Disclosure

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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

- 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

What causes dry eyes?

Treatments

Lid Disorders

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

Lid Disorders

Blepharitis

- a chronic inflammation - not an infection.

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

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

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 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.


Pupil and Iris

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

Crystalline Lens

Accommodation

Near objects

Far objects

Presbyopia—loss of focusing ability with age

Retina

The retina has photoreceptor cells called rods and cones.

Optic Nerve Problems - Glaucoma

Retinal Problems

Normal fundus

Retinal detachment

Optic Nerve Problems - Glaucoma
How the Eye Works

1) Light enters the eye through the ___________.

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

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 ______. 

Images are focused onto the ______. 

How the Eye Works

5) Signals travel from the retina to the brain through the ______ _______. The _________ ______ of the brain then translates light into vision.

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

Rapid Fire Review

1.

2.

3.

4.

5.

Normal Eye and Refraction

1.

2.

3.

4.

5.

6.
Myopia - Nearsighted Eye

...the eye is longer

Spectacle Correction of Myopia

A “minus” lens causes light rays to diverge...
...to focus further back in the eye, on the retina

Hyperopic - Farsighted Eye

...the eye is shorter

Hyperopic - Farsighted Eye

...or cornea is too “flat”
...light to be out of focus

Astigmatism

Astigmatism - In one plane, light focuses on retina

...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
...and glasses may be required for close viewing

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

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/fun/3d-not.htm

Ocular Motility

3 Cranial Nerves control ocular movement

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


Binocular Vision

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

Image source: http://learnthvrg.org/wm/ranoisnep/epapp/12/1.jpg

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

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

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.

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.

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
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 ____________.

**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.

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**Strabismus Treatment**

**Strabismus Treatment:**

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

**Patching the ____________ forces the brain to use the problem eye.**

**Botox:**

- a toxin developed from Clostridium botulinum, a common ____________.
Strabismus Treatment

- Strabismus surgery is done to straighten the eye. With resection_____________________.
- If the muscle is too strong it is made weak by___________________________.


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!!

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