

Disclosure

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- ✓ President, Carlton & Associates, LLC – Carlton and Associates, LLC provides communications and educational materials for the optical industry
- ✓ Contributing Editor for *Refractive Eyecare* magazine.
- ✓ Contributing Author Eyecare Business magazine.
- ✓ Communications Committee member OWA.
- ✓ Has been in the optical industry for 30 years with more than half of this time working in practices.
- ✓ *Vision Monday's* Most Influential Women Award in Optical 2005

Ocular Anatomy and Motility

- ◆ Course #214 Monterey Symposium
- ◆ Jenean Carlton BA, ABOC, NCLC

Ocular Anatomy Overview

The Human Vision System

- ✓ The eye is an amazing organ that works like a camera.
- ✓ Think of the cornea and crystalline lens as the lenses of a camera, the iris as the shutter, and the retina as the photographic film.

The Human Vision System

Vision takes place in the occipital lobe of the brain

✓ The brain can be thought of as the development center because it converts electrical signals from the retina into vision.

Lids and Lacrimal System

The tear film has 3 layers:



- Outer:** the lipid layer (meibomian glands in lids) is the oil layer.
- Middle:** the aqueous layer (lacrimal glands) is mainly water and provides oxygen and nutrients.
- Inner:** the mucin layer (goblet cells in conjunctiva) helps the tears adhere to the cornea. It is the mucus layer.

Dry Eye Syndrome







Lid Disorders

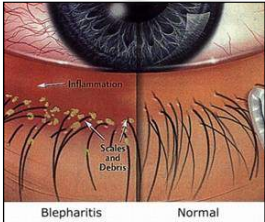
Ectropion= Out



Entropion= In

Ptosis- a drooping of the lid. Lids can have other problems too like turning out, in.

Lids Disorders




Blepharitis is a chronic inflammation- not an infection.

Treatments are lid scrubs, warm compresses, antibiotics and anti-inflammatories.


Image source: <http://www.bascomptommetry.com/eyelidorders.html>

Lid Disorders




Hordeolum (stye) - acute inflammation of a sebaceous gland.

Lid Disorders




Chalazion-Chronic inflammation of a meibomian gland - not an infection. Results in blockage of the gland. The first symptoms resemble those of styles.


Conjunctiva and Sclera Disorders




Subconjunctival hemorrhage - result of a broken blood vessel. Spontaneous - benign. Traumatic - ruptured globe until proven otherwise.




Conjunctiva and Sclera Disorders Conjunctivitis – “pink eye”



Viral = clear discharge, contagious



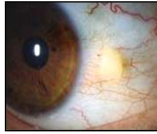
Allergic = giant papillary, itch




Bacterial = green/yellow discharge, antibiotics

Conjunctiva and Sclera Disorders

Pinguecula - elevated growth of the conjunctiva.



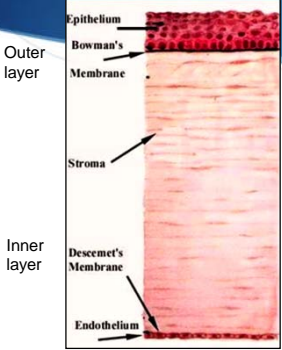
Pterygium - a membrane that grows across the cornea



Both caused by excessive UV exposure, and dusty, windy environments.

Image: <http://www.pterygium.us/images/pinguecula.jpg>

Cornea- 5 Layers

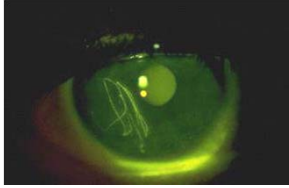


The cornea is the window of the eye and has five layers.

The cornea has 45 diopters of power and is avascular.


Corneal Disorders

Abrasions- This could be an abrasion from a foreign body caught in the upper lid.



Corneal Disorders

- ✓ Foreign Bodies
- ✓ Symptoms and removal



Corneal Disorders

Corneal Ulcer is an infection developed after a break of the epithelium layer.


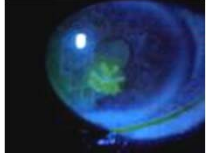
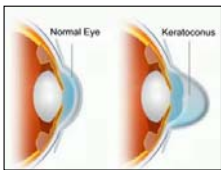



Image: opt.pacificu.edu

Corneal Disorders

Keratoconus- progressive thinning of the central cornea.



Normal Eye Keratoconus



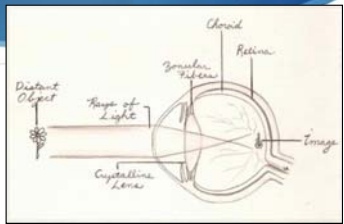


Image 1: <http://www.eyecorx.com/patient/article.asp?itemtype=publicarticle&itemid=CADC1677B4957B1807E1024FBBE0ED36>
Image 2: http://commons.wikimedia.org/wiki/Image:Keratoconus_eye.jpg

Pupil and Iris







The **iris** controls the size of the pupil and light passing through the eye.

Crystalline Lens Accommodation

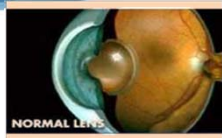
Near objects




Far objects



Cataract



NORMAL LENS



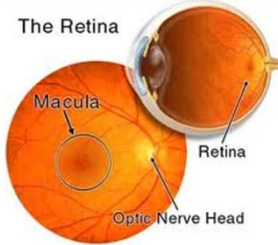
CLOUDY LENS

Presbyopia – loss of focusing ability with age

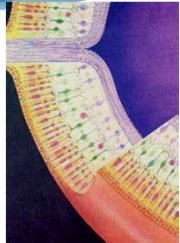
Retina

✓ The retina has **photoreceptor cells called rods and cones.**

The Retina

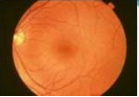


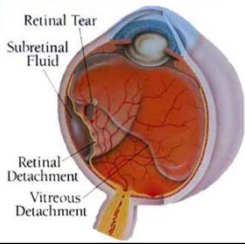
Macula Retina Optic Nerve Head



Retinal Problems

Normal fundus





Retinal Tear
Subretinal Fluid

Retinal detachment

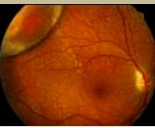
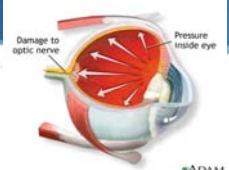
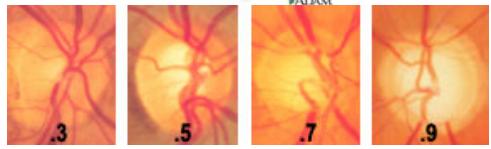


Image: <http://www.houstonretina.com/tear.html>

Optic Nerve Problems - Glaucoma



Damage to optic nerve Pressure inside eye



How the Eye Works

1) Light enters the eye through the _____.

The diagram shows a cross-section of the eye. Light rays from a 'Distant Object' enter through the 'Cornea' and pass through the 'Crystalline Lens'. The rays converge and focus on the 'Retina' at the back of the eye, forming an 'Image'. Other labeled parts include the 'Choroid' and 'Zonular Fibers'.

How the Eye Works

2) Light travels through the _____ and is focused by the _____.

The diagram is titled 'Anatomy of the Eye' and shows a cross-section of the eye with the following labels: Cornea, Iris, Pupil, Crystalline Lens, Vitreous chamber, Retina, Optic nerve, Fovea (center of the macula), Central retinal artery & vein, and Area of the optic disk. The Choroid is also labeled at the top.

The _____ is the colored **muscular ring** that surrounds the _____ and functions **like a camera shutter**.

How the Eye Works

3) Light exits the _____ and travels through a jelly-like substance in the middle of the eye. Images are focused onto the _____.

The diagram is identical to the one in the first slide, showing light rays from a 'Distant Object' entering through the 'Cornea', passing through the 'Crystalline Lens', and focusing on the 'Retina' to form an 'Image'. Labels include 'Choroid', 'Zonular Fibers', and 'Retina'.

How the Eye Works

5) Signals travel from the retina to the brain through the _____. The _____ of the brain then translates **light into vision**.

The diagram shows a profile of a human head with the brain highlighted in green. The optic nerves are shown connecting the eyes to the brain.

Vision in humans takes place in the _____ - not the eye.

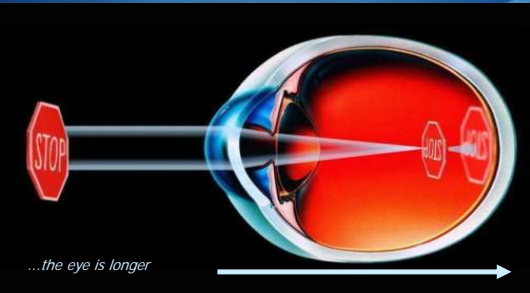
Rapid Fire Review

The diagram shows a cross-section of the eye with eight numbered boxes for labeling: 1. (Iris), 2. (Ciliary muscles), 3. (Choroid), 4. (Vitreous body), 5. (Retina), 6. (Optic nerve), 7. (Cornea), and 8. (Pupil).

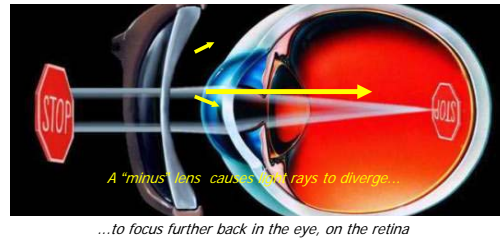
Normal Eye and Refraction

The diagram shows a cross-section of an eye. A yellow arrow points from a 'STOP' sign (distant object) through the 'Cornea' and 'Lens' to focus on the 'Retina'. Text labels include: 'Through Cornea', 'Light travels from distant object', and 'To the pupils or Retina'.

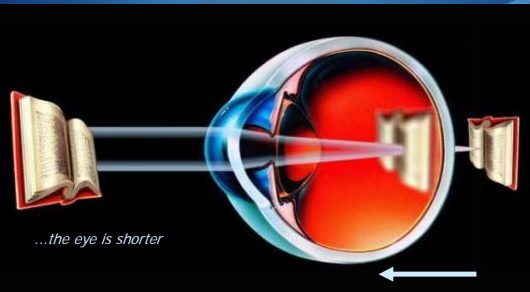
Myopia- Nearsighted Eye



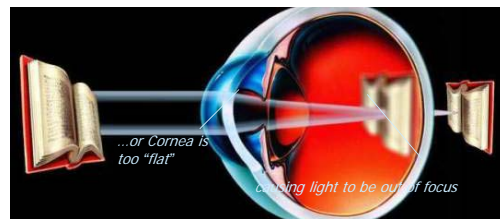
Spectacle Correction of Myopia



Hyperopic- Farsighted Eye

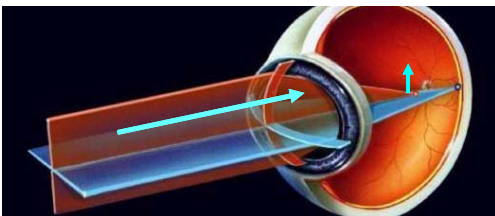


Hyperopic- Farsighted Eye



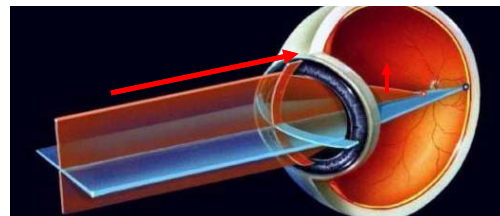
Astigmatism

Astigmatism - In one plane, light focuses on retina



Astigmatism

...but does not in another plane



Astigmatism

Causing light in both planes to focus on the retina

Presbyopia

Normally, when a close object is viewed...

Presbyopia

...to focus light on the retina

Presbyopia

With Presbyopia, the lens will not sufficiently reshape...

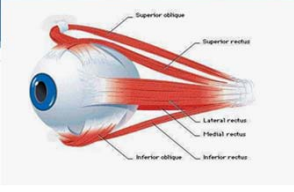
Presbyopia

...and glasses may be required for close viewing

Ocular Motility: the movement of our eyes to place images on the fovea of each eye.

Ocular Motility

- ◆ Binocular Vision
- ◆ Fixation
- ◆ Extraocular Muscles



- ◆ Eyes that move together in perfect harmony have **stereo** vision.

Ocular Motility

- ◆ Convergence
- ◆ Divergence

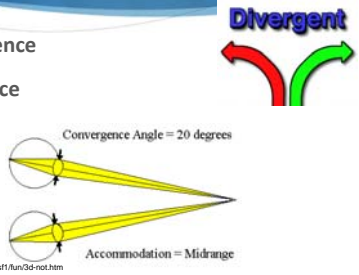
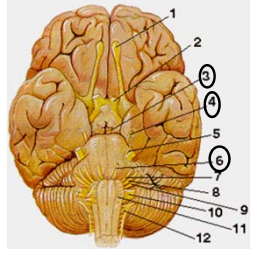


Image source: <http://www.ebicom.net/~rsf1/AunGd-not.htm>

Ocular Motility

3 Cranial Nerves control ocular movement

- ✓ CNIII- Oculomotor Nerve
- ✓ CN IV-Trochlear Nerve
- ✓ CN VI- Abducens Nerve



Cranial Nerves

Image source: http://library.thinkquest.org/11965/html/cyber-anatomy_ner692.html

Ocular Motility

3LR5O

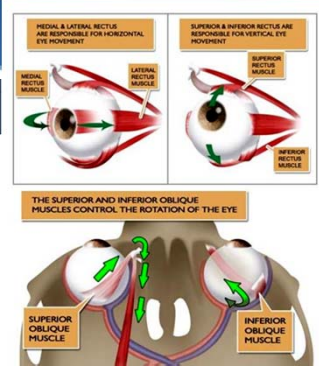


Image source: <http://www.uniteforaught.org/course/eye/eyemuscle3.jpg>

Binocular Vision

Binocular Vision-
A single image is gained by the blending of retinal signals from both eyes.

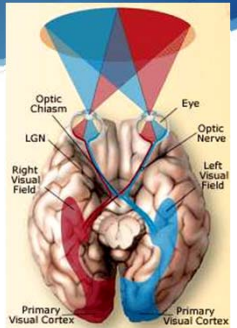


Image source: http://www.nlm.nih.gov/senses/popups/images/b410_1p.gif

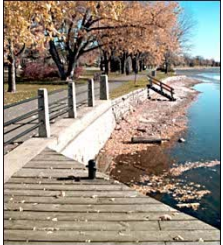
Binocular Vision

Depth Perception

- ◆ Allows us to travel about safely in our world.
- ◆ Without it our ability to judge distances or estimate the size of objects is limited.
- ◆ However, everyone - even monocular patients, have some level of depth perception.

Ocular Motility

- ◆ **Monocular patients estimate depth perception**
 - ◆ Magnification
 - ◆ Parallel lines
 - ◆ Shadows



Ocular Motility problems

- ◆ **Diplopia is double vision or 2 images.**
- ◆ **Monocular or binocular?**
- ◆ **Strabismus is a misalignment of the eyes.**




Image source: <http://www.honda-tech.com/zerofthead75d-1246218&postid=16525201>

Strabismus

Strabismus:

Failure of the two eyes to simultaneously direct their gaze at the same object due to an imbalance in the activity of the EOM's.

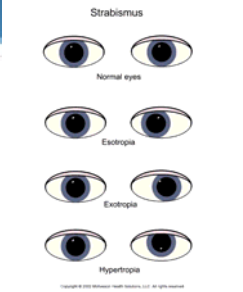


Image source: http://www.fairview.org/healthlibrary/content/rea_strabism_art.htm

Strabismus

Strabismus can be subtle or obvious, intermittent or constant.


- ◆ **It can affect one eye only or shift between the eyes.**
- ◆ **Usually presents early in life.**
- ◆ **If left untreated strabismus can result in the brain suppressing the image from one eye, this is called amblyopia.**

Strabismus

- ◆ **Amblyopia:**
 - ◆ Loss of vision due to muscle imbalance, anisometropia, or cataract.
 - ◆ Sometimes referred to as “lazy eye”.
 - ◆ Can occur in children up to teenage years.
 - ◆ The amblyopic eye is the weaker eye.

Diagnosing Strabismus

Cover Test

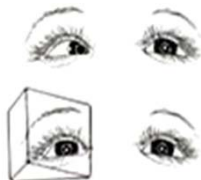


http://www.ssc.education.ed.ac.uk/courses/Pictures/skill15.jpg

Diagnosing Strabismus

◆ **Krimsky's Test**

✓ The strength of the prism required to center the corneal reflection in the eye with strabismus is equal to the amount of _____.




Diagnosing Strabismus

Hirschberg Reflex Test

◆ A screening test for the recognition of strabismus is the Hirschberg Reflex test. Light reflexes _____ in the same place for each eye.

OD: Note that light reflex falls on center of pupil.



OS: Light reflex falls on temporal margin of pupil.

Image source: <http://eyelink.med.utoronto.ca/Lectures04-05/Paediatric/03Strabismus.htm>

Strabismus Treatment

Strabismus Treatment:

- ✓ 1. Prism
- ✓ 2. Patching/Atropine drops
- ✓ 3. Vision Training/Orthoptics
- ✓ 4. Botox injections
- ✓ 5. Surgery

Strabismus Treatment

◆ Prisms displace images towards the _____ of the prism.

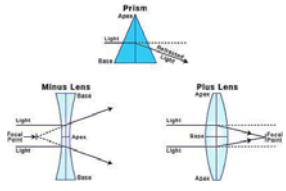


Image source: <http://science.howstuffworks.com/lens3.htm>

Strabismus Treatment

Patching the _____ forces the brain to use the problem eye.



Patching = occlusion.
What about drops?

Image source: <http://eyelink.med.utoronto.ca/Lectures04-05/Paediatric/03Strabismus.htm>

Strabismus Treatment

◆ **Botox:**

◆ a toxin developed from *Clostridium botulinium*, a common _____.

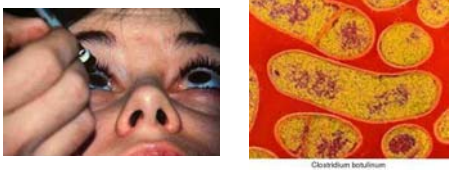
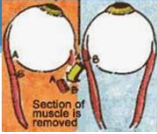


Image source: <http://www.ophthalmic.hyperguides.com/tutorials/pediatric/botulinum/tuto04.asp>

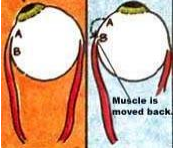
Strabismus Treatment

- ◆ Strabismus surgery is done to straighten the eye. With resection _____.



Resection

- ◆ If the muscle is too strong it is made weak by _____.



Recession

Image source: <http://www.myeeyeworld.com/files/squint.htm>

Rapid Fire Review

- ✓ Eyes that don't move perfectly together don't _____.
- ✓ Binocular vision is _____.
- ✓ What is amblyopia and what causes it?
- ✓ Horizontal movements are made by these 2 muscles _____.

Rapid Fire Review

- ✓ Diplopia is _____.
- ✓ Strabismus is _____.
- ✓ Occluding the good eye forces _____.
- ✓ There are 5 methods of treating strabismus. They are _____.

Thank You!!

- ◆ Please contact me: jeneancarlton@bellsouth.net