RADY 401 Case Presentation

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September 13, 2021
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
Patchy, irregular bilateral hyperintensities in cortical and subcortical layers of the parietal and superior frontal lobes.

Central sulcus
MRI Brain at level 3rd ventricle

Non-contrast axial MRI – T2

Symmetric, bilateral cortical and subcortical signal in occipital lobes

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
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

Non-contrast axial MRI – FLAIR

- Symmetric, bilateral cortical and subcortical signal in occipital lobes
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 $\rightarrow$ CNS hyper-perfusion $\rightarrow$ autonomic dysregulation $\rightarrow$ BBB damage, vasogenic edema
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Hypertension $\rightarrow$ CNS hyper-perfusion $\rightarrow$ autonomic dysregulation $\rightarrow$ 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

Source: UpToDate, 2021.
PRES: Radiographic findings

- DWI and ADC can help differentiate cytotoxic from vasogenic edema

<table>
<thead>
<tr>
<th>Image conditions (MRI)</th>
<th>Vasogenic edema</th>
<th>Cytotoxic edema</th>
<th>PRES</th>
<th>Cerebral infarction (Acute stage)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FLAIR</td>
<td>↑</td>
<td>↑</td>
<td>↑</td>
<td>N, then ↑</td>
</tr>
<tr>
<td>DWI</td>
<td>N</td>
<td>↑</td>
<td>N</td>
<td>N, then ↑</td>
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<tr>
<td>ADC</td>
<td>↑</td>
<td>↓</td>
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<td>↓</td>
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</tbody>
</table>

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

Tetsuka and Ogawa (2019).
<table>
<thead>
<tr>
<th>Imaging Modality</th>
<th>Sensitivity/Specificity</th>
<th>Cost</th>
<th>Radiation/Contrast</th>
</tr>
</thead>
<tbody>
<tr>
<td>MRI brain w/ and w/o contrast</td>
<td>FLAIR is most sensitive 100% sens in CRF pts² Unknown specificity</td>
<td>$3,054.00 Max $5,091.00</td>
<td>No radiation exposure Contraindications for contrast use (e.g. renal failure)</td>
</tr>
<tr>
<td>CT head without contrast</td>
<td>Lower sensitivity 40-80% on 2 small studies¹²</td>
<td>$1,084.80 Max $1,808.00</td>
<td>1.6-3.2 mSv (~8-16. mo.)⁴</td>
</tr>
</tbody>
</table>

¹ Dandoy et al. (2016).  
² Hu et al. (2017)  
## Discussion: Appropriateness of Imaging

- Non-contrast CT

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Appropriateness Category</th>
<th>Relative Radiation Level</th>
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</thead>
<tbody>
<tr>
<td>CT head without IV contrast</td>
<td>Usually Appropriate</td>
<td>🌟🌟🌟</td>
</tr>
<tr>
<td>MRI head without IV contrast</td>
<td>Usually Appropriate</td>
<td>○</td>
</tr>
<tr>
<td>MRI head without and with IV contrast</td>
<td>May Be Appropriate</td>
<td>○</td>
</tr>
<tr>
<td>CT head without and with IV contrast</td>
<td>May Be Appropriate</td>
<td>🌟🌟</td>
</tr>
<tr>
<td>CT head with IV contrast</td>
<td>Usually Not Appropriate</td>
<td>🌟🌟🌟</td>
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Variant 1: Acute mental status change. Increased risk for intracranial bleeding (i.e., anticoagulant use, coagulopathy), hypertensive emergency, or clinical suspicion for intracranial infection, mass, or elevated intracranial pressure. Initial imaging.
Discussion: Appropriateness of Imaging

- Non-contrast CT
- MRI with and without contrast
Discussion: Appropriateness of Imaging

- Non-contrast CT

- MRI with and without contrast

“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
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


