

Vision – is made possible via the optic nerve, cranial nerve two, (CN II).

We will omit eye development

Accessory structures of the eye:

- Orbit, or eye socket. This is made up of 7 bones.
- 
- Eyebrow. Functions to provide shade for the eye and as a perspiration blocker.
- 
- Eyelids, also called palpebrae: consist of several structures including the orbicularis oculi and levator palpebrae superioris muscles. The eyelids function in blinking to moisten and cleanse the eye. The palpebral fissure is the gap between the upper and lower lids. The commissures are the angles of the palpebral fissure. The medial commissure is broader than the lateral and contains the lacrimal caruncle. Eyelids contain the tarsal plates which are connective tissue that aids in maintaining the shape of the eyelid. The eyelid also has Meibomian glands which moisten the eye. Along the edge of the eyelid we also find ciliary glands, which also moisten the eye. It is an infected ciliary gland which causes the condition known as a stye.
- 
- eyelashes: are for protection from airborne particles. These are attached to nerves to cause a blink reflex when touched.
- 
- conjunctiva: is located on the inside of the eyelid. It is made of stratified squamous epithelium of varying thickness depending on the area. It has two portions:
  1. Palpebral conjunctiva - on the back of the eyelid.
  2. bulbar conjunctiva - is a reflected portion that reaches out onto the cornea of the eyeball.
- lacrimal apparatus or gland: - produces tears. It is located superolaterally to the eye. so that the tears drain medially and down to an area known as the puncta lacrimalis. From here the tears drain through the lacrimal lake, and into the nasal cavity.

Extrinsic eye muscles are for movements of the eyeball. There are 6 extrinsic eye muscles.

- 1) superior rectus.
- 2) inferior rectus.
- 3) lateral rectus.
- 4) medial rectus.
- 5) superior oblique.
- 6) inferior oblique.

With slight exception, the extrinsic muscles of the eye direct the gaze in the direction indicated by the name of the muscle. The superior rectus muscle directs the gaze superiorly, or elevates the gaze. The inferior rectus muscle directs the gaze inferiorly, or depresses the gaze. The lateral rectus muscle directs the gaze laterally, or abducts the gaze. The medial rectus muscle directs the gaze medially, or adducts the gaze. The superior oblique muscle directs the gaze inferolaterally, or down and out. This is possible because this muscle passes through the trochlea to change direction and insert on the upper, lateral, posterior aspect of the eyeball. The inferior oblique muscle directs the gaze superolateral, or up and out.

These 6 muscles are innervated by cranial nerves III, IV and VI. An easy way to remember the innervation is LR<sub>6</sub>(SO<sub>4</sub>)<sub>3</sub>.

The Eyeball has three layers.

- 1) Fibrous tunic - this layer forms the sclera, which is opaque, and the cornea, which is clear. The Sclera is the white of the eye. It is avascular. The Cornea is transparent and refractive. It is also avascular.
- 2) Vascular tunic, also referred to as the uvea. It consists of three parts:

- a. the choroid, is highly vascular. It lines almost all of the internal surface of the sclera. It functions to reflect light back into the eyeball.
- b. the ciliary body, forms a ring of fibers coming from ciliary muscles. These have ciliary process which attach to zonular fibers which in turn attach to the lens. The suspensory ligament of the lens is made up of these zonular fibers. When ciliary muscles are relaxed a constant tension is placed on the lens making it flatter. When ciliary muscles are contracted the tension on the lens is released and the lens becomes rounder.
- c. the iris, is an extension of the choroid and is colored. It contains an opening called the pupil, which function to regulate the amount of light entering the eyeball proper. Contraction of the circular fibers, the sphincter pupillae muscle, results in a smaller pupil. Contraction of radial fibers, the dilator pupillae muscle, results in a larger pupil.

Lens - is made up of a transparent protein. It is highly refractive and its shape determines the amount of refraction.

A flat lens is better for viewing distant objects.

A round lens is better for viewing nearer objects.

Retina - is generally divided into an outer pigmented layer and an inner nervous layer. The inner nervous layer covers the posterior and lateral portions of the inner eyeball. Along the lateral margins (near the ciliary body) it thins to form the pigmented layer which covers the back of the ciliary body and iris.

The retina is subdivided into ten layers.

Note that the photoreceptors, rods and cones, are on the side of the retina furthest from the light, therefore the light must pass through the other layers of the retina to reach and stimulate the rods and cones.

At the center of the posterior part of the retina is an oval, yellow colored area, called the macula lutea. It has a central depression called the fovea centralis. The fovea centralis is the area of the retina with the most distinct vision. This is because the photoreceptors are present in greater numbers here than elsewhere, and the inner layers of retina are displaced laterally to allow unobstructed passage of light rays to the layer of photoreceptors.

Approximately 3mm to the medial side of the macula lutea is the optic disc with the central artery of the retina. This is where the optic nerve connects to the eyeball. Here there are no rods and cones so it is often called the blind spot.

Chambers of the eye - the eye is divided into anterior and posterior portions.

1) Anterior cavity - is the portion anterior to the lens. It is subdivided into 2 chambers.

a) anterior chamber - located between the cornea and the iris.

b) posterior chamber - is located between the iris and the suspensory ligaments of the lens.

Both of these chambers are filled with aqueous humor. It is a fluid which serves to maintain an intraocular pressure of about 24mm Hg. It also provides nutrients to the lens and cornea. This fluid drains via the scleral venous sinus, also called the canal of Schlemm, at the junction of the iris and cornea, into the bloodstream.

2. Vitreous chamber - is located between the lens and the retina. This chamber contains vitreous body, not humor. The vitreous body helps to hold the retina and the lens in place. It is not continually produced therefore if it is lost or damaged it is not replaced or repaired.

Far sighted.

This condition is caused by a couple of different factors. The lens of the eye may be too flat, or the eyeball itself may be too short. In either case the calculated focal point of the light is posterior to the retina. This means the light has not yet focused when it hits the retina.

Presbyopia is a form of far sightedness that generally occurs in older people. The lens has hardened and thus is less compliant (less able to curve), so remains relatively flat. This makes it harder to see near objects. In this condition the light focuses behind the eye.

#### Myopia (near sighted)

In this condition the lens is thickened or the eyeball is too long. In either case it causes the light to focus in front of the retina. The people can see objects that are near but far away objects are blurred (nearsighted).

Can do a radial keratotomy to flatten the lens.

May do epikeratoplasty - pre-prepared donor cornea

#### Glaucoma

is a pressure buildup in the anterior chamber of the eye. If untreated it will result in blindness. Can treat with eye drops to promote drainage of aqueous humor. Surgical intervention may be required to open a new canal for drainage.