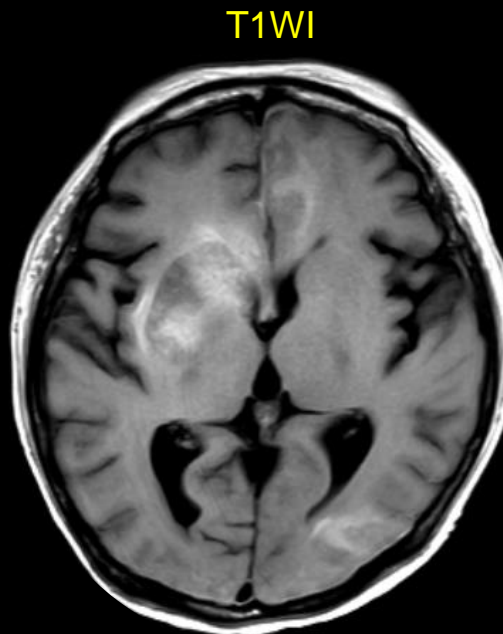
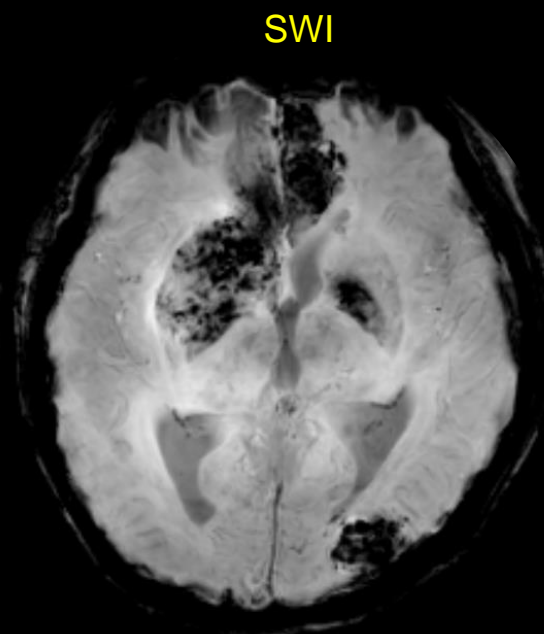
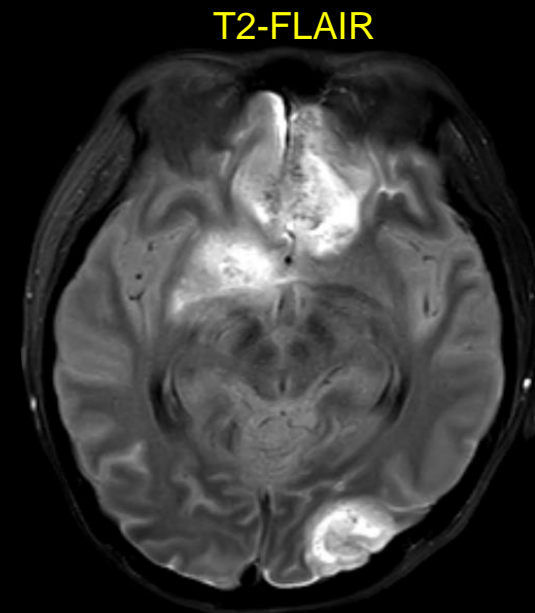
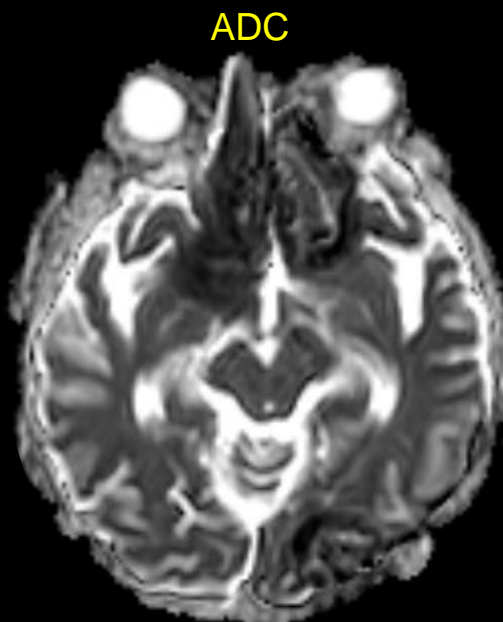
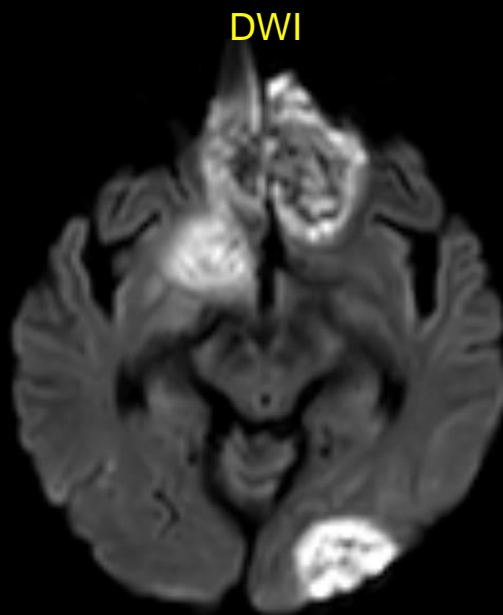
T1 WI C+

- 40 yo female, Hx B-ALL, prior allogenic transplant
- Admitted Steroid refractory GVHD
- Recent change in mental status

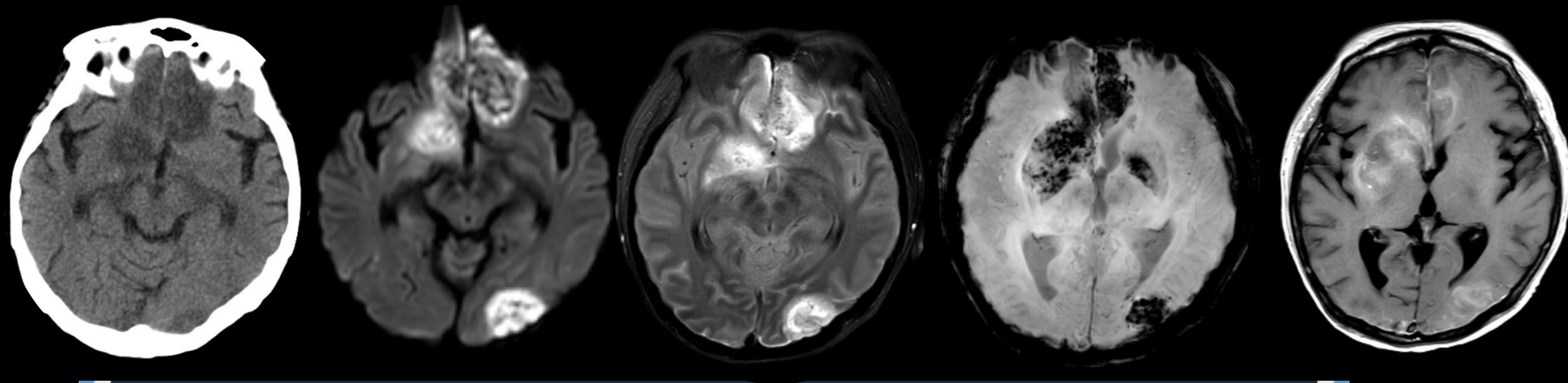


Case #5

- 40 yo female, Hx B-ALL, prior allogenic transplant
- Admitted Steroid refractory GVHD
- Recent change in mental status



Case #5



- 40 yo female, Hx B-ALL, prior allogenic transplant
- Admitted Steroid refractory GVHD
- Recent change in mental status

Please select the incorrect statement:

This is a treatable condition, however, the mortality rates are very high.

0%

Hemorrhagic components are very typical for this entity, as seen in this case

0%

Methotrexate based intrathecal chemotherapy should be strongly considered

0%

Vascular Imaging is likely of no benefit in this case

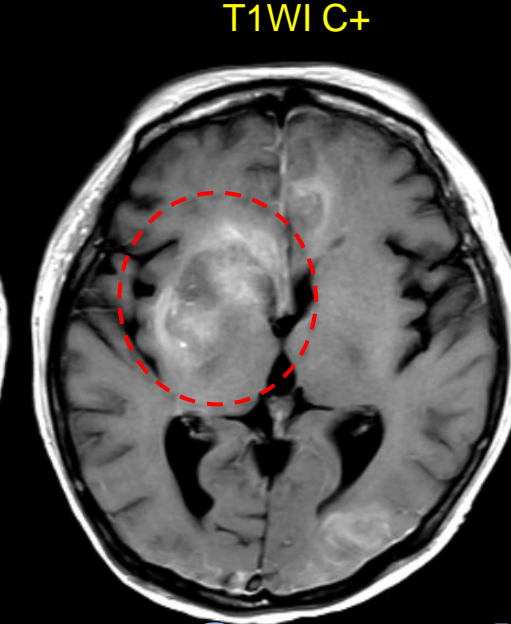
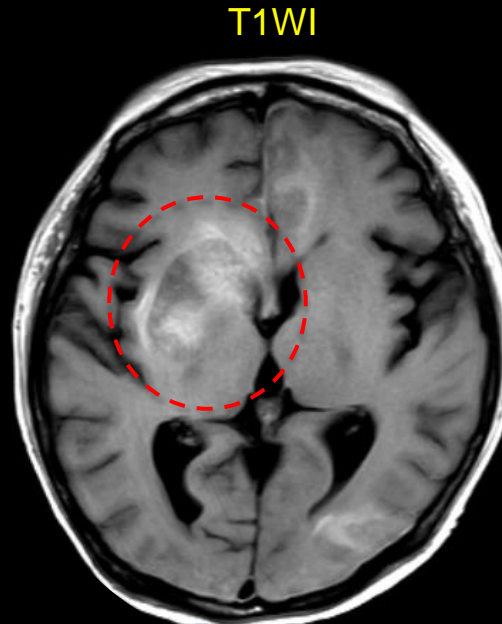
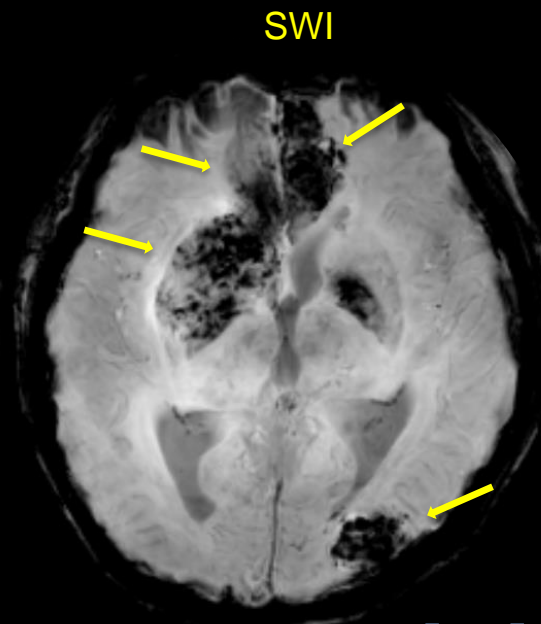
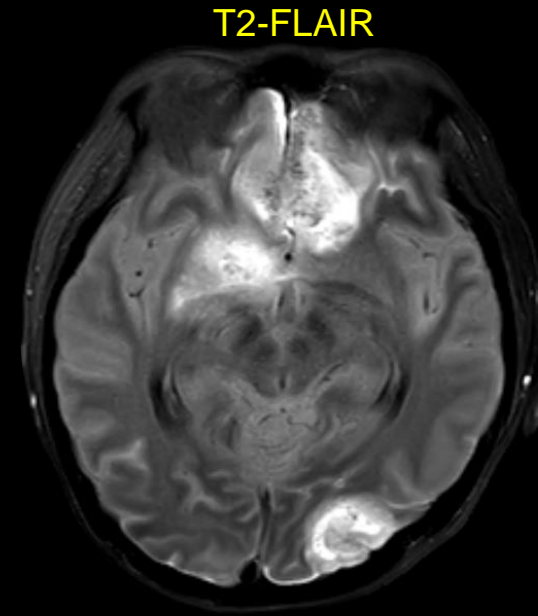
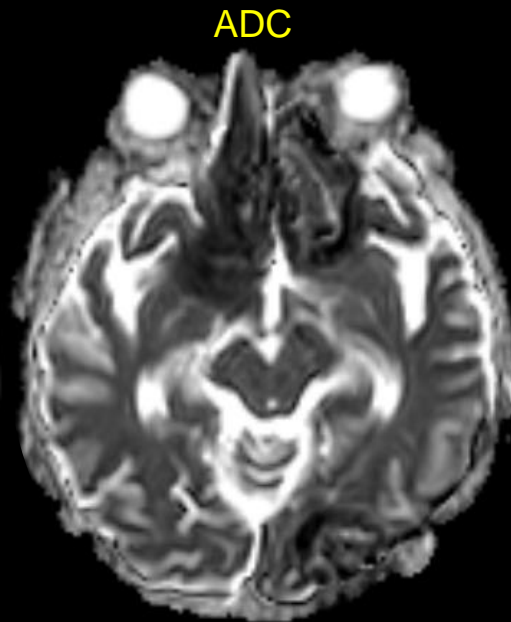
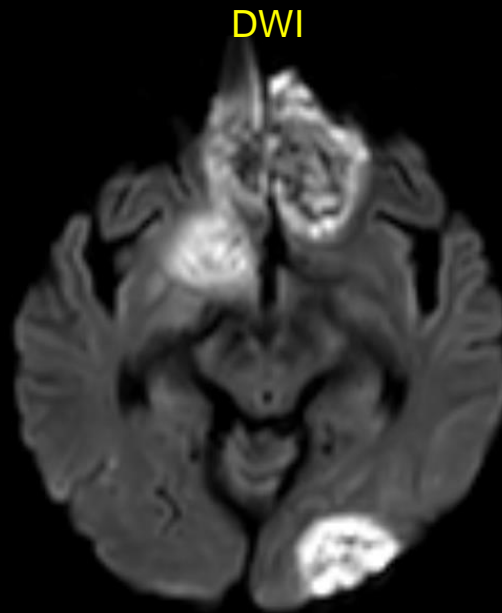
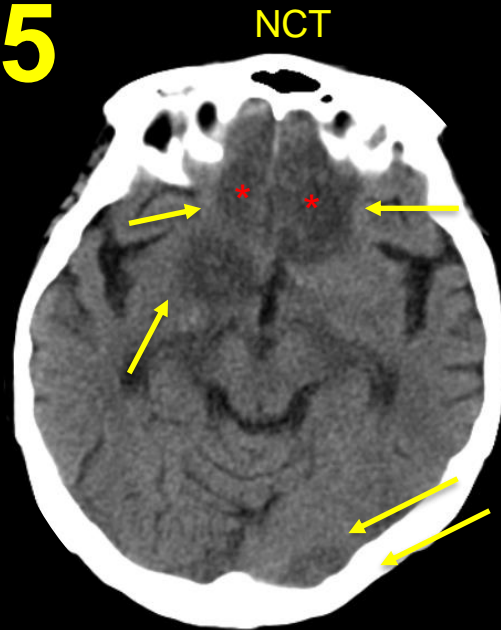
0%

Chest CT may offer clues to the correct diagnosis

0%

Case #5

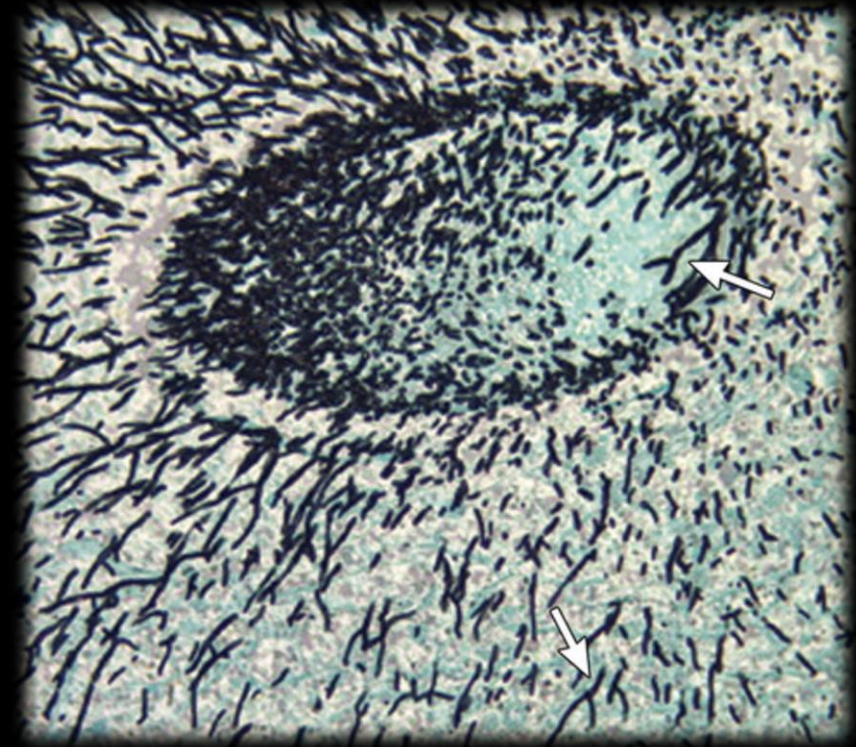
- 40 yo female, Hx B-ALL, prior allogenic transplant
- Admitted Steroid refractory GVHD
- Recent change in mental status



Angioinvasive Fungal Cerebritis

Angioinvasive Fungal Cerebritis

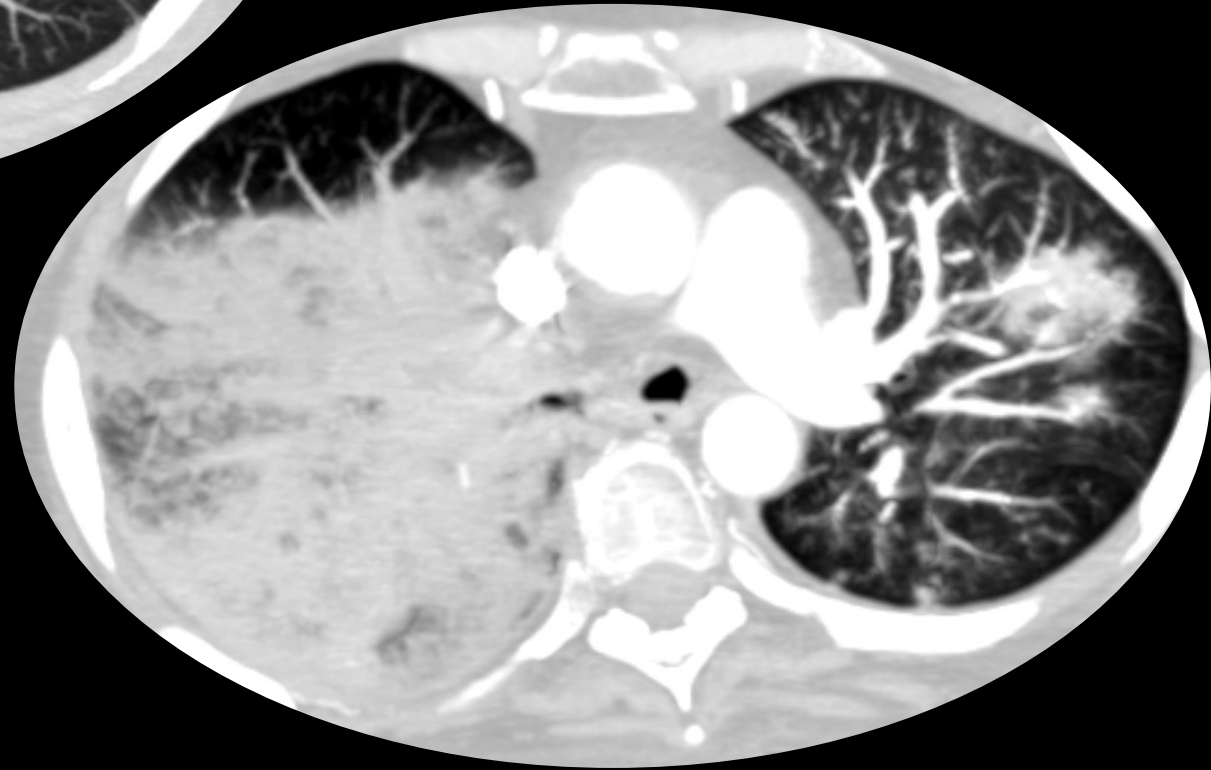
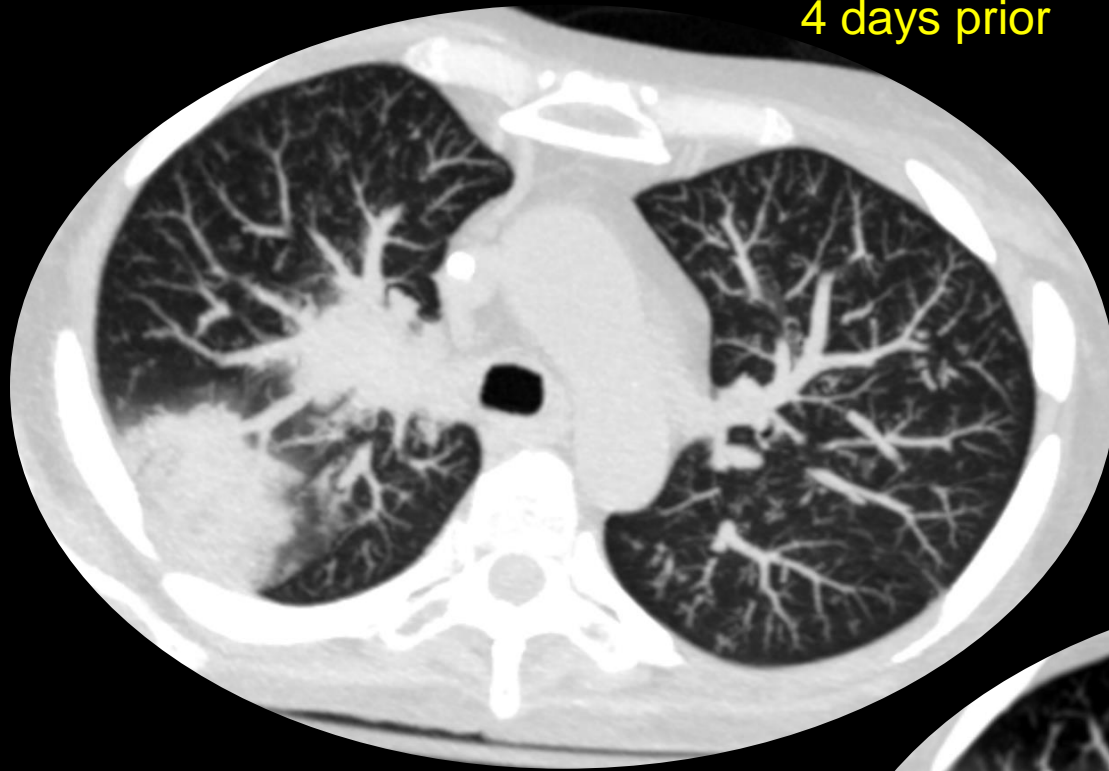
- Life threatening CNS infection, usually *Aspergillus* or *Mucor*
- Immunocompromised, hematogenous versus direct extension
- Poor prognosis with ~ very high mortality for cerebral aspergillosis
- Pulmonary aspergillosis treatable
- **Mechanism**
 - Invasion walls of both small and large blood vessels
 - Thrombosis, infarction, hemorrhage, necrosis
 - Abscess if immune response partially preserved

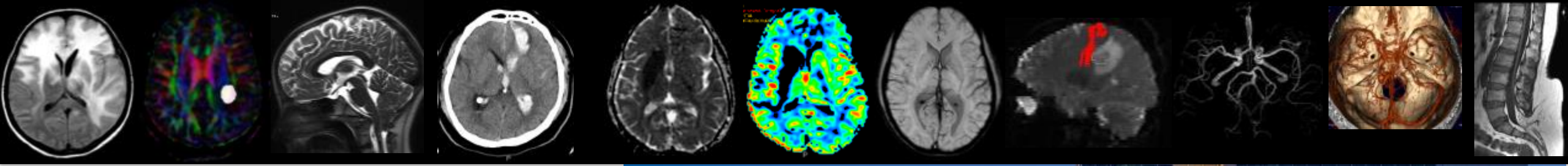


Case #5

- 40 yo female, Hx B-ALL, prior allogenic transplant
- Admitted Steroid refractory GVHD
- Recent change in mental status

4 days prior





Thank you for participating !



Marco C Pinho
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Brain Summit 2024: Current Trends in Neurology

UT Southwestern
O'Donnell Brain Institute

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Medical Center