Visual System

Chapter 8

Visual Cortex/Occipital Lobe

Frontal Lobe thinking, planning, & central executive functions; motor execution
Parietal Lobe somatosensory perception integration of visual & somatospatial information
Temporal Lobe language function and auditory perception involved in long term memory and emotion
Occipital Lobe visual perception and processing

Visual Pathway

1. photoreceptors in the retina, a layer of cells at the back of the eye
2. Information leaves the eye by way of the optic nerve
3. parallel processing of neurons at the optic chiasm (then called the optic tract)
4. optic tract wraps around the midbrain to get to the lateral geniculate nucleus (LGN), where the visual mask occurs
5. LGN sends fan out through the deep white matter of the brain as the optic radiation, which will ultimately reach the
6. primary visual cortex, at the back of the brain.
CN II - Optic Nerve

- Sensory - Vision
- Fibers come from retina, converge on optic disc, exit and join to become optic chiasma, some of which cross
- Terminate in visual cortex
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<th>Visual Field Loss and Associated Anatomic Sites</th>
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A lesion affecting the optic nerve of one eye will lead to loss of the entire visual field of the same eye. Thus a lesion at 1 would result in the following visual field defect (loss of sight represented by the area being blacked out):
A lesion here represents damage to the optic chiasm. Therefore, only the decussating fibres will be damaged, thus the fibres from the temporal fields of both eyes. The result is that the temporal field of vision of each eye is lost, and this is termed a 'bitemporal hemianopia'.

A lesion here affects only the fibres originating from the temporal retina of one eye. Therefore, a lesion here would result in loss of the left half of the visual field of the right eye. This defect is termed a 'left hemianopia of the right eye'.
This lesion affects either the optic radiation or the visual cortex itself. Because these fibers originate from both eyes, both visual fields will be compromised. The result is that the contralateral hemisphere of both visual fields is lost, and a lesion here would be termed a 'left homonymous hemianopia'.

**Emmetropia**

- requires no correction to allow for sharp, clear vision at all distances.
- Light directed to one sharp point that falls on the visual receptors in the retina on the back of the eye, called the fovea or macula.
- Lens bends to help focus on objects that are near and relaxes to focus on things far away.

![Emmetropia diagram](http://www.northwestern.edu/emmetropia/diagram)
Myopia

- can see things up close better than farther away.
- Light focused to one sharp point of light that falls in front of the fovea or macula within the retina. Therefore, when the light reaches the fovea where the visual receptors are, the light is a blur area instead of a sharp point resulting in blurry vision.
- To correct, a minus power lens is placed on or in front of the eye refocusing the light to the fovea resulting in clear vision for our patients.

Hyperopia

- sees things at a distance better than things near.
- light is focused to one sharp point of light that falls behind the fovea or macula within the retina. Although distance vision is often alright, reading and near work suffer because either there is not enough focusing ability left to see clearly at near, or the strain caused by the excessive focus demand causes headaches or double vision.
- Glasses or contact lenses are prescribed.
Presbyopia

- Patient loses the ability to focus on near objects around the age of 40
- Occurs because the lens in the eye becomes less flexible as the aging process progresses.
- Loss of flexibility results in an inability of the lens to change the point of focus from a distance object to a near object.
- Reading or bifocal glasses are prescribed to focus the light onto the macula or fovea while viewing a near object.

![Normal Vision vs Aging Eye Diagram](http://www.dндексаринг.info/images/presbyopia.jpg)

Astigmatism

- Irregular lens or cornea
- Light is not focused to one sharp point on the back of the eye. Instead, the light is focused to an area of points called a blur circle.
- The larger the size of the blur circle, the wider the range of points the light is focused to. As this blur circle increases in size, the amount of astigmatism a patient has and needs corrected is increased.
- Astigmatism is corrected by placing a lens on or in front of the eye that refocuses light to a single point on the fovea or macula providing clear vision.

![Astigmatism Diagram](http://www.northwestern.edu/healthpros/images/astigmatism.jpg)