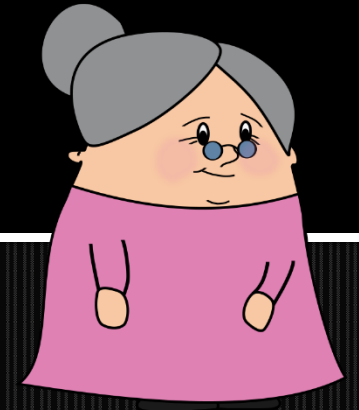


RADY 401 Case Presentation

Nga Nguyen April 2018

Ed. John Lilly, MD

Patient History



75 y/o woman presents to the ED April 9

Triage Note (8:22PM)

Patient stated having slurred speech about **1400 (2:00PM)** yesterday, patient reports rt chronic arm weakness

PMH

- Allergies (Rhinitis & Sinusitis)
- Bronchitis
- Lt Sided facial Palsy
- Never smoked
- Never consumed EtOH
- **Rt. Sided ear pain 12/20/2016**
- ENT Surgery (unsure of details)

Medications

- Azithromycin
- Hydrocodone-Chlorpheniramine
- Montelukast
- Neomycin-polymyxin-dexamethasone

Physical Exam

Neurologic: face mildly asymmetric. Cannot raise right eyebrow, tongue midline. Droop on right. PERRL. EOMI. Slurred speech. Normal shoulder shrug. Strength 4+ in right hand, left hand 5. No pronator drift. Strength 5/5 in lower extremities



What are the next diagnostic steps?

Next Dx Step?

- ACR Appropriateness Criteria: acsearch.acr.org
- Most appropriate study: Non-contrast CT Head

Variant 3:

New focal neurologic defect, fixed or worsening. Less than 6 hours. Suspected stroke.

Radiologic Procedure	Rating	Comments	RRL*
CT head without IV contrast	9	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.	☼☼☼
MRI head without IV contrast	8	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.	○
MRI head without and with IV contrast	8	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.	○
MRA head and neck without IV contrast	8	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.	○
MRA head and neck without and with IV contrast	8	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.	○
CTA head and neck with IV contrast	8	CTA can be obtained after NCCT.	☼☼☼
CT head perfusion with IV contrast	6		☼☼☼
MRI head perfusion with IV contrast	5		○
Arteriography cervicocerebral	5		☼☼☼
CT head with IV contrast	3		☼☼☼
CT head without and with IV contrast	3		☼☼☼
US duplex Doppler carotid	2		○

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

*Relative Radiation Level

Next Dx Step: Noncontrast Head CT

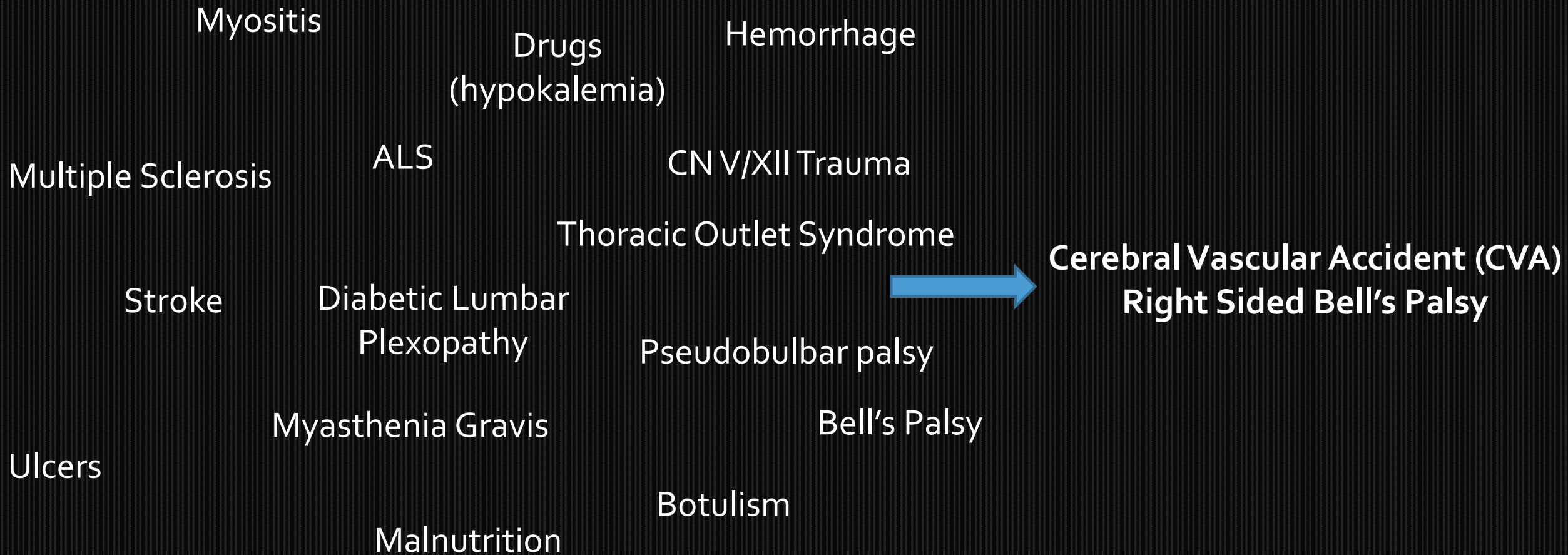
Non-contrast head CT (NCCT) is the study of choice because it will effectively **rule out hemorrhage**.

- Intracranial hemorrhage (ICH) is an **absolute contraindication** to tPA administration, the cornerstone of ischemic stroke treatment.
- Head CT may also demonstrate the ischemic stroke, but it is important to note that early strokes **may have no visible findings**.
- Contrast solution can **mask the findings of intracranial hemorrhage**. Inability to reliably rule out ICH can create the difficult dilemma of treating with tPA in the presence of possible ICH or missing the window to treat possible ischemic stroke. This can be avoided by ordering a NCCT first.

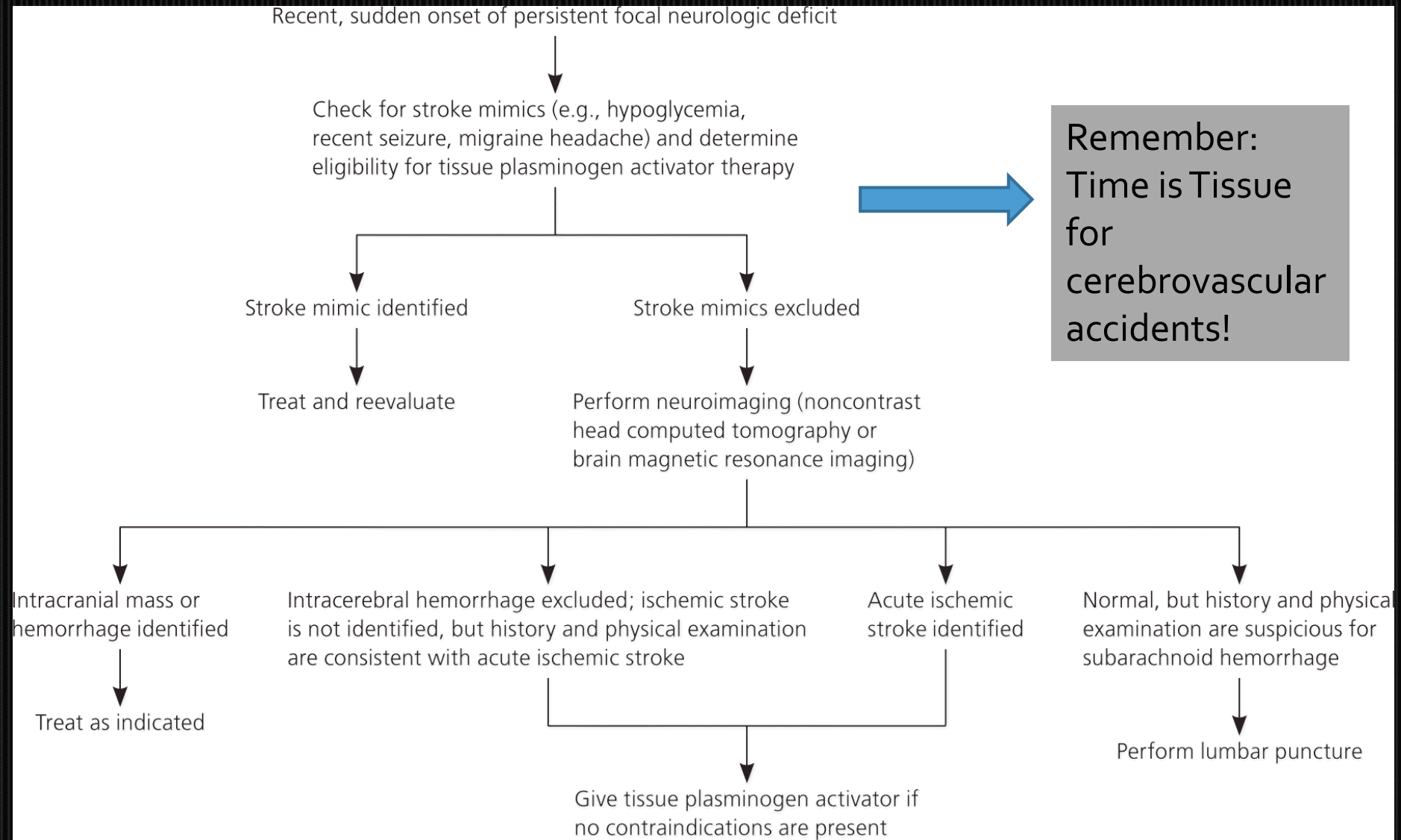
To demonstrate a stroke, contrast-enhanced head CT or MRI are the best choices. It may not be necessary to acutely demonstrate a stroke, and these should generally only be considered after NCCT has been performed.

To demonstrate other structural changes, MRI is excellent for visualizing brain parenchyma

Differential Diagnosis Symptoms: dysarthria, facial weakness, limb weakness



General Workup

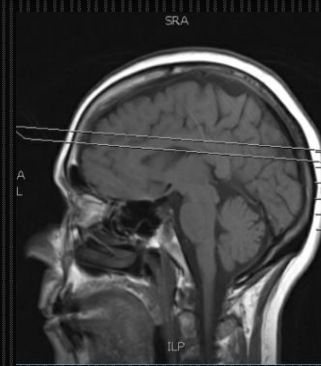


MUST WORK QUICKLY!

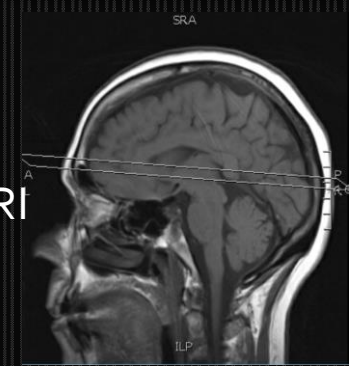
- Door-to-needle time, as defined by the American Heart Association, is the time from **initial stroke symptom presentation to tPA administration**
- **60 minutes**
- Includes transport, intake/ H&P, NCCT, blood glucose, ruling out mimickers, ordering tPA, delivering the drug to the patient's room, establishing IV access, and administering tPA.

List of Patient Imaging Studies

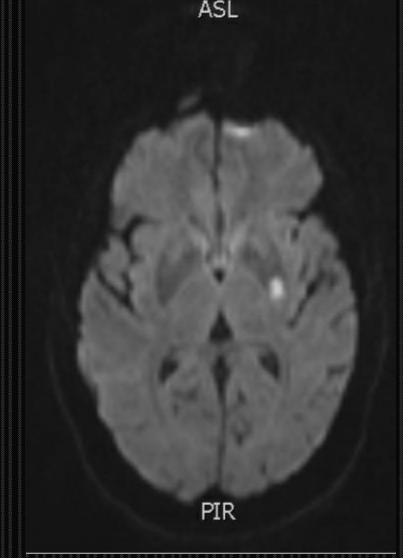
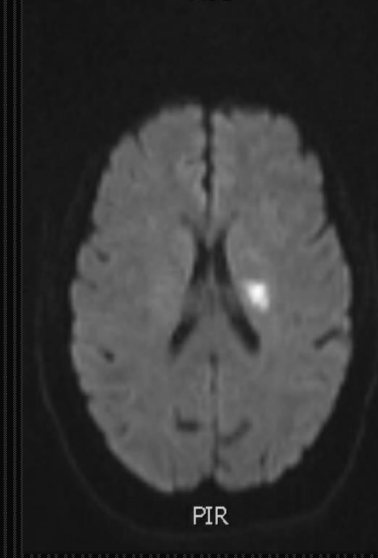
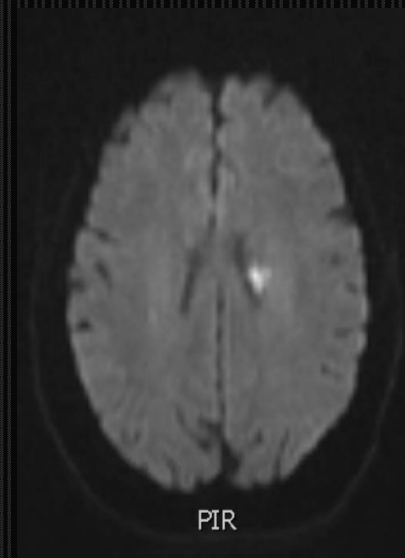
- CT w/o contrast
- MRI Head w/o contrast
- MRA Head w/o contrast
- CTA Neck w/o contrast



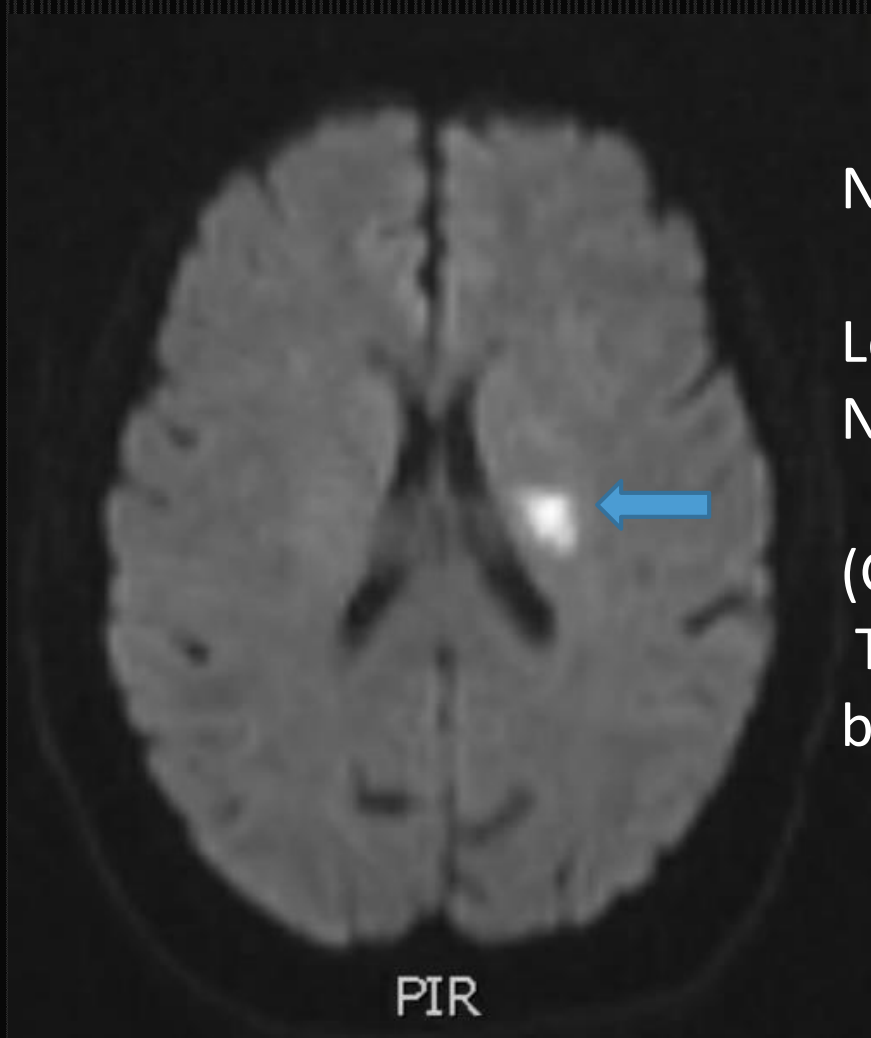
Non-contrast T1 MRI
Sagittal



Non-contrast MRI DWI
Transverse



MRI

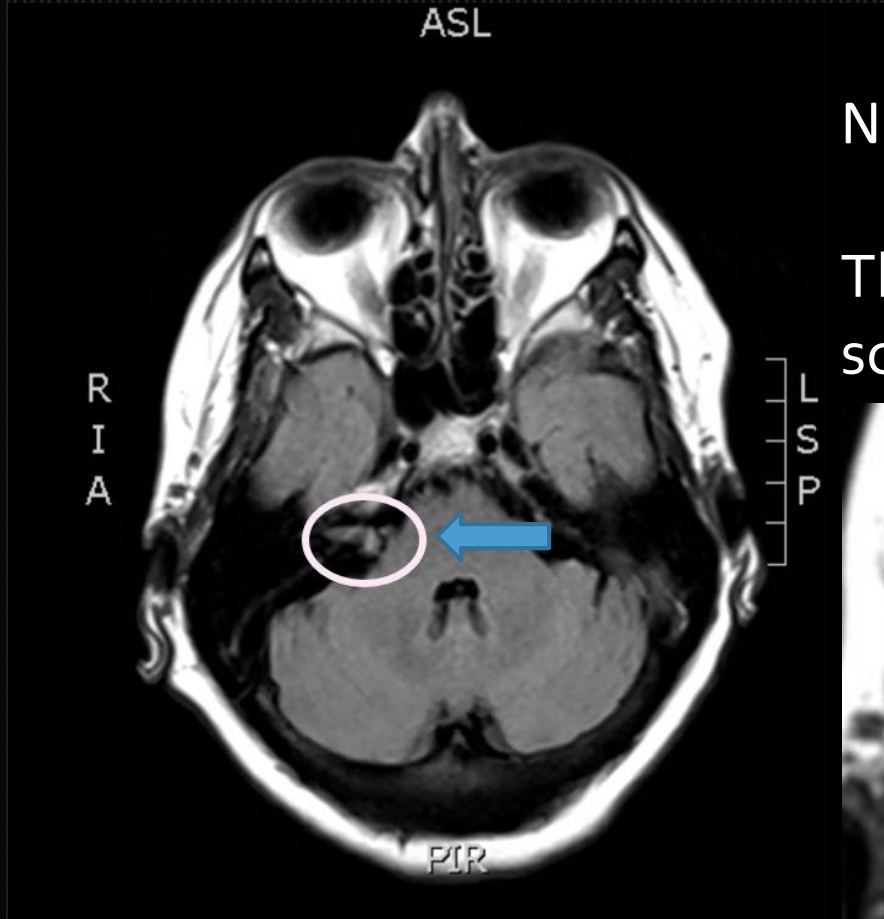


Noncontrast axial MRI diffusion weighted imaging (DWI)

Left posterior limb of the internal capsule acute infarct
No hemodynamically significant stenosis or aneurysm

(Grey matter is lighter, white matter is darker
T2 Diffusion weighted - Restricted diffusion shows up
bright in infarction, abscess, lymphoma, edema)

MRI



Noncontrast axial T1

There is a right internal auditory canal vestibular schwannoma 1.5 x 0.7 cm



Patient treatment and outcome

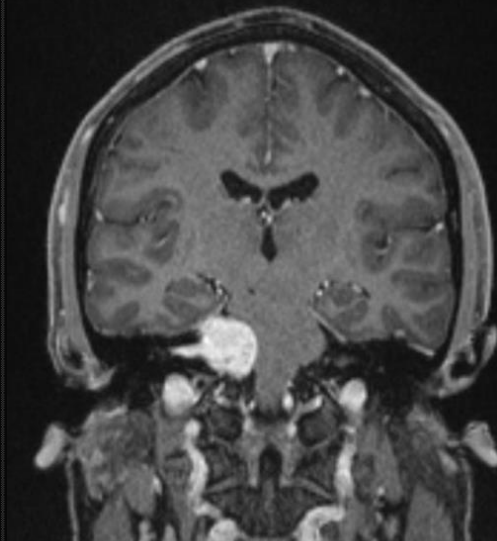
- At time of presentation, patient did not qualify for tPA (symptoms > 6 hours)¹⁰
- MRI Diagnoses made: small nonhemorrhagic infarct on left and vestibular schwannoma on right
- CTA Neck: unremarkable
- Treatment
 - Amlodipine
 - Atorvastatin
 - Aspirin
- Discharged in stable condition
- Post phone call
 - Set-up appt with Neurology for evaluation
 - ENT consult
 - Consider removal of schwannoma to relieve symptoms
 - Follow-up planning if surgery is not warranted

	Ref Range & Units	2d ago
Triglycerides	1 - 149 mg/dL	177 ▲
Cholesterol	100 - 199 mg/dL	322 ▲
HDL	40 - 59 mg/dL	62 ▲
LDL Calculated	60 - 99 mg/dL	225 ▲

Imaging discussion : MRI Acoustic Schwannoma

- The overall sensitivity of MRI to diagnose Acoustic Schwannoma were found, Sensitivity- 96%, Specificity- 88.2%, PPV-92.31%, NPV-93.75% and Accuracy 92.86%. Test is significant with $p < 0.0001$ level
- Regarding internal auditory canal tumors, the sensitivity of contrast-enhanced CT was 36% and MRI 100%, and for cerebellopontine angle tumors the sensitivity was 68% and 100%, respectively
- “Ice cream on cone” appearance⁴

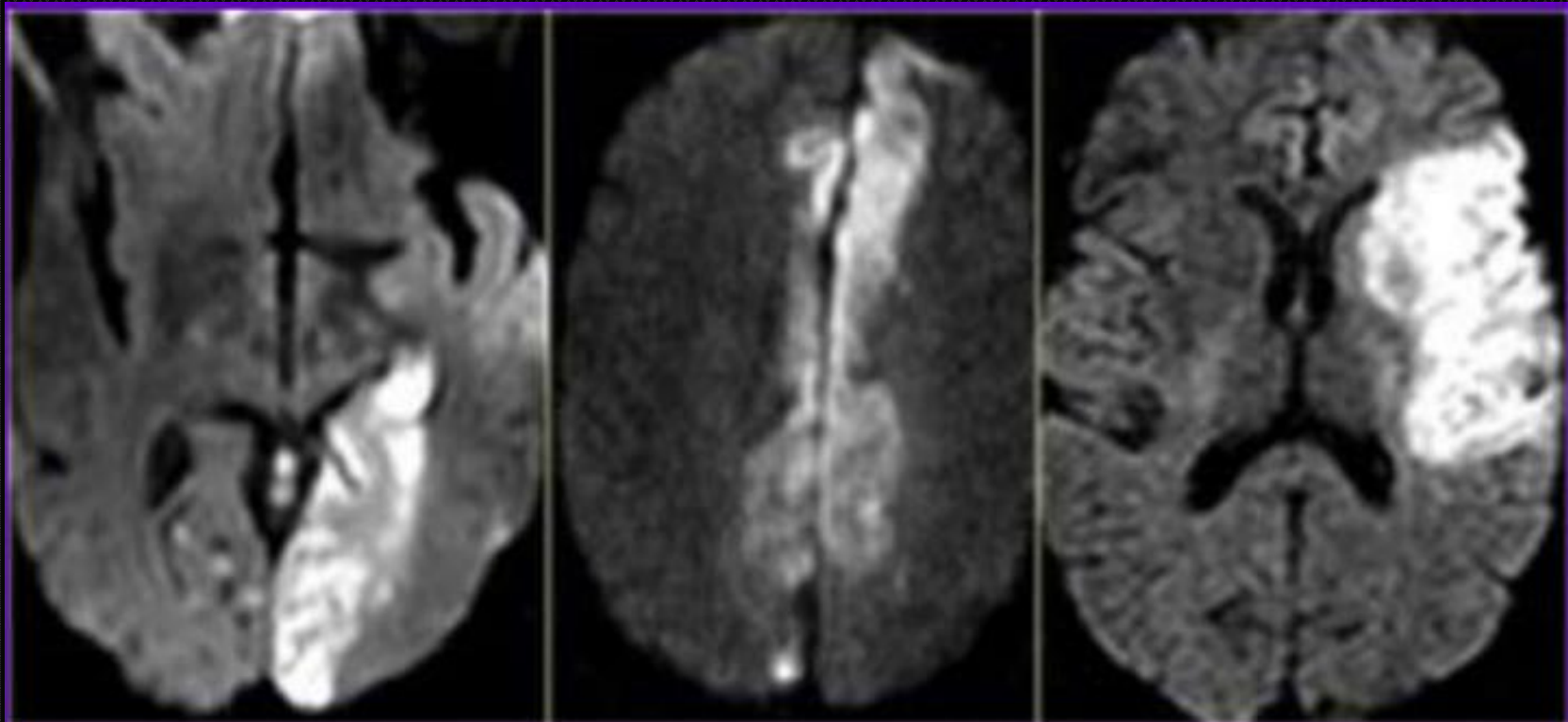
Coronal enhanced T1 MRI



Axial enhanced T1 MRI

Imaging discussion: MRI Stroke

- Diffusion weighted MRI proved to have a sensitivity of 94.4% and a specificity of 92.1%⁵



DWI in posterior, anterior and middle cerebral infarction

Cost of Patient Imaging Studies

- MRI Head w/o contrast: \$3919
- MRA Head w/o contrast: \$2963
- CTA Neck w/o contrast \$3420, 16 mSv (5.0 – 32)
- Total: ~\$10500

Prices base on nondiscounted University of Michigan prices
Radiation dose based on Harvard Health Publishing^{6,9}.

References

1. (2012). Sensorineural hearing loss: radiologic diagnosis. *Revista da Associação Médica Brasileira*, 58(5), 519-529. <https://dx.doi.org/10.1590/S0104-42302012000500005>
2. Acsearch.acr.org. (2018). *Appropriateness Criteria*. [online] Available at: <https://acsearch.acr.org/list> [Accessed 4 May 2018].
3. Acsearch.acr.org. (2018). *Appropriateness Criteria*. [online] Available at: <https://acsearch.acr.org/list> [Accessed 4 May 2018].
4. Drarunlnaik.com. (2018). *Dr. Arun L.Naik - Acoustic Tumor (Vestibular schwannoma)*. [online] Available at: http://drarunlnaik.com/acoustic_tumor/ [Accessed 4 May 2018].
5. Haque S, e. (2018). *Role of MRI in the evaluation of acoustic schwannoma and its comparison to histopathological findings*. - PubMed - NCBI. [online] Ncbi.nlm.nih.gov. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/22352228> [Accessed 4 May 2018].
6. Publishing, H. (2018). *Radiation risk from medical imaging - Harvard Health*. [online] Harvard Health. Available at: <https://www.health.harvard.edu/cancer/radiation-risk-from-medical-imaging> [Accessed 4 May 2018].
7. Radpod.org. (2018). *Radiology Picture of the Day » Archives » Vestibular Schwannoma*. [online] Available at: <http://www.radpod.org/2007/03/09/vestibular-schwannoma/> [Accessed 4 May 2018].
8. Slideshare.net. (2018). *Imaging in acute stroke*. [online] Available at: <https://www.slideshare.net/muhammadbinzulfiqar5/imaging-in-acute-stroke> [Accessed 4 May 2018].
9. Uofmhealth.org. (2018). *Uninsured - Imaging Pricing | Michigan Medicine*. [online] Available at: <https://www.uofmhealth.org/patient-visitor-guide/uninsured-imaging-pricing> [Accessed 4 May 2018].
10. Yew, K. and Cheng, E. (2018). *Diagnosis of Acute Stroke*. [online] Aafp.org. Available at: <https://www.aafp.org/afp/2015/0415/p528.html> [Accessed 4 May 2018].