Major Ocular Structures

1-----fibrous tunic, outer layer which consists of the sclera and the cornea;
2---- vascular tunic, middle layer responsible for nourishment which consists of the iris, and choroid, and the ciliary body;
3----nervous tunic, inner layer of photoreceptors and neurons called the which consists of the retina.
The eye also contains three fluid-filled chambers. The volume between the cornea and the iris is known as the anterior chamber, while the volume between the iris and the lens is known as the posterior chamber, both chambers contain a fluid called aqueous humor. Aqueous humor is watery fluid produced by the ciliary body. It maintains pressure (called intraocular pressure) and provides nutrients to the lens and cornea. Aqueous humor is continually drained from the eye through the Canal of Schlemm. The greatest volume, forming about four-fifths of the eye, is found between the retina and the lens called the vitreous chamber. The vitreous chamber is filled with a thicker gel-like substance called vitreous humor which maintains the shape of the eye.
Light enters the eye through the transparent, dome shaped cornea. The cornea consists of five distinct layers. The outermost layer is called the epithelium which rests on Bowman's Membrane. The epithelium has the ability to quickly regenerate while Bowman's Membrane provides a tough, difficult to penetrate barrier. Together the epithelium and Bowmanâs Membrane serve to protect the cornea from injury.
Corneal or lenticular changes can cause light focusing problems for the retina, leading to blurred or distorted near and distant vision. Toric lenses are a good treatment option for astigmatism; they have a sliced donut shape to allow different refractive levels.
The innermost layer of the cornea is called the endothelium which rests on Descemet's Membrane. The endothelium removes water from cornea, helping to keep the cornea clear. The middle layer of the cornea, between the two membranes is called the stroma and makes up 90% of the thickness of the cornea.
From the cornea, light passes through the pupil. The amount of light allowed through the pupil is controlled by the iris, the colored part of the eye. The iris has two muscles: the dilator muscle and the sphincter muscle. The dilator muscle opens the pupil allowing more light into the eye and the sphincter muscle closes the pupil, restricting light into the eye. The iris has the ability to change the pupil size from 2 millimeters to 8 millimeters.
Just behind the pupil is the crystalline lens. The purpose of the lens is to focus light on the retina. The process of focusing on objects based on their distance is called accommodation. The closer an object is to the eye, the more power is required of the crystalline lens to focus the image on the retina. The lens achieves accommodation with the help of the ciliary body which surrounds the lens. The ciliary body is attached to lens via fibrous strands called zonules. When the ciliary body contracts, the zonules relax allowing the lens to thicken, adding power, allowing the eye to focus up close. When ciliary body relaxes, the zonules contract, drawing the lens outward, making the lens thinner, and allowing the eye to focus at distance.
Light reaches its final destination at the retina. The retina consists of photoreceptor cells called rods and cones. Rods are highly sensitive to light and are more numerous than cones. There are approximately 120 million rods contained within the retina, mostly at the periphery. Not adept at color distinction, rods are suited to night vision and peripheral vision
Cones, on the other hand, have the primary function of detail and color detection. There are only about 6 million cones contained within the retina, largely concentrated in the center of the retina called the fovea. There are three types of cones. Each type receives only a narrow band of light corresponding largely to a single color: red, green, or blue. The signals received by the cones are sent via the optic nerve to the brain where they are interpreted as color. People who are color blind are either missing or deficient in one of these types of cones.
EYE TRAUMA
Eye Trauma:

Eye trauma refers to damage caused by a direct blow to the eye. The trauma may affect not only the eye, but the surrounding area, including adjacent tissue and bone structure.

There are many different forms of trauma, varying in severity from minor injury to medical emergencies. Even in cases where trauma seems minor, every eye injury should be given medical attention.
Causes Eye Trauma

When the eye is hit with blunt force, it suddenly compresses and retracts. This can cause blood to collect underneath the hit area, which leads to many of the common symptoms of eye trauma.
Symptoms of Eye Trauma

- Pain
- Trouble seeing
- Cuts to the eyelid
- One eye not moving as well
- One eye sticks out
- Blood in the clear part of the eye
- Unusual pupil size or shape
- Something embedded in the eye
- Something under the eyelid that cannot be easily removed
Every eye injury should be given medical attention; do not touch, rub or try to remove any object in the eye. If the eye has been cut or there is an object in the eye, rest a protective shield – such as a paper cup – on the bone around your eye. Make sure there is no pressure on the eye itself. Seek immediate, professional medical attention.
Treatments for Eye Trauma

In minor cases of trauma, such as a black eye from a sports injury, applying cold to the affected area can help bring swelling down, and allow the affected area to heal faster. However, even in cases where trauma seems minor, every eye injury should be given medical attention.
The best way to avoid eye trauma is to prevent it by using protective eyewear while doing things that may put them at risk. Activities include home repair, yard work, cleaning, cooking, and playing sports. In most cases of injury, people report not properly protecting their eyes – which shows that proper precautions may prevent an eye injury.
Hyphema
Hyphema

is a condition that occurs when blood enters the anterior chamber of the eye between the iris and the cornea. People usually first notice a loss of vision or decrease in vision. The eye may also appear to have a reddish tinge, or it may appear as a small pool of blood at the bottom of the iris or in the cornea. A traumatic hyphema is caused by a hit to the eye from a projected object or a blow to the eye. A hyphema can also occur spontaneously.
A decrease in vision or a loss of vision is often the first sign of a hyphema. People with microhyphema may have slightly blurred or normal vision. A person with a full hyphema may not be able to see at all (complete loss of vision). The person's vision may improve over time as the blood moves by gravity lower in the anterior chamber of the eye, between the iris and the cornea.
vision will improve, however some people may have other injuries related to trauma to the eye or complications related to the hyphema. A microhyphema, where red blood cells are hanging in the anterior chamber of the eye, is less severe. A layered hyphema when fresh blood is seen lower in the anterior chamber is moderately severe. A full hyphema (total hyphema), when blood fills up the chamber completely, is the most severe
Complications

While the vast majority of hyphemas resolve on their own without issue, sometimes complications occur. Traumatic hyphema may lead to increased (IOP), peripheral anterior synechiae, optic atrophy, staining of the cornea with blood, re-bleeding, and impaired accommodation.
Complications

Secondary hemorrhage, or rebleeding of the hyphema, is thought to worsen outcomes in terms of visual function and lead to complications such as glaucoma, corneal staining, optic atrophy, or vision loss. Rebleeding occurs in 4–35% of hyphema cases and is a risk factor for glaucoma. Young children with traumatic hyphema are at an increased risk of developing amblyopia, an irreversible condition.
Causes

Hyphemas are frequently caused by injury, and may partially or completely block vision. The most common causes of hyphema are intra ocular surgery, blunt trauma, and lacerating trauma. Hyphemas may also occur spontaneously, without any inciting trauma. Spontaneous hyphemas are usually caused by the abnormal growth of blood vessels (neovascularization), tumors of the eye (retinoblastoma or iris melanoma), uveitis, or vascular anomalies (juvenile xanthogranuloma).
Causes

Additional causes of spontaneous hyphema include: rubeosis iridis, myotonic dystrophy, leukemia, hemophilia, and von Willebrand disease. Conditions or medications that cause thinning of the blood, such as aspirin, warfarin, or drinking alcohol may also cause hyphema. Source of bleeding in hyphema with blunt trauma to eye is circulus iridis major artery.
The main goals of treatment are to decrease the risk of re-bleeding within the eye, corneal blood staining, and atrophy of the optic nerve. Small hyphemas can usually be treated on an outpatient basis.
Treatment

There is little evidence that most of the commonly used treatments for hyphema (antifibrinolytic agents [oral and systemic aminocaproic acid, tranexamic acid, and aminomethylbenzoic acid], corticosteroids [systemic and topical], cycloplegics, miotics, aspirin, conjugated estrogens, monocular versus bilateral patching, elevation of the head, and bed rest) are effective at improving visual acuity after two weeks.
Treatment

Surgery may be necessary for non-resolving hyphemas, or hyphemas that are associated with high pressure that does not respond to medication. Surgery can be effective for cleaning out the anterior chamber and preventing corneal blood staining.
HYPHHEMA
eye injury

healthy eye

blood in the front chamber of the eye
Cornea
Cornea

cornea is not only a clear window through which light passes on its way into the eye, it provides most of the focusing power in the eye as well. Corneal disease is a serious condition that can cause clouding, distortion, scarring and eventually blindness.
types of corneal disease.

------- keratoconus, □

------- endothelial dystrophy □

------- bullous keratopathy □
Keratoconus is a weakening and thinning of the central cornea. The cornea develops a cone-shaped deformity. Progression can be rapid, gradual or intermittent. Keratoconus usually occurs in both eyes, but can occur in only one eye.
endothelial dystrophy

**endothelial dystrophy** is a hereditary abnormality of the inner cell layer of the cornea called the endothelium. The purpose of this layer is to pump fluids out of the cornea, keeping it thin and crystal clear. When the endothelium is not healthy, fluids are not pumped out and the cornea develops swelling, causing it to become cloudy and decrease vision.
Bullous keratopathy is a condition in which the cornea becomes permanently swollen. This occurs because the inner layer of the cornea, the endothelium, has been damaged and is no longer pumping fluids out of the tissue.
Cause

-- Infection: Bacterial, fungal and viral infections are common causes of corneal damage.

-- The cause of keratoconus in most patients is unknown.

-- Age: Aging processes can affect the clarity and health of the cornea.

-- Cataract and intraocular lens implant surgery: Bullous keratopathy occurs in a very small percentage of patients following these procedures.

-- Heredity


**Cause**

-- Contact lenses

-- Eye trauma

-- Certain eye diseases, such as retinitis pigmentosa, retinopathy of prematurity, and vernal keratoconjunctivitis.

-- Systemic diseases, such as Leber's congenital amaurosis, Ehlers-Danlos syndrome, Down syndrome.

-- Ectasia (thinning) **Keratoconus**, or thinning of the cornea following refractive laser surgery
Corneal Disease Symptoms

-- Blurred Vision

Blurred vision refers to a lack of sharpness of vision resulting in the inability to see fine detail. Blurred vision may result from abnormalities present at birth such as nearsightedness or farsightedness that require corrective lenses (glasses) or it may signal the presence of eye disease.
Corneal Disease Symptoms

-- visual impairment, such as blurred or cloudy vision,
-- severe pain in the eye,
-- tearing, sensitivity to light.
-- Some patients have additional symptoms of headache, nausea, and fatigue.
Treatment

Treatment is tailored to the individual disease and the individual patient. Treatments might include medications, laser treatment, or surgery, depending on the condition.
**Treatment**

**Infections** are treated with medicated eye drops (antibiotics, antivirals, and anti parasitics) and, in some cases, oral medication. Herpetic stromal keratitis is a recurring swelling that develops after a **herpes** eye infection and is managed with anti-inflammatory steroid eye drops. **Abrasion** might require temporary patching or a bandage contact lens, depending on the cause and extent of the injury.
Keratoconus, in which the cornea can take on a distorted cone shape, is often managed with special contact lenses.

--- Newer treatments, including corneal crosslinking (riboflavin and ultraviolet-A) and corneal implants, are also options. Advanced keratoconus diseases are treated with anterior lamellar keratoplasty or corneal transplant.
EYE LID MALPOSITION
Eyelid malposition is the abnormal positioning of the eyelids due to various causes.

The disorder is relatively common. As well as looking unsightly, it can lead to visual and ocular problems, which can become serious.
most common forms

- Eyelid retraction: the upper eyelid is abnormally high or the lower eyelid is abnormally low.

- Ptosis: drooping of the upper eyelid.

- Entropion: the eyelid turns inwards causing the eyelashes to brush against the cornea.

- Ectropion: the lower eyelid turns outwards.
Entropion and Ectropion of the lower eyelid

Entropion

Healthy eye

Ectropion
causes

It is usually caused by tissue relaxation due to ageing, but can also occur as a result of paralysis of the facial nerve (Bell’s palsy), trauma, scarring and surgery. Ageing is the main cause of eyelid malformation.
Ptosis can cause a reduction in the visual field.

Ectropion causes poor distribution of tears over the cornea, resulting in possible irritation, a burning sensation, a feeling of grit in the eye, tearing and reddening of the eyelid and the conjunctiva.

Entropion can produce the sensation of a foreign body in the eye, tearing, irritation of the cornea and even crusting of the eyelid and mucous secretion.
TREATMENT

Eyelid malposition is treated with surgery. The general aim is to reposition or anatomically and functionally reconstruct the eyelid.

Occasionally, the solution involves implanting skin grafts from patients themselves to cover areas of the eye that are left exposed as a result of retraction.
In some cases of lower eyelid malposition, surgery called the trans conjunctival mid-face lift. This technique avoids visible incisions, as it is performed through the conjunctiva, and consists of lifting the cheek in order for the lower eyelid to return to its normal position.

In most cases, existing surgical techniques offer an immediate solution to eyelid malposition and its associated problems.
Lacrimal gland
lacrima gland

THE LACRIMAL GLAND (TEAR GLAND) IS AN EXOCRINE GLAND LOCATED ABOVE THE EYE BALL, IN THE ANTERIOR PART OF THE UPPER OUTER ASPECT OF EACH ORBIT.
The lacrimal gland consists of two connecting parts: the larger orbital part and the smaller palpebral part.

The gland together with its associated drainage system of ducts form the lacrimal apparatus.
Blood supply

- **Arterial**: lacrimal artery
  - (from ophthalmalic artery)
- **Venous**: superior ophthalmalic vein
Innervation

Sensory: lacrimal nerve (from ophthalmic nerve)

Parasympathetic: greater petrosal nerve (from facial nerve)

Sympathetic: deep petrosal nerve (from internal carotid plexus)
Functions

Lacrimal fluid production: lubrication, protection and nutrition of the ocular surface
Pathway of tears

Lacrima1 gland $\rightarrow$ lacrimal ducts $\rightarrow$ ocular surface $\rightarrow$ lacrimal puncta $\rightarrow$ lacrimal canaliculi $\rightarrow$ lacrimal sac $\rightarrow$ nasolacrimal duct $\rightarrow$ inferior nasal meatus $\rightarrow$ nasopharynx
Structure

The lacrimal gland is an almond-shaped structure, about 2 cm in length. It is located in the anterior, superotemporal aspect of the orbit, within the lacrimal fossa of the frontal bone. The gland is split into two contiguous parts (lobes) by the lateral aponeurotic fibers of the levator palpebrae superioris muscle into an orbital part and a palpebral part. This division is only partial due to a posterior wall of parenchyma between the lobes.
orbital part

rests above the aponeurosis of the □ levator palpebrae superioris muscle and the lateral rectus muscle laterally.
palpebral part

lies below the levator palpebrae superioris aponeurosis and projects into the superolateral aspect of the upper eyelid to attach to the superior conjunctival fornix. This part of the lacrimal gland can be observed clinically by everting the eyelid.
Ducts

The lacrimal gland contains about 12 main excretory ducts. Ducts from the orbital part of the gland accompany those of the palpebral part by piercing through the levator palpebrae superioris aponeurosis to empty into the conjunctival sac. These ducts open along the lateral aspect of the superior fornix of the conjunctiva.
LACRIMAL GLAND OBSTRUCTION
LACRIMAL GLAND OBSTRUCTION

Excessive tearing is the most common complaint of patients with nasolacrimal duct obstruction, followed by acute or chronic infections.

Pain at the side of the nose suggests dacryocystitis.

Nasolacrimal duct obstruction is more common with increasing age and more common in females than males.
Cause

- Involutional stenosis
- Dacryolith
- Sinus disease
- Trauma
- Inflammatory disease
- Lacrimal plugs
- Neoplasm
- Congenital
Involutional stenosis

- Involutional **stenosis** is probably the most common cause of nasolacrimal duct obstruction in older people.
- It affects women twice as frequently as men.
- Compression of the **lumen** of the nasolacrimal duct is caused by inflammatory infiltrates and edema.
Sinus disease

Sinus disease often occurs in conjunction with, and in other instances may contribute to the development of nasolacrimal duct obstruction. Patients should be asked about previous sinus surgery, as the nasolacrimal duct is sometimes damaged when the maxillary sinus ostium is being enlarged anteriorly.
Naso-orbital fractures may involve the nasolacrimal duct. Early treatment by fracture reduction with stenting of the entire lacrimal drainage system should be considered. However, such injuries are often not recognized or are initially neglected as more serious injuries are managed. In such cases, late treatment of persistent epiphora usually requires dacryocystorhinostomy.
Neoplasm

- Neoplasm should be considered in any patient presenting with nasolacrimal duct obstruction.

- In patients with atypical presentations, including younger age, male gender, further workup is appropriate.

- Bloody punctual discharge

- Lacrimal sac distension above the medial canthal tendon is also highly suggestive of neoplasm
Congenital nasolacrimal duct obstruction, or dacryostenosis, occurs when the lacrimal duct has failed to open at the time of birth. Around 6% of infants have congenital nasolacrimal duct obstruction, or dacryostenosis. Persistent watery eye even when not crying. If a secondary infection occurs (Dacryocystitis), purulent (yellow / green) discharge may be present.
Management

----- Intubation and stenting

---- Dacryocystorhinostomy
Intubation and stenting

Some clinicians believe that partial stenosis of the nasolacrimal duct with symptomatic epiphora sometimes responds to surgical intubation of the entire lacrimal drainage system. This procedure should be performed only if the tubes can be passed easily. In complete nasolacrimal duct obstruction, intubation alone is not effective, and a dacryocystorhinostomy should be considered.
A dacyocystorhinostomy is the treatment of choice for most patients with acquired nasolacrimal duct obstruction. Surgical indications include recurrent dacyocystitis, chronic mucoid reflux, painful distension of the lacrimal sac, and bother some epiphora. For patients with dacyocystitis, active infection should be cleared, if possible, before a dacyocystorhinostomy is performed.
A “red eye” is a general term that is used to describe red, irritated, and bloodshot eyes. The redness happens when tiny blood vessels under the eye’s surface get larger or become inflamed. Usually, it is a reaction to something that is irritating the eye. The condition can affect one or both eyes, and it can develop over time or appear suddenly, such as with allergies or an eye injury.
Red eyes can be accompanied by eye pain, itching, eye discharge, swollen eyes, or changes in vision, such as blurred vision. Many times, though, a red eye looks worse than it feels. Many cases of red eye are relatively harmless and usually improve with home remedies or over-the-counter treatments.
CASES OF RED EYE

Allergies
Blepharitis (inflamed eyelid)
Conjunctivitis (pink eye)
Dry eye
Eye injury
Glaucoma
Excessive alcohol use
Smoking
TREATMENT OF RED EYE

Many times, rest, cool compresses over closed eyes, lightly massaging the eyelids, gently washing the eyelids, and/or over-the-counter eye drops, can relieve the symptoms. Other times, an eye doctor may recommend and prescribe antibiotics, special eye drops, or ointments.
PREVENTION

Don't rub the eyes. Dirt and germs on the hands and fingers can cause even more redness and irritation.

Keep contact lenses clean, and do not wear them longer than recommended.

Remove eye makeup properly and keep eyes clean.

Take regular breaks when looking at the computer screen for long periods of time.

Schedule an eye exam to make sure the cause of red eye is not something more serious.
ERGENT RED EYE

Eyes are painful •
Vision is affected •
Eyes become extra sensitive to light •
Symptoms have continued for a week or more, or are getting worse •
The eye is producing a lot of pus or mucus •
A fever or aches are also present with the eye discomfort •
uvea
uvea, also called the uveal layer, uveal coat, uveal tract, vascular tunic or vascular layer is the pigmented middle of the three concentric layers that make up an eye
Structure

The uvea is the vascular middle layer of the eye. It is traditionally divided into three areas, from front to back, the:

---- Iris
---- Ciliary body
---- Choroid
Function

-Nutrition and gas exchange: uveal vessels directly perfuse the ciliary body and iris, to support their metabolic needs, and indirectly supply diffusible nutrients to the outer retina, sclera, and lens, which lack any intrinsic blood supply. (The cornea has no adjacent blood vessels and is oxygenated by direct gas exchange with the environment.)

-Light absorption: the uvea improves the contrast of the retinal image by reducing reflected light within the eye, and also absorbs outside light transmitted through the sclera, which is not fully opaque
Iris

is a thin, annular structure in the eye, responsible for controlling the diameter and size of the pupil, thus the amount of light reaching the retina. Eye color is defined by that of the iris. In optical terms, the pupil is the eye's aperture, while the iris is the diaphragm.
The iris consists of two layers: □

- the front pigmented fibro vascular layer known as □ a stroma and, beneath the stroma, pigmented epithelial cells.

The stroma is connected to a sphincter muscle □ (sphincter pupillae), which contracts the pupil in a circular motion, and a set of dilator muscles (dilator pupillae), which pull the iris radially to enlarge the pupil, pulling it in folds.
iris is divided into

1- The **pupillary zone** is the inner region whose edge forms the boundary of the pupil.

2- The **ciliary zone** is the rest of the iris that extends to its origin at the ciliary body.
Microanatomy

1- Anterior limiting layer
2- Stroma of iris
3- Iris sphincter muscle
4- Iris dilator muscle (myoepithelium)
5- Anterior pigment epithelium
6- Posterior pigment epithelium
Eye color

The iris is usually strongly pigmented, with the color typically ranging between brown, hazel, green, gray, and blue. Occasionally, the color of the iris is due to a lack of pigmentation, as in the pinkish-white of oculocutaneous albinism, or to obscuration of its pigment by blood vessels, as in the red of an abnormally vascularised iris. Despite the wide range of colors, the only pigment that contributes substantially to normal human iris color is the dark pigment melanin.
Eye color

The quantity of melanin pigment in the iris is one factor in determining the phenotypic eye color of a person. Structurally, this huge molecule is only slightly different from its equivalent found in skin and hair. Iris color is due to variable amounts of eumelanin (brown/black melanins) and pheomelanin (red/yellow melanins) produced by melanocytes. More of the former is found in brown-eyed people and of the latter in blue- and green-eyed people.
Genetic and physical factors determining iris color

Iris color is a highly complex phenomenon consisting of the combined effects of texture, pigmentation, fibrous tissue, and blood vessels within the iris stroma, which together make up an individual's epigenetic constitution in this context. A person's "eye color" is actually the color of one's iris, the cornea being transparent and the white sclera entirely outside the area of interest.
Genetic and physical factors determining iris color

Melanin is yellowish-brown to dark brown in the stromal pigment cells, and black in the iris pigment epithelium, which lies in a thin but very opaque layer across the back of the iris. Most human irises also show a condensation of the brownish stromal melanin in the thin anterior border layer, which by its position has an overt influence on the overall color.
Heterochromia is an ocular condition in which one iris is a different color from the other iris (complete heterochromia), or where the part of one iris is a different color from the remainder (partial heterochromia or sectoral heterochromia). Uncommon in humans, it is often an indicator of ocular disease, such as chronic iritis or diffuse iris melanoma, but may also occur as a normal variant. Sectors or patches of strikingly different colors in the same iris are less common. Anastasius the First was dubbed dikoros (having two irises) for his patent heterochromia since his right iris had a darker color than the left one.
uvea (ciliary body)
The ciliary body is a part of the eye that includes the ciliary muscle, which controls the shape of the lens, and the ciliary epithelium, which produces the aqueous humor. The aqueous humor is produced in the non-pigmented portion of the ciliary body. The ciliary body is part of the uvea, the layer of tissue that delivers oxygen and nutrients to the eye tissues. The ciliary body joins the ora serrata of the choroid to the root of the iris.
Sectional Anatomy of the Eye

- Pupil
- Posterior chamber
- Anterior chamber
- Anterior cavity
- Cornea
- Iris
- Canal of Schlemm
- Ciliary body
- Ora serrata
- Posterior cavity (Vitreous chamber)
- Suspensory ligaments
The ciliary body is a ring-shaped thickening of tissue inside the eye that divides the posterior chamber from the vitreous body. It contains the ciliary muscle, vessels, and fibrous connective tissue. Folds on the inner ciliary epithelium are called ciliary processes, and these secrete aqueous humor into the posterior chamber. The aqueous humor then flows through the pupil into the anterior chamber. The ciliary body is attached to the lens by connective tissue called the zonular fibers (fibers of Zinn). Relaxation of the ciliary muscle puts tension on these fibers and changes the shape of the lens in order to focus light on the retina.
Structure

The inner layer is transparent and covers the vitreous body, and is continuous from the neural tissue of the retina. The outer layer is highly pigmented, continuous with the retinal pigment epithelium, and constitutes the cells of the dilator muscle. This double membrane is often considered continuous with the retina and a rudiment of the embryological correspondent to the retina. The inner layer is unpigmented until it reaches the iris, where it takes on pigment. The retina ends at the ora serrata.
Function

The ciliary body has three functions: accommodation, aqueous humor production, resorption, and maintenance of the lens zonules for the purpose of anchoring the lens in place.
Accommodation

Accommodation essentially means that when the ciliary muscle contracts, the lens becomes more convex, generally improving the focus for closer objects. When it relaxes, it flattens the lens, generally improving the focus for farther objects.
Aqueous humor

The ciliary epithelium of the ciliary processes produces aqueous humor, which is responsible for providing oxygen, nutrients, and metabolic waste removal to the lens and the cornea, which do not have their own blood supply. Eighty percent of aqueous humor production is carried out through active secretion mechanisms (the Na+K+ATPase enzyme creating an osmotic gradient for the passage of water into the posterior chamber) and twenty percent is produced through the ultrafiltration of plasma. Intraocular pressure affects the rate of ultrafiltration, but not secretion.
Lens zonules

The zonular fibers collectively make up the suspensory ligament of the lens. These provide strong attachments between the ciliary muscle and the capsule of the lens.