

1. Understand the neuroanatomy of vision

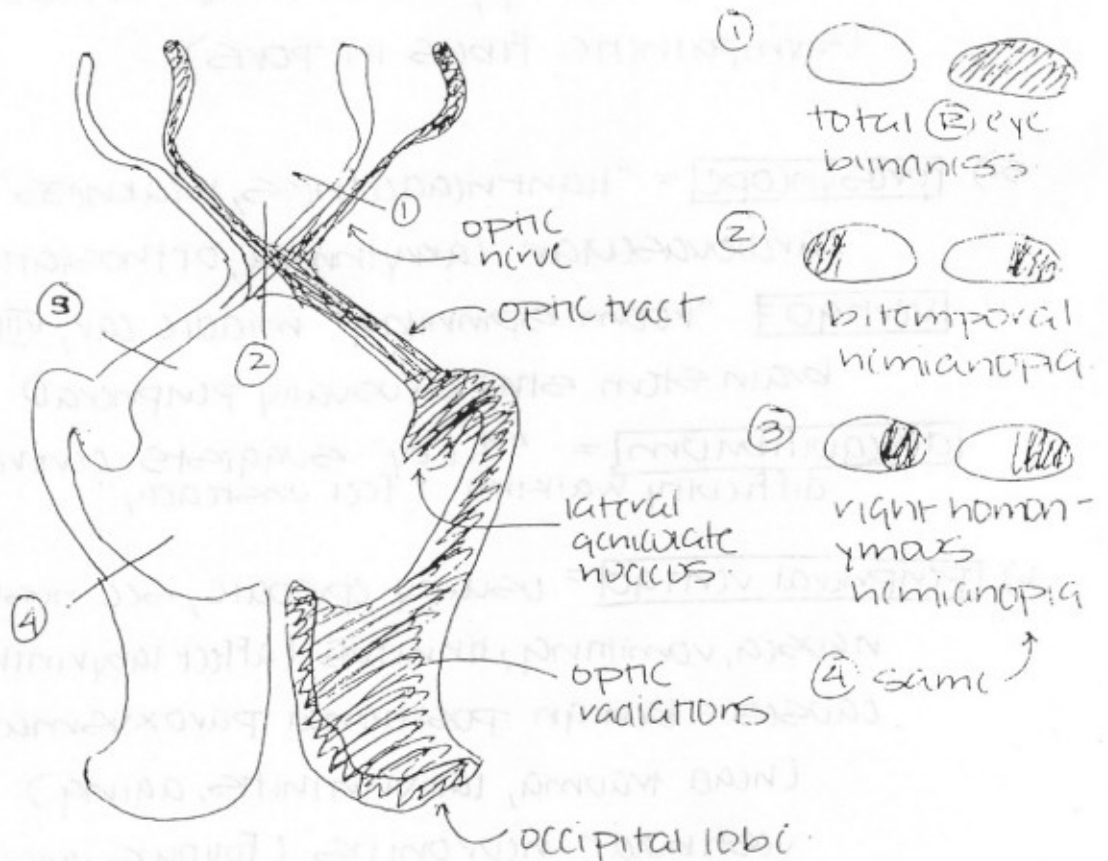
Light enters through retina by way of photoreceptors (rods and cones), these photoreceptors contain visual pigments that undergo isomerization that result in slow hyperpolarization of the photoreceptor cells. The photoreceptor cells interact downstream w/ bipolar cells that then connect to ganglion cells. The information obtained by the photoreceptor cells undergoes a great deal of processing before arriving at the ganglion cells (i.e. information about color and contrast). The axons of the ganglia cells from the entire retina converge at the optic disk. The axons exit the eye there and become myelinated and become the optic nerve. The optic nerve fibers proceed to the optic chiasm (at the anterior part of the sella turcica), where there is a partial decussation of the fibers. Fibers from the nasal halves of the retina cross, those from the temporal halves do not decussate. Fibers leaving the chiasm then continue as the optic tracts, which then proceed to the left and right lateral geniculate nuclei of the thalamus. Optic fibers terminate primarily at 3 locations: the lateral geniculate bodies (LOB), the superior colliculus and the pretectal area. The superior colliculus receives direct visual input from the optic tracts and also receives projections from the visual cortex. The superior colliculus then projects neurons to the pons (via tectopontine tract) and spinal cord (via tectospinal tract). The tectopontine tract relays visual information to the cerebellum, while the tectospinal tract mediates reflexive control of head and neck movements. The pretectal area is important for mediating the pupillary reflexes. The pretectal area receives input from the optic tract and then projects to the Edinger-Westphal nucleus bilaterally. This nucleus gives rise to the preganglionic parasympathetic neurons of CN III. The majority of fibers go to the LOB, which receives a topographic pattern representing the contralateral visual half-field. Within the LOB, the central visual field is represented more extensively than the peripheral visual field. The LOB consists of 6 layers of neurons, optic fibers from the ipsilateral eye distribute to layers 2, 3, and 5, while fibers from the contralateral eye distribute to layers 1, 4, and 6. From the LOB, fibers from the geniculocalcarine tract (aka optic radiations). Fibers from the lateral part of the LOB loop outward and pass through the temporal lobe before arriving at the occipital lobe. Fibers from the medial portion follow a more direct nonlooping route to the occipital lobe. The optic radiations arrive at the calcarine fissure in the occipital lobe. The cuneus gyrus (superior to the fissure) receives impulses from the upper quadrant of the ipsilateral side of both retinas. The lingual gyrus (inferior to fissure) receives impulses from lower quadrants of the retinas.

DISORDERS OF VISION HEARING AND BALANCE

1) Neuro anatomy of vision

(L)

(R)



2) LESIONS → SEE ABOVE

3) thiamine deficiency causes classic triad of ophthalmoplegia, ataxia, confusional state
 ocular abnormalities: nystagmus, abducens (VI) nerve palsy, horizontal or combined horizontal and vertical gaze palsy
 sometimes see anisocoria or sluggish pupils

4) Cerebellar/pontine angle lesion: ^{ALCOHOL, MENIENNE} hearing loss, dizziness

can cause horizontal nystagmus or eye deviation toward the lesion (CORTICOBULBAR FIBERS THAT REGULATE GAZE HAVE CROSSED)
6th nerve palsy, vertical nystagmus, ocular bobbing, CONSTRICTED PUPILS (sympathetic fibers in pons).

5) presyncope = "lightheadedness, weakness" usually cardiovascular (arrhythmia, orthostatic)

vertigo = "room spinning" middle ear, VIII nerve
brain stem stroke (usually peripheral)

dis-equilibrium = "dizzy" suggests central lesion
difficulty walking "feel unsteady"

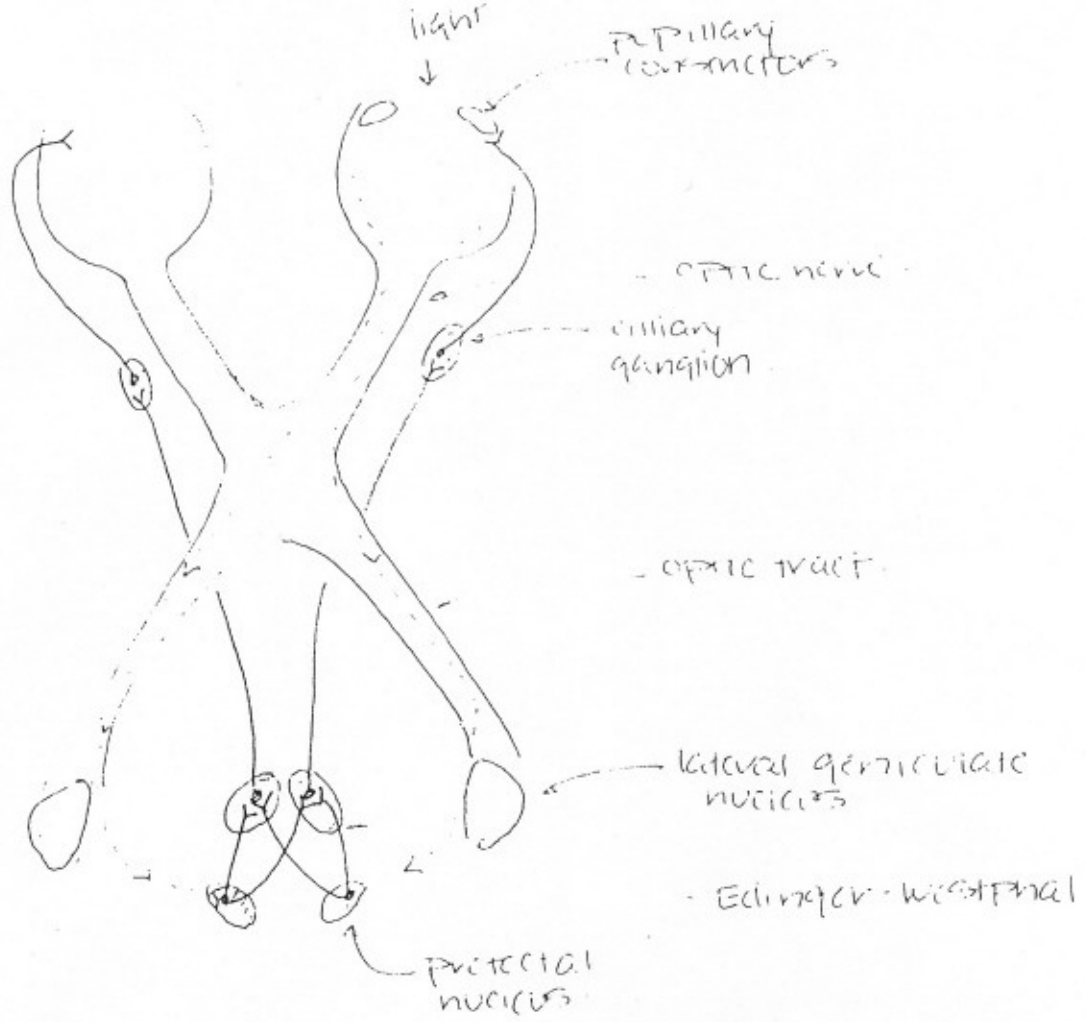
6) Peripheral vertigo = usually episodic, see nystagmus
nausea, vomiting, tinnitus (affect labyrinth, vestibule, CN VIII)
causes = benign positional paroxysmal vertigo (head trauma, labyrinthitis, aging)
vestibular neuronitis (follows viral illness)
Meniere's syndrome (↑ endolymph fluid pressure)

central vertigo brainstem, vestibular nuclei and (variously) cortex. usually lasts longer than peripheral vertigo, can see vertical nystagmus and may have focal neurological exam
causes = schwannoma, drug toxicity, scleritis, head injury, stroke

7) benign positional vertigo

usually lasts < 1min, nystagmus toward dysfunctional ear, sx can be reproduced in the office and are usually fatiguable (Rx = positional maneuver multiple times)
causes = head trauma, labyrinthitis, aging

8) pupillary light reflex:



light hits retina → signal travels through optic nerve ON BOTH SIDES → synapses in pretectal nucleus → sends contralateral and ipsilateral signal to Edinger-Westphal → synapse in ciliary ganglia → pupillary constrictors