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المحاضرة الاولى

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General information about the eye

The human eye is the organ which gives us the sense of sight, allowing us to observe and learn more about the surrounding world than we do with any of the four senses. We use our eyes in almost every activity we perform, whether reading, working, watching television, writing a letter, driving a car, and in countless other ways. The sight is the sense value more than all the rest. The eye allows us to see and interpret the shape ,colors and dimensions of objects in the world by processing the light they reflect or emit .The eye is able to detect bright light or dim light , but it cannot objects when light is absent .

The eye is a small important organ embedded in the orbital fat in the skull in a small cavity called the orbit, its protected anteriorly by the eye lids and eye barrow.

*The eye lids protect the eye from dust, insect and bright light.

*The eye lash protect the eye from sweating.

*The orbital bones, muscles and fat protect the eye posteriorly, this good protection for the eyes due to the important function of the eye which deals with visual process.

The eye consists of :

1- Eye ball.

2-Eye lids.

3-Lacrimal gland .

The eye ball consists of (3 coats) +(3 chambers)+ (the lens).

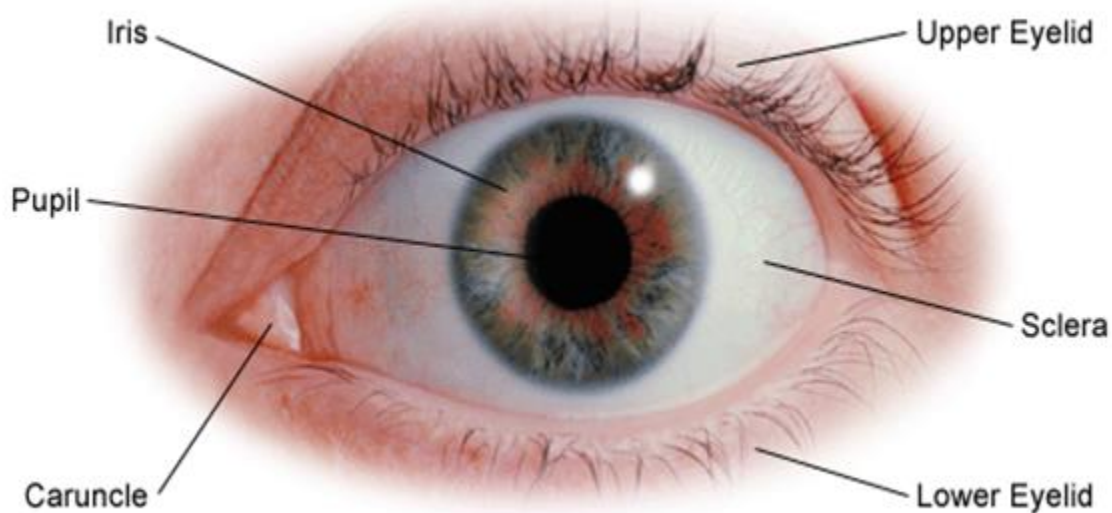
The eye ball consists of 3 coats (layers):

- 1-External coat (fibrous coat).
- 2-Middle coat (vascular coat).
- 3-Inner coat (nervous coat).

The eye ball consist of (3 chambers):

- 1-Anterior chamber.
- 2-Posterior chamber.
- 3-Vitrous chamber.

The lens of the eye is same as the lens of the camera its not contain any blood vessels or nerves.



General appearance of the eye

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The eye ball

Its lies in the anterior part of the orbit its not perfectly spherical ,its protected by :

- 1- Orbital wall.
- 2-Muscles.
- 3-Fat bad.
- 4-Eye lids and eye lash.

Coats of the eye :

1-External (fibrous coat), its contain of two parts:

- a- Cornea.
- b- Sclera.

2- Middle coat (UVEA) its contain three parts:

- a- Choroids.
- b- Ciliary.
- c- Iris.

3- Inner coat (nervous)

- a- Retina.
- b- Optic nerve.

The cornea

The appearance of the cornea is transparent, forming 1/6 of the eye ball, its separated from the iris by aqueous humour in the anterior chamber and its responsible for entering of the light through the eye .

Histology of the cornea

The anatomical structure compose of (3)layers in between (2) membranes :

1-Epithelium:

Consist of (5-6) layers of two types of cells:

- a- Squamous cells with (4-5) layers.
- b- Columnar cells with one layer which is firmly bound to the cornea and connected with conjunctiva at the margin of the cornea.

2-Anterior lamina or bowmans membrane, which separated between epithelium and stroma and its resist the infection.

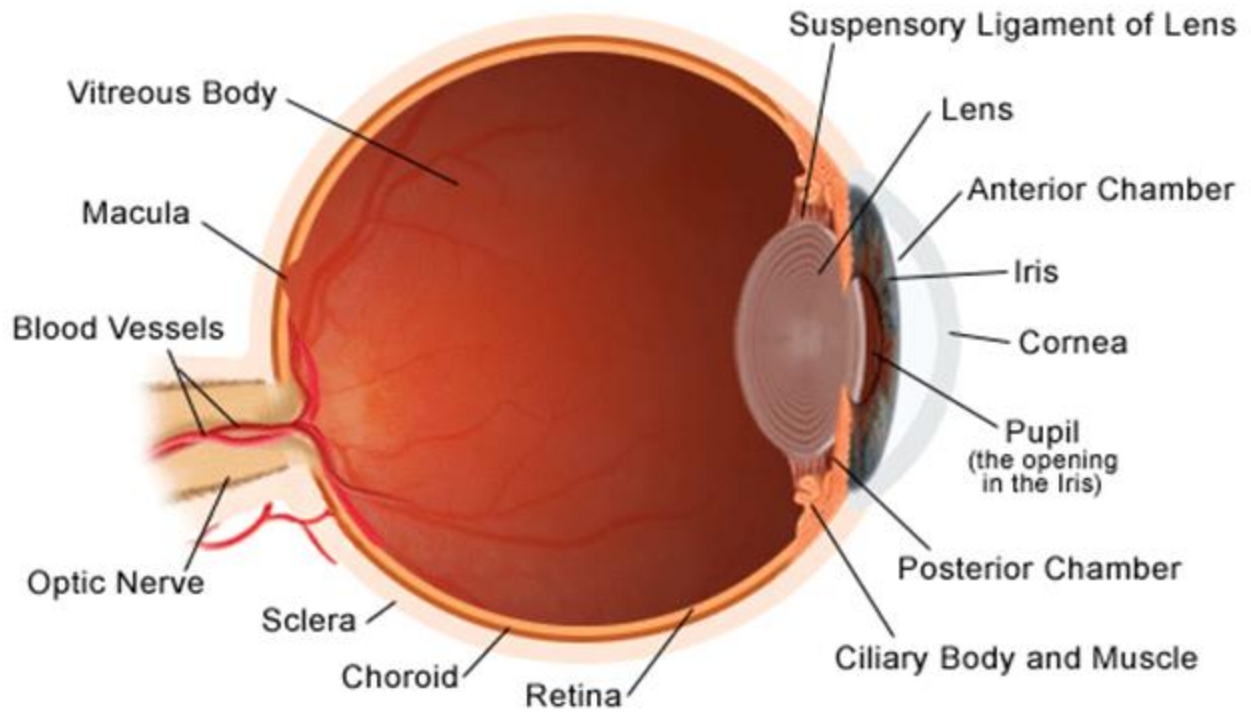
3-Stroma

It's about (60%) of the cornea with (60) layers of fibrous tissue arranged in a manner that gives its transparency. There are no blood vessels and no pigment cells.

4-Posterior elastic lamina or (decement membrane).

Its strong elastic plate, separated between the stroma and endothelium .

5-Endothelium: It's one layer (granular cells)its continues with anterior part of the iris.



Anatomical structure of the eye

Sclera

It's a white ,dense fibrous coat, surrounding the eye from all sites except the anterior surface in which the cornea presents, and its form 5/6 of the eye ball. The sclera (from the Greek skleros, meaning hard), also known as the white of the eye, is the opaque, fibrous, protective, outer layer of the eye containing collagen and elastic fiber. In humans the whole sclera is white, contrasting with the colored iris, but in other mammals the visible part of the sclera matches the color of the iris, so the white part does not normally show. In the development of the embryo, the sclera is derived from the neural crest. In children, it is thinner and shows some of the underlying pigment, appearing slightly blue. In the elderly, fatty deposits on the sclera can make it appear slightly yellow.

The sclera forms the posterior five-sixths of the connective tissue coat of the globe. It is continuous with the cornea, and maintains the shape of the globe, offering resistance to internal and external forces, and provides an attachment for the extra ocular muscle insertions. The sclera is perforated by many nerves and vessels passing through the posterior scleral foramen, the hole that is formed by the optic nerve. pass. The thickness of the sclera varies from 1mm at the posterior pole to 0.3 mm just behind the rectus muscle insertions. The sclera's blood vessels are mainly on the surface. Along with the vessels of the conjunctiva (which is a thin layer covering the sclera), those in the episclera render the inflamed eye bright red.

Limbus : Is the line that separated sclera and cornea.

Histology of the sclera

The sclera consist of three fibrous layers:

1-Episcleral tissue.

Its fibrous tissue connected with tendon capsule which covers the sclera

2-Sclera proper.

It's a net of fibrous tissue.

3-Mesodermal layer.

Its contain small fibrous bundle with pigment cells.

Canal of Schlemm

It's a small channel in the sclera (in the limbus) its oval in shape, its function is to drainage the aqueous humour in the anterior chamber to the aqueous vein through the space of fontana .

Pectinat ligament

Its continuous of the margin of the decement membrane in the cornea its divided in bundles of fibers, some of these pass into choroids and others arch to the iris so the cornea connected to the iris by this ligament.

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المحاضرة الرابعة

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Middle coat (UVEA)

It's the colored layer of the eye which consist (3)parts

A- The iris

The iris is a thin, circular structure in the eye. It controls the diameter and size of the pupils.

Eye color is the color of the iris. In humans, the iris may look green, blue, brown, hazel (a combination of light brown, green and gold), grey, violet, or even pink. In response to the amount of light entering the eye, muscles attached to the iris expand or contract the pupil. The larger the pupil, the more light can enter the eye and reach the retina.

It lies in front of the lens, and behind to the cornea, Its circular structure with different color varies from person to other and there is a small hole in the center of the iris called pupil .

The function of the pupil is to control the amount of light entering the eye and reaching the retina, this occur by two sets of muscles fibrous:

- 1- Circular muscles called sphincter pupillae.
- 2- Radial muscle called dilater pupillae.

(Both are involuntary muscle)

Histology of the iris

Its (4) layers:

- 1-Anterior endothelium
- 2- Stroma (sphincter pupillae)
- 3-Posterior membrane (dilater pupillae)
- 4-Posterior epithelium.

1-Anterior endothelium

It's one layer of squamous cells continuous from the endothelium layer of the cornea.

2- Stroma

It consist of :

a- Connective tissue

b-Circular muscle fiber (sphincter pupillae)

c-Chromophore cells which is responsible for the color of the iris, when its little so the iris become blue or gray.

d- Blood vessels.

3-Posterior membrane

Contain radial muscle fibers which dilated the pupil (involuntary muscles).

4-Posterior epithelium:There are (2) types of cells:

a- Spindle shape.

b- Cubic shape.

Nerve supply of the iris :

1- Trigeminal nerve (sensory nerve fiber).

2- Oculomotor nerve (motor nerve fiber).

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المحاضرة الخامسة

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Middle coat (UVEA)

Ciliary body

It's the second part of the middle coat of eye ball. It lies between the iris and the choroids ,its triangle in shape ,the wide margin (anteriorly) connected to the iris while the narrow margin (posteriorly) called Ora Serrata .

Ora Serrata: Is the posterior point of the ciliary body in which the retina started .

Histology of the ciliary body

There are three layers:

1- Epithelium layer.

2- Stroma.

3-Ciliary processes.

1- Epithelium layer

Its consist of two layers of cells lining the inner side of the ciliary body and connected with the posterior epithelium of the iris. The outer layer consists of pigment cells, while the inner layer free of them.

The suspensory ligament of the lens originated from this layer.

2- Stroma

It consists of connective tissue ,blood vessels, and ciliary muscles which are involuntary muscles and are (3) groups :

a- Longitudinal muscles fibers which are continuous with the sclera and it originated from scleral spur and inserted to the choroids.

Scleral spur: It's a prominent in the sclera in its inner side connected to the cornea.

b- Circular muscle fibers.

It lies in the anterior part of the ciliary body .Its form circular ring around iris, originated from scleral spur and inserted to the choroid.

c- Radial muscle fibers.

Its originated from scleral spur and inserted to the choroids.

The function of these muscles fibers (the 3 groups) is to make the lens more circular and this lead to opening of the canal of Schlemm.

3- Ciliary processes

It consists two layers of cells filled with capillary vessels forming a net ,it's about 75 processes .The function of ciliary processes are the secretion of aqueous humour.

Nerve supply of ciliary body :

- 1- Short ciliary nerve (a branch of Oculomotor nerve) responsible for contraction of ciliary muscles.
- 2- Long ciliary nerve (a branch of Oculomotor nerve) responsible for relaxation of ciliary muscles.

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Middle Coat The Choroid

The choroid, also known as the choroidea or choroid coat, is the vascular layer of the eye, containing connective tissue, and lying between the retina and the sclera.

The choroid provides oxygen and nourishment to the outer layers of the retina. The structure of the choroid is generally divided into four layers :

1-Haller's layer - outermost layer of the choroid consisting of larger diameter blood vessels.

2-Sattler's layer - layer of medium diameter blood vessels.

3-Choriocapillaris - layer of capillaries.

4-Bruch's membrane - innermost layer of the choroid.

It's the largest part of the middle coat it lies between sclera and retina, its spongy tissue responsible for nutrition of the retina ,it consist of three layers of blood vessels with different size :

The blood vessels of the choroid collected to form Vortex veins.

In some animals (cats and dogs) there is crystal in the cells of the choroidal layer which reflected the light during night.

Inner coat of the eye ball (nervous coat)

It consist of two parts:

1- Retina.

2- Optic nerve.

1- The retina : is the third and inner coat of the eye which is a light-sensitive layer of the eye ball. the retina and the optic nerve originate as outgrowths of the developing brain, so the retina is considered part of the central nervous system (CNS) and is actually brain tissue.

The retina is a layered structure with several layers of neurons interconnected by synapses. The only neurons that are directly sensitive to light are the photoreceptor cells.

Macula Lutae : is a small oval dark spot in the retina with slight depression called (fovea centralis)which is responsible for central vision.

2- Optic nerve :is about 4 cm. long ,runs backward and medially through the posterior part of the orbital cavity, then pass through the optic canal into cranial cavity and joint the optic chiasms Optic disc : it's the area in which the optic nerve and the blood vessels(artery and vein) pass through the eye ball it's also called (physiological blind spot) because there is no nerve cells in this area so there is no nerve impulse = blindness (in this spot only)

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Histological layers of the retina

It consist of ten layers from inside to outside:

1-Internal limiting membrane.

2-Optic nerve fiber layer.

3- Ganglionic cells layer.

4- Inner plexiform layer

5- Inner nuclear layer.

6-Outer plexiform layer

7-Outer nuclear layer

8-Outer limiting membrane

9-Rods and Cones layer.

10-Pigment epithelium layer.

Rods and Cones layer is the most important layer which is responsible for vision and forming the nerve impulse to transmitted to the brain through the optic nerve.

Rods :are about (125-150) million parts in the retina which is sensitive for nocturnal vision ,they are look like cylinder in shape.

Cones :are about (6-7) million cones responsible for diurnal vision and color vision .It increases in fovea centralis and macula lutea.