When and How to Order Neuroimaging

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Disclosure

• No conflicts to disclose

• I will not discuss off label use of medications
How to order

Scan type
• MRI
• MRA
• MRV
• CT
• CTA
• CTV

Location
• Brain
• Orbit
• Neck

With or without contrast?
Should I order gadolinium contrast for MRI?

• Gadolinium increases sensitivity & specificity

• Contrast improves diagnosis

• Very few reasons for not giving Gd
Nephrogenic systemic fibrosis

- Indurated skin and nodules
  - 2-75 days after MRI
  - Fibrosis of all organs
- 8-87 yo
- 200 patients worldwide
- Renal insufficiency and gadolinium
Nephrogenic systemic fibrosis

- GFR < 30 mL/min

- No effective treatment
  - Oral and topical steroids
  - Photopheresis and plasmapheresis
  - Physical therapy

Grobner T, Kidney Int, 2007
What is Fat suppression?

• AKA – SPIR, STIR, fat saturation
• Fat is bright white on MRI
What do you see here?
What do you see here?

Polar bear in a snowstorm
Can you tell if this nerve is enhancing?
Should I order “fat suppression”?

- If you order orbital MR, you should order fat suppression
When to order a CT?

- Orbital trauma
- Calcification
- Orbital cellulitis
- Orbital lesions
- Urgent scan needed
- MRI contraindicated
- Aneurysm
- Venous thrombosis
When to order an MR?

- MR is superior to CT in almost every circumstance
Will any scanner do?
0.2 Tesla
Open permanent magnet
Poor resolution
Diffusion weighted imaging

1.0 Tesla
Open Superconducting magnet
Diffusion weighted imaging
Fat supression
MRA/MRV

Standard = 1.5T
70 cm bore, 1.5T
• “Trailer Trash”?  
  • 0.2 – 0.5 T

• 1.5 T mobile Magnet

• Technical expertise variable
How are scans ordered in your office?

- Doctor tells technician to get an MRI on Mrs. Jones
- The technician fills out request forms
- Same scan on everyone?
Easy mistakes to avoid in neuroimaging

4. MRI brain when you need ....
3. No gadolinium contrast
2. No fat suppression
#1: Poor communication with the radiologist
Elmalem VI, JNO 2011

- 8 pts - isolated 3rd secondary to PCOM aneurysm
- 8/8 “negative imaging”
  - review of outside MRA/CTA confirmed aneurysm
Elmalem VI, JNO 2011

- Poor history in 6/7
  - “Headache”
  - “Horner syndrome”
  - “Diplopia”

- No neuro-radiologist in 6/7
Communication

• Where to look
• Why you are looking
• Go look with them
• If you think they should have a lesion (progressively worse, new signs) then get a new imaging study or a new neuroradiologist
Illustrative Cases
24 year old woman

- Acute unilateral vision loss x 3 days
- LE = 20/200
- Pain with eye movement
- Central scotoma LE
- Left RAPD
Diagnosis? Image? When?

1. MRI – brain/orbits/+gad
2. MRI/MRA circle of Willis
3. MRI/MRV brain
4. MRI brain/neck
5. CT brain/orbits
6. CTA circle of Willis
7. no scan
• MRI brain
• MRI orbit
  – Fat suppression
• Gadolinium
• < 7 – 10 days from sx onset
61 year old man

- HTN & DM
- Acute painless LOV RE = 20/200
- Right RAPD
- Altitudinal field defect RE
- Swollen optic disc
Diagnosis? Image? When?

- 1. MRI – brain/orbits/+gad/FLAIR
- 2. MRI/MRA circle of Willis
- 3. MRI/MRV brain
- 4. MRI brain/neck
- 5. CT brain/orbits
- 6. CTA circle of Willis
- 7. no scan
Non-arteritic anterior ischemic optic neuropathy

- Rule out giant cell arteritis (ESR/CRP)
- No imaging necessary for NAION
61 year old woman

- HTN & DM
- Rubbed LE and sudden LOV OD – 20/200
- Right RAPD
- Altitudinal field defect RE
- Pale optic nerve RE
- Disc at risk LE
Diagnosis? Image? When?

1. MRI – brain/orbits/+gad/FLAIR
2. MRI/MRA circle of Willis
3. MRI/MRV brain
4. MRI brain/neck
5. CT brain/orbits
6. CTA circle of Willis
7. no scan
Beware of the A

- AION always has a swollen optic nerve
- Altitudinal defect not specific for AION
- Atrophy = compressive until proven otherwise
- Acute awareness ≠ not acute onset
52 year old woman with DV and ptosis x 1 week
Diagnosis? image? When?

1. MRI – brain/orbits/+gad/FLAIR
2. MRI/MRA circle of Willis
3. MRI/MRV brain
4. MRI brain/neck
5. CT brain/orbits
6. CTA circle of Willis
7. no scan
Case Five

- 14 y/o M
- Acute loss of vision LE
- Mild vitreous cells LE
- Left RAPD
- Optic disc edema with macular star
- RE normal
Diagnosis? Image? When?

1. MRI – brain/orbits/+gad/FLAIR
2. MRI/MRA circle of Willis
3. MRI/MRV brain
4. MRI brain/neck
5. CT brain/orbits
6. CTA circle of Willis
7. no scan
Neuroretinitis

- Bartonella henselae
- No imaging generally needed
24 year old woman

- Obese
- HA, N/V
- 20/20 OU
- Big blind spots OU
- Bilateral optic disc edema
Diagnosis? image? When?

1. MRI – brain/orbits/+gad/FLAIR
2. MRI/MRA circle of Willis
3. MRI/MRV brain
4. MRI brain/neck
5. CT brain/orbits
6. CTA circle of Willis
7. no scan
Pseudotumor cerebri is a diagnosis of exclusion

- Check BP
- MRI with MR venogram today
- LP with opening pressure
25 year old woman

- Intermittent blur/diplopia OS while reading for past 3 months, getting worse
- She can blink it away
- Eye has dull ache for 3 months
- Mom has MS
- 20/20 OU, normal exam
Diagnosis? Image? When?

1. MRI – brain/orbits/+gad/FLAIR
2. MRI/MRA circle of Willis
3. MRI/MRV brain
4. MRI brain/neck
5. CT brain/orbits
6. CTA circle of Willis
7. no scan
Dry eye syndrome

Sometimes this patient comes in with a scan!

Memekomik.club
59 year old woman

- Sudden painless vision loss 4 days ago, progressing rapidly
- Acuity – 20/20 OD, 20/400 OS
- RAPD OS
- No symptoms of GCA
- Normal optic discs OU
Diagnosis? Image? When?

1. MRI – brain/orbits/+gad/FLAIR
2. MRI/MRA circle of Willis
3. MRI/MRV brain
4. MRI brain/neck
5. CT brain/orbits
6. CTA circle of Willis
7. no scan
79 year old with painful ptosis LUL
Diagnosis? image? When?

- 1. MRI – brain/orbits/+gad/FLAIR
- 2. MRI/MRA circle of Willis
- 3. MRI/MRV brain
- 4. MRI brain/neck
- 5. CT brain/orbits
- 6. CTA circle of Willis
- 7. no scan
Head of the humerus

Patient was not laughing
Summary

• MR superior to CT for most ophthalmic conditions
• “Always” order contrast and fat suppression
• Be very specific in your request
• Neuroradiology fellowships are 2 years for a reason!
Thank you for your attention!