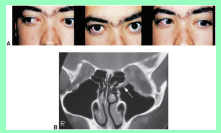
5.2.3. Neuroimaging in Neuro-Ophthalmology (III)

How to Order

- provide pertinent clinical information to the radiologist
  - expected location of the pathology
  - suspected differential diagnosis
- inappropriate images are often worse than no images at all
  - provide a false sense of security
  - create third-party–payer barriers to the required reimaging

What to Order

- MRI is usually more valuable than CT in detecting a lesion and narrowing the differential diagnosis
- suspected large-vessel disease
  - MRA
  - CTA
  - digital angiography
- imaging should be done of brain and orbits
  - orbital imaging provides details of the optic nerves and surrounding tissues that are often not detected with brain imaging alone
- pathology localized to the orbit
  - either CT or MRI can provide useful information
  - orbital fat produces excellent contrast with the other orbital components on CT and MRI
  - direct coronal images are useful in most orbital disorders
    - with MRI, direct coronal imaging is not a problem
    - CT may require specific positioning (eg, neck extension)



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- MRI of the orbit should be done with fat-saturation techniques

Negative Study Results

- when an imaging study fails to demonstrate expected pathology
  - first step is to reexamine the study parameters
    - speaking directly with the radiologist
    - ideally with a neuroradiologist
  - can provide the clinical information required to enhance the radiographic report's accuracy and usefulness
- were the appropriate studies performed, including required sequences and orientations?
- was the area of interest adequately imaged?

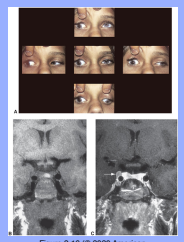

Figure 2-16 (© 2020 American Academy of Ophthalmology)

- are the study results really negative?

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When to Order

- Fundamental Concepts in Localization
  - first goal of neuro-ophthalmic evaluation is clinical localization of the lesion
  - See Table 2-5
- information acquired by imaging should
  - have some influence on patient management
  - provide a more accurate prognosis of the disease's natural history
  - not be available by simpler or less expensive means
- transient visual phenomena without residual deficit
  - most frequently related to large-vessel disease
  - require assessment of the vascular structures
- suspicion of a neoplastic mass lesion
  - order imaging study
- optic neuropathy that is not otherwise clinically explained (decreased vision)
  - imaging of the course of the optic nerve
- unilateral disc edema
  - anterior ischemic optic neuropathy (AION)
    - imaging not required in classic nonarteritic AION
  - papillitis (acute optic neuritis)
    - cerebral MRI
      - cerebral white matter signal abnormalities typical of multiple sclerosis
      - best demonstrated on
        - T2-weighted images
        - FLAIR images
    - specific orbital MRI sequences
      - postcontrast T1-weighted with fat saturation
      - T2-weighted
      - signal abnormalities within the affected optic nerve
    - CT scan has very limited value in demyelinating disease
  - intraorbital compression
- central visual function is affected without disc edema
- field defects respect the vertical midline
  - parachiasmal or retrochiasmal pathology
- bitemporal visual field defects
  - chiasm or parasellar region
    - pituitary adenoma with suprasellar extension

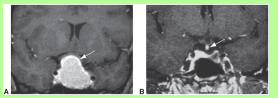

Figure 2-14 (© 2020 American Academy of Ophthalmology)

    - meningioma
    - craniopharyngioma
    - chiasmatic glioma
    - aneurysm
    - metastases
    - chordomas
    - dysgerminomas
    - lymphomas
    - histiocytoses
    - epidermoids
    - Rathke cleft cysts
    - granulomatous inflammatory disease
- homonymous visual field defects
  - retrochiasmal visual pathway
  - most commonly vascular in origin
  - should be imaged unless clearly associated with a prior stroke syndrome
- binocular double vision
  - both CT and MRI may provide necessary information regarding the extraocular muscles
    - MRI is somewhat more sensitive to changes associated with inflammation or infiltration
    - CT delineates the size of the extraocular muscles well
      - particularly on direct (ie, not reformatted) coronal images
  - acute onset of isolated ocular motor cranial nerve palsy
    - most likely due to microvascular ischemia
      - especially
        - age >50 year
        - when associated with a history of diabetes mellitus, hypertension, or vascular disease
    - emergent imaging may not be required
  - pupil involving CN III palsy
    - requires immediate imaging
  - simultaneously occurring ocular motor cranial nerve palsies
    - especially when the fifth nerve is involved
    - cavernous sinus location is most likely
- skew deviation
  - supranuclear lesion producing a vertical misalignment that does not fit the pattern of CN III or CN IV palsy
  - MRI of the posterior fossa should be obtained
- pain associated with ptosis and miosis (Horner syndrome)
  - carotid artery dissection should be suspected
    - MRI/MRA
    - CT/CTA
    - through the carotid artery
- conditions associated with negative imaging
  - AION (nonarteritic or arteritic)
  - isolated microvascular ischemic ocular motor cranial neuropathy
  - eye pain in a patient with normal findings on neuro-ophthalmic examination

Ophthalmology Mind Maps/Arman Mashayekhi, MD