

RADY 401 Case Presentation

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Focused HPI and Exam

64 y.o. woman with history of polysubstance abuse, hypertension, chronic pain, presenting with fever, altered mental status, and HTN. Recently treated for rhabdomyolysis after being vaccinated for COVID.

Vitals: BP 187/89, HR 98, SpO₂ 98% on RA

Exam:

- Obese, chronically ill-appearing older woman. Not following commands or answering questions.
- CV, lung, abdominal exams wnl.
- HEENT: Bruising noted over left temple.
- Neuro: Pupils 2mm, equal, reactive. Face symmetric. Moving left sided extremities spontaneously, minimal right-sided movements. Symmetric hyperreflexia. Positive right-sided Babinski. No tremor or clonus.

Initial Work-Up and Imaging

- WBC 18.2, lactate 2.1, Cr 0.70, CK 1,443.
- U/A + ketones, protein
- U-tox positive for opioids (prescribed)
- LP bland, EKG unremarkable
- **Imaging:**
 - **Non-contrast CT head***
 - **MRI brain with and without contrast**
 - **MRV brain without contrast**
 - CT Abdomen and Pelvis w/ contrast
 - CXR, ankle and elbow XR

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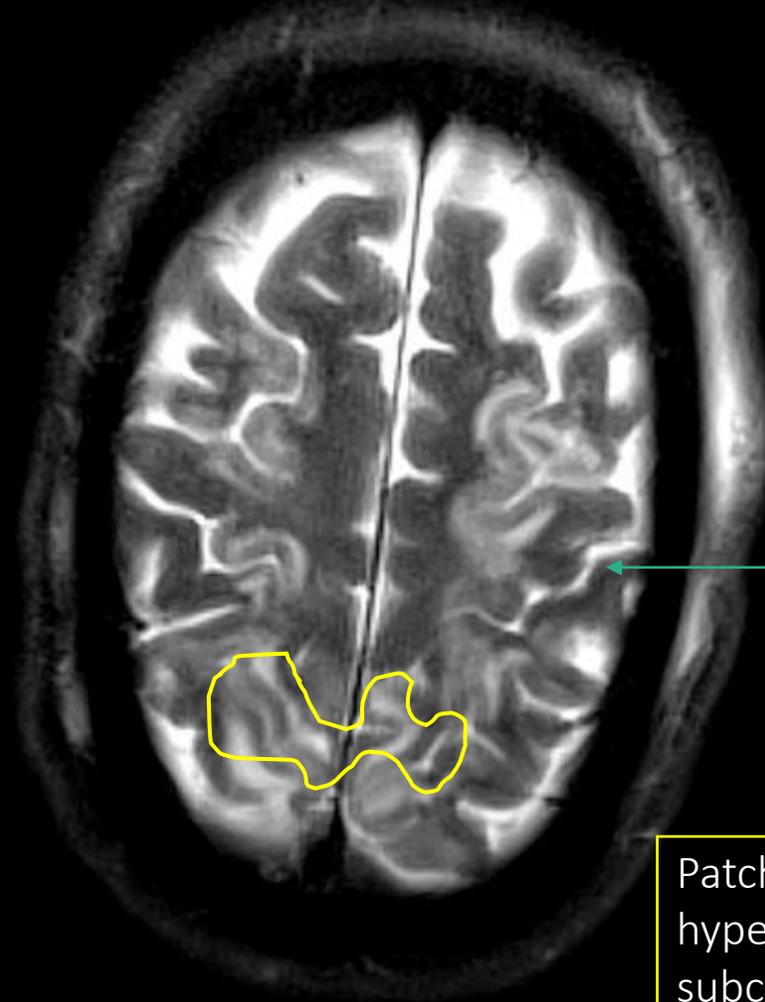


*Head CT from outside hospital
Severe motion artifact
No acute hemorrhage or midline shift noted.
Left frontal scalp soft tissue swelling

MRI Brain

Non-contrast axial T2 MRI
Fluid and edema bright

Non-contrast axial T2 - FLAIR
CSF is dark, edema bright



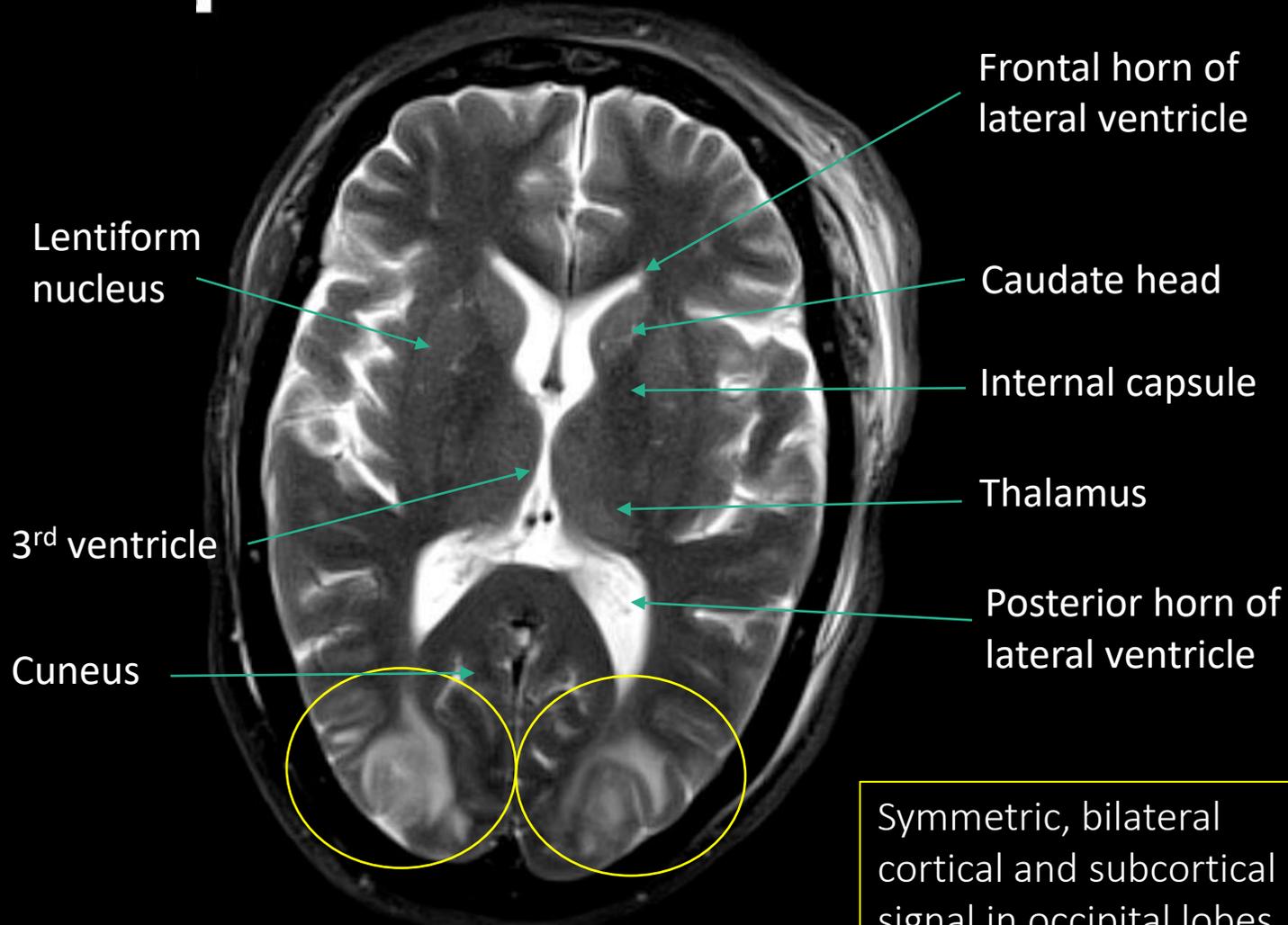
Central sulcus

Patchy, irregular bilateral hyperintensities in cortical and subcortical layers of the parietal and superior frontal lobes



MRI Brain at level 3rd ventricle

Non-contrast axial MRI – T2



Frontal horn of lateral ventricle

Caudate head

Internal capsule

Thalamus

Posterior horn of lateral ventricle

Lentiform nucleus

3rd ventricle

Cuneus

Symmetric

No blood, bone fracture

Ventricles size and shape wnl

No masses evident

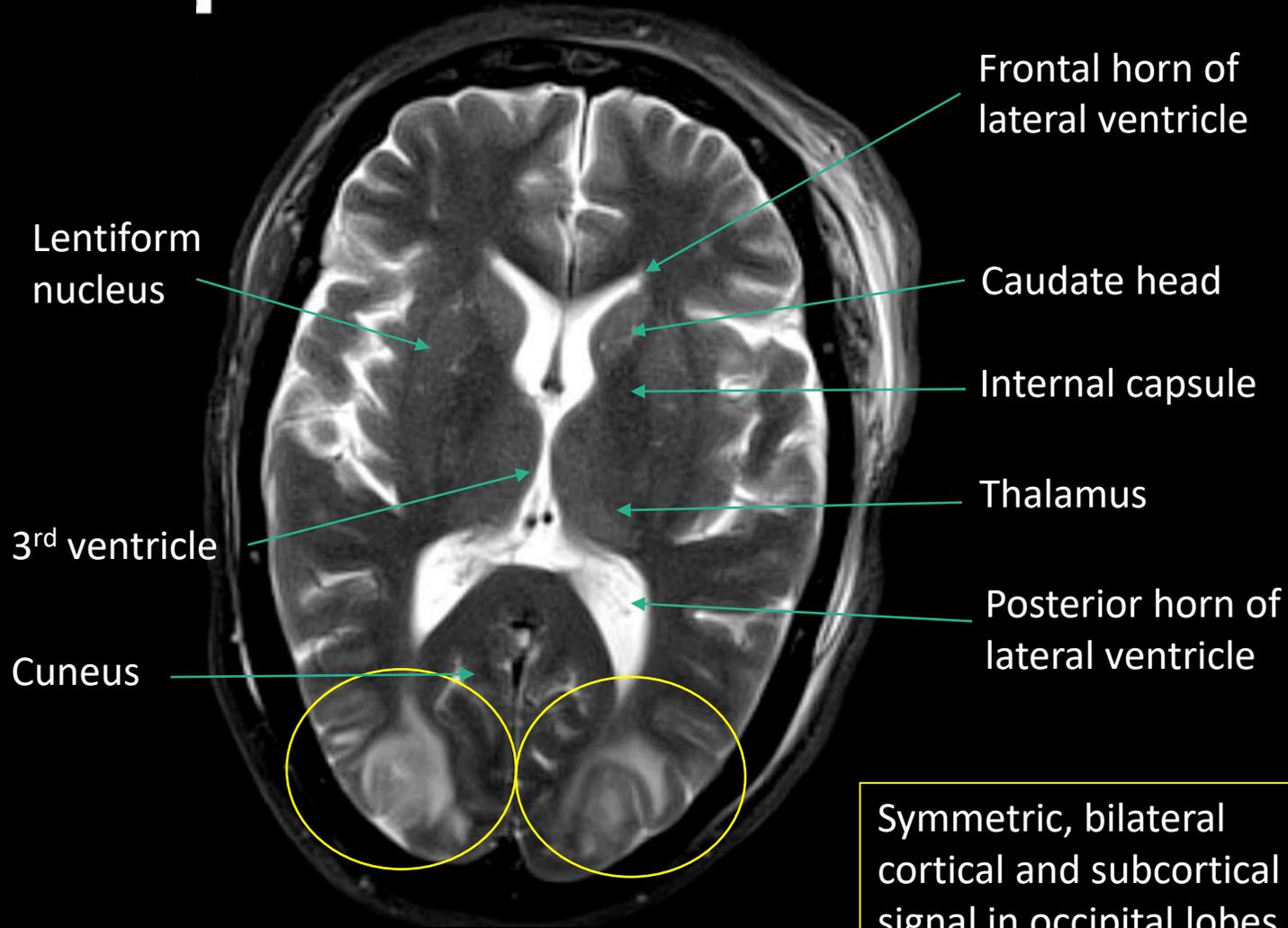
Posterior sulci harder to see

+ Bilateral hyperintensities in the occipital lobe, c/w vasogenic edema

Symmetric, bilateral cortical and subcortical signal in occipital lobes

MRI Brain at level 3rd ventricle

Non-contrast axial MRI – T2

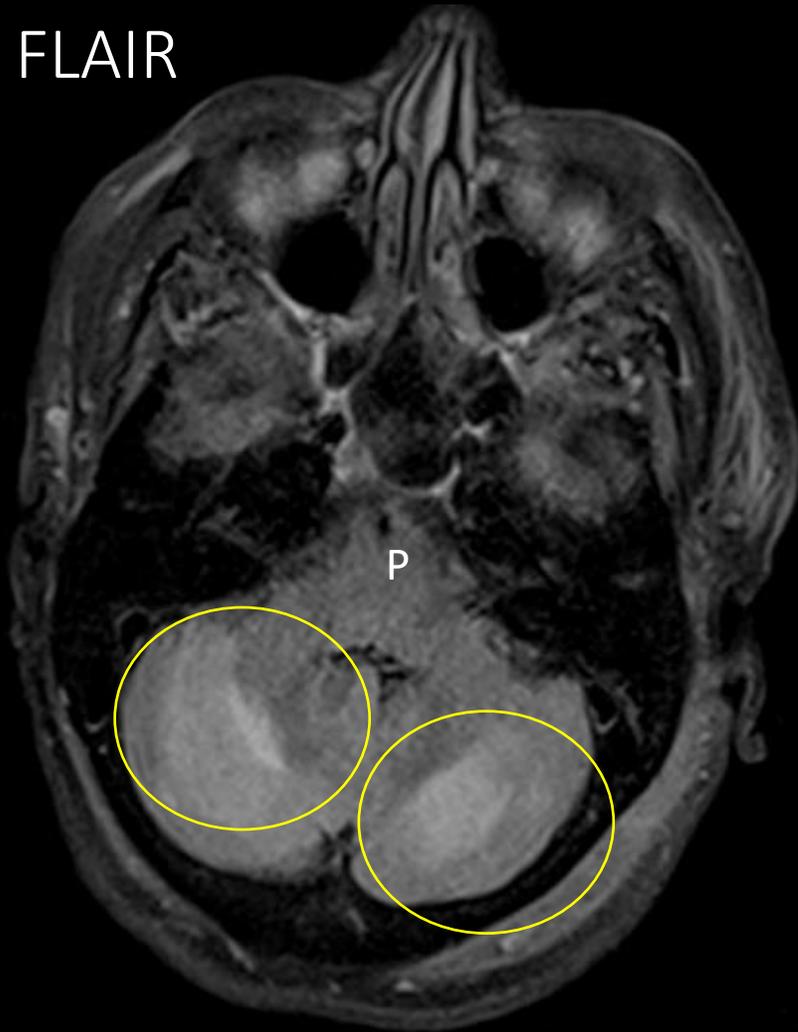


Non-contrast axial MRI – FLAIR



MRI Brain - DWI (L) and ADC (R)

FLAIR



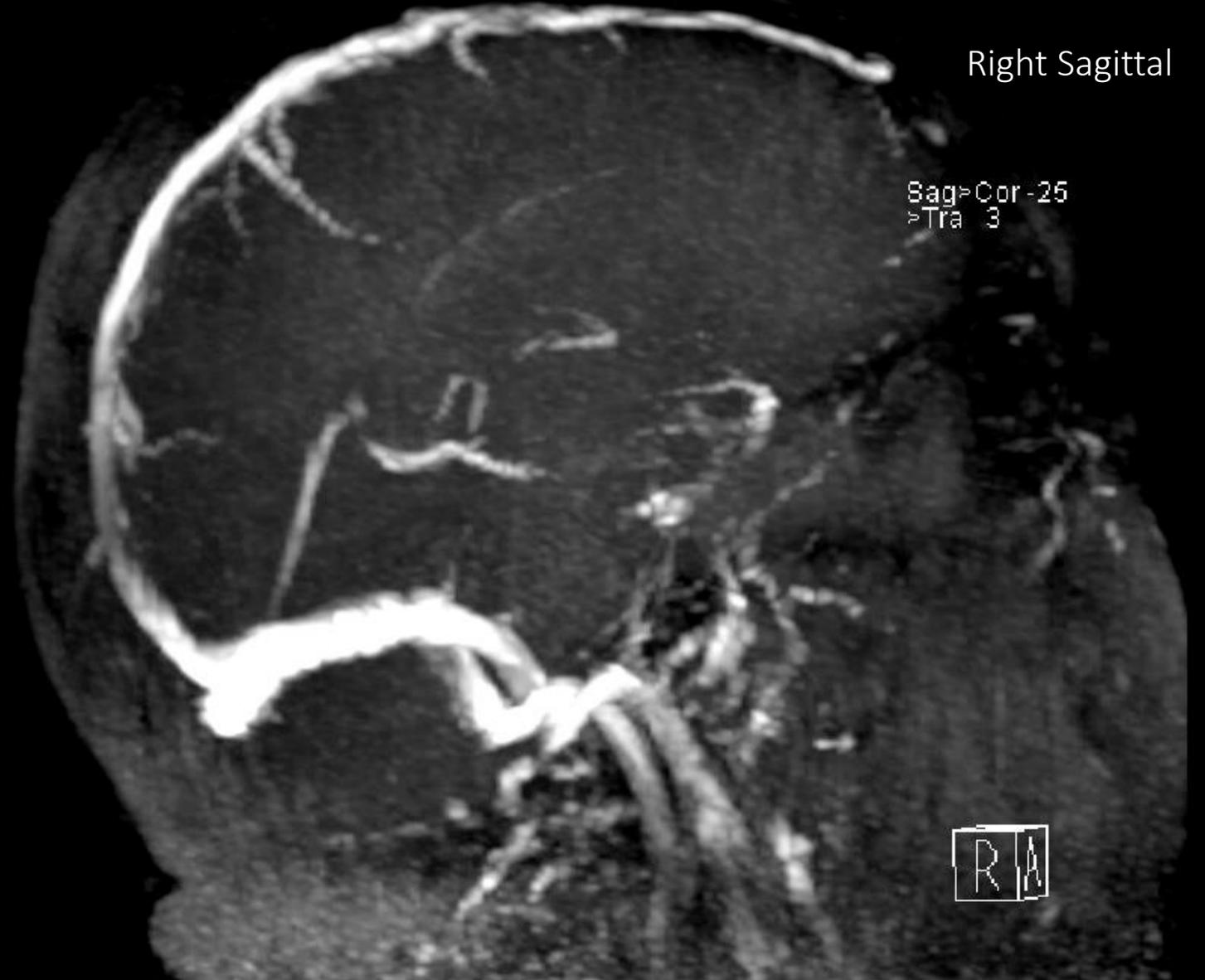
T2 diffusion-weighted image:
Acute infarcts appear bright



ADC (apparent diffusion coefficient) map
Ischemia would be hypointense

MRV Head without contrast

- Rule out cerebral venous thrombosis

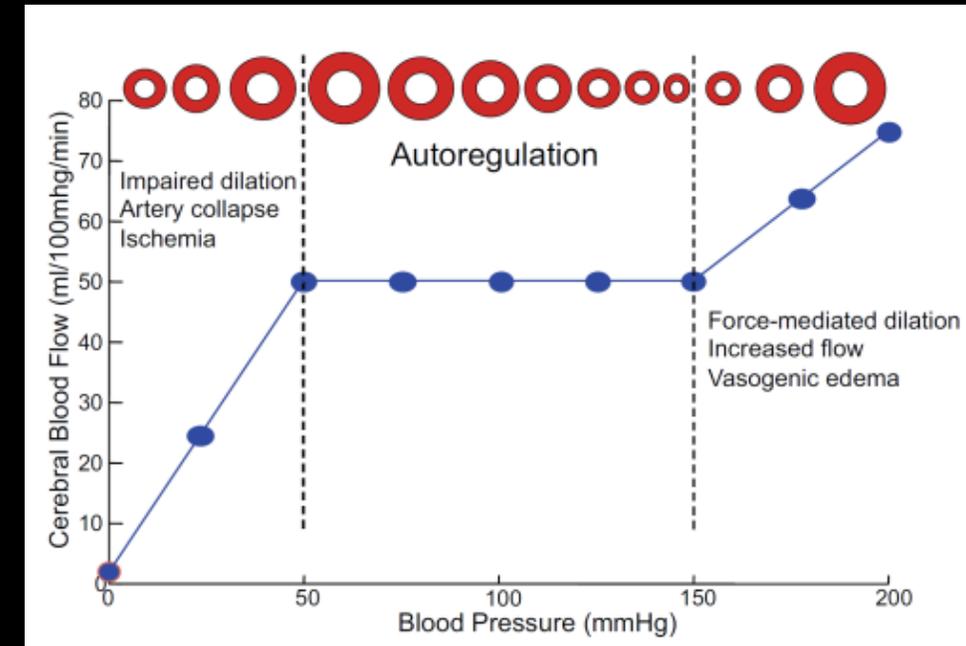


Next Steps and Diagnosis

- Intubated for altered mental status on HD2.
- Fluids, blood pressure management, and respiratory support.
- With supportive care, the patient's mental status improved drastically.
- She was extubated and discharged five days after admission.

PRES: Posterior Reversible Encephalopathy Syndrome

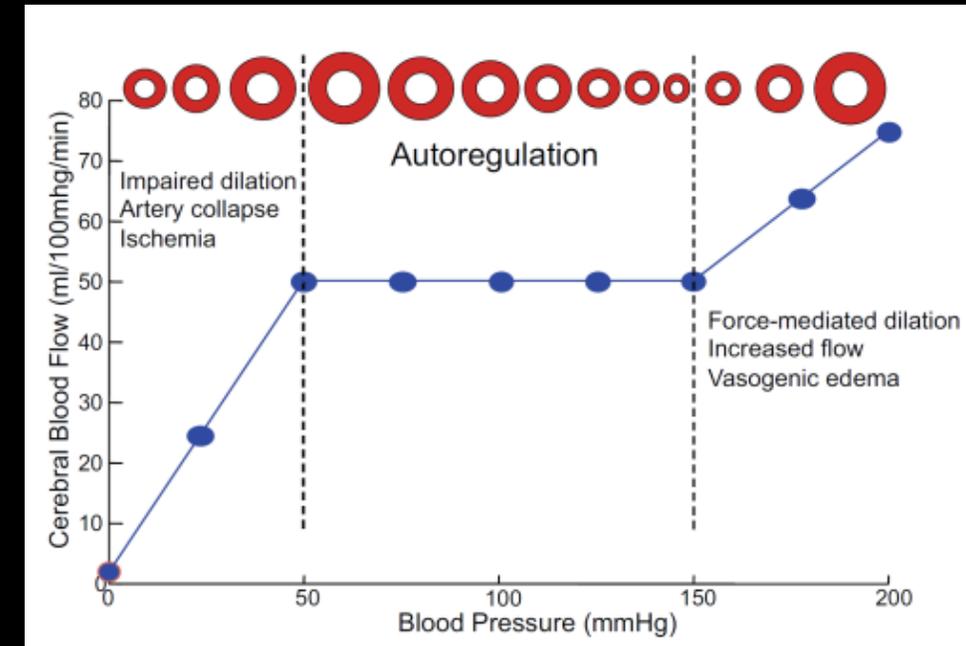
Hypertension → CNS hyper-perfusion → autonomic dysregulation → BBB damage, vasogenic edema



PRES: Posterior Reversible Encephalopathy Syndrome

Hypertension → CNS hyper-perfusion → autonomic dysregulation → BBB damage, vasogenic edema

- Diagnosis:
 - (1) Hypertension,
 - (2) Neuroradiographic findings,
 - (3) Neurologic symptoms
- Risk factors: immunosuppressive drugs, chemotherapy, sepsis, AID, HUS/TTP
 - HTN with eclampsia, renal failure
 - Likely more common than documented



PRES: Radiographic findings

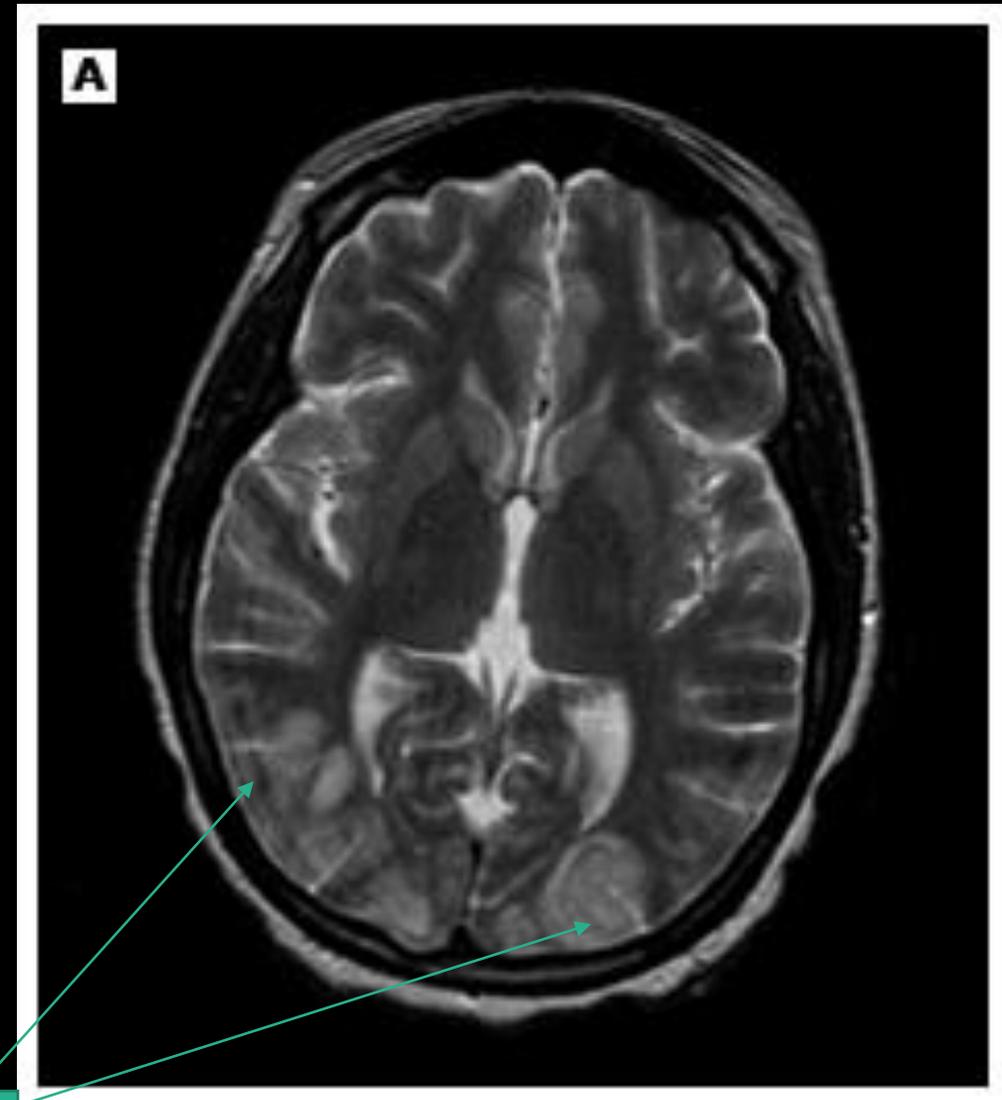
Currently no formal diagnostic criteria.

Classic findings on MRI:

- ✓ Bilateral, symmetric vasogenic edema
- ✓ Parieto-occipital involvement, 70-90%
- ✓ Cortical + subcortical white matter

Atypical PRES may involve other watershed regions, cerebellum, or basal ganglia

Patchy bilateral hyperintensities in the white matter of the occipital lobe



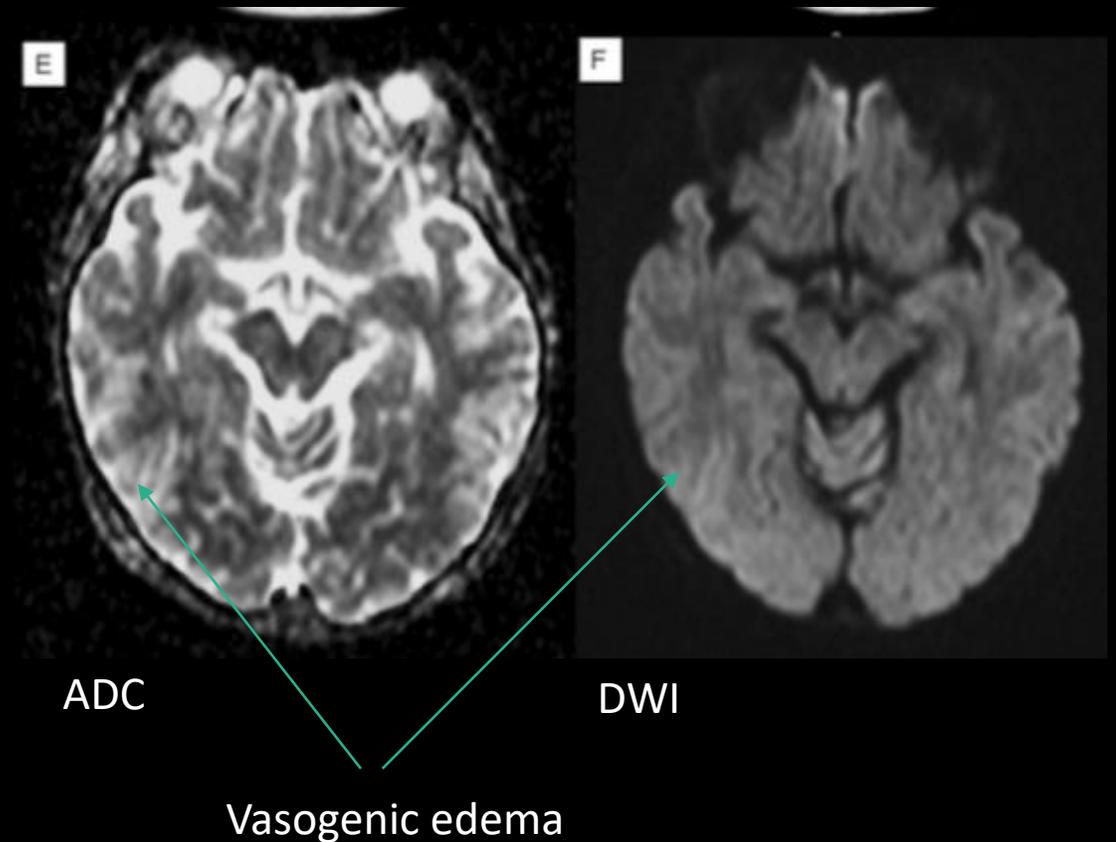
PRES: Radiographic findings

- DWI and ADC can help differentiate cytotoxic from vasogenic edema

Table 2. Characteristics of PRES on MRI.

Image conditions (MRI)	Vasogenic edema	Cytotoxic edema	PRES	Cerebral infarction (Acute stage)
FLAIR	↑	↑	↑	N, then ↑
DWI	N	↑	N	N, then ↑
ADC	↑	↓	↑	↓

N, normal; PRES, posterior reversible encephalopathy syndrome; ↑, hyperintense signal; ↓, hypointense signal.



Tetsuka and Ogawa (2019).

Discussion: Imaging Modalities

	Sensitivity/Specificity	Cost ³	Radiation/Contrast
MRI brain w/ and w/o contrast	FLAIR is most sensitive 100% sens in CRF pts ² Unknown specificity	\$3,054.00 Max \$5,091.00	No radiation exposure Contraindications for contrast use (e.g. renal failure)
CT head without contrast	Lower sensitivity (40-80% on 2 small studies) ¹⁻²	\$1,084.80 Max \$1,808.00	1.6-3.2 mSv (~8-16. mo.) ⁴

¹ Dandoy et al. (2016).

² Hu et al. (2017)

³ UNC Health Care Price List (9/12/21). www.unhealthcare.org/patients-families-visitors/billing-financial-assistance/chargemaster/.

⁴ RadiologyInfo.org (3/20/19). <https://www.radiologyinfo.org/en/info/safety-xray>

Discussion: Appropriateness of Imaging

- Non-contrast CT

Variant 1: Acute mental status change. Increased risk for intracranial bleeding (ie, anticoagulant use, coagulopathy), hypertensive emergency, or clinical suspicion for intracranial infection, mass, or elevated intracranial pressure. Initial imaging.

Procedure	Appropriateness Category	Relative Radiation Level
CT head without IV contrast	Usually Appropriate	⊕ ⊕ ⊕
MRI head without IV contrast	Usually Appropriate	○
MRI head without and with IV contrast	May Be Appropriate	○
CT head without and with IV contrast	May Be Appropriate	⊕ ⊕ ⊕
CT head with IV contrast	Usually Not Appropriate	⊕ ⊕ ⊕

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CT head without and with IV contrast	May Be Appropriate	⊕ ⊕ ⊕
CT head with IV contrast	Usually Not Appropriate	⊕ ⊕ ⊕

- MRI with and without contrast

Variant 4: Persistent or worsening mental status change despite clinical management of the suspected underlying cause (intoxication, medication-related, hypoglycemia, sepsis, etc) or acute change in mental status of unknown cause. Initial imaging.

Procedure	Appropriateness Category	Relative Radiation Level
MRI head without and with IV contrast	Usually Appropriate	○
MRI head without IV contrast	Usually Appropriate	○
CT head without IV contrast	Usually Appropriate	⊕ ⊕ ⊕
CT head without and with IV contrast	May Be Appropriate	⊕ ⊕ ⊕
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- MRI with and without contrast

Variant 4: Persistent or worsening mental status change despite clinical management of the suspected underlying cause (intoxication, medication-related, hypoglycemia, sepsis, etc) or acute change in mental status of unknown cause. Initial imaging.

“MRI may prove useful as a second-line test when occult pathology is suspected and the initial head CT is unrevealing because MRI’s higher sensitivity in detecting small infarcts, encephalitis, and subtle cases of SAH...

...Non-contrast MRIs...are usually sufficient in the assessment of intracranial complications related to hypertensive emergency, including PRES.”

Discussion: Appropriateness of Imaging

- MR venography without contrast for suspected dural venous sinus thrombosis

Variant 1:

Acute mental status change. Increased risk for intracranial bleeding (ie, anticoagulant use, coagulopathy), hypertensive emergency, or clinical suspicion for intracranial infection, mass, or elevated intracranial pressure. Initial imaging.

Procedure	Appropriateness Category	Relative Radiation Level
CT head without IV contrast	Usually Appropriate	⊕ ⊕ ⊕
MRI head without IV contrast	Usually Appropriate	○
MRI head without and with IV contrast	May Be Appropriate	○
CT head without and with IV contrast	May Be Appropriate	⊕ ⊕ ⊕
CT head with IV contrast	Usually Not Appropriate	⊕ ⊕ ⊕

Variant 6:

Suspected dural venous sinus thrombosis.

Radiologic Procedure	Rating	Comments	RRL*
MR venography head without and with IV contrast	9	Parenchymal imaging and vascular brain imaging with CT or MR should be considered. With contrast is preferred over MRV without contrast.	○
MR venography head without IV contrast	8	Parenchymal imaging and vascular brain imaging with CT or MR should be considered. Can be useful in the patient with a contraindication to contrast.	○

PRES: Management

- Mainly supportive care, close neurologic monitoring
 - Monitor for seizure
- Blood pressure management
 - Ca-channel blockers for vasospasm risk
 - Avoid acute drops in MAP
- Medication and risk factor review
 - Consider risk factors, non-adherence, medication list, illicit drugs

Takeaway: UNC Top Three

1. PRES is a clinical and radiographic diagnosis, to be considered in patients with neurologic changes and hypertension.
2. T2/FLAIR sequences show bilateral and symmetrically distributed vasogenic edema, classically in the parieto-occipital lobes.
3. Manage with supportive care and blood pressure control. Most cases of PRES are, per its name, reversible :)

References

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