Ocular Adnexa

- Eyelids
- Lashes
- Eyebrows
- Lacrimal apparatus
- Tarsal plates
- Orbit
- Extraocular Muscles
- Conjunctiva

6 Muscles

- Medial rectus
  - Most powerful eye muscle
  - Turns the eye toward the nose (adduction)
- Lateral rectus
  - Move the eye away from the nose (abduction)

- Inferior rectus
  - Primary action to move eye downward (depression)
  - Secondary action adducts the eye
  - Tertiary action rotate top of eye toward the temple and bottom of eye toward nose (extension)
- Superior rectus
  - Primary action to move eye upward (elevation)
  - Secondary action adducts the eye
  - Tertiary action rotate top of eye toward nose and bottom toward temple (inhension)

Extraocular muscles

1. Journey to the Center of the Eye: Ocular Anatomy
   Cecelia Koetting, OD FAAO
   Denver, CO
   CPC Course AP-0011-20

2. Ocular Adnexa

3. Ocular Adnexa

4. Extraocular muscles

5. Extraocular muscles

6. Extraocular muscles

7. Extraocular muscles

8. Extraocular muscles

9. Extraocular muscles
Obliques

- Superior oblique
  - Primary action: intorsion
  - Secondary action: depression
  - Tertiary action: abduction
- Inferior oblique
  - Only EDM with origin at front of orbit
  - Primary action: extorsion
  - Secondary action: elevation
  - Tertiary action: abduction

Abduction = away from midline
Adduction = in toward midline
Extorsion and intorsion are based on where the top of the eye is moving

Orbital Bones

- Bony socket containing the eye and most of its accessory organs
- Roof, medial wall, and floor very thin
- More easily damaged
- Injury
- Infection
- Tumor

Orbit
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Lacrical System

- Lacrical Gland
  - Located superior temporal to the eye, behind the orbital rim
  - Supplies the tears to the eye
- Lacrical Duct
  - The drainage system for tears from the gland to the surface of the eye
- Nasolacrical Duct
  - Drainage system for tears away from the eye
  - Connected to the nasal passage

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Sinuses

- Air spaces within the bones
  - When clogged, infected or cancerous enlargement causes:
    - Headaches
    - Periorbital pain
    - Pain feeling it’s coming from the eye

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Layers of the Eyeball

- Sclera
- Choroid
- Retina

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Fun Facts

- Globe is not symmetric
Sclera  
- The white portion of the eye  
- Tough, fibrous tissue  
- Gives shape and structure to the eye

Choroid  
- Intermediate vascular layer (blood vessels)  
- Provides nourishment for the retina allowing it to function  
- Is between sclera and the retina

Retina  
- The layer that allows us to see  
- Innermost neural layer  
- Where the light/images entering through the pupil is focused  
- Screen in the movie theater  
- Images fall on the nerve cells of the retina  
- Retina transmits the images to the brain via the optic nerves  
- Brain interprets the images

Anterior Ocular Anatomy

Schematic of Human Eye  

Conjunctiva  
- Clear cellophane-like tissue covering the sclera and inside of the eyelids  
- *Palpebral conjunctiva* lines the inside of eyelids  
- *Bulbar conjunctiva* covers the sclera

Cornea  
- Clear dome-like tissue over the very front (anterior) portion of the eye  
- Most powerful refractive media of the eye  
- #2 is the crystalline lens  
- Provides most of eyes ability to focus light  
- Curvature is greater than the rest of the globe  
- Limbus marks the junction with the sclera  
- 5 layers vs 6 layers  
- Cornea is avascular

Corneal Anatomy

OCT-A
**Corneal Layers**
- **A. Anterior Epithelium**: 5-7 cells thick, approx 50 um
- **B. Bowman’s Membrane**
- **C. Stromal Membrane**: barrier
- **D. Descemet’s Membrane**: barrier
- **E. Endothelium**: actively pumps water and ions from stroma to produce corneal dehydration and keep transparency. These cells do not regenerate if damage and corneal decompensation will result (white and cloudy).

**Role of Limbal Stem cells**
- Regenerate the entire corneal epithelium
- Produce the basal cell layer of the epithelium
- Then basal cells migrate toward the center of the cornea
- As more toward center also move up to become wing cells and eventually upwards to become surface cells
- Then shed into the tear film
- Turnover of the epithelium cells is approximately 7 days.

**Anterior Chamber**
- The area inside the eye behind the cornea and in front of the iris
- It is filled with clear watery fluid called aqueous humor
- Aqueous Humor: clear watery fluid produced by the ciliary body
- It fills the front part of the posterior chamber and anterior chamber
- Provides nutrients to the lens
- Maintains intraocular pressure
- Is the only fluid continuously produced in the eye.

**Iris**
- The colored part of the eye
- Two circular muscles with a hole in the middle called the pupil
- Iris sphincter constricts the pupil
- Iris dilator muscle enlarges the pupil
- Work together to control the size of the pupil for maximum visual performance
- Constricts with light or reading or doing near work
- Dilates in the dark

**Uvea**
- Pigmented layer of the eye
- Below sclera and cornea
- Made up of
  - Iris
  - Choroid
  - Ciliary body

**Pupillary Muscles**
- Dilator muscle of iris
- Sphincter muscle of iris

**Anisocoria**
- Muscle in the eyeball that alters the shape of crystalline lens
- Direct control over focusing ability of the eye called accommodation
- A part of the ciliary body
- Also includes ciliary epithelium which is the part that makes the aqueous humor
Crystalline Lens
- Provides focusing power to the eye
- Allows adjustment of the eye to focus from distance to near objects
- Shape change controlled by the ciliary muscle
- 2nd most powerful refractive medium
- Connected to the ring of ciliary muscles via long thin fibers called the suspensory ligaments

Posterior Chamber
- Narrow space located within the eye behind the iris and in front of the lens

Schematic of Human Eye

Retina
- Fundus
- Macula
- Fovea centralis
- Optic nerve
- Optic disk
- Rods and cones

Optic Nerve
- Nerve carries impulses from retina to the brain
- Transmits the signals from the rods and cones

Optic Disk
- Portion of the optic nerve within the eye that is visible through pupil
- Formed by the meeting of all the retinal nerve fibers
- Has no receptors so is insensitive to light and causes our physiological blind spot
- Appearance of the disc is indicative of health of the nerve

Photoreceptors
- 2 types
  - Cones
    - 6-7 million
    - Allow for color vision
  - 3 types of cones, red, green, and blue
  - Clear central vision (detail)
  - Within the fovea
  - Rods
    - 120 million
    - Allow for black/white vision
    - More sensitive with night vision, motion detection, and peripheral vision
    - Found everywhere else

Fundus
- Bottom or base of an organ
- Refers to the inferior surface of the eyeball

Macula
- Central part of the retina
- Used for seeing in detail
- 3-5mm in diameter with foveal depression in center

Fovea Centralis
- 1.5mm area within macula where visual acuity is the sharpest
- Contains the highest number of cones
- Allow daytime and color vision
Questions?

Thank you!