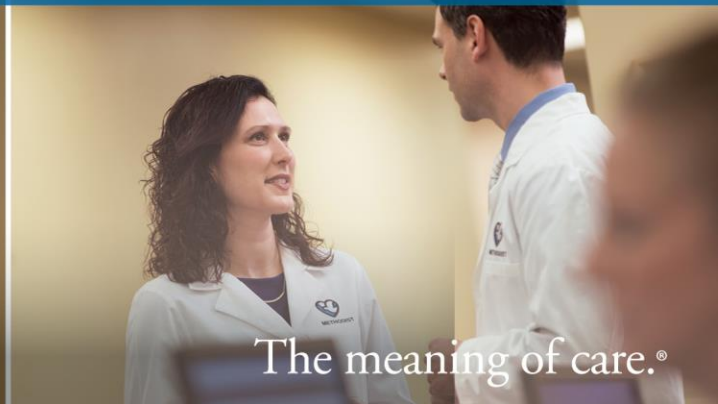


# Posterior Circulation Stroke

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The meaning of care.®



# Disclosures

- I have no disclosures



# Objectives

- Recognize presenting symptoms of posterior circulation stroke
- Dizzy plus
- Identify anatomy associated with posterior circulation stroke
- Identify a few syndromes associated with posterior circulation stroke





# Posterior Circulation Stroke

- Ischemic strokes comprise 87% of all strokes (ASA, 2016),
- Approximately 20% of ischemic strokes are posterior strokes
- Annual incidence of posterior stroke in the US: 160,000 (estimation based upon the above)
- As many as 165,000 strokes/year may be misdiagnosed in US emergency departments
- Posterior strokes are 3X more likely to be misdiagnosed

## Other cortical regions (including medial temporal and parietal lobes)

Blood supply—Supplied by posterior cerebral artery in some but not all people  
Ischaemia symptoms—Neuropsychological such as memory deficits, alexia, acalculia, agraphia, prosopagnosia

## Thalamus

Blood supply—Posterior cerebral artery  
Ischaemia symptoms—Sensory loss or disturbance

## Occipital lobes

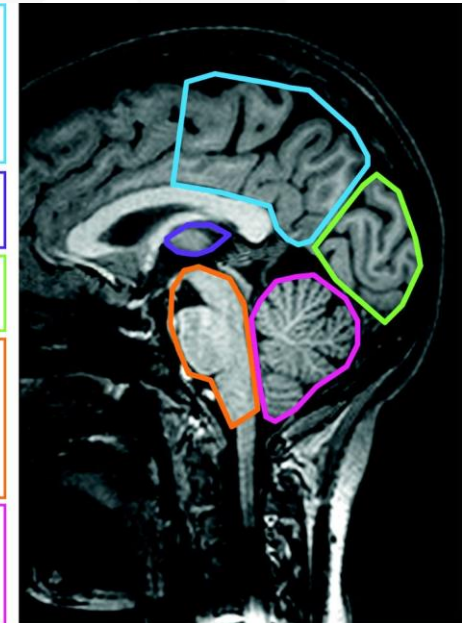
Blood supply—Posterior cerebral artery  
Ischaemia symptoms—Visual field defects

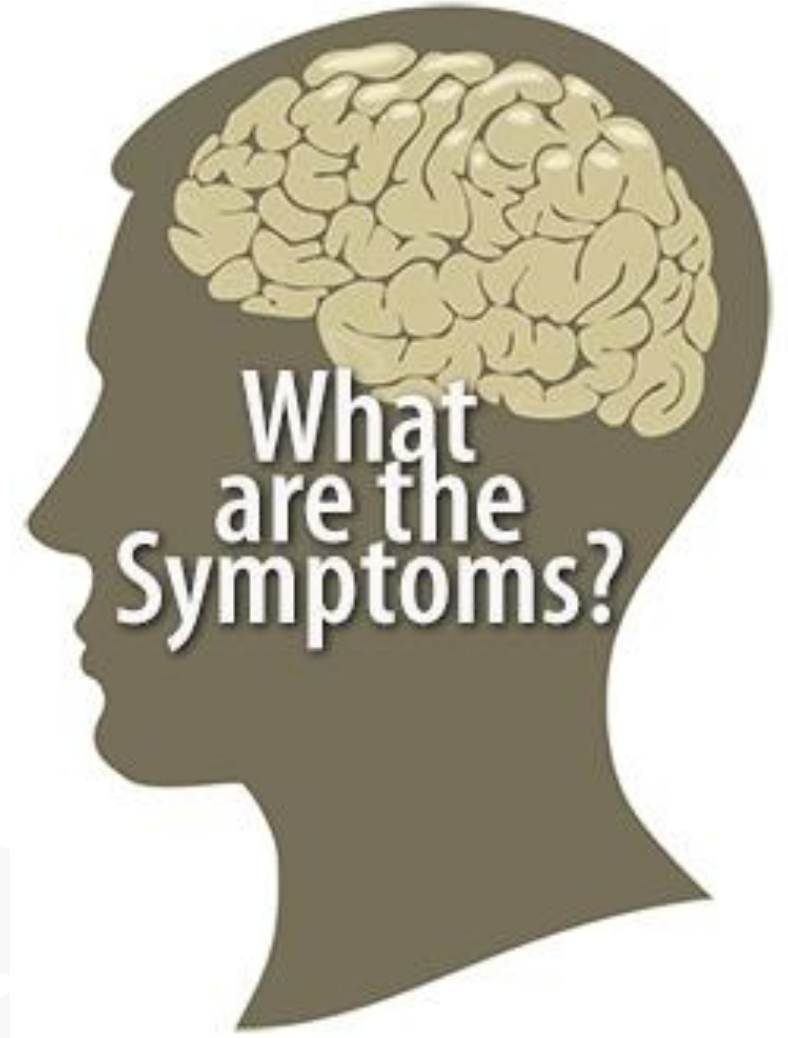
## Brainstem (midbrain, pons, medulla)

Blood supply—Basilar, superior cerebellar, and anterior inferior cerebellar arteries  
Ischaemia symptoms—Limb weakness, sensory loss, cranial nerve palsies; classical brainstem syndromes with crossed signs; "locked-in" syndrome; "top of the basilar" syndrome

## Cerebellum

Blood supply—Superior, anterior inferior, and posterior inferior cerebellar arteries  
Ischaemia symptoms—Vertigo, ataxia, nystagmus, and other cerebellar signs





# PRESENTING SYMPTOMS



## Most common presenting symptoms of posterior circulation ischemia

### According to the New England Medical Center Posterior Circulation Registry

- Dizziness (47%)
- Unilateral limb weakness (41%)
- Dysarthria (31%)
- Headache (28%)
- Nausea and Vomiting (27%)



# Most common signs of posterior circulation ischemia

- Unilateral limb weakness (38%)
- Gait ataxia (31%)
- Unilateral limb ataxia (30%)
- Dysarthria (28%)
- Nystagmus (24%)



# Vertigo

- Sensation of feeling off balance
- Often caused by inner ear problem
  - **Benign paroxysmal positional vertigo (BPPV)**
    - Tiny calcium particles clump in inner ear canals
  - **Meniere's Disease**
    - Caused by fluid buildup and changing pressure
    - Vertigo often accompanies tinnitus and hearing loss
  - **Vestibular Neuritis**
    - Inner ear infection (usually viral)





# Dizzy plus

- Primary presentation is often “I’m dizzy”
- Ask probing questions to determine if the patient has any other symptoms
- **5 D’s of posterior stroke**
  - Dizziness
  - Diplopia
  - Dysarthria
  - Dysphagia
  - Dystaxia
- May also have motor/sensory deficits which mimic anterior circulation





# Peripheral vs Central

Differentiating features of peripheral and central originated vertigo, nystagmus, ataxia, and headache.

## Summary of peripheral vs. central etiology distinguishing features

	Peripheral cause	Central cause
<b>VERTIGO</b>		
Onset	Acute or gradual	Acute
Duration	Minutes to hours	Days to weeks
Impact of head movement	Worsens	Variable
Auditory symptoms	Frequent	Often absent
Dix-Hallpike	Positive	Negative
Associated neurological findings	Absent	Often present
<b>NYSTAGMUS</b>		
Direction of fast-phase	Unidirectional	Can be alternating
Vertical component	Absent	Can be present
Fatigability	Fatigable in 30–60 s	Not fatigable
Presence of vertigo symptoms	Always present	Can be absent
<b>ATAXIA</b>		
Gait ataxia	Present but less severe	Very severe
Truncal ataxia	Uncommon	Common
Cerebellar testing	Normal	Frequently abnormal
Onset	Acute or gradual	Acute
Severity at onset	Less likely to be severe at onset	More likely to be maximal at onset
Headache	Uncommon	Common
Location	Variable	Occipital
Unilateral	Variable	Commonly unilateral
Onset timing	Variable	Typically at time of other symptoms
<b>HINTS</b>		
Head impulse test	Abnormal (gaze correction)	Normal
Nystagmus	Fast-phase in one direction	Fast-phase alternating directions
Test of skew	Skew absent	Skew present

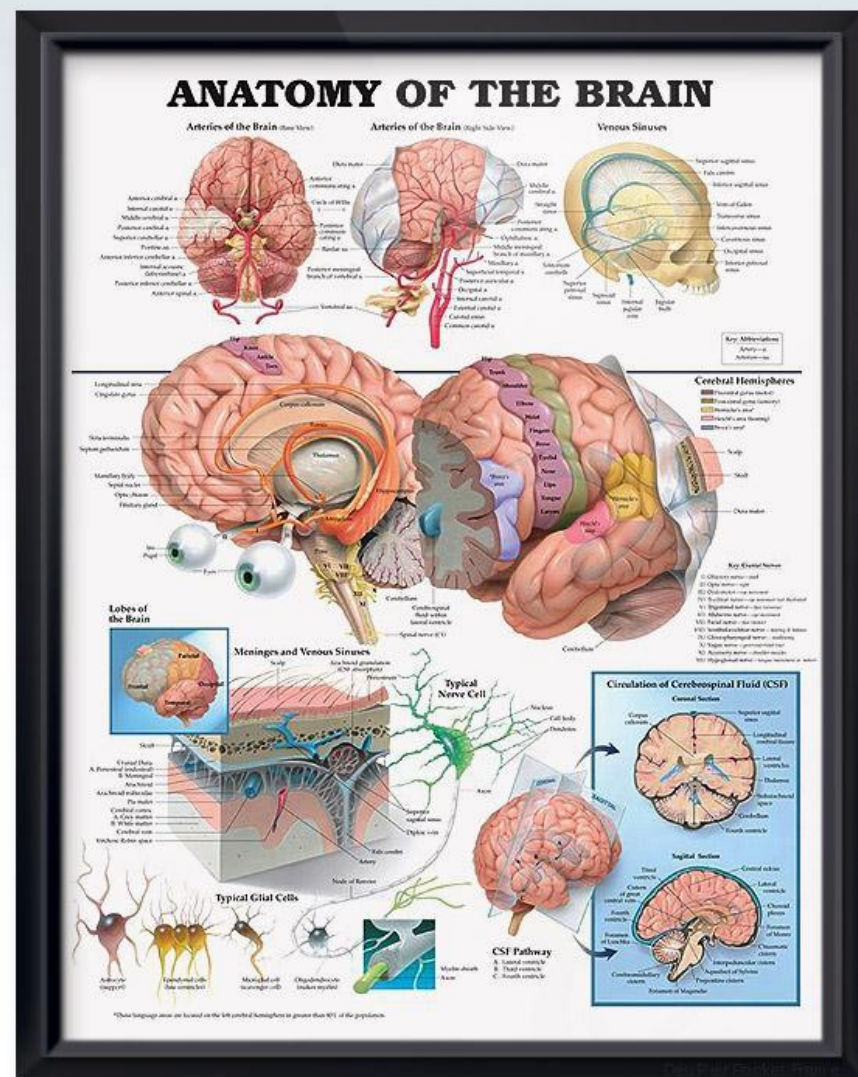


## HiNTS exam

- Head impulse testing
- Nystagmus
- Test of Skew
- 100% sensitivity, 96% specificity
- <https://www.youtube.com/watch?v=1q-VTKPweuk>



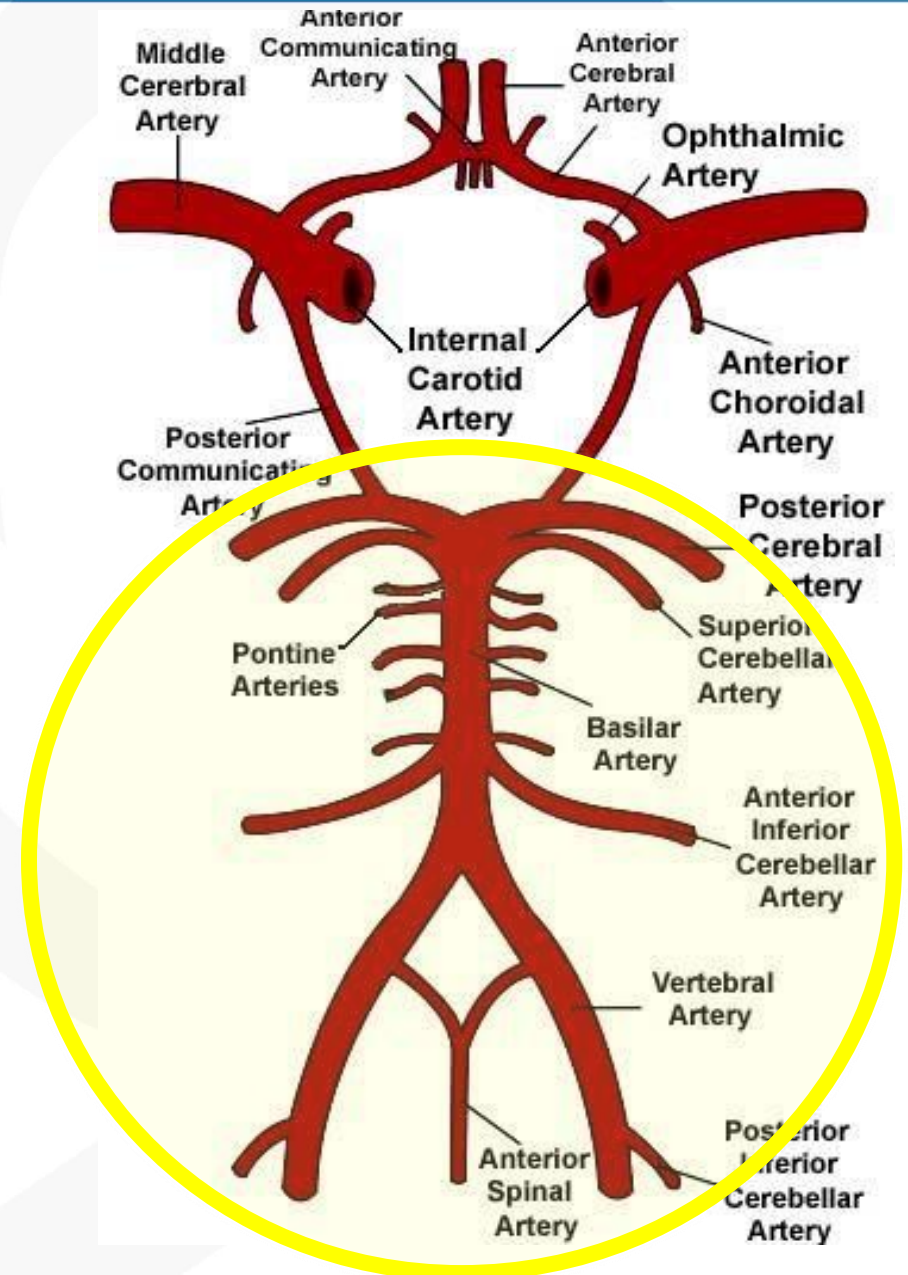
# ANATOMY





# Vertebrobasilar Arterial System

- Upper
  - Posterior Cerebral Artery
  - Superior Cerebellar Artery
- Middle
  - Basilar Artery
  - Anterior Inferior Cerebellar Artery
- Lower
  - Vertebral Artery
  - Posterior Inferior Cerebellar Artery







# Areas of the brain affected by occlusion in the vertebrobasilar arterial system

## Other cortical regions (including medial temporal and parietal lobes)

Blood supply—Supplied by posterior cerebral artery in some but not all people

Ischaemia symptoms—Neuropsychological such as memory deficits, alexia, acalculia, agraphia, prosopagnosia

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# Common etiology of posterior circulation stroke

- Cardioembolic
- Artherosclerosis
- Dissection (traumatic or spontaneous)
- Less common
  - Migraine
  - Hypercoagulable disorders
  - Drug abuse
  - Vasculitis
  - Fibromuscular dysplasia



**A FEW SYNDROMES THAT MAY OCCUR DUE  
TO POSTERIOR CIRCULATION STROKE**



# Locked-In Syndrome

- Symptoms: complete paralysis, inability to speak, no facial movements, dysphagia, unresponsive to painful stimuli
- Able to hear and see, normal intelligence, may only communicate with eye movement
- Primary case is a brainstem hemorrhagic or ischemic stroke
- Supportive cares include: breathing support, alternative nutrition, VTE prophylaxis, pressure injury prevention, speech therapy
- <https://www.youtube.com/watch?v=A3uEMyVnThI>



# Wallenberg Syndrome

- Symptoms: hoarseness, n/v, hiccups, nystagmus, inability or decrease in ability to sweat, body temperature sensation issues, dizziness, ataxia, balance difficulties, swallowing difficulties
- Caused by a stroke in the lateral medulla
- Supportive care: speech therapy, antiemetics, physical therapy, occupational therapy, tube feedings





# Anton-Babinski Syndrome

- Symptoms: cortical blindness but unaware, confabulation
- Primary cause: bilateral infarction of the posterior cerebral artery
- Supportive cares: occupational therapy, physical therapy, audio books, 24 hours assistance



## “Top of the Basilar” syndrome

- Symptoms: hallucinations and behavioral changes, alternating abnormalities of alertness, disorientation, visual, oculomotor deficits and cortical blindness
- Primary cause: thromboembolic occlusions of the distal third or tip of the basilar artery
- Often missed due to patient confusion and unawareness of visual deficits



# Balint Syndrome

- Symptoms: oculomotor apraxia, optic ataxia, visual simultagnosia
- Primary cause: stroke affecting both parietal lobes
- Supportive cares: occupational therapy, audio books, 24 hour care
- <https://www.dailymotion.com/video/x2wdjoj>



# A few case studies





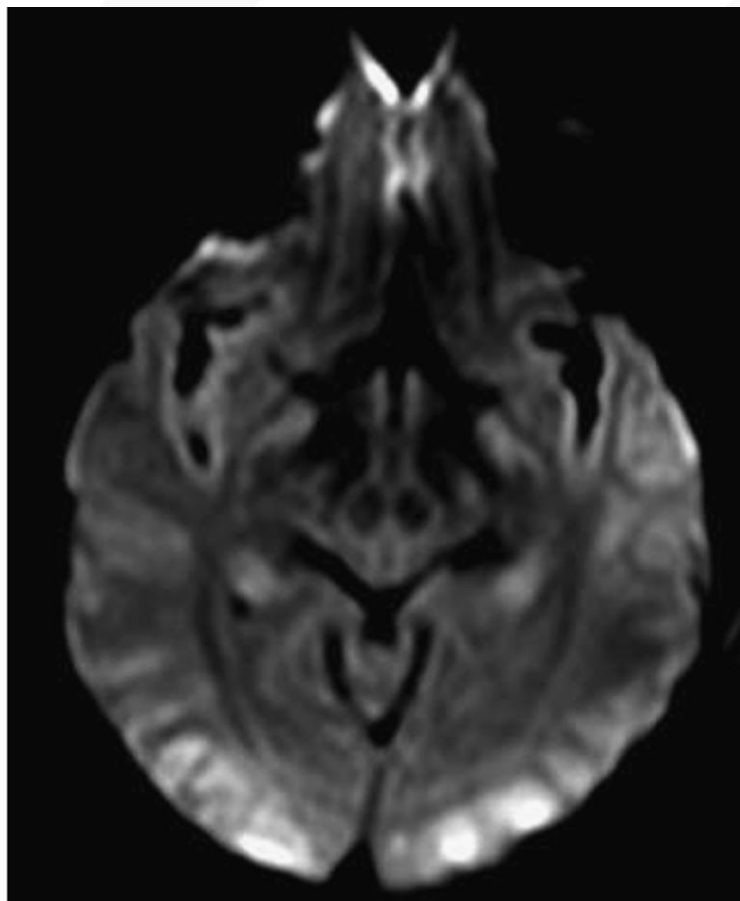
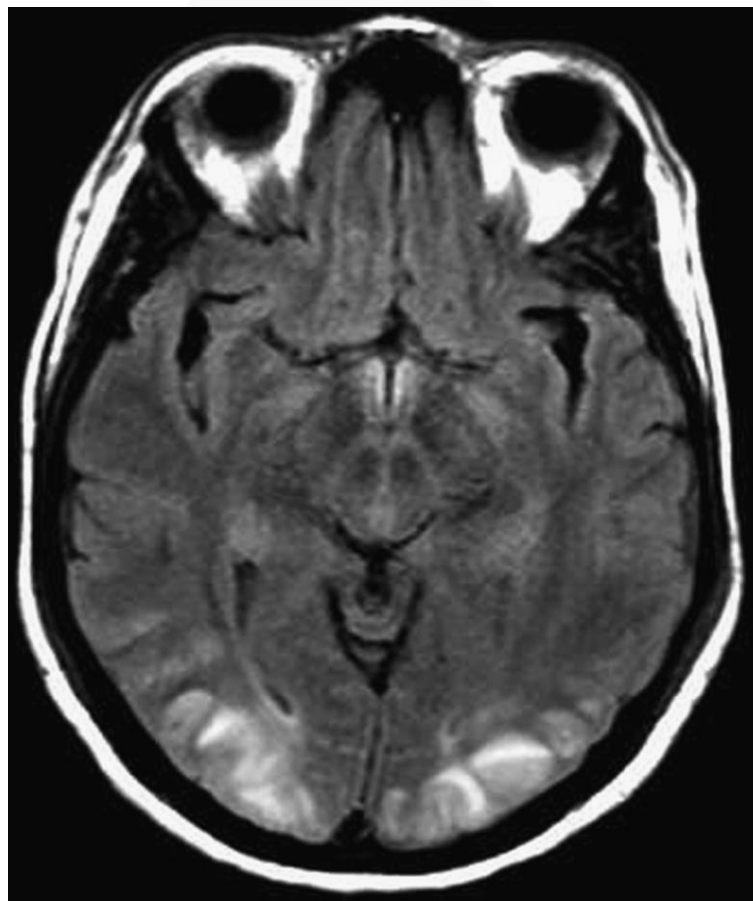
## Julie: 68 year old female

- “When I got up from my nap, I couldn’t find the door”
- Became more confused over the next two days
- Couldn’t dial the phone
- Couldn’t find the cabinets
- Daughter became concerned when she didn’t hear from her mom
- Made appointment with ophthalmologist, vision test was 20/30 without glasses and 20/20 with glasses
- Ophthalmologist referred to neurologist





Julie: 68 year old female





## Craig: 59 year old male

- Presents with complaints of weakness over 2 hours
- Also complains of hoarseness and blurry vision
- Medication change one week ago
- Recently had a cold, but felt he was “over it”
- Returned from a business trip previous night
- ED assessment positive for dysarthria

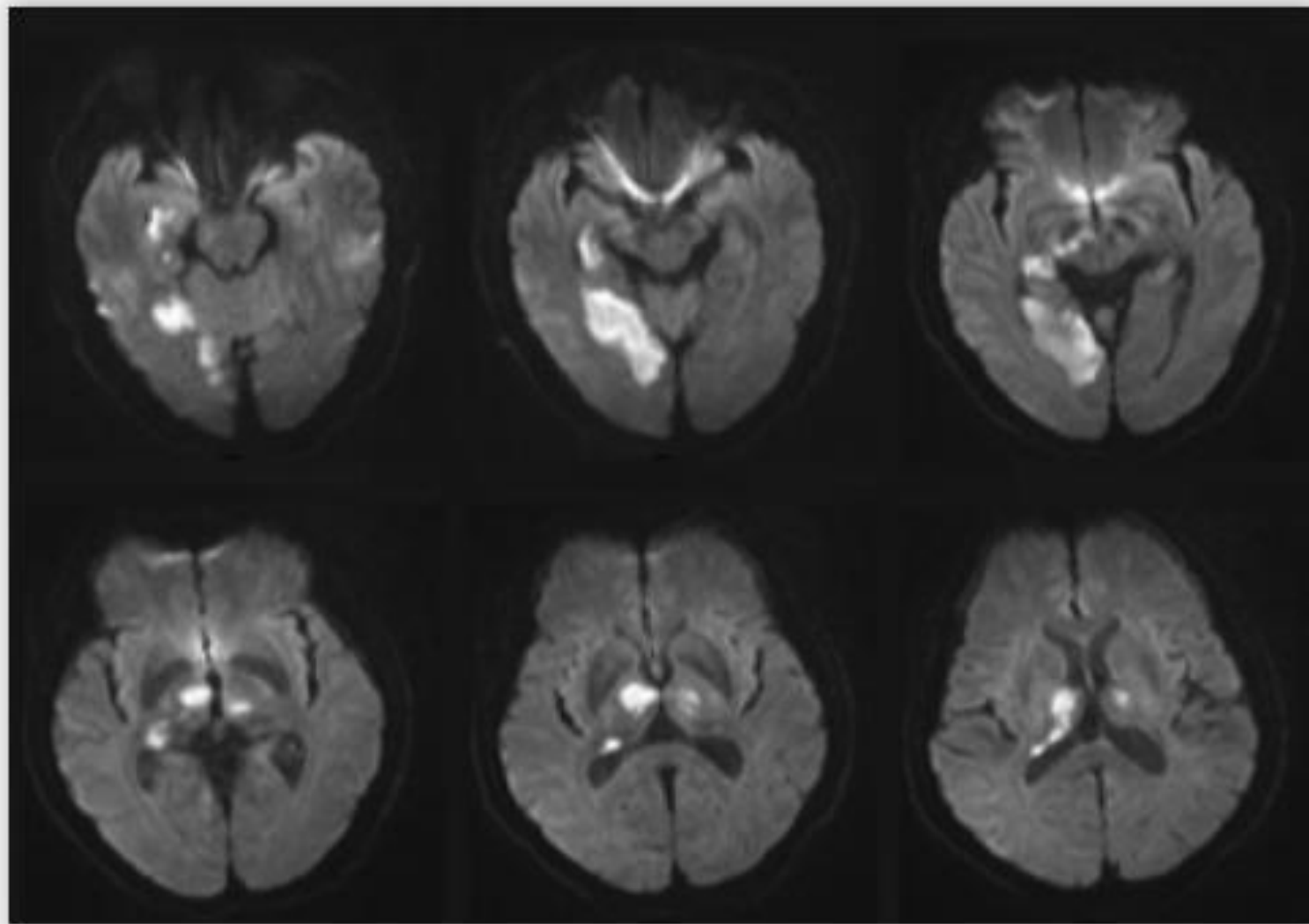


## Susan: 78 year old female

- Found by her husband to be unresponsive after a nap
- CT scan was negative for any acute findings, old infarct noted
- Patient was on opioid medications for long-standing back pain
- Admitted to ICU with GCS of 4
- Periods of hypersomnia and unresponsiveness alternating with agitation and delirium



Susan: 78 year old female





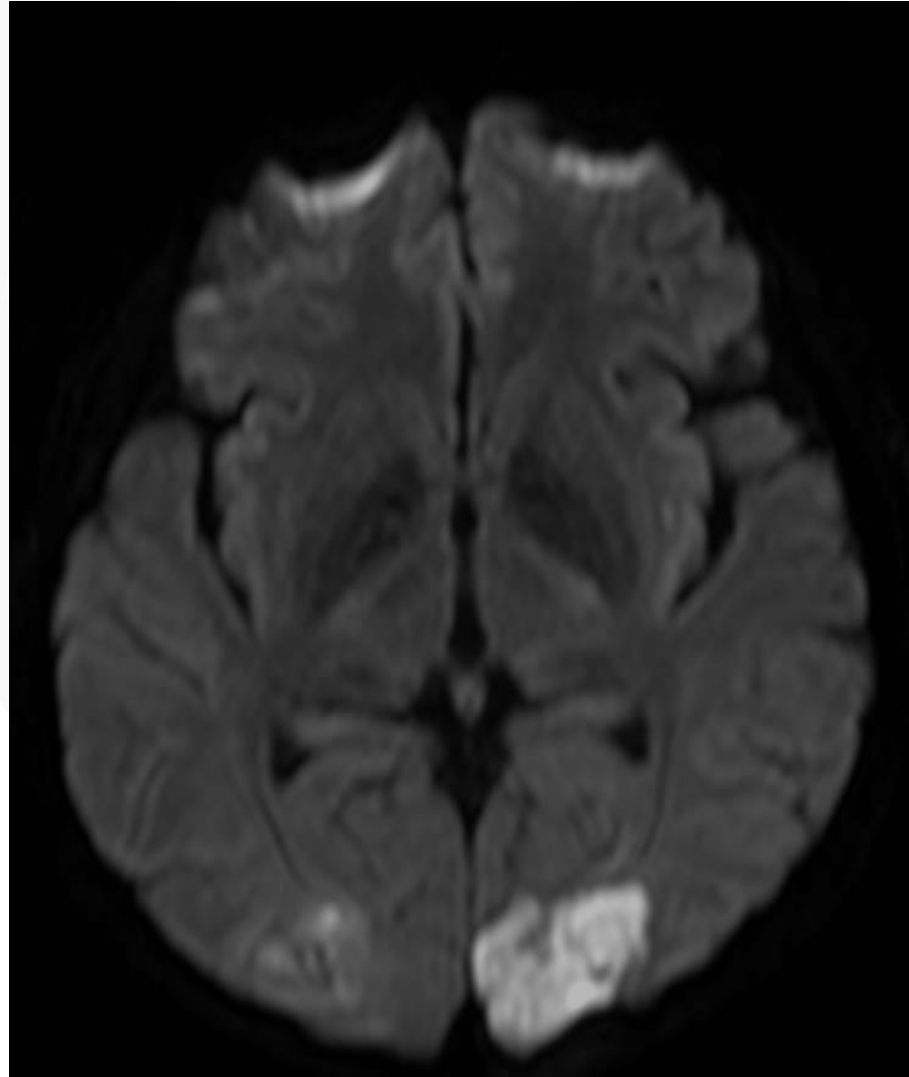
## George: 90 year old male

- Son brought patient to see primary care physician after realizing something was not right with his dad
- MD assessment reveals bilateral blindness, anosognosia, and vivid visual confabulation
- Symptoms are reported to have been present for 3 days





George: 90 year old male





## In Conclusion



- Posterior circulation strokes count for approximately 20% of strokes
- Asking probing questions are key to differentiating vertigo and posterior circulation stroke
- HiNTS exam is helpful in assessing potential posterior circulation stroke, but is not commonly done in the ED or acute hospitalization
- Posterior circulation stroke is associated with some interesting syndromes
- IV thrombolytic therapy may be appropriate if eligible



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