Anatomy and Physiology of Vision: The Visual Pathways

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ALSO: INTRODUCTION TO NEURO-OPHTHALMOLOGY

1. Afferent (Eye to brain)
2. Pupil (Afferent-Efferent Reflex)
3. Efferent (Eye Movements)
No actually, you do need to ask questions first, later, and again. Direct questions to your current hypothesis.
RETINA

- 9 Layers
- Anatomical layout (horizontal raphe)
- 3 “functional layers”
  - Photoreceptors (rods and cones)
  - Bipolar cells and “integrators”
  - Retinal ganglion cells
Lesions of the optic disc/nerve

- Visual field defect = arcuate/central
- Less than 50% loss no effect on:
  - VF
  - VA
  - Contrast
  - Color
  - Disc appearance
Why Visual Fields respect Horizontal Raphe: Cogan, trypsin digest
Optic Disc/Nerve

1.2 million axons
Visual Field defect = arcuate if disc
Visual Field defect = central if nerve
PARASYMPATHETIC PUPILLARY REFLEX

1. Optic nerve to both pretectum (PT)
2. PT to both Edinger-Westphal (EW)
3. EW with IIIrd N. to Ciliary Ganglion (CG)
4. CG via long ciliary nerves to pupil
SYMPATHETIC PUPILLARY REFLEX

1. Hypothalamus to T1
   C.S.C. Budge
2. Sympathetic trunk to
   S.C.G.
3. S.C.G. through cav. sinus to eye
Optic Chiasm

- 53% Decussation
- 12 mm above pituitary diaphragm
- Visual Fields usually bitemporal
Willinbrand’s knee
Horton’s artifact
Binasal VF defects
Optic Chiasm in Coronal Section
Other Pathways from the Retina to Primary Visual Nuclei
Parallel Processing

- LGN: Visual Acuity
- PT: Pupils
- SC: Eye movements
- Pulvinar: Eye movements
- Hypothalamus (3): Circadian rhythm
- AOS: Visual propriocept.
LGN:

6 layers

2 Magnocellular

4 Parvocellular

2,3,5 = Ipsilateral

This patient had absolute glaucoma on ipsilateral side
Stripe of Gennari = Striate Cortex = Occipital Visual Cortex (area 17 = V-1)
Table 7-1, Clinical Characteristics for Localization of Visual system Lesions

<table>
<thead>
<tr>
<th></th>
<th>Optic Nerve</th>
<th>Chiasm</th>
<th>Retrochiasmal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deficit</td>
<td>Monocular*</td>
<td>Binocular</td>
<td>Binocular</td>
</tr>
<tr>
<td>Acuity</td>
<td>Diminished</td>
<td>Variable</td>
<td>Normal</td>
</tr>
<tr>
<td>Pupil (light)</td>
<td>Sluggish</td>
<td>Variable</td>
<td>Normal</td>
</tr>
<tr>
<td>Field pattern</td>
<td>Central scotoma</td>
<td>Bitemporal hemianopia</td>
<td>Homonymous hemianopia</td>
</tr>
<tr>
<td>Optic disc</td>
<td>Variable pallor</td>
<td>Variable pallor</td>
<td>Normal</td>
</tr>
</tbody>
</table>

*single lesion.
Progressing VF defect from pituitary adenoma

Same for both eyes
OS Bow-tie atrophy R tract lesion
Left eye with right tract lesion causing loss of right half of retina and left VF loss.
OS Bow-tie atrophy R tract lesion
Central VFs Usually more revealing

- Tangent VF
- Amsler Grid
- Facial Amsler