Focused patient history and workup

• WW is a 50 year old F with a history of ulcerative colitis and recent hospitalization for a severe UC flair and active GI bleeding presenting with R side deficits. She took a nap earlier in the day, upon waking up had pain in her head and neck along with R sided weakness and numbness

• Initial non-contrast head CT at outside facility was done to evaluate for hemorrhage/stroke
• No history of coagulopathy or strokes.

• Vitals: BP 114/84 || HR 82 || O2 97% RA
• Neuro Exam: PEERL, EOMI, no facial asymmetry. 5/5 strength on L, 3/5 strength RU extremity, 2/5 strength RL extremity, 2+ reflexes bilaterally
• Initial labs overall normal with exception of Hgb of 8.5 2/2 recent GI bleed
List of imaging studies

• Non contrast head CT (regional hospital)
• MRI with and without contrast
• MRA Neck (Unremarkable)
• MRA Head (Unremarkable)
Initial Non-Contrast Head CT

Stroke window used

Findings?

- Hypoattenuation and loss of sulci/gyri in the R parietal lobe
- Area of edema
- CTA was unremarkable
- TPA held 2/2 active GI bleeding

Next step: Further evaluation with MRI
Findings?

- Increased T2 signal in L parietal lobe
- Loss of signal on Susceptibility Weighted Imaging (SWI)
  - Put together, this suggests blood products
  - SWI shows loss of signal in areas that interact/distort local magnetic field (blood, iron)

- Current and previous findings suggest a venous infarct
  - Atypical location for arterial infarct (spans >1 arterial zone)
  - Evolution of peripheral lobar hemorrhage
  - Cortical edema/hemorrhage

- Venous infarcts make up approx. 0.5-1% of strokes
  - Causes are venous thrombosis or external compression
T1 MRI

Superior Sagittal Sinus
Thrombus

Straight Sinus
Vein of Galan
Dilated R transverse sinus

L transverse sinus

Axial View

Empty Delta Sign

Superior Sagittal Sinus
Thrombus

Axial View

Sagittal View

Thrombus
Patient treatment or outcome

- **Dx: Cerebral Venous Thrombosis**
  - Typically seen in younger women (<50) with hypercoaguable states (Factor V, malignancy, hormone replacement, etc.)
  - Only 3% CVT attributed to IBD flairs
    - Pt had recent severe UC flair and was hospitalized
  - Typically present with new/unique persistent headache
  - Symptoms of increased Intracranial HTN (papilledema, nausea, visual disturbance)
  - Focal motor deficits
    - Encephalopathy

- Initially treated with Heparin despite ongoing GI/brain bleed.
- Continued to develop worsening brain edema, subarachnoid hemorrhage leading to midline shift and subfalcine herniation even after craniectomy
- Developed septic shock + multisystem organ failure
- Developed PEA and expired several days later
Choosing Imaging for CVT

- **ACR appropriateness criteria**

- If CVT suspected, MR or CT venogram is gold standard for diagnosis
  - MRV is superior if signs of deep cerebral vein involvement (encephalopathy) and can be done w/o contrast
  - CTV obtained rapidly and usually performs just as well as MRV...but consider contrast/radiation

- WW received non contrast head CT and MRI with/without contrast imaging (red stars)
What about CT?

- Non-Contrast Head CT can identify secondary signs of CVT
  - Delta sign: Hyperdensity of posterior superior sagittal sinus thrombus
  - Cord sign: Hyperdensity of obstructed sinus
  - Venous infarct
  - Diffuse cerebral edema
  - Subarachnoid hemorrhage
  - Direct visualization of thrombus only seen 33% of time

- Contrast enhanced CT can see empty delta sign
  - Contrast around a filling deficit

- MRV/CTV much better at detecting actual thrombus in veins
Sensitivity/specificities for imaging modalities

• Contrast + Non Contrast CT $^{3,5}$
  • Sensitivity 79%
  • Specificity 90%

• CT Venogram * $^{3,6}$
  • Sensitivity 100%
  • Specificity 100%

• MR Venogram $^3$
  • 86-97% Sensitivity
  • 52-100% Specificity

  • * Based on smaller studies

Cost and Radiation

- **CT with and without contrast**
  - 3.2 mSv
  - Equivalent to 13 mo. background radiation
  - $1,390.12 ± $686.13 without insurance
  - $681.60 ± $563.58 with insurance

- **CT Venogram**
  - 1.6 mSv
  - Equivalent to 6 mo. background radiation

- **MRI with and without contrast**
  - No radiation
  - May cost several thousand dollars

- **MR venogram**
  - No radiation
  - May cost several thousand dollars
UNC Top Three

1. Think about cerebral venous thrombosis if you have a younger patient with a new, unique headache and suspicion of a hypercoagulable state or if imaging suggests venous stroke.

2. MR or CT venograms are the gold standard for detecting cerebral venous thrombosis and are similar in successfully making the diagnosis. Consider imaging time, cost, radiation, and radiology consultation to help make the best choice.

3. If you order a non contrast head CT, secondary findings of CVT can appear such as venous infarction, delta sign, cortical edema with hemorrhage, dense cord sign.
References