Neuro-ophthalmology Curriculum Roadmap

Outline of lectures

- Neuro-op emergencies (1 hour)
  - To be presented in lecture style in the first two weeks of the academic year-BK
  - Learning objectives:

- Approach to anisocoria (2-hour)--BK
  - Anatomy presented by residents
  - Case-based discussion
  - Learning objectives:

- Approach to diplopia (2-hour)--SV
  - Anatomy presented by residents
  - Learning objectives:
    - Understand the pathophysiology, work up, treatment, and natural history of each of the conditions below.
    - Comitant
      - Decompensated phorias
      - Sagging eye/heavy eye syndrome
      - Congenital
        - CN palsies
        - Duane’s
        - Brown’s
    - Incomitant
      - Cranial nerve 3, 4 and 6 palsies
        - Anatomy and course of each CN
        - Functions of the CN3 subnuclei
        - Proper work up for CN3 palsy and alarm signs
          - Pupil-involving vs. pupil-sparing
          - Complete vs. partial/divisional
          - Aberrant regeneration- examples and significance
        - Acute vs. chronic CN4 palsy
        - Skew deviation vs. CN4 palsy
        - Differential for CN6 palsy in children vs. adults
    - Convergence spasm
    - Superior oblique myokymia
    - Internuclear ophthalmoplegia
    - Restrictive diplopia (trauma/TED/orbital myositis)
    - Variable
      - Ocular myasthenia gravis (Will also be covered in MAL topic)
      - Thyroid eye disease (Will also be covered in MAL topic)
      - Guillain Barre/Miller Fisher Syndrome
    - More than 1 CN involved
      - Cavernous sinus syndrome
      - Orbital syndrome
• How to distinguish between supranuclear versus nuclear/infranuclear palsies
• How to distinguish between restrictive versus paretic diplopia

Approach to vision loss (2-hour)--AC
  o Anatomy presented by residents
  o Case-based discussion
  o Should include discussion of visual field testing and interpretation
    o Can VF testing be combined with Glaucoma division who also presents on VF’s?
  o Learning objectives:

Neuro-radiology and Cranial nerve 7 (2-hour)--SV
  o Cranial nerve 7 anatomy presented by residents
  o Learning objectives:
    • CN7 (See anatomy handout and worksheet attached to be used as pre-work)
      • CN7 UMN and LMN pathways
      • Path of CN7 LMN from the genu around CN6 at facial colliculus →
        internal auditory meatus → geniculate ganglion→
          o External ear and ear canal, stapedius, lacrimal gland, salivary
tongue/taste, 5 nerve divisions that supply facial
muscles
    • Dysfunction of CN7
      o Presentation of UMN vs. LMN lesion
      o LMN lesions: Dysfunction of stapedius, cerebellopontine angle
        tumor, Bell’s palsy
      o Infectious/inflammatory lesions: Lyme, HSV, VZV, sarcoidosis,
        Melkersson-Rosenthal syndrome
    • Overactivity of CN7
      o Signs, symptoms, pathophysiology, and treatment of benign
        essential blepharospasm vs. hemifacial spasm vs. facial
        myokymia
  • Neuro-radiology
    • Utility and limitations of CT head/facial/sinus vs. MRI head/orbits
    • Utility and limitations of MRI orbits vs. MRI Brain
    • Utility and limitations of CTA head and neck vs. MRA head and neck vs.
carotid duplex US
    • MRI sequences
      o Utility and limitations of each sequence
        • T2, T2 w/FS, T1, T1+C w/FS
        • MPRAGE, STIR, CISS
        • ADC, DWI
    • Anatomy:
      o Circle of Willis vessels
      o Origin and path of CN 3, 4, 5, 6, 7
• Foramina/other: optic canal, superior orbital fissure, inferior orbital fissure, foramen rotundum, foramen ovale, clivus, carotid canal, clinoid
• Orbits: EOMs and optic nerves, optic nerve sheaths

• Diagnostics: Know the images to order, typical findings, and sequences to review for the following lesions
  o Stroke
  o TED, orbital myositis
  o Sarcoïdosis
  o Lymphoma
  o Multiple sclerosis, MOG, NMO
  o Meningioma
  o Optic pathway glioma
  o Craniopharyngioma, prolactinoma
  o C-C fistula
  o IIH

• Papilledema and Optic neuropathies (2-hour)--AC
  o View lecture
  o Case-based discussion
  o Learning objectives:

• Functional vision loss, headaches, eye pain & facial pain (2-hour)--BK
  o View KBD lecture online beforehand
  o Case-based discussion
  o Learning objectives:

• OKAP review (1-hour) - guest lecturer

10 Core topics to be mastered during rotation
Mutually assured learning topics to present at morning meeting.
1. TED and OMG
2. AION vs. ON
3. Hallucinations and higher order cortical function
4. IIH
5. Pituitary tumors
6. MS and mimickers
7. N-O of malignancy
8. Migraine and vertigo-when to image
9. Reading images during rotation (during morning report and in clinic)
Required clinical skills to be turned in
1. List of exam skills to be checked off by N-O faculty--below
2. List of “N-O conditions seen and diagnosed by resident”--below
3. Visual fields worksheet
4. Nystagmus worksheet
   a. Watch Bob Daroff videos on NOVEL

Directed reading/landmark trials
Several excellent review articles are listed in the ophthalmology residents’ Box.
Additional landmark trials to consider including
1. IIH treatment trial
2. Optic neuritis treatment trial (and follow up studies)
3. International optic nerve trauma study
4. Ischemic optic neuropathy decompression trial

Other resources available to residents to review on their own
Moran Core lectures
Novel.utah.edu
J. Lawton Smith podcasts
Review of N-O by Banderas
9. Skill list that must be checked off by neuro-ophthalmology faculty by the end of residency:
   put in portfolio

<table>
<thead>
<tr>
<th>SKILL</th>
<th>PERFORMED</th>
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<tbody>
<tr>
<td>Visual acuity testing</td>
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<td>Perform contrast sensitivity testing</td>
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<td>Confrontation visual fields and recording field</td>
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<td>Swinging flashlight test to determine if there is a relative afferent pupillary defect</td>
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<td>Measure RAPD correctly</td>
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<td>Perform and interpret 3 Goldmann Visual Fields</td>
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<td>Using cover/uncover testing document:</td>
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<td>III N Palsy</td>
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<td>IV N Palsy</td>
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<td>VI N Palsy</td>
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<td>Skew deviation</td>
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<td>Document convergence/divergence insufficiency</td>
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<td>Perform and interpret 1 Humphrey Visual Field</td>
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<td>Temporal artery biopsy</td>
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<td>Tensilon/Ice Test</td>
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<td>Eye movement examination (pursuit, saccades, VOR, VOR Suppression, nystagmus)</td>
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<td>Funduscopic examination of the optic disc: cup to disc ratio</td>
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<td>Grade papilledema correctly</td>
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<td>Recognize optic disc coloboma</td>
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<td>Recognize optic disc hypoplasia</td>
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<td>Perform and interpret OCT</td>
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<td>Watch Focal ERG performed</td>
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<td>Interpret full-field ERG</td>
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<td>Interpret Visual evoked potential (VEP)</td>
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<td>Cocaine test and interpretation</td>
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<td>Hydroxyamphetamine testing and interpretation</td>
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<tr>
<td>Pilocarpine testing and interpretation</td>
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### Pupil Conditions
- Adie’s tonic pupil
- Horner’s pupil
- Argyll Robertson pupil
- Diabetic tonic pupil

### Visual Fields
- Bitemporal visual field
- Homonymous hemianopia
- Homonymous quadrantanopia
- Arcuate defect
- Central scotoma
- Non-physiologic field loss

### Optic Nerve Conditions
- Optic neuritis
- AION—non-arteritic
- AION arteritic
- Optic perineuritis
- Optic nerve tumor:
  - Meningioma
  - Glioma
- Optic nerve drusen
- Coloboma
- Morning Glory disc
- Optic nerve hypoplasia

### Eye Movement Disorders
- Nystagmus
- Down beat nystagmus
- Upbeat nystagmus
- Convergence retraction nystagmus
- III Nerve Palsy
- IV Nerve Palsy
- VI nerve palsy
- Skew deviation
- Comitant deviation
- Convergence/Divergence insufficiency
- INO
- BINO
- One-and one-half syndrome
- Saccadic pursuit
- Hypometric Saccades
- Hypermetric Saccades
- Ocular flutter
- Opsoclonus

### Vertigo
- Benign positional vertigo

### Hallucinations
- Charles Bonnet