Ocular Anatomy for the Paraoptometric
Minnesota Optometric Association Paraoptometric CE
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Total CE Hours: 1
Format: Live / Lecture
AOA/CPC Approved / AP-0008-16 / 1 hour

Course description: This course will review the anatomy of the eye from front to back. The anterior and posterior chambers of the eye will be addressed, along with other key components including: orbital bones, tear film, ocular adnexa, and extraocular muscles. Common pathologies associated with each anatomical structure will also be addressed.

Learning Objectives:
After today’s lecture, the attendee should be able to:
- Identify common periocular structures such as the lids, lashes and glands.
- Name the parts of the lacrimal apparatus.
- Differentiate between the cornea, scleral and conjunctiva.
- Name the different chambers of the eye.
- Discuss the general anatomy of the internal structures of the eye such as the iris, lens, vitreous and retina.
- Name the extraocular muscles of the eye.
Introduction/Periocular Area (10 min)

Ocular Adnexa
- eyelids
- eyebrows
- eyelashes
- accessory glands
- lacrimal apparatus

Adnexa Landmarks
- medial canthus
- lateral canthus
- plica semilunaris: third eyelid
- caruncle: contains modified sebaceous and sweat glands
- lacrimal lake = plica semilunaris + caruncle

Eyelid Layers
1. skin
2. subcutaneous connective tissue
3. striated muscle
4. sub-muscular connective tissue
5. tarsal plate or fibrous layer
6. smooth muscle
7. conjunctiva (bulbar/palpebral)

Eyelid Muscles
- striated muscle
  - orbicularis oculi
    - innervated by facial nerve (CN VII)
    - closes the eyelids
  - levator palpebrae superioris
    - innervated by oculomotor nerve (CN III)
    - elevates the eye lid

Eyebrows and Eyelashes
- eyebrows
- eyelashes
  - protection
  - lubrication

Accessory Glands
- Meibomian glands
  - sebaceous glands
  - oil secretes into tear film
- blocked Meibomian gland
  - hordeolum
  - chalazion
- ciliary glands - sweat glands
accessory lacrimal glands – produce aqueous layer of tears
- Glands of Krause and Wolfring

**Lacrimal Apparatus**
- lacrimal gland
  - located under the frontal bone at upper-outer angle of the orbit
- lacrimal canals/ducts
- conjunctival sac
- puncta (2 per eye)
  - punctal plugs
- canaliculi
- lacrimal sac
- nasolacrimal duct

**External Structures (10 min)**

**The Globe**
- Fibrous Layer
  - Cornea
  - Sclera
- Vascular Layer
  - Choroid
  - Ciliary body
  - Iris
- Nerve Layer
  - Retina
  - Macula
  - Optic nerve

**Sclera**
- white in color
- protection
- pierced posteriorly by the optic nerve
- insertion point for the six eye muscles (EOMs)
- junction between the cornea and sclera is called the limbus

**Conjunctiva**
- epithelial membrane
  - bulbar
  - palpebral
- covers the anterior sclera
- continues to the back surfaces of the lids to form a conjunctival sac
  - fornix - where bulbar and palpebral meet
- vascular tissue
  - burst blood vessels here cause a subconjunctival hemorrhage

**Cornea**
- transparent
- avascular
- function - refraction of light rays
- refractive power approx +45 D
- layers:
  - Epithelium
  - Bowman's membrane
    - will scar if injured
  - Stroma
  - Descemet's membrane
  - Endothelium

**Internal Structures (20 min)**
- fundus
- posterior pole
- optic nerve/disk
- macula
- retina
- choroid
- pigment layer

**Chambers of the Eye**
- anterior chamber
- posterior chamber
- vitreous chamber

**Ciliary Body**
- located near the base of the iris and posterior to it
- composed of blood vessels and muscle fibers (ciliary muscle)
- ciliary process produces aqueous

**Aqueous Humor**
- manufactured by ciliary body
- clear, with a watery consistency (99% H2O)
- flows from posterior chamber through pupil into anterior chamber
- functions
  - refraction of light
  - maintenance of intraocular pressure (IOP)
  - provide nutrients to the posterior cornea and the crystalline lens

**Crystalline Lens**
- provides +12-14 D of power
- functions
  - refraction of light
  - accommodation (focus adjustment of the eye)
  - contains a high degree of protein

**Iris**
- colored part of eye
-most anterior portion of the vascular layer
-consists of blood vessels, pigment and muscle tissue
  -pigment (melanocytes) in the iris gives the eye its color
    -more pigment = brown
    -less pigment = blue
-pupil size regulates light entry into the eye
  -smaller with age
  -anisocoria = different sized pupils
  -mydriasis = pupil dilation
  -miosis = pupil constriction

Vitreous Chamber
  -functions: refraction of light and internal support

Vascular Layer (Uveal Tract)
  -middle layer of the eye situated between the sclera and retina
  -composed mostly of blood vessels and capillary nets
  -function
    -supplies nutrition to other layers of the eye
    -blood travels through here
  -parts: choroid / ciliary body / iris

Nerve Layer – Retina
  -inner-most layer of the eye
  -has 10 layers
  -detachments best viewed by dilated fundus exam (DFE)
  -visual receptors are cones and rods
  -macula
  -fovea
  -optic nerve head
    -physiological blind spot
  -ora serrata
    -most anterior portion of retina
    -nearly all rods

Eye Muscles and Nerves (10 min)

Anatomy of the Extraocular Muscles
  -six muscles associated with eye movements
    -superior rectus (SR)
      -primary movement is elevation of the eye
    -inferior rectus (IR)
      -primary movement is depression of the eye
    -medial rectus (MR)
      -most powerful EOM
    -lateral rectus (LR)
      -adduction: moves the eye inward
      -abduction: moves the eye outward
- superior oblique (SO)
- inferior oblique (IO)
- innervated by cranial nerves \( \text{LR}_6(\text{SO}_4)_3 \)

**Anatomy of the Bony Orbit**
- protection/support
- attachment sites for muscles and the eyeball

**Bones of the orbit**
- frontal: forehead
- ethmoid: weakest bone
- sphenoid
- zygomatic: strongest bone
- maxilla
- lacrimal
- palatine: smallest bone

**Openings of the orbit**
- purpose of openings
- major openings
  - optic foramen – CN II - optic nerve
  - supraorbital fissure – CN IV - trochlear nerve