MUSCLES OF THE EYE
There are two groups of muscles within the orbit:
1- extrinsic muscles of eyeball (extra-ocular muscles) involved in movements of the eyeball or raising upper eyelids;
2- intrinsic muscles within the eyeball, which control the shape of the lens and size of the pupil.

The extrinsic muscles include:
- THE LEVATOR PALPEBRAE SUPERIORIS
- SUPERIOR RECTUS
- INFERIOR RECTUS
- MEDIAL RECTUS
- LATERAL RECTUS
- SUPERIOR OBLIQUE
- INFERIOR OBLIQUE

The intrinsic muscles include:
- THE CILIARY MUSCLE
- THE SPHINCTER PUPILLAE
- THE DILATOR PUPILLAE

+ 1 levator palpebrae superioris
Extrinsic muscles
Of the seven muscles in the extrinsic group of muscles, one raises the eyelids, while the other six move the eyeball itself. The movements of the eyeball, in three dimensions are:

- **Elevation**: moving the pupil superiorly
- **Depression**: moving the pupil inferiorly
- **Abduction**: moving the pupil laterally
- **Adduction**: moving the pupil medially
- **Internal Rotation**: rotating the upper part of the pupil medially (or towards the nose)
- **External Rotation**: rotating the upper part of the pupil laterally (or towards the temple)
1-LEVATOR PALPEBRAE SUPERIORIS

**Origin:** Lesser wing of sphenoid anterior to optic canal  
**Insertion:** Anterior surface of tarsal plate; a few fibers to skin and superior conjunctival fornix  
**Nerve supply:** Oculomotor nerve /superior branch  
**Actions:** Elevation of upper eyelid

2-SUPERIOR RECTUS

**Origin:** Superior part of common tendinous ring  
**Insertion:** Anterior half of eyeball superiorly  
**Nerve supply:** Oculomotor nerve /superior branch  
**Function:** Elevation, adduction, medial rotation of eyeball

3-INFERIOR RECTUS

**Origin:** Inferior part of common tendinous ring  
**Insertion:** Anterior half of eyeball inferiorly  
**Nerve supply:** Oculomotor nerve /inferior branch  
**ACTION:** Depression, adduction, lateral rotation of eyeball
4-MEDIAL RECTUS

**Origin:** Medial part of common tendinous ring  
**Insertion:** Anterior half of eyeball medially  
**Nerve supply:** Oculomotor nerve / inferior branch  
**Action:** Adduction of eyeball

5-LATERAL RECTUS

**Origin:** Lateral part of common tendinous ring  
**Insertion:** Anterior half of eyeball laterally  
**Nerve supply:** Abducent nerve [VI]  
**Action:** Abduction of eyeball

6-SUPERIOR OBLIQUE

**Origin:** Body of sphenoid, superior and medial to optic canal  
**Insertion:** Outer posterior quadrant of eyeball  
**Nerve supply:** Trochlear nerve  
**Action:** Depression, abduction, medial rotation of eyeball
**Origin:** Medial floor of orbit posterior to rim; **maxilla lateral** to nasolacrimal groove

**Insertion:** Outer posterior quadrant of eyeball

**Nerve supply:** Oculomotor nerve / inferior branch

**Action:** Elevation, abduction, lateral rotation of eyeball

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**Note:** Arrows indicate direction of eye movement produced by each muscle
The origins of the superior and inferior recti are situated about 23° medial to their insertions, and, therefore, when the patient is asked to turn the cornea laterally, these muscles are placed in the optimum position to raise (superior rectus) or lower (inferior rectus) the cornea. The superior and inferior oblique muscles can be tested. The pulley of the superior oblique and the origin of the inferior oblique muscles lie medial and anterior to their insertions. The physician tests the action of these muscles by asking the patient first to look medially, thus placing these muscles in the optimum position to lower (superior oblique) or raise (inferior oblique) the cornea.

Because the lateral and medial recti are simply placed relative to the eyeball, asking the patient to turn his or her cornea directly laterally tests the lateral rectus and turning the cornea directly medially tests the medial rectus.
Figure 11-24 The cardinal positions of the right and left eyes and the actions of the recti and oblique muscles principally responsible for the movements of the eyes. A. Right eye, superior rectus muscle; left eye, inferior oblique muscle. B. Both eyes, superior recti and inferior oblique muscles. C. Right eye, inferior oblique muscle; left eye, superior rectus muscle. D. Right eye, lateral rectus muscle; left eye, medial rectus muscle. E. Primary position, with the eyes fixed on a distant fixation point. F. Right eye, medial rectus muscle; left eye, lateral rectus muscle. G. Right eye, inferior rectus muscle; left eye, superior oblique muscle. H. Both eyes, inferior recti and superior oblique muscles. I. Right eye, superior oblique muscle; left eye, inferior rectus muscle.
1- OUTER FIBROUS COAT

is made up of:
1- Posterior opaque part

2- THE SCLERA
   the dense white part

1- THE CORNEA
   the anterior transparent part

The Sclera

- The sclera is composed of dense fibrous tissue and is white.
- Posteriorly, it is pierced by the optic nerve and is fused with the dural sheath of that nerve.
- The sclera is also pierced by the ciliary arteries and nerves and their associated veins.

- The sclera is directly continuous in front with the cornea at the corneoscleral junction, or limbus.
The transparent cornea is largely responsible for the refraction of the light entering the eye. It is in contact posteriorly with the aqueous humor.

**Blood Supply**
- The cornea is avascular and devoid of lymphatic drainage.
- It is nourished by diffusion from the aqueous humor and from the capillaries at its edge.

**Nerve Supply**
- Long ciliary nerves from the ophthalmic division of the trigeminal nerve.

**Function of the Cornea**
The cornea is the most important refractive medium of the eye.
THE VASCULAR COAT CONSISTS OF:
FROM BEHIND FORWARD
1- THE CHOROID
2- THE CILIARY BODY
3- THE IRIS.

1- THE CHOROID
The choroid is a black vascular membrane deep to the sclera.

2- THE CILIARY BODY
The ciliary body is continuous posteriorly with the choroid, and anteriorly it lies behind the peripheral margin of the iris. Contains the ciliary muscle (the main muscle of accommodation) which is connected to the suspensory ligaments of the lens.
The ciliary muscle is supplied by the parasympathetic fibers from the oculomotor nerve. After synapsing in the ciliary ganglion, the postganglionic fibers pass forward to the eyeball in the short ciliary nerves.

Action: Contraction of the ciliary muscle, This relieves the tension in the suspensory ligament, and the elastic lens becomes more convex. This increases the refractive power of the lens.
The Iris and Pupil

is a thin, contractile, pigmented diaphragm with a centre a

aperture

The pupil

- It is suspended in the aqueous humor between the cornea and the lens.
- The periphery of the iris is attached to the anterior surface of the ciliary body.
- It divides the space between the lens and the cornea into an anterior and a posterior chamber.

The muscle fibers of the iris are *involuntary* and consist of circular and radiating fibers.

*The circular fibers* form the sphincter pupillae

Nerve supply: The sphincter pupillae is supplied by *parasympathetic* fibers from the oculomotor nerve. After synapsing in the ciliary ganglion, the postganglionic fibers pass forward to the eyeball in the short ciliary nerves.

*The radial fibers* form the dilator pupillae is supplied by *sympathetic* fibers, which pass forward to the eyeball in the long ciliary nerves.

Action:
The sphincter pupillae constricts the pupil in the presence of bright light and during accommodation.

The dilator pupillae dilates the pupil in the presence of light of low intensity or in the presence of excessive sympathetic activity such as occurs in fright.
3-Nervous Coat: The Retina

The retina consists of:

1-AN OUTER PIGMENTED LAYER
2-AN INNER NERVOUS LAYER.

- Its outer surface is in contact with the choroid, and its inner surface is in contact with the vitreous body.

At the center of the posterior part of the retina is an oval, yellowish area, the macula lutea, which is the area of the retina for the most distinct vision. It has a central depression, the fovea centralis.
The contents of the eyeball consist of:
1- THE AQUEOUS HUMOR
2- THE VITREOUS BODY
3- THE LENS

**Aqueous Humor**
is a clear fluid that fills the anterior and posterior chambers of the eyeball.

Obstruction to the draining of the aqueous humor results in a rise in intraocular pressure called glaucoma.
The vitreous body fills the eyeball behind the lens and is a transparent gel.

The hyaloid canal is a narrow channel that runs through the vitreous body from the optic disc to the posterior surface of the lens; in the fetus, it is filled by the hyaloid artery, which disappears before birth.

The function of the vitreous body is to contribute slightly to the magnifying power of the eye. It supports the posterior surface of the lens and assists in holding the neural part of the retina against the pigmented part of the retina.
The lens is a transparent, biconvex structure enclosed in a transparent capsule. It is situated behind the iris and in front of the vitreous body and is encircled by the ciliary processes.

**Accommodation of the Eye**

To accommodate the eye for close objects, the ciliary muscle contracts and pulls the ciliary body forward and inward so that the radiating fibers of the suspensory ligament are relaxed. This allows the elastic lens to assume a more globular shape.

With advancing age, the lens becomes denser and less elastic, and, as a result, the ability to accommodate is lessened (presbyopia). This disability can be overcome by the use of an additional lens in the form of glasses to assist the eye in focusing on nearby objects.

**Constriction of the Pupil During Accommodation of the Eye**

To ensure that the light rays pass through the central part of the lens so spherical aberration is diminished during accommodation for near objects, the sphincter pupillae muscle contracts so the pupil becomes smaller.

**Convergence of the Eyes During Accommodation of the Lens**

In humans, the retinæa of both eyes focus on only one set of objects (single binocular vision). When an object moves from a distance toward an individual, the eyes converge so that a single object, not two, is seen. Convergence of the eyes results from the coordinated contraction of the medial rectus muscles.