RADY 401 Case Presentation

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Acknowledgement: Sallie Wilson, MD for help with IMPAX

Ed. John Lilly, MD
Patient A is a 92 y.o. male who presented at the geriatric clinic on 06/08 with worsening left-sided deficits, facial droop, inattention, sleepiness, and worsened stooped gait.

- PMHX notable for: Right parietal ischemic stroke with hemorrhagic conversion 12/2017; A-fib, Eliquis 2.5 mg BID; s/p pacemaker

- Physical Exam
  - Neuro: “Alert, but somewhat inattentive. Notable facial droop, cranial nerves otherwise intact. Seems to be neglecting the left side, able to ambulate, favors the right leg, has some trouble cooperating with instructions for strength testing, though in general seems to have full strength on individual muscle testing. Unable to fully supinate his left palm in trying to test for pronator drift.”
Head CT was ordered and patient was taken to the ED...

- Differential for current symptoms\(^1\)
  - Lyme disease
  - Otitis media
  - Ramsay Hunt
  - Sarcoidosis/Guillain-Barre
  - Tumor
  - Multiple sclerosis
  - Stroke/CVA
List of imaging studies

First (Read @ 3:35pm on 6/8):
- CT Head without contrast was ordered.

Second (Read @ 10:42pm on 6/8):
- MRI Brain without and with contrast

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### Table: Imaging Studies

<table>
<thead>
<tr>
<th>Radiologic Procedure</th>
<th>Rating</th>
<th>Comments</th>
<th>RRL*</th>
</tr>
</thead>
<tbody>
<tr>
<td>CT head without IV contrast</td>
<td>9</td>
<td>Parenchymal brain imaging and CT or MR vascular imaging of the head and neck should be considered. Noncontrast head CT is often obtained first to assess for hemorrhage or large infarct. MRI is more sensitive than CT for acute infarct.</td>
<td>3</td>
</tr>
<tr>
<td>MRI head without IV contrast</td>
<td>8</td>
<td>Parenchymal brain imaging and CT or MR vascular imaging of the head and neck should be considered. Can be useful if there is a contraindication to contrast. Noncontrast head CT is often obtained first to assess for hemorrhage or large infarct. MRI is more sensitive than CT for acute infarct.</td>
<td>0</td>
</tr>
<tr>
<td>MRI head without and with IV contrast</td>
<td>8</td>
<td>Noncontrast head CT is often obtained first to assess for hemorrhage or large infarct. MRI head with contrast can be helpful to determine the age of infarct and to evaluate for other causes of symptoms such as tumor or infection.</td>
<td>0</td>
</tr>
<tr>
<td>MRA head and neck without IV contrast</td>
<td>8</td>
<td>Can be obtained in conjunction with MRI head. Preferred MR vascular imaging of the head and neck includes noncontrast head MRA and contrast-enhanced neck MRA. Can be useful in patients with renal failure or contrast allergies.</td>
<td>0</td>
</tr>
<tr>
<td>MRA head and neck without and with IV contrast</td>
<td>8</td>
<td>Can be obtained in conjunction with MRI head. Preferred MR vascular imaging of the head and neck includes noncontrast head MRA and contrast-enhanced neck MRA.</td>
<td>0</td>
</tr>
<tr>
<td>CTA head and neck with IV contrast</td>
<td>8</td>
<td>CTA can be obtained after NCCT.</td>
<td>3</td>
</tr>
<tr>
<td>CT head perfusion with IV contrast</td>
<td>6</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>MRI head perfusion with IV contrast</td>
<td>5</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Arteriography cervicocerebral</td>
<td>5</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>CT head with IV contrast</td>
<td>3</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>CT head without and with IV contrast</td>
<td>3</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>US duplex Doppler carotid</td>
<td>2</td>
<td></td>
<td>2</td>
</tr>
</tbody>
</table>

*Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate

https://acsearch.acr.org/list
CT Head Without Contrast

Axial View
- Mass effect
- Midline shift
- 4.01 cm
- 5.06 cm

Coronal View
- Tumor
- Vasogenic edema
- A
MRI Brain Without and With Contrast

Diffusion-weighted (ADC)  T2 Axial  Coronal T1 With Contrast

Mildly heterogeneous

4.8 x 5.1 x 6 cm mass

5.96 cm
**Dx: Right temporoparietal meningioma**
- Meningiomas are intracranial tumors arising from the level of the meninges. They are typically benign and slow-growing with low potential to spread. Common symptoms include headache, weakness, paralysis, visual field reduction, and speech problems\(^2\).
- Typically, these tumors have well-defined borders and are definitively diagnosed via biopsy\(^3\).

**Tx: Right temporoparietal craniotomy for resection of meningioma**
- The goal of the craniotomy is to provide full access to the meningioma and complete removal\(^3\). The patient will then undergo long-term observation, which involves repeat MRIs. May potentially require radiation therapy dependent on surgical outcomes.
Persistent vasogenic edema
Decreased midline shift
No obvious tumor residual visualized
CT? MRI? All of the above?

<table>
<thead>
<tr>
<th>Clinical Condition: Focal Neurologic Deficit</th>
<th></th>
</tr>
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<td>Variant 4: Single or multiple focal neurologic deficits, subacute onset, progressive or fluctuating.</td>
<td></td>
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<td>MRI head without and with IV contrast</td>
<td>8</td>
<td></td>
<td>O</td>
</tr>
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<td>8</td>
<td></td>
<td>O</td>
</tr>
<tr>
<td>CT head without IV contrast</td>
<td>7</td>
<td>Acute screening.</td>
<td>★★★</td>
</tr>
<tr>
<td>MRA head and neck without and with IV contrast</td>
<td>6</td>
<td></td>
<td>O</td>
</tr>
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<td>6</td>
<td></td>
<td>O</td>
</tr>
<tr>
<td>CT head without and with IV contrast</td>
<td>6</td>
<td>If MRI is unavailable or contraindicated. Consider CT perfusion.</td>
<td>★★★</td>
</tr>
<tr>
<td>CTA head and neck with IV contrast</td>
<td>6</td>
<td>For suspected vascular abnormality.</td>
<td>★★★</td>
</tr>
<tr>
<td>CT head perfusion with IV contrast</td>
<td>5</td>
<td></td>
<td>★★★</td>
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<td>MRI head perfusion with IV contrast</td>
<td>5</td>
<td></td>
<td>★★★</td>
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<tr>
<td>CT head with IV contrast</td>
<td>4</td>
<td></td>
<td>★★★</td>
</tr>
<tr>
<td>MR spectroscopy head without IV contrast</td>
<td>4</td>
<td>For selected cases.</td>
<td>O</td>
</tr>
<tr>
<td>MRI functional (fMRI) head without IV contrast</td>
<td>3</td>
<td></td>
<td>O</td>
</tr>
<tr>
<td>Tc-99m HMPAO SPECT head</td>
<td>3</td>
<td>For problem solving in HIV/AIDS.</td>
<td>★★★★</td>
</tr>
<tr>
<td>Thallium-201 SPECT head</td>
<td>3</td>
<td>For problem solving in HIV/AIDS.</td>
<td>★★★★</td>
</tr>
<tr>
<td>Arteriography cervicocerebral</td>
<td>3</td>
<td>For problem solving.</td>
<td>★★★</td>
</tr>
<tr>
<td>FDG-PET/CT head</td>
<td>2</td>
<td></td>
<td>★★★★</td>
</tr>
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*Relative Radiation Level

- MRI technology is the **gold standard** for intracranial disorders, including tumors. But CTs can still be useful to detect most meningiomas⁴.
  - Consider pros and cons of CT vs. MRI.
    - Availability/urgency
    - Cost
    - Radiation exposure
    - Bone/tissue involvement

- MRI pulse sequences = radiofrequency pulses and gradients that result in images with a particular appearance.
  - Can be utilized to aid in diagnoses and understand etiologies
  - Common sequences include:
    - T₁, T₂, FLAIR, DIR, DWI (ADC, DTI), etc.

https://acsearch.acr.org/list
MRI Pulse Sequences and Tumors

- Standard brain MRI protocol can include T1, T2, Diffusion-weighted imaging (DWI), and fluid-attenuated inversion recovery (FLAIR) complemented by T1-W1 post gadolinium

- Diffusion-weighted imaging (DWI) maps molecular motion of water (Brownian motion), can be helpful for early stroke detection and tumors (i.e. grading of meningiomas)

- Many other modalities present that can assist neuroradiology in understanding the etiology of brain pathology.
CT and MRI for Diagnosing Meningiomas

- **CT**
  - Specificity: 95.0%
  - Sensitivity: 74.0%
  - PPV: 95.0%
  - NPV: 75.0%

- **MRI**
  - Specificity: 86.1%
  - Sensitivity: 96.9%
  - PPV: 78.1%
  - NPV: 98.2%

https://www.amberusa.com
Self-Pay⁹:
- CT w/o Contrast = $2,207
- MRI w/ and w/o Contrast = $6,490

Private Insurance (BCBSNC)¹⁰:
- CT w/o Contrast = $219 – $1,170
- MRI w/ and w/o Contrast = $932 – $3,159

https://go-chinsurance.com/
Both CT and MRI have roles in the diagnosis of brain tumors.

CT usually completed in the acute setting, followed by MRI to confirm.

CT Chest/Abdomen/Pelvis can help rule in/out mets.

Post op MRIs completed to detect surgical excision success.

Costs can be high, utilize ACS Appropriateness to determine risks.

Pt was discharged on June 16th, 2018 (8 days from first CT scan).
References